

# Inadequate Institutions and Inefficient Outcomes in Mexico's Sugar Industry

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## Abstract

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Institutions can encourage market development and economic growth by creating incentives for individuals to invest in productivity. When institutions fail to create incentives, or create incentives for individuals to make poor production decisions, development objectives may suffer as a result. In this thesis, I argue that dysfunctional formal and informal institutions weaken the incentives to invest in sugarcane for Mexican farmers and sugar mill owners; furthermore, that these institutional weaknesses, and not trade liberalization, cause low-quality sugarcane and inefficient sugar production. Land tenure institutions create incentives for farmers to continue producing on small plots of land while sugarcane farmer associations fail to coordinate farmers' investment and cultivation decisions. Industry pricing regulations weaken farmers' incentives to improve their sugarcane stock. A history of government expropriation of sugar mills unexpectedly creates incentives for owners to invest more in mills than in increasing field productivity. Increasing migration from sugarcane-producing regions and land consolidation efforts by Mexican sugar mills suggest that current inefficient production standards may soon change. Institutional reforms would speed up this process while also seeking to improve farmer welfare during the transition.

In *The Open Veins of Latin America*, Eduardo Galeano argues that gold, sugar and oil drove colonial states and modern powers to reap Latin America's riches while leaving its population poverty-stricken and struggling to survive under states that fail to defend their interests.<sup>1</sup> Sugarcane and sugar production were an important source of wealth for many Latin American countries, including Mexico. During the colonial period, haciendas were established to mass produce and process sugarcane; African slaves and indigenous laborers were forced to work the land.<sup>2</sup> Sugar exports generated important foreign exchange for the country, while also providing much-needed calories to its population. In contrast, today sugar is not nearly as valuable as gold or oil, its role in generating foreign exchange is far less important, and a growing obesity problem in Mexico indicates most of the population can access more than enough calories for survival.

Sugar is no longer valued as highly as it was in colonial times, but it remains a strategic commodity for the Mexican government, which protects sugar producers from international trade and supports them with high subsidies.<sup>3</sup> Sugarcane cultivation and processing supports an estimated 2.2 million Mexicans.<sup>4</sup> Concerned about welfare and political implications should the industry fail, in 2009 the Mexican government spent 114.4 million pesos to support the sugarcane sector. Supports to sugar were second in importance to supports provided to corn farmers, and represent 8% of the country's agricultural subsidies.<sup>5</sup>

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<sup>1</sup> Eduardo Galeano, *Open Veins of Latin America: Five Centuries of the Pillage of a Continent*, 25th ed. (Monthly Review Press, 1997).

<sup>2</sup> Ibid.

<sup>3</sup> \_\_\_\_\_, *Tenencia de la tierra e industria azucarera*, \_\_\_\_\_, 2007).

<sup>4</sup> Leonard Mertens, *Hacia el trabajo decente en el sector de azúcar*, Working Paper (Ginebra: Oficina Internacional de Trabajo, 2008).

<sup>5</sup> *Caña de azúcar*, Mesa de Trabajo/Diálogo (Agroprospecta; Red Mexicana de Investigación en Política Agroalimentaria, March 2009), <http://www.agroprospecta.org/docs/Mesas/CanaAzucarMarzo09.pdf>.

Despite sugar's importance and the support provided to the industry each year, the Mexican sugar industry has stagnated, and sugarcane producers facing low incomes increasingly migrate to the United States.<sup>6</sup> Some analysts have identified market liberalization strategies Mexico pursued as a cause of the crisis in the sugar industry.<sup>7</sup> Mexico's development policy for much of the twentieth century included centralized markets and high levels of public ownership and investment in industrial processes, including sugar production. Beginning in the late 1980s, Mexico adopted a development strategy of less regulated markets, privatized state-run industries, and liberalized trade. A similar process took place within the sugar industry, though the state still controls 14 sugar mills and regulates some aspects of sugar production and marketing. While the shift from a centrally planned to a market-based economy proved difficult and jeopardized the livelihoods of many smallholder farmers, I argue that the market transition does not provide the entire explanation for low productivity in Mexico's sugar sector. Instead, in this thesis I identify how formal and informal institutions in Mexican sugar production shape producer decisions and constrain farmers from making investments to improve production. By analyzing the ways in which institutions—defined as society's written and unwritten rules—determine productivity in the sugar industry, I contribute to the growing literature on the impact of institutions on development.

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<sup>6</sup> Francis Mestries Benquet, "Crisis Agrícola y Emigración en Veracruz," *Comercio Exterior* 55, no. 12 (Diciembre 2005): 1030.

<sup>7</sup> Peter Singelmann, *Mexican sugarcane growers: economic restructuring and political options* (La Jolla Calif.: Ejido Reform Research Project Center for U.S.-Mexican Studies UCSD, 1995); Luis Garc

, 1997); Francis Mestries Benquet, "Globalización, crisis azucarera y luchas cañeras en los años noventa," *Sociológica* 15, no. 44 (September 2000): 41-68.

I first present an overview of the choices farmers and mill owners make during sugarcane cultivation and sugar production. Next, I explore Mexico's sugar markets and identify low field productivity as the primary contributor to the sector's limited growth. I then explore the ways in which poor climate and lack of investments in sugarcane cultivation and harvest cause low productivity. Following a brief exploration of scholarly literature on institutions, I argue that the ejido system of smallholder farming, farmer associations, the pricing policy, and mill expropriations have structured the market in ways that incentivize farmers to make inefficient production decisions. Finally, I offer predictions on how the industry may change in the future and conclude with policy suggestions that seek to alter the incentives institutions offer farmers, in a sense changing the rules of the game for producers and for Mexican sugar production.

## **I. Cane Sugar Production Choices**

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Cane sugar is produced by extracting the chemical compound sucrose from sugarcane. Higher levels of sucrose in sugarcane allow for more efficient extraction. To obtain sugar, mills press molasses out of sugarcane and refine it into a syrup, brown sugar, or white sugar. While sugar can be consumed anywhere along the production process—as molasses, syrup, brown or white sugar—its quality and price increase at greater levels of processing.

Sugarcane originated in Indonesia, but it has been adapted for cultivation around the world. A member of the grass family, sugarcane grows best in hot, sunny climates with moderate rainfall. However, unlike its cousin corn, sugarcane can be hardy through droughts and other adverse climate conditions. Once planted, cane must grow for 18 months before it



can be harvested by cutting the plant at the base of its stalk. After the initial harvest, cane will resprout and can be harvested again the next year. The process can be repeated for up to 10-15 years but sucrose content decline each year; after the 6<sup>th</sup> year sugarcane contains so little sucrose that it is not well-suited for sugar production.<sup>8</sup>

### **Farm-level Production Decisions**

A farmer's production decisions affect the quantity of sugarcane he can produce and the quality of his cane's sucrose content upon delivery to the mill. Sugarcane is sometimes referred to in Mexico as a "lazy crop" because the plant will produce for years without much oversight or care from the farmer.<sup>9</sup> The nickname belies the fact that sugarcane quality varies greatly depending on the quality of husbandry that it receives. Sugarcane's sucrose content changes depending on seed variety, irrigation and fertilizer levels, days of sunlight, planting and harvesting times, age of the plant, as well as the delay between harvest and processing. Sucrose levels vacillate from year to year, with warm, wet years producing a sugarcane crop with higher sucrose levels. Still, farmers' decisions can improve sucrose content despite poor weather. For example, farmers must determine whether their land is well-suited for growing sugarcane, and make decisions about the kinds of inputs they can provide their crop. For most of these investments, farmers seek financing to cover the initial expense of the purchase or to smooth consumption over the period in which he will not be able to harvest cane. Sugarcane requires 20-40 days of manual labor per hectare,<sup>10</sup> so farmers must also choose whether to commit that labor themselves, to hire outside labor to care for cane, or to commit some or no labor to

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<sup>8</sup>

<sup>9</sup> Farmer Interviews in Atoyac, Veracruz, in person, July 31, 2009.

<sup>10</sup> Mertens, *Hacia el trabajo decente en el sector de azúcar*.

sugarcane's care. While the plant will continue growing without the proper investments, the harvested cane will be highly fibrous, making it more difficult to obtain sucrose during the industrialization process.

Sugarcane harvesting techniques aim to reduce sucrose loss or reduce the delay between harvest and delivery to the mill. The sucrose in sugarcane starts to decompose as soon as the cane is harvested, losing 10% of their sucrose content within 24 hours of the harvest,<sup>11</sup> so the stalks must be quickly transported to a sugar mill for processing. Producers must choose between a manual or a mechanized harvest, depending on the cost of manual labor and the cost of investing in a cane-cutting machine, as well as the marginal losses of sucrose content each technique incurs.

The majority of the world's sugarcane production is completed by hand by first burning and then cutting the crop.<sup>12</sup> When done correctly, burning sugarcane can temporarily preserve sucrose. Manual harvesters then cut close to the base of the plant where the sucrose content is greater. They carry cane to trucks for transport, or place it in orderly piles so that a lifting machine can place the piles in a truck. The manual harvest is slow, brutal work for laborers, and can be very dangerous.<sup>13</sup> If farming households are not willing or able to provide labor themselves they must hire outside labor. Burning cane also poses risks to the rest of the crop, should a fire get out of control.

Mechanized harvests use machines to cut and transport cane, and offer another option for completing the sugarcane harvest. Sugarcane does not need to be burned before it is

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<sup>11</sup> Francisco Argüello Zepeda and Jose Luis de la Cruz R., *La privatización de la industria azucarera mexicana y su impacto social* (Universidad Autónoma de Tamaulipas/Consejo Tamaulipeco de Ciencia y Tecnología, Tampico, 1998).

<sup>12</sup> Mertens, *Hacia el trabajo decente en el sector de azúcar*.

<sup>13</sup> Ibid.

harvested mechanically, reducing the threat that other crops will catch fire. Machines cut and deposit cane into a transporting vehicle in one movement, greatly speeding up the harvest; one machine can harvest the equivalent of 250 laborers.<sup>14</sup> However, machines are not able to cut cane stalks as close to the ground as manual laborers, resulting in some sucrose losses. They also tend to include more rocks, dirt, and other foreign materials with the harvested cane, which slows the industrialization process.<sup>15</sup> Machines are also a large capital investment that poor farmers cannot afford, and work best on flat, unrocky terrains of 20 hectares or more.<sup>16</sup> Farmers who can afford to mechanize their harvest, and do so on land that is appropriate for the machinery, will save time and improve the sucrose content of their sugarcane.

Because sugarcane is processed in large quantities at a time, cultivation decisions must also take into consideration mill capacity for processing the sugarcane it receives. Producers need to coordinate their harvest, cutting, and delivery to ensure the mill can receive their cane upon arrival, since the cane loses sucrose during processing delays. At the same time, the mill owner will seek to run the mill exactly at capacity in order to extract the greatest efficiency from electricity and other sunk costs of operation. Especially in regions composed of many small to medium farmers, farmer-mill coordination is necessary to ensure cane is processed quickly and at lowest cost.

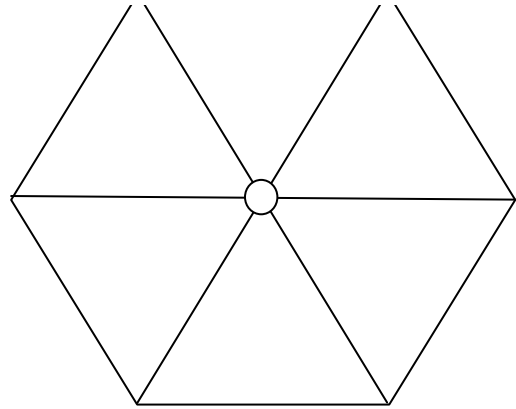
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<sup>14</sup> *Diagnóstico y Propuestas de Acciones para Hacer Mas Eficientes La Operación del Proceso Cosecha-Transporte-Abasto* (Distrito Federal: SAGARPA, August 2008).

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

Figure 1 depicts an efficient production and processing method for sugarcane. The small circle in the middle of the hexagon represents the mill, while each surrounding triangle is an expanse of land



dedicated to sugarcane.<sup>17</sup> In order to take advantage of both mill capacity and peak sucrose levels in the sugarcane, planting and harvest should be organized such that one farmer's crop matures earliest, is harvested and sent to the mill. In sequence, the rest of the farmers' crops should peak in short succession after the first farmer, such that machinery use and transport is minimized while sucrose is maximized. Of course, if one farmer's crop is not sufficient to maintain mill capacity, several farmers should coordinate their crop during the cultivation period so it can be harvested at the same time.

### Challenges for Smallholder Sugarcane Production

Sugarcane production benefits from economies of scale. In the United States' antebellum South, large sugarcane plantations of more than 200 hectares benefited from economies of scale when compared with smaller neighboring farms.<sup>18</sup> Plantations could implement cost-saving measures such as the mechanization of the harvest and the use of steam mills to press cane soon after cutting, thus preserving the syrup. Plantations could also afford more slave labor, and could organize that labor in factory-style production. Small farms did not have access to capital or credit to make large purchases. Even if they did, the production techniques

<sup>17</sup> Figure and explanation drawn from interview with Enriquez Poy, Manuel; Asociacion de Tecnicos Azucareros de Mexico, in person, July 20, 2009.

<sup>18</sup> Mark D. Schmitz, "Economies of Scale and Farm Size in the Antebellum Sugar Sector," *The Journal of Economic History* 37, no. 4 (December 1977): 959-980, <http://www.jstor.org/stable/2119350> (accessed December 21, 2009).

would not have been cost-effective, given the small size of their farms. As a result, small farms produced sugarcane more slowly, and at lower quality.

Today, small farmers of sugarcane in countries like Mexico, India, and Thailand face the same challenges competing against mega-farms in Australia and Brazil. Innovations like improved seeds and fertilizer may improve production for both large and small farmers today, but other mechanical innovations from the last 150 years, such as harvesting machines and mechanical irrigation, benefit large farmers who can finance the investment and reap the benefits.

Smallholder sugarcane producers can work together to achieve economies of scale and be more competitive against larger farms, but policies that try to promote coordination must take into account on-the-ground realities. Recent research to improve smallholder productivity reflects some of these challenges. For example, smallholder cooperatives aim to organize farmers, helping them overcome coordination problems to make joint investments.

Cooperatives face challenges, though, in areas where access to land is not homogenous and farmers with larger landholdings may use their unequal power to obtain higher rents.<sup>19</sup>

Outgrower schemes in which the sugar mill contracts with many small farmers and provide production inputs intend to help smallholders coordinate their production and achieve the benefits of scale. Sugar mills that own their own lands will resist outsourcing, though, since contracting with small farmers increases their risk and transaction costs.<sup>20</sup> Regions in which

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<sup>19</sup> Abhijit Banerjee et al., "Inequality, Control Rights, and Rent Seeking: Sugar Cooperatives in Maharashtra," *The Journal of Political Economy* 109, no. 1 (February 2001): 138-190, <http://www.jstor.org/stable/3078528> (accessed September 18, 2009).

<sup>20</sup> Kurt Sartorius and Johann Kirsten, "The boundaries of the firm: why do sugar producers outsource sugarcane production?," *Management Accounting Research* 16, no. 1 (March 2005): 81-99,

smallholder sugarcane production predominates face additional challenges attaining the productivity levels of large farms regions.

### **Mill-level Production Choices**

In the processing stage, mill owners also make decisions that affect efficiency and quality. Without entering into a technical discussion of the sugar-making process, it is important to note that mills look for ways to maximize sucrose extraction and minimize labor, electricity and machinery costs. For example, mills may choose to pay more for sugarcane with a high sucrose and low fiber content to avoid expensive repairs to machinery. Cane fiber can stick to machinery, lowering extraction efficiency and increasing the risk that machinery will break.<sup>21</sup> For similar reasons, mills prefer buying cane that is free of dirt, rocks, and other foreign materials. Finally, mill owners prefer locations and business relationships which ensure consistent and coordinated delivery of sugarcane; such knowledge will facilitate a mill's production and maximize its marginal product of labor and capital.

One way to increase the utility of processing sugarcane—or at the very least reduce its cost—is to process the byproducts from sugar production. For example, mills can sell the excess fiber—called bagasse—to paper-processing plants. Syrups can be processed into industrial alcohols and alcohol-based products. Mills and alcohol distilleries often locate near each other to take advantage of this sugar by-product, while some mill owners may choose to invest in an in-house distillery to integrate production. Recently fiber has been put to highly profitable use

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<http://www.sciencedirect.com/science/article/B6WMY-4FBFR06-1/2/b5ec03bb416186c19d4827e934cb6e6f> (accessed July 27, 2009).

<sup>21</sup> Pacheco, Jorge; Zafranet, July 2, 2009.

by combusting it for electricity generation.<sup>22</sup> Since sugar mills typically use an exceptionally high amount of electricity, the ability to be self-reliant on electricity is very attractive to mill owners.

Given the various processes that may be taking place within one mill—sugar processing, electricity generation, alcohol distillation, among others—mill owners face choices about how and where to invest. Since the industry itself is over 500 years old, many outdated mills rely on antiquated technologies for processing cane. Owners can make repairs to existing processes or invest in new ones which may provide additional value-added production. In the example of electricity generation, older mills utilize outdated machinery that lack the technical capacity to transform burning bagasse into electricity.<sup>23</sup> Such mills would need to undertake large capital investments to obtain this capacity, perhaps at the expense of making repairs to equipment used to process sugarcane.

Among the final decisions a mill owner needs to make regards the type of sugar he chooses to produce. Sugar can be processed into three general varieties: mascabado, brown, and white sugar. There are numerous quality differences within these categories. For example, while mascabado sugar is generally inedible, the Mexican variety, piloncillo, is edible.<sup>24</sup> White sugar can be produced at internationally recognized ISO levels, which indicate differing qualities. Mill owners make choices about the kind of sugar they produce and the quality of

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<sup>22</sup> Noe Aguilar Rivera et al., “¿Por qué diversificar la agroindustria azucarera en México?,” *Globalizacion, Competitividad, y Gobernabilidad*, 2009, 10.3232./GCG.2009.V3.N1.03.

<sup>23</sup> Ibid.

<sup>24</sup> Donald Mitchell, *Sugar policies opportunity for change* (The World Bank, February 2004), RePEc, <http://ideas.repec.org/p/wbk/wbrwps/3222.html> (accessed March 31, 2009).

that sugar based on the market price and demand preferences they face, as well as their mill's production capabilities.

Finally, mills decide how, where, and through whom they market their final product. Given the fact that sugar is produced for only a few months a year, mills may decide to store some of their production to avoid swamping the market and driving down prices (and conversely to take advantage of high prices during the months outside the harvest). Next, mills choose whether to market sugar themselves, whether to use an intermediary, or whether to vertically integrate with another industry which relies on sugar inputs, such as the beverage or confectionary industry. Finally, mill owners choose whether to market their product to consumers located in the domestic or foreign markets, whether their sugar will be for household consumption, small business consumption such as bakeries, or large enterprise production. Of course, many of these choices will be made before a mill's sugar hits the market, given the varying preferences of production and delivery among these different consumers.

The decisions farmers and mill owners make affect one another as much as they affect the decision maker himself. When a sugarcane farmer chooses to invest in his crop, he improves sucrose content and allows the mill owner to process sugar more efficiently. Since a global market for sugarcane is virtually non-existent, given how quickly sucrose decomposes in sugarcane, farmers rely on mills to make production and marketing decisions that ensure sugarcane (in the form of sugar) reaches a final consumer. When a mill makes poor production decisions, output and revenues may suffer. Farmers, sensing an uncertain business climate, may choose to switch crops to ensure continued income. Farmers and mill owners are separate actors participating in a business transaction for sugarcane, and as such they may sometimes



see their roles as adversarial. However, their choices during the production process also make them interdependent. This thesis addresses why Mexican farmers and mill owners sometimes fail to make production decisions that would improve the quality of sugarcane and the efficiency of sugar production. To understand the issue, I begin by exploring indicators of low productivity in the Mexican sugar industry. I then address what is causing these problems, and why.

## II. Low Productivity in the Mexican Sugar Industry

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Mexico is among the leading nations in cane sugar production because its fields produce lots of sugarcane, not because its sugarcane contains a lot of sucrose. Mexico is slowly increasing sugar production, though gains in output one year are often diminished when production falls the next year (see Figure 2). The 1980s saw 3% annual growth in output, mostly because more land was incorporated into production.<sup>25</sup> Growth in the sector has averaged only 1% each year since the 1990s. Domestic sugar production in Mexico is usually able to meet domestic demand while high tariffs protect the market from international competition (See Figure 3).<sup>26</sup> Mexico is the world's seventh largest producer of sugar, and is fifth among cane-sugar producing nations.<sup>27</sup> Mexico is also sixth in the world for sugar consumption.<sup>28</sup>

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<sup>26</sup> Tariffs on raw sugar are 136%, while tariffs on refined sugar imports are 127%. Mitchell, *Sugar policies opportunity for change*.

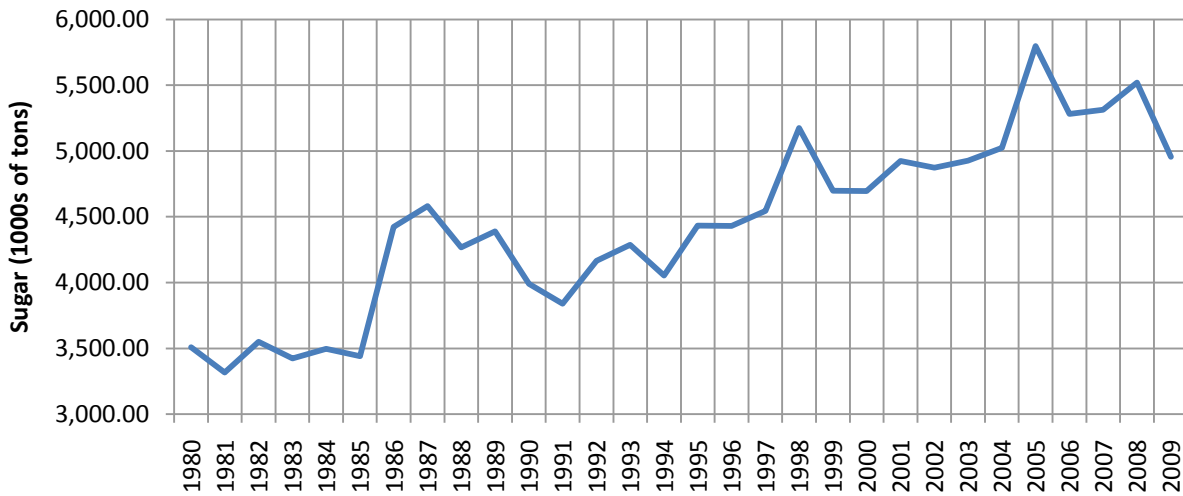
<sup>27</sup> *Sugar: World Production Supply and Distribution* (Washington, D.C.: Foreign Agricultural Service, USDA, November 2009), [http://www.fas.usda.gov/htp/sugar/2009/Nov\\_sugar\\_2009.pdf](http://www.fas.usda.gov/htp/sugar/2009/Nov_sugar_2009.pdf).

<sup>28</sup> Foreign Agricultural Service via *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009* (Mexico City: Unión Nacional de Cañeros A.C. - CNPR, 2009).

## Low Sucrose Content in Sugarcane and Stagnating Cane Yields

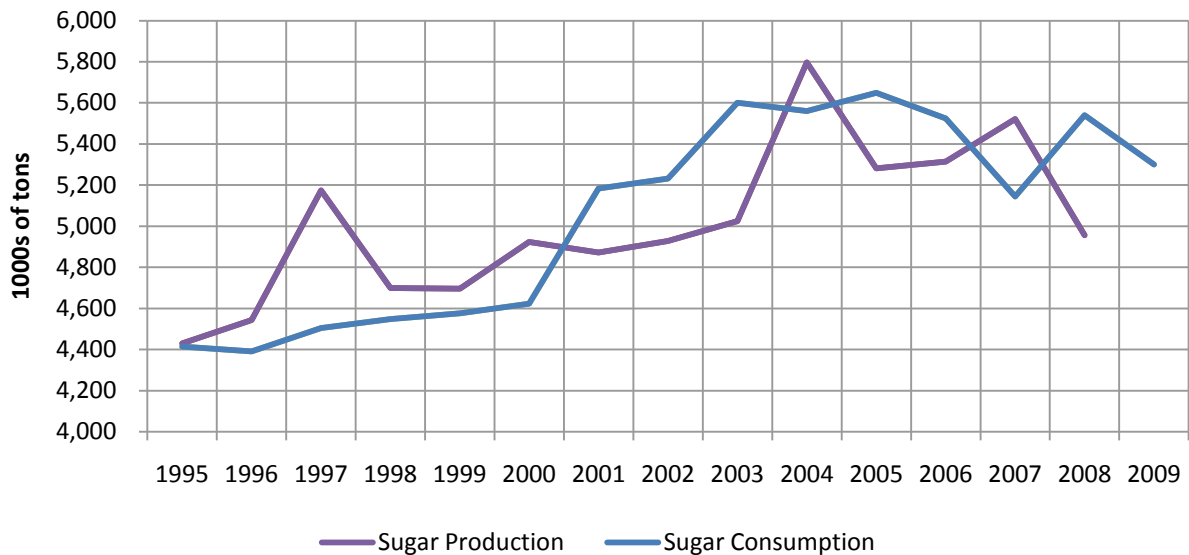
Despite high overall output, Mexico's sugar industry suffers from low productivity due to stagnating sugarcane yields and low sucrose content in sugarcane. Mexico's sugarcane yields usually outperform both Brazil and India, which are world leaders in sugar production (See

Figure 2: Sugar Production in Mexico



Source: FAOStat

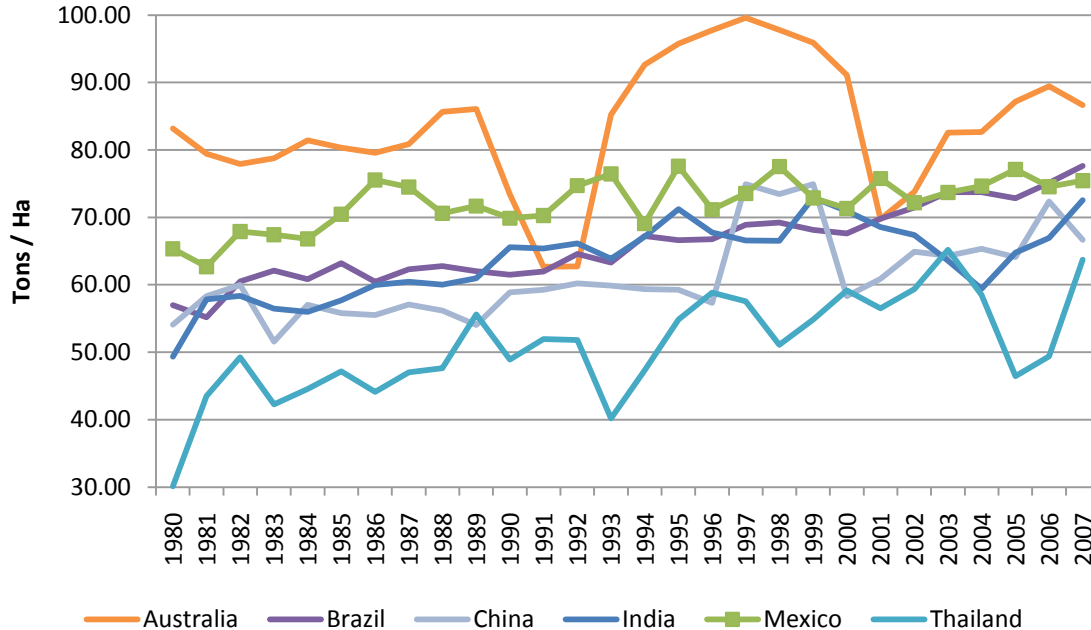
Figure 3: Sugar consumption outstrips production in recent years



Source: Production: "FAOSTAT" (Rome), faostat.fao.org. Consumption: SAGARPA

Figure 4).<sup>29</sup> In recent years, though, Brazil has increased yields to almost 80 tons/hectare; India and China have also improved sugarcane yields, surpassing Mexico's yields several times in recent years.<sup>30</sup> Meanwhile, Mexican yields grew only 8% in the 1990s and initial estimates suggest a 7% increase from 2001 to 2008.<sup>31</sup> During droughts, yields suffer even more; in 2009 sugarcane production reached only 64 tons per hectare; yields that low haven't been seen since 1974.<sup>32</sup> Mexico may no longer be a leader in sugarcane yields for the Western Hemisphere, but it remains a leader among other large producers. It is too soon to say whether Mexico's sugarcane yields are beginning a long-term decline. Nevertheless, the potential for continued low sugarcane yields mean losses in overall sugar produced, threatening Mexico's position as a top producer of cane sugar.

Figure 4: Mexico's sugarcane yields are high, but not growing



Source: FAOSTAT

<sup>29</sup> "FAOSTAT" (Rome), faostat.fao.org.

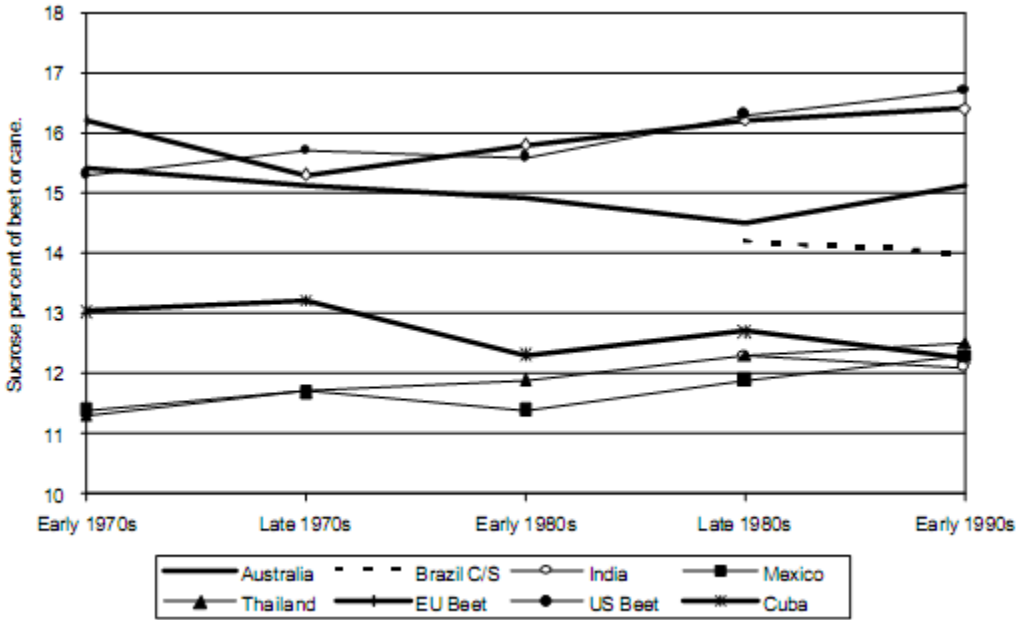
<sup>30</sup> *Sugar: World Production Supply and Distribution*.

<sup>31</sup> "FAOSTAT"; *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*.

<sup>32</sup> *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*.

A more concerning indicator is the low levels of sucrose in Mexican sugarcane. Unlike sugarcane yields, the sucrose content in Mexican sugarcane has historically been low compared to other countries.<sup>33</sup> Figure 5 compares sucrose levels among top sugar-producing nations for the later third of the 20<sup>th</sup> century. Mexican sugarcane consistently contains the lowest sucrose levels as a percent of overall sugarcane, meaning Mexican sugarcane is highly fibrous and cannot be efficiently processed into sugar. Low sucrose levels undercut high sugarcane yields, since it takes more low-quality sugarcane to produce the same amount of sugar as smaller amounts of high-sucrose sugarcane. Mexico is well below the sucrose levels that Australia and India consistently attain, reducing its competitiveness with other major producing nations.

Figure 5: Average Sucrose Content of Beet or Cane Sugar, the 1960s to the 1990s



Source: LMC International

<sup>33</sup> James Fry, *Regional Competitiveness in the Sugar Industry* (Oxford: LMC International Ltd.), Google Scholar, <ftp://ftp.fao.org/docrep/fao/005/x4988e/x4988e15.pdf> (accessed January 1, 2010).

Not all sugarcane-growing regions produce cane with consistently low sucrose content.

Figure 6 charts the percentage of sucrose in sugarcane among Mexico's six producing regions.

While most producing regions tend toward the national average of 13.52% sucrose content in

sugarcane (for years 1999-2009), the Central states of Puebla and Morelos achieve higher sucrose

levels that are competitive with Australia. Some regions like the Pacific, comprised of the states

of Jalisco, Michoacan, Nayarit and Colima, come close to achieving similarly high levels of

sucrose. However, the Gulf state of Veracruz, which contributes over 40% of national

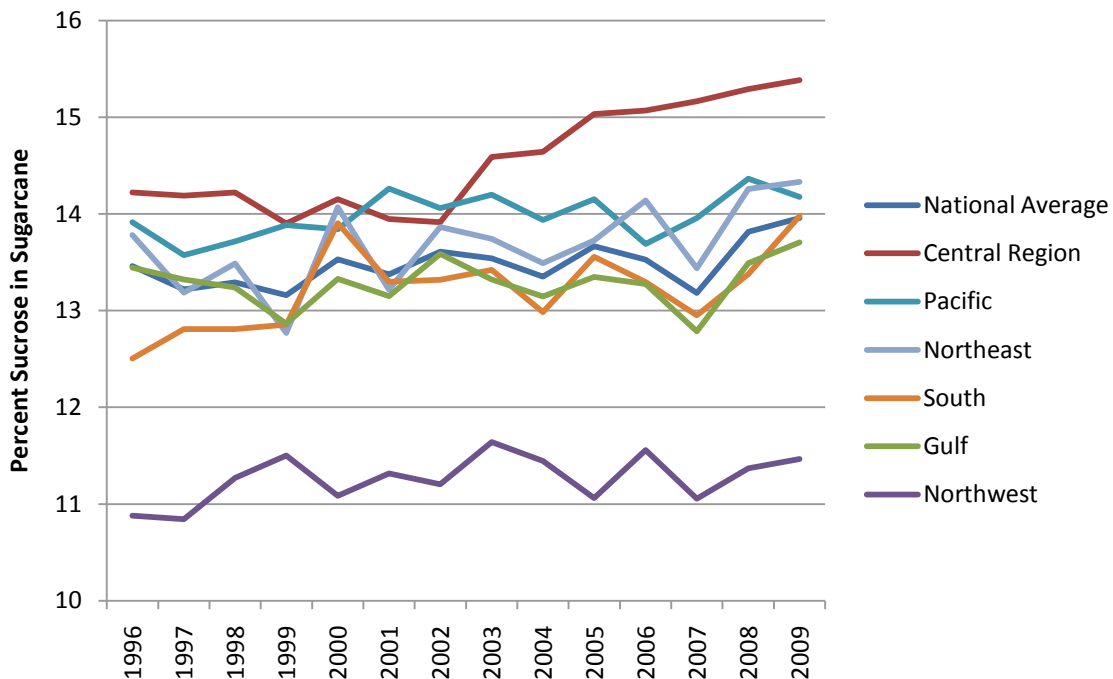
sugarcane production, and the Northeastern state of Sinaloa struggle below the national

average. Mexico has the potential to produce high-quality sugarcane in at least some regions. It

is concerning, though, that not all regions produce at internationally competitive levels while

other regions continue to produce sugarcane when the quality of the cane is so poor.

Figure 6: Sucrose Levels in Sugarcane Vary Widely across Regions



Source: Unión Nacional de Cañeros. Estadística de la Caña de Azúcar 2000-2009. 2009

Mexico's sugar industry suffers from low productivity in the field even as mills modernize their production processes. Mexico is considered a medium-to-low cost producer of sugar.<sup>34</sup> Furthermore, as discussed in Section VI (page 60), Mexican mills have increased efficiency since the 1990s.<sup>35</sup> As mills increase their ability to extract sucrose from sugarcane, sugar production has grown despite lackluster performance in the cane fields.<sup>36</sup> The low levels of sucrose in Mexico's sugarcane make the extraction process less efficient and the overall cost of production higher. The most modern equipment cannot produce much sugar from low-sucrose sugarcane, so even if Mexico's sugar mills were to become the world's most efficient, the problems in its sugarcane fields would still limit the industry's productivity. Mexican mills must process more cane to extract sucrose, though there is less of each. In the following sections I explore contributing causes of low productivity in sugarcane production, in order to address why productivity is so low and what reforms could improve it.

### III. Contributors to Low Productivity in Mexican Sugar

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Mexico's productivity in sugarcane fields is consistently low, with yields falling in recent years. Below I discuss why an ill-suited climate and low levels of farmer investments

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<sup>34</sup> S. Haley and M. Ali, *Sugar Backgrounder* (Washington, D.C.: Economic Research Service. USDA, July 2007), Google Scholar, <http://www.ers.usda.gov/Publications/SSS/Jul07/SSS249/>.

<sup>35</sup> *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*.

<sup>36</sup> While mills are choosing to modernize their facilities, improved mill efficiency is not entirely due to their owners' investments. One mill owner observed that the harvest season is shorter when yields are smaller since there is less cane to harvest each year. The condensed harvest season allows more cane to be cut when its sucrose content peaks. Mills receive proportionally more cane at peak sucrose content than in the past, and are able to process the cane more efficiently because of earlier modernization efforts. Enriquez Poy, Manuel; Asociacion de Tecnicos Azucareros de Mexico, interview.

contribute to the decline. While these factors help us understand low productivity, it is less apparent why farmers make the decisions that reduce productivity.

### **Some regions in Mexico are not well-suited for sugarcane**

If Mexico's climate does not support sugarcane, or allows only hardy and fibrous plants to survive, the industry will necessarily be inefficient, costs will be higher, and Mexico would be unable to compete internationally. Mexico is large and climatically diverse, with some cold, dry regions that are unsuitable for sugarcane. Other regions, though, are similar to conditions found in sugarcane's native Indonesia. Research in Veracruz, which contribute 42% of Mexico's annual sugar production, indicates that terrain is hilly, the soil is rocky and diverse, and climate patterns can be irregular. Soils with different chemical and microbiological elements may require different cane varieties and fertilizer use, which makes coordinated cultivation more difficult. Researchers found 33 different soil types in the cultivation area for just one mill in Veracruz. In response to the varying soil conditions, farmers cultivated three varieties of sugarcane.<sup>37</sup> A similar study identified technological innovations which could overcome most soil variations, thus producing more consistent yields with higher sucrose content, but concluded that high costs limited farmers from investing in the technologies.<sup>38</sup> The hilly topography in Western Veracruz probably contributes to the high cost of technology for farmers, since large machines intended to process sugarcane are incapable of maneuvering mountainous lands. The study also noted that nearby mountains caused weather patterns that

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<sup>37</sup> Patricio Sánchez et al., "Clasificación Campesina de Tierras y su Relación con la Producción de Caña de Azúcar en el Sur de Veracruz," *Terra* 20 (April 2002): 359-369.

<sup>38</sup> Armando Dominguez Torres et al., *Caracterizacion Del Agroecosistema Cañero Con Fines De Incrementar Su Productividad En El Ingenio La Gloria, Veracruz* (Veracruz: Colegio de Postgraduados, 2004), [http://www.colpos.mx/cveracruz/SubMenu\\_Publi/Avances2004/caracterizaci%F3n\\_del\\_agroecosistema\\_ca%F1ero.html](http://www.colpos.mx/cveracruz/SubMenu_Publi/Avances2004/caracterizaci%F3n_del_agroecosistema_ca%F1ero.html) (accessed July 27, 2009).

could bring rainfall to some fields, while neighboring fields were left dry. Although Veracruz produces the most sugarcane in Mexico, some regions are probably not the best environment for its cultivation.

Much like Veracruz, there are probably parts of the rest of the country that are appropriate for sugarcane, and other areas under cultivation that shouldn't be. For example, the Central and Gulf regions in particular have hot, sunny climates with fairly consistent rainfall that nourish sugarcane.<sup>39</sup> Morelos and other Central states offer flat terrains with universal irrigation infrastructure, improving the conditions for sugarcane cultivation.<sup>40</sup> As a result, sugarcane yields in the Central region are well above the national average.<sup>41</sup> In contrast, the Northwest region has a dry climate that is less hospitable for sugarcane. The northwestern state of Sinaloa is well-known for its large, well-capitalized and irrigated sugarcane farms, but sugarcane yields just match the national average.<sup>42</sup> Despite costly investments, the northwestern region is not well-suited for sugarcane cultivation. Poor sugarcane-growing regions produce cane with low sucrose levels, which can lower Mexico's national average. However, the least productive regions contribute very little to overall output,<sup>43</sup> so low productivity in these areas is not the entire story behind low sucrose levels and stagnating yields.

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<sup>39</sup> *Sugar and Sweeteners Outlook* (Washington, D.C.: Economic Research Service, USDA, May 30, 2006).

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> Ibid.

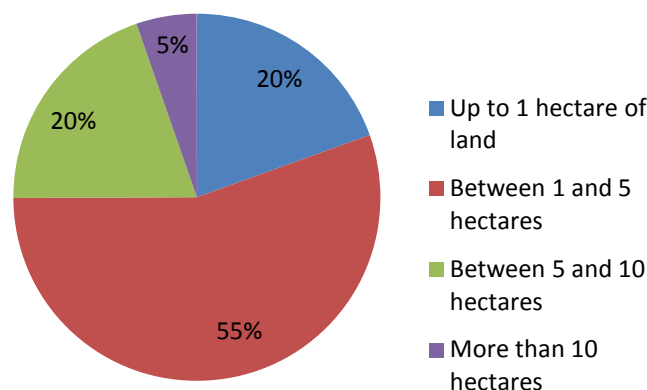
<sup>43</sup> Ibid.



## Smallholder Farming Predominates in Mexican Sugarcane Production

Most Mexican sugarcane farmers have access to very little land, which limits their ability to attain economies of scale and can increase the barriers to accessing credit for investments. In 2007, Mexico's census agency, INEGI, found 55% of producers held 5 hectares or less, and an additional 20% produced on lands between 5 and 10 hectares in size.<sup>44</sup> Though they account for 75% of all sugarcane producers, smallholders on 5 hectares or less contributed 61% of total sugarcane production (See Figure 7).<sup>45</sup>

Figure 7: Land Distribution Among Sugarcane Farmers



Source: Padrón de Productores Cañeros 2007

Smallholder farming is not a phenomenon unique to the Mexican sugar industry, or to Mexico as a whole; however, as discussed in Section I on page 7, sugarcane production benefits from economies of scale. Small plots of land are not well-suited for mechanized production and smallholders face coordination barriers in sugarcane planting, cultivation, and harvest. While

<sup>44</sup> Calculations based on SAGARPA, "Padrón de Productores de la Caña de Azúcar," Survey, 2007. SAGARPA's figures find that 93,000 households cultivated sugarcane on up to 5 ha. of land in 2007, but Mertens, *Hacia el trabajo decente en el sector de azúcar*, cites 123,000 households cultivating sugarcane on 4 ha. in 2005.

<sup>45</sup> *Sugar and Sweeteners Outlook*.

smallholder farmers are not inevitably less efficient producers, they face additional barriers to producing competitively alongside large farms. If smallholder farmers are not well-coordinated and do not benefit from economies of scale, they may contribute to low productivity in Mexican sugarcane production.

### **Sugarcane Farmers do not Invest in Improving Productivity**

Some indicators suggest that sugarcane farmers are unable or unwilling to invest in sugarcane, reducing overall productivity. For example, Mexico's sugarcane plants are old. As mentioned, sugarcane loses sucrose content each year that it is harvested; after the sixth harvest it should be replanted. A sugarcane field should be 20% plantilla (year-old cane), 20% soca (two year-old) and 60% resoca (more than two year-old cane).<sup>46</sup> Mexican sugarcane fields in 2008 contained 13% plantilla, 15% soca, and 72% resoca.<sup>47</sup> One comparatively well-off farmer interviewed stated that he did not replant his cane until it was ten years old.<sup>48</sup> The number of resoca plants in Mexico's cane fields already surpass the preferred proportion, and it's possible that some resoca cane is very old. As the cane fields age, sucrose levels and yields will fall.

A second indicator of low levels of investment in Mexico's sugarcane fields is the inadequate and improper use of inputs such as fertilizer and irrigation. Irrigation systems reach 30% of sugarcane lands, though most of the systems are little more than water pumps that act as a supplement to rains.<sup>49</sup> Limited irrigation, especially in areas of Veracruz where rainfall is unpredictable, can limit sugarcane's productivity. At the same time, farmers apply fertilizers

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<sup>47</sup> Aguilar Rivera et al., "¿Por qué diversificar la agroindustria azucarera en México?," citing Mexican government body COAAZUCAR 2008.

<sup>48</sup> Farmer Interviews in Atoyac, Veracruz, interview.

<sup>49</sup> *Caña de azúcar*.

haphazardly, often without consideration for the needs or limitations of the soil in which the cane is growing.<sup>50</sup> Since fertilizers also depend on sufficient access to water—but can't withstand flooding—the limited irrigation systems further harm sugarcane's growth. The poor or limited use of inputs reflect the low level of investments farmers make in sugarcane lands, which ultimately impact the crop's productivity. If farmers are failing to invest in their lands by applying little fertilizer and replanting their sugarcane infrequently, their actions would explain the low sucrose levels and stagnating sugarcane yields.

### **Inefficiencies in the Supply Chain Reduce Sugarcane's Quality**

Poor husbandry among sugarcane farmers contributes to low initial sucrose levels, but long delays between harvest and processing also play an important role. It is estimated that in 1998 half a million tons of potential sugar was lost due to inefficiencies during the harvest.<sup>51</sup> Long delays during sugarcane's harvest and its transport to the mill cause some of the losses, since delays before processing dramatically lowers sugarcane's sucrose content, as discussed in Section I (page 4). The delay between harvest and processing at three Mexican mills averaged 21-33 hours.<sup>52</sup> The most time was lost during the harvest itself, due to the many *frentes de corte*, or contiguous plots of sugarcane around which farmers organize the harvest.<sup>53</sup> The large number of *frentes de corte* means each frente is small, which impedes the efficient use of

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<sup>50</sup>

<sup>51</sup> Ibid.

<sup>52</sup> *Diagnóstico y Propuestas de Acciones para Hacer Mas Eficientes La Operación del Proceso Cosecha-Transporte-Abasto.*

<sup>53</sup> For example, the mill Motzorongo in Veracruz has 460 *frentes de corte*, though the owner stated that fewer *frentes* would increase the speed of the harvest. In additional interviews with sugarcane farmers and mill industry representatives, I heard the same opinion that the *frentes de corte* could be reduced to one fourth their current number and improve the speed of the harvest. Sánchez, Jorge Luis; Cámara Nacional de las Industrias Azucarera y Alcoholera, August 3, 2009; Farmer Interviews in Atoyac, Veracruz, interview; Enriquez Poy, Manuel; Asociación de Técnicos Azucareros de Mexico, interview.

harvesting machinery. As a result, manual cutting remains the preferred harvest method among Mexican sugarcane growers; about two thirds of Mexico's sugarcane harvest is performed manually.<sup>54</sup> As discussed, harvesting manually is very slow, and the sucrose content falls as the cane lies cut and waiting for transport. In areas where machines are used, machines must maneuvered rocky terrain and the small frentes. The harvest moves slowly despite mechanization, and the sucrose content again suffers as the cut cane waits—this time already deposited in trucks—for the machines to cut enough cane to fill the truck and send it on to a mill.

Even once a truck full of cut cane is on the road to a mill, another delay occurs during transport. Mexican sugarcane farmers supplying a given mill can be spread out and far from a mill, and the time it takes farmers to transport their cane increases delays. An average-sized mill in Mexico should only need 2,500 hectares to source sugarcane, but Mexican mills tend to source cane from the surrounding 10,000 hectares or more.<sup>55</sup> The distance between farm and mill causes further sucrose losses as cane is transported. Unpaved roads, vehicular breakdown, and even farmer protests can further slow cane's arrival to a mill for processing.<sup>56</sup> However, compared with harvesting delays, transport delays are much lower,<sup>57</sup> indicating that farmers' distance from the mills is not the primary cause of low sucrose levels.

A final important delay occurs as sugarcane awaits entry into the mill for processing. Each frente de corte employs a truck and driver to transport the cut cane to the mill. Trucks are

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<sup>54</sup> *Diagnóstico y Propuestas de Acciones para Hacer Mas Eficientes La Operación del Proceso Cosecha-Transporte-Abasto.*

<sup>55</sup> Enriquez Poy, Manuel; Asociación de Técnicos Azucareros de México, interview; *Diagnóstico y Propuestas de Acciones para Hacer Mas Eficientes La Operación del Proceso Cosecha-Transporte-Abasto.*

<sup>56</sup> *Diagnóstico y Propuestas de Acciones para Hacer Mas Eficientes La Operación del Proceso Cosecha-Transporte-Abasto.*

<sup>57</sup> *Ibid.* Transport delays are between 2-6% of total delivery delays.

estimated to wait between 3 and 10 hours in line outside a mill before entering to dump cane for processing.<sup>58</sup> The delays are extraordinary compared to the 40 minutes Australian trucks wait to deliver sugarcane.<sup>59</sup> Delays are even longer when a truck's sugarcane is found to be dirty, or if quota restrictions are placed on cane from farmers pertaining to a certain growers association; in these cases trucks are sent to the end of the line and forced to wait up to three days.<sup>60</sup>

The slow speed of Mexico's sugarcane harvest contributes to the low levels of field productivity the sector struggles with. Between the slow harvest and the long lines entering the mill, cane is processed more than a day after it was cut.<sup>61</sup> As mentioned in Section I, day old cane has already lost 10% of its sucrose. If sucrose levels were 10% higher, Mexico still wouldn't perform at the level of Australia, India or Brazil (see Figure 5), but it would certainly contribute to improving overall productivity. The delays in processing sugarcane once again raise the question of why farmers fail to coordinate their efforts to ensure their crop arrives in peak condition. Like the choice to cultivate in regions ill-suited for sugarcane, and like the choice to under-invest in the crop, why do farmers choose to market their cane under such poor conditions?

#### **IV. Opportunities for Growth in Mexican Sugar**

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The Mexican sugar industry would benefit from increased productivity in sugarcane in regions of the country which support its cultivation. In particular, smallholder cane-growing households would benefit from reforms to increase their welfare. Given the small farm size

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<sup>58</sup> Ibid.

<sup>59</sup> Ibid.

<sup>60</sup> Ibid.

<sup>61</sup> Ibid.

which predominates in Mexican sugarcane cultivation, farmers' revenue above costs—their income from cane farming—averaged just over \$3000 for a 3 hectare farm in 2004.<sup>62</sup> The minimum salary for Mexico's rural regions in 2004 was \$1365,<sup>63</sup> meaning households growing sugarcane earned more than twice the minimum salary. Most agricultural workers, including day laborers, earn less than 2 minimum salaries.<sup>64</sup> The minimum salary is calculated per worker, though, and income from sugarcane cultivation may represent the entire family's efforts. If incomes from sugarcane are distributed between two adult workers—which may be the case on plots of 3 hectares or more—then families receive just one minimum wage salary per worker from cane cultivation. While revenue above costs per hectare is high in some regions, as I discuss next, the small plots of land sugarcane farmers work means their annual income is fairly low, and farmers on small plots of land with large families may be quite poor.

Higher levels of investment in sugarcane could improve the sector's productivity, and would hopefully increase farmers' incomes. Figure 8 illustrates cultivation and harvest costs for sugarcane farmers in Mexico's cane-producing regions. Typical costs for sugarcane farmers include seeds; fertilizer; and labor or machinery for cultivation, harvest, and transport.<sup>65</sup> Mexican farmers also pay administrative costs to farmer associations and social security

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<sup>62</sup> Personal calculations based upon *Sugar and Sweeteners Outlook*.

<sup>63</sup> "Salarios Mínimos - 2004 - SAT México,"

[http://www.sat.gob.mx/sitio\\_internet/asistencia\\_contribuyente/informacion\\_frecuente/salarios\\_minimos/45\\_719.html](http://www.sat.gob.mx/sitio_internet/asistencia_contribuyente/informacion_frecuente/salarios_minimos/45_719.html) (accessed January 3, 2010). An exchange rate of 11.257 pesos to the dollar was used in this calculation; it is the same rate the USDA used in calculations cited above.

<sup>64</sup> Gerardo Esquivel, *El mercado laboral rural en México: caracterización y agenda de investigación* (CEPAL, Naciones Unidas, January 2009), <http://www.eclac.org/cgi-bin/getProd.asp?xml=/publicaciones/xml/4/35144/P35144.xml&xsl=/mexico/tpl/p9f.xsl&base=/mexico/tpl/top-bottom.xml> (accessed March 31, 2009).

<sup>65</sup> *Sugar and Sweeteners Outlook*. The original data source is Coaazucar, a now defunct Mexican commission which oversaw the sugar market. Unfortunately USDA does not provide information on the methods used to derive harvest and cultivation costs, or to calculate net returns to sugarcane production. Nor does it provide more detail than I have provided here regarding what costs farmers face in each region, and how they might differ.

contributions, among other expenses.<sup>66</sup> There are significant variations in costs and net incomes among regional sugarcane farmers. Assuming that cultivation costs are proportional with some level of investments in fertilizer, crop renewal, and irrigation, and that harvest costs include investments in mechanization,<sup>67</sup> it appears that some regions in Mexico invest more in sugarcane than others, and that some regions obtain higher output as a result of greater investments. I explore this hypothesis below.

As mentioned, the Gulf state of Veracruz produces more sugar than any other region, but Veracruz's farmers appear to make few investments in their crop. The state has the lowest cultivation costs and average levels of harvest costs. Veracruz also produces sugarcane with very low sucrose levels (see Figure 6) and below average yields.<sup>68</sup> Assuming that mills process sugarcane into sugar at an 82% efficiency rate,<sup>69</sup> Veracruz's fields produced 7.4 tons of sugar per hectare on average in 2004, valued at \$4,072 at world prices.<sup>70</sup>

In contrast, farmers from the Central region appear to invest more in sugarcane production, and the sugarcane the region produces contains much more sucrose. Central-region farmers (representing 7% of overall production, but with smaller farms on average

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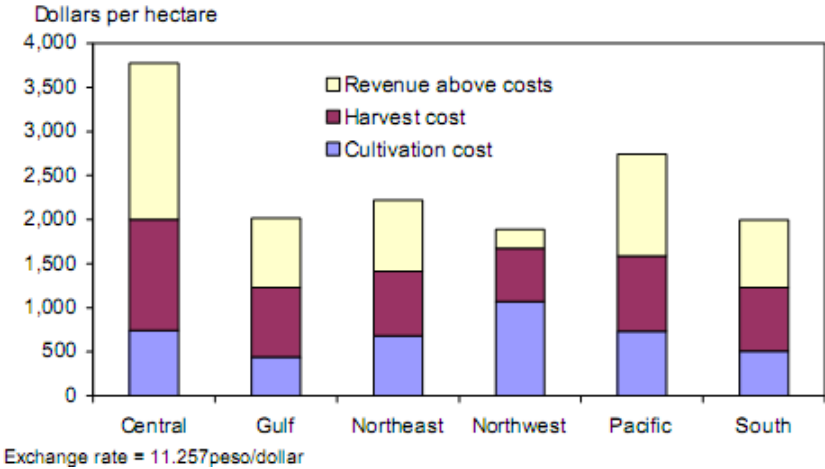
<sup>67</sup> This assumption is supported by the fact that the Central region and the Northwest region have higher costs and they have each made some form of productive investments (irrigation systems in the Central region and irrigation systems and mechanized harvests in the Northwest) as noted in the previous section. However, it is possible that higher costs do not reflect higher investments; perhaps they are actually an indication of more expensive inputs. More research on the actual level of investments in each region would strengthen this hypothesis.

<sup>68</sup> *Sugar and Sweeteners Outlook*.

<sup>69</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar*, 2005. See discussion of mill efficiency with the section Sugarcane Pricing Regulations on page 56.

<sup>70</sup> Calculations based on the percent sucrose content in Veracruz's sugarcane for 2004, cane yield per hectare in Veracruz for 2004, an estimated 83% efficiency rate for mills to convert sucrose into sugar, and the 2004 world price for raw sugar (*Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*; *Ley de Desarrollo Sustentable de la Caña de Azúcar*; Stephen Haley and USDA Economic Research Service, "ERS/USDA Briefing Room - Sugar and Sweeteners: Recommended Data," <http://www.ers.usda.gov/briefing/sugar/data.htm#yearbook> (accessed October 23, 2009); *Sugar and Sweeteners Outlook*.)

Figure 8: Mexico sugarcane revenue and costs, per hectare, by region (2003/4)



Source: USDA Sugar and Sweeteners Outlook citing Coaazucar.

than the rest of the country) face the highest overall costs per hectare, and their cultivation costs are slightly higher than every other region except the Northwest. As mentioned, one reason Central farmers’ costs are higher is because all plots in the region are irrigated. It is possible that a higher level of investment contributes to sugarcane yields of 113 tons per hectare, compared to the average yield in Mexico of 74 tons per hectare, and sucrose levels that are the highest in the nation (see Figure 6). Farms in the Central region produced 13.8 tons of sugar per hectare in 2004, again assuming a mill efficiency rate of 82%. The value of the sugar produced per hectare in the Central region at world prices was \$7,570. While Central region farmers pay almost \$670/ha more than farmers in the Gulf region to produce sugarcane, they produced almost \$3,500 more sugar per hectare. Central farmers spent just \$325 more per hectare than farmers in the highly capitalized Northwest, but they produced \$3,600 more sugar per hectare. Farmers in the Central states spend more to produce sugarcane, but the cane they produce is a higher quality. As a result, the value of the additional sugar the region produces per hectare is almost five times the difference in costs farmers in the Central and Gulf regions pay, and more



than 11 times the difference in costs for farmers in the Central and Northwest regions. Table 1 below summarizes these findings.

**Table 1: Costs of Sugarcane Production and Value of Sugar Produced across Regions, 2004**

|  | Central Region | Pacific Region | Northeast Region | South Region | Gulf Region | Northwest Region |
|--|----------------|----------------|------------------|--------------|-------------|------------------|
| Production costs per hectare of sugarcane            | \$1,999        | \$1,586        | \$1,410          | \$1,229      | \$1,231     | \$1,674          |
| Contribution to Overall Sugar Production             | 7%             | 22%            | 17%              | 9%           | 42%         | 3%               |
| Avg. farm size (hectares)                            | 1.7            | 3.0            | 6.4              | 5.0          | 3.9         | 7.0              |
| Sucrose content                                      | 14.6%          | 13.9%          | 13.5%            | 13.0%        | 13.1%       | 11.4%            |
| Sugarcane yield (tons/ha)                            | 113.8          | 86.1           | 69.3             | 71.2         | 68.2        | 76.1             |
| Sugar yield (tons/ha, with 82% mill efficiency)      | 13.8           | 9.0            | 7.8              | 7.7          | 7.4         | 7.2              |
| Value of sugar produced per hectare, at world prices | \$7,569        | \$5,450        | \$4,246          | \$4,198      | \$4,072     | \$3,958          |
| Ratio of sugar's value to production cost            | 3.8            | 3.4            | 3                | 3.4          | 3.3         | 2.4              |

Sources: Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009; Ley de Desarrollo Sustentable de la Caña de Azúcar; Stephen Haley and USDA Economic Research Service, "ERS/USDA Briefing Room - Sugar and Sweeteners: Recommended Data," <http://www.ers.usda>.

Farmers in the Central region appear to produce higher quality sugarcane because they invest more in cane production and because the region is better suited for sugarcane.

Compared to Veracruz, farmers from the Central states invest almost twice as much in their stock. The regions offer somewhat different climatic and geographic conditions for cane cultivation, but some regions in Veracruz are suitable for sugarcane. I posit that the different levels of investments in each region contributes to the quality of sugarcane produced and the greater amount of sugar produced per hectare in the Central states. In contrast, investment levels in the Northwest are similar to the Central states, but sugar production is much lower in the Northwest because the climate is not well-suited for growing sugarcane. Given the much greater value obtained per hectare from growing sugarcane in a climate that is appropriate for it

and with the proper investments, it seems some Mexican sugarcane farmers, especially in the Gulf region, are missing an opportunity to produce sugar more competitively and generate more value in the industry.

## **V. Institutions as Frameworks for Growth and Development**

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The previous sections identify low investment in the improvement of sugarcane fields and sugarcane cultivation in regions that do not support the crop as the main sources of Mexico's low productivity in sugar production. A more important question remains, though: why do farmers fail to undertake the investments necessary to improve the production process? Moreover, why do some farmers continue to grow sugarcane in regions that don't support the crop, or on small plots of land that limit the returns to production? What choices do producers face that keep them producing at low productivity levels? If we assume farmers are knowledgeable about sugarcane cultivation—that is, they know what improves the harvest and what can harm it—and that they are rational actors, there must be some other constraints impeding farmers from making the necessary investments to improve sugarcane production and increase their own incomes.

The institutions that structure and support Mexican sugar production limit the sector's productivity and exacerbate poverty among smallholder cane farmers. To explore how and why this is happening, in this section I define institutions and explore their role in shaping social interactions. I then elaborate on the ways that institutions affect development in the next section by analyzing how the institutions in Mexican sugar production limit producer choices and ultimately lower productivity.

## Institutions Defined

The Institutional Analysis and Development (IAD) framework<sup>71</sup> offers the following definition of institutions: they are "the prescriptions that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales."<sup>72</sup>

Institutions boil down to the socially created prescriptions, or rules, that govern people's choices in various spheres of life. Individuals working within an institution have different expectations about outcomes than individuals working in a situation that is not structured by rules. When institutions change the possible outcomes, individuals make choices about their activities based upon those new outcomes.<sup>73</sup> In this way, institutions can affect the welfare of an individual, his family, his community, and society as a whole.

Ostrom offers the example of an exchange of goods to illustrate how institutions affect outcomes. Without institutions, two parties may be unwilling to trade for fear that the other party will snatch their goods without offering payment. Without an institutional structure, individuals choose whether to risk participating in an exchange or not; they will probably decide that the risks outweigh the potential gains. When institutions create a more secure environment for trade through rules about bartering, bargaining, and contracts, they create different potential outcomes for individuals thinking about participating in an exchange. More

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<sup>71</sup> As developed by Elinor Ostrom and others within the Workshop in Political Theory and Policy Analysis. Elinor Ostrom, *Understanding Institutional Diversity* (Princeton University Press, 2005).

<sup>72</sup> *Ibid.*, 3.

<sup>73</sup> Ostrom, *Understanding Institutional Diversity*.

people will make the choice to participate and in doing so, they have improved their own welfare, the welfare of their trading partner, and perhaps of their community.<sup>74</sup>

Understanding the ways that institutions shape behavior can provide powerful insights into why countries develop. The 2002 World Development Report analyzed institutions' potential to affect market outcomes in developing countries. The Report argues that strong institutions—such as the rule of law, property rights, and judicial institutions—help individuals channel their resources into productive, welfare-improving endeavors, while inefficient institutions do the opposite. It also highlights how weak institutions may affect the poor disproportionately. For example, when institutions fail to provide social safety nets or secure property rights, the poor's options for pursuing a livelihood and making investments to improve their welfare may be more limited than those of the rich, due to higher risks poor people face if an investment fails.<sup>75</sup> By analyzing how these institutions improve or inhibit economic performance in rural regions, policymakers may be able to create institutions that are strong, long-lasting, and conducive to society's development goals.

### **Growing Interest in Institutions' Impact on Development**

Policymakers must understand the ways in which institutional rules affect individual expectations in order to predict their choices and larger socio-economic outcomes. As Elinor Ostrom observes, "when individuals learn the artisanship of crafting rules, they can experiment and learn to create more productive outcomes (as well as participants) over time. Learning to craft rules that attract and encourage individuals who share norms of reciprocity and

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<sup>74</sup> Ibid.

<sup>75</sup> World Bank, *World Development Report: Building Institutions for Markets* (New York: Oxford University Press, 2002).

trustworthiness, or who learn them over time, is a fundamental skill needed in all democratic societies."<sup>76</sup>

While all institutions affect personal behavior and social outcomes, economic institutions are especially important when analyzing economic growth because they shape producer and consumer choices. Economic institutions—such as commodity and insurance markets, contract law, or land tenure—affect growth and productivity by establishing rules for organizing production, allocating resources, and selecting investments.<sup>77</sup> For example, Acemoglu and Robinson argue that the institution of paying tribute to the colonial elite in Latin America—which created a rule that indigenous people must contribute some of their crop to a nearby hacienda—caused commoners to invest less in production, since those investments might be captured by the elite.<sup>78</sup> As a result of the institution, productivity growth in Latin America stagnated. By understanding how rules create incentives or disincentives for producers, the authors argue it is possible to identify why some regions develop slowly. Perhaps more intriguingly, after identifying which rules limit economic growth and why they limit growth, it may also be possible to amend those rules and overcome the barriers to development.

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<sup>76</sup> Ostrom, *Understanding Institutional Diversity*, 133.

<sup>77</sup> Daron Acemoglu, S Johnson, and J Robinson, *Institutions as the Fundamental Cause of Long-Run Growth*, Discussion Paper (London: Center for Economic Policy Research, 2004), <http://www.cepr.org.ezproxy.library.tufts.edu/pubs/dps/DP4458.asp>.

<sup>78</sup> Daron Acemoglu and James A Robinson, "Persistence of Power, Elites, and Institutions," *American Economic Review* 98, no. 1 (3, 2008): 267-293, <http://www.atypon-link.com/AEAP/doi/abs/10.1257/aer.98.1.267> (accessed September 14, 2009).

Engermann et al. note that the structure of a society's political institutions—such as voting rights and judicial systems—can affect the rules of its economic institutions.<sup>79</sup> Again using the example of colonial Latin America, the authors point out that restrictions on voting rights allowed only elite society members to participate in creating rules governing economic interactions. Interested in protecting their status, the elite established rules that limited property rights and access to credit for most individuals. As a result, economic institutions in Latin America tended to benefit only the rich and powerful, and stifled opportunities for the poor. Similarly, the elite affected economic outcomes in more indirect ways by creating rules which limited access to education, which might have allowed some individuals to increase productivity through innovation. Economic institutions emerge from society's political institutions and can reflect the interests of the politically powerful.

Ahmed et al. find that private sector firms frequently take on the government's role of establishing institutions in the rural non-farm economy. Local and national governments were the primary actors under government-led development models, establishing rules to create producer incentives or structure market interactions. Recently, governments have played less dominant roles in the marketplace, while large businesses such as food processors or resource extraction industries undertake new responsibilities. For example, businesses may extend credit, provide marketing infrastructure or extension services for employees or

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<sup>79</sup> Stanley L. Engerman et al., "Factor Endowments, Inequality, and Paths of Development among New World Economies [with Comments]," *Economía* 3, no. 1 (Fall 2002): 41-109, <http://www.jstor.org.ezproxy.library.tufts.edu/stable/20065432> (accessed September 14, 2009).

subcontractors.<sup>80</sup> The rules that the private sector establishes to access these services may add to the institutions established by the government or replace them. Governments are not the only actors that create institutions, and especially in rural areas powerful private actors may be able to establish rules that affect many people.

Analysts have already connected institutions to low growth and low productivity in Mexico. In particular, Santiago Levy (2009) describes the ways in which business interests, organized labor, and uncompetitive political parties inhibit the formation of extensive credit institutions, limit producer and consumer choices, and ultimately hamper Mexico's competitiveness in world markets.<sup>81</sup> With this thesis, I add to the understanding of the ways that institutions contribute to slow economic growth by linking the institutions in Mexican sugar production to low productivity in Mexico's sugarcane fields.

## **VI. The Economic Impact of Institutions on Mexico's Productivity in Sugar**

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In this section I present the modern-day institutions and markets that shape Mexican sugar production and analyze the impact of these forces on productivity. I begin with a discussion of the ejido farming system, followed by farmers' organizations and nationally established sugarcane pricing schemes. I then address how a history of expropriation of sugar mills also affects field productivity. For each institution, I identify the rules the institutions establish, the actors affected by those rules, and the choices they can be expected to make given

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<sup>80</sup> Steven Haggblade, Peter Hazell, and Thomas Reardon, eds., "The Policy and Institutional Environment Affecting the Rural Nonfarm Economy," in *Transforming the rural nonfarm economy: opportunities and threats in the developing world* (Baltimore Md.: Johns Hopkins University Press, 2007).

<sup>81</sup> Santiago Levy and Michael Walton, eds., *No growth without equity? inequality, interests, and competition in Mexico* (Basingstoke [etc.]: Palgrave Macmillan with World Bank, 2009).

the rules they follow. I then compare the expected outcomes with the actual outcomes to offer a hypothesis about the impact that institutions have on individual behavior and productivity.

### **Institutions in Land Tenure**

As discussed in Section III (page 20), most Mexican sugarcane is cultivated on small farms, even though the barriers to efficient production are higher for smallholders. Mexico's land tenure institutions, including the ejido system of collective ownership and privatization reforms, create incentives for farmers to continue farming sugarcane on small plots of land even though productivity suffers as a result.

#### **The ejido system created incentives for farmers to subdivide lands**

The land reform at the end of the Mexican Revolution created communal tracts of land called ejidos for Mexico's peasantry. One of the causes of the revolution was the labor uprising among sugarcane workers on haciendas in the state of Morelos. At the end of the war the Institutional Revolutionary Party (PRI) broke apart the haciendas into ejidos in an effort to respond to the laborers' demands for land.<sup>82</sup> The ejidos created communities of farming households by dividing the land into three sections: the village, individual plots for growing subsistence or other crops, and a communal area for gathering firewood and grazing livestock.

Smallholder sugarcane farming emerged as a result of the rules that the ejidos established for receiving government benefits and the choices producers made in response. First, ejido lands were owned collectively. Ejido members could not sell all or part of the ejido or use the lands as collateral for loans; violating members faced expulsion. Second, in exchange

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<sup>82</sup>

, *Tenencia de la tierra e industria azucarera*; Galeano, *Open Veins of Latin America*.



for land and subsidies of agricultural inputs, financing, and other social services, ejido members were expected to maintain loyalty to the PRI.<sup>83</sup> Responding to the incentives the rules offered ejido members, families sought to pass on government benefits to their children by bequeathing plots of land, subdividing the original allotment with each new generation. Since families lost ejido membership and received no restitution for their land if they moved off the ejido, farmers chose to maintain tenure of the land, sometimes instead of pursuing other opportunities.<sup>84</sup> Families that did choose to abandon the land often left behind a relative or acquaintance to work the land in their absence, in hopes of continuing to receive government handouts.<sup>85</sup> Therefore, even when families did leave ejido lands, the number of farms often remained unchanged. Similarly, families that moved off the land often rented or sold their plots (or portions of their plots) to non-member households illegally.<sup>86</sup> As a result the number of farmers working in each ejido continued to rise. Ejido lands were originally intended to provide mass employment and stave off rural poverty. The rules governing ejidos caused more farmers to choose to continue farming than might have otherwise, while land grew fragmented as each generation sought to receive government benefits.

### **Ejidos reduced opportunities for farmers to improve productivity**

The institution of collective land ownership through ejidos impeded farmers from accessing credit to make investments that could improve sugarcane productivity. Ejidos sought to ensure land security for peasant farmers by establishing the rule that ejidos were collectively

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<sup>83</sup> , *Tenencia de la tierra e industria azucarera*; Galeano, *Open Veins of Latin America*.

<sup>84</sup> , *Tenencia de la tierra e industria azucarera*.

<sup>85</sup> Ibid.

<sup>86</sup> Ibid.

owned, and no ejido member could sell the land. The rule limited farmers from choosing to obtain private credit, since credit institutions often have regulations that require collateral in order to receive a loan. However, ejido farmers expected the government to provide inputs in exchange for political support, and indeed for much of the 20<sup>th</sup> century the government provided sugarcane farmers with sufficient subsidies to maintain field productivity.<sup>87</sup> Ejido farmers today receive fewer benefits, but they were still constrained from obtaining credit because of the restrictions on using ejido lands as collateral.<sup>88</sup> When the rule on receiving government benefits broke down, the rule on collective land ownership persisted. Farmers were still limited in their ability to obtain credit for making productive investments, and the government no longer filled the gap. The ejido system structured farmers' decision-making so land was sub-divided into small plots; at the same time, the institution constrained farmers from making investments to improve sugarcane productivity on the little land they did work.

### **Insecure Land Tenure Reduces Farmers' Ability to Coordinate the Harvest**

In addition to constraints on accessing credit, collective land ownership created insecurity over usufruct rights among farmers. Ejido community boards were established to demarcate usufruct rights among ejido farmers and the boards could potentially reallocate farm plots as they saw fit, or as one or a few powerful community members desired. At the same

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<sup>87</sup> Ibid. As noted in the previous section, sucrose levels remained low throughout the 20<sup>th</sup> century, while sugarcane yield was typically high. This reflects the government's focus on basic input provision, such as fertilizers, without attempting to overcome some of the larger barriers for improving sucrose levels, including improved irrigation systems and better coordination among farmers to simulate economies of scale.

<sup>88</sup> *apertura comercial.*

time, high-levels of extra-legal sale and rental meant a family's farmlands might not be reflected in any legal documentation.<sup>89</sup>

In response to uncertainty among farmers that their most valuable asset—access to land—could be taken away, many farmers build living fences out of trees or bushes. The fences intend to establish permanent boundaries around a family's farmland in order to inhibit its usurpation by another community member.<sup>90</sup> Whether or not fences and other barriers are successful at strengthening usufruct rights, they do inhibit coordinated efforts during the sugarcane harvest. The divisions between the plots slows the harvest as laborers or machines move from one plot to the next, instead of sweeping across all plots, as described in Figure 1 on page 7. The rules of collective ownership, and the uncertainty those rules created, led farmers to make decisions about the use of their land which impedes their coordination. Given how important coordinated cultivation efforts are for smallholder sugarcane farmers to achieve economies of scale, the institutions of land tenure may be reducing farmers' opportunities to improve productivity.

### **Land Reform Failed to Incentivize Land Consolidation or Improve Productivity**

During the transition to an open market economy, the Mexican government amended the Constitution in 1991 to promote the privatization and sale of ejido land. The land reform attempted to undo some of the adverse effects the ejido system had on landholding size and productivity by establishing rural land and credit markets. It reformed the land tenure institution to allow ejidos to be broken apart into privately owned plots. Farmers could use

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<sup>89</sup> \_\_\_\_\_, *Tenencia de la tierra e industria azucarera*.

<sup>90</sup> Farmer Interviews in Atoyac, Veracruz, interview.

their private landholdings as collateral to receive loans and make investments in improving productivity. Through the sale of ejido lands, some farmers could consolidate plots and increase economies of scale.

Despite the potential outcomes of land reform, sugarcane farmers continue to produce predominantly on ejido lands. Moreover, the size of sugarcane plots on ejido lands is not much greater than the size of privatized sugarcane plots. In Veracruz, the Mexican state with the highest levels of sugarcane production, 76% of producers work land within the ejido system, while 22% have private landholdings. The average plot of sugarcane in an ejido is 4 hectares, while private landowners work an average of 7 hectares.<sup>91</sup> The predominance of smallholder ejido farming in Veracruz is representative of most sugarcane production in Mexico.

Land reform was unsuccessful at reducing fragmentation of ejido lands because the rules for obtaining private property were difficult to comply with while the benefits of remaining an ejido were still present. The privatization process required three steps: first, community members surveyed the ejido and established each household's land rights based on the territory they had been cultivating within the ejido. Then, the ejido assembly voted to privatize the land; a super-majority was needed to finalize the decision. Finally, after the vote for privatization, the state would provide official land titles.<sup>92</sup> The regulations required communities to initiate the process of privatization, but the consequence for failing to initiate the process was simply that privatization would not move forward. Since the consequence failed to provide an incentive for ejidos to move toward privatization, many remained under collective ownership. This must have been especially true in regions still dominated by

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<sup>91</sup> SAGARPA, "Padrón de Productores de la Caña de Azúcar."

<sup>92</sup> , *Tenencia de la tierra e industria azucarera*.

corporatist political structures, since moving towards privatization would have ended the political benefits and subsidies community members received under ejidos.

The reform was not intended to require land privatization, so the rules the reform created place a heavy burden on ejido communities, to the extent that they may have discouraged privatization.<sup>93</sup> Ejido members had to initiate the privatization process by electing to demarcate their land. Since ejido lands are communal, such a process frequently led to boundary disagreements. Similarly, long-term squatting and rental led to disagreements over who had the right to ejido land. The requirement that the ejido council approve privatization via super-majority could exacerbate power imbalances within the community.<sup>94</sup> Nevertheless, such disagreements had to be resolved within the community before government representatives commenced titling. When individual boundary conflicts could not be overcome or a super-majority could not be reached as a community, privatization of ejido lands was not able to move forward. Especially since weak land and labor markets and low access to credit limited farmers from profiting from privatized land,<sup>95</sup> the costs of privatization often outweighed the benefits for ejido communities.

One incentive for ejidos to move from collective to private ownership could have come from credit institutions, rather than land tenure institutions. As mentioned above, beginning in the 1990s the government stopped providing credit and other subsidies to ejidos at the levels it had in the past. Since ejido farmers did not have titles to their land, they had an incentive to privatize in order to obtain loans for investment. However, two problems inhibited credit

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<sup>93</sup> Ibid.

<sup>94</sup> Ibid.

<sup>95</sup> The impacts of land, labor and credit markets of sugarcane farmers' decision-making is explored further below.

institutions' rules from becoming real incentives for ejidos to privatize. First, when ejidos did privatize, the plots of land that farmers received were simply too small to act as collateral for most banks.<sup>96</sup> Second, private institutions lending rules do not reflect the needs of small farmers. Respondents to a survey of three mills suggest that high interest rates and concerns about using their land as collateral dissuade many farmers from pursuing a loan.<sup>97</sup> Even though the rules for accessing credit institutions might have incentivized ejidos to privatize their land, the fragmentation of ejido lands prohibited farmers from taking advantage of private lending; without this incentive, it is possible that ejido farmers saw very few benefits from privatization, and chose not to pursue it.

The rules for privatization also failed to offer a good alternative to illegal land rental and sale within the ejidos. For individuals living in ejidos that chose not to privatize their land, illegal rental and sale were easier than complying with the rules for privatization. Furthermore, ejido members who sold or rented parts of their land extra-legally were not punished with expulsion from the community.<sup>98</sup> Though the land reform attempted to do away with illegal sales by instituting a system for privatization, many ejido households found that the best strategy was to sell land illegally and run the risk of consequences.<sup>99</sup>

Many ejidos did privatize their lands, but sometimes the privatization process caused greater fragmentation among smallholders. In an attempt to divide lands fairly, sometimes farmers were ceded several plots of different quality and located in different parts of the ejido

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<sup>96</sup> , *Tenencia de la tierra e industria azucarera*.

<sup>97</sup> Ibid., 107.

<sup>98</sup> , *Tenencia de la tierra e industria azucarera*.

<sup>99</sup> Ibid.

during the demarcation process.<sup>100</sup> The intention was to give each farmer an equal share of high quality and low quality lands. As a result, individual farmers became private landowners of sugarcane plots that had different soil characteristics and cultivation requirements, and may be located far away from one another. Though on aggregate the farmer might own several hectares in total, the time he lost travelling and caring for each plot would diminish his productivity.

Mexico's land tenure institutions create incentives for farmers to subdivide small plots of land or rent them extra legally instead of consolidating private lands among a few farmers. The institutions limit access to credit for making investments, and productivity in sugarcane suffers as a result. Although reforms sought to undo the ejidos as the predominant form of land tenure, ejidos survived the privatization attempts and continue to implement their original policy goal of providing mass rural employment in agriculture. As a result, most sugarcane farmers work five hectares or less and earn minimum wages. While land tenure institutions may not be a direct cause of low farmer incomes, by creating incentives for farmers to subdivide lands and continue farming very small plots, the institutions reduce farmers' earnings potential in sugarcane.

### **Sugarcane farmers' associations**

Sugarcane farmers' associations organize cane growers politically through representation and lobbying at the national level. They also organize farmers economically by contributing to the organization of the sugarcane harvest and assisting farmers making

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<sup>100</sup> Ibid.

investments to improve their sugarcane stock. Members of a sugarcane organization must grow sugarcane and pay dues to the group.<sup>101</sup> In return, members receive government benefits that unassociated cane farmers do not. Government support of sugarcane in the 1980s included medical care, pensions, housing, financing, and production supports such as fertilizers, seeds, and irrigation systems.<sup>102</sup> In exchange, farmers were expected to be loyal to the PRI.<sup>103</sup> Similar to the supports the government provided ejido members, most subsidies farmers received through sugarcane organizations were slowly dismantled in the 1990s.<sup>104</sup> Today farmers associated with the organizations still receive political representation, social security benefits, assistance obtaining credit, and assistance coordinating the harvest.<sup>105</sup> The rules structuring how farmers receive these benefits incentivize them to become members of the two dominant farmers' associations, to remain sugarcane farmers, and to limit coordination of production except when they are compelled to do so.

### **The Benefits of Political Representation Keep Farmers within a Corporatist Structure**

The farmers' associations were established by the Mexican government to represent farmers' interests while also constraining their organizing ability outside the political structure of the association. In the years of PRI control, the organizations were mechanisms for

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<sup>101</sup> The UNPCA charges dues equal to 0.05% of the value of each ton of sugarcane a farmer produces. Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, in person, July 8, 2009.

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<sup>103</sup> Political loyalty is no longer a requirement, but the PRI maintains a strong base of support among farmers. "Quienes Somos," *Confederación Nacional Campesina*, 2009, <http://www.cnc.org.mx/quienes.html> (accessed October 16, 2009); M. J Kurtz, *Free market democracy and the Chilean and Mexican countryside* (Cambridge Univ Pr, 2004).

<sup>104</sup> *a apertura comercial*. Many sugarcane farmers are organized within ejidos and farmers' associations. During the years of PRI control, both mechanisms served to channel political desires up to politicians and send subsidies and other government supports down to farmers. Further research is needed to understand whether ejidos and farmer organizations coordinated or duplicated their efforts.

<sup>105</sup> Singelmann, *Mexican sugarcane growers: economic restructuring and political options*.



communicating farmers' concerns up to government officials, and for passing favors down through the network of national, state, and local representatives and finally to the farmers.<sup>106</sup> Today, farmer organizations have greater independence from the government and, as I discuss below, have significant influence over policymaking for the sector. Entrenched leadership and cronyism within the farmers' association, though, means the associations emphasize politically expedient short-term solutions over long-term strategies for the sector.

There are two dominant farmers' organizations. The oldest is the National Union of Sugarcane Producers (UNPCA), a branch of the National Confederation of Farmers that the PRI established to represent ejido-based producers.<sup>107</sup> The UNPCA was the predominant representative of cane-grower interests until 1973, when the National Confederation of Rural Producers established the National Cane-growers Union (UNC).<sup>108</sup> The UNC tends to represent private landholders producing on larger landholdings than UNPCA members.<sup>109</sup> Like the UNPCA, the UNC has historically supported the PRI political party.

Until 2005, the UNPCA and the UNC were the only cane-growers' associations legally allowed to represent farmers. The PAN-led government sought to diversify the voices representing the sugarcane growers—as well as break into the PRI's rural base of support—by creating opportunities for new groups to form under the Law on the Sustainable Development of Sugarcane.<sup>110</sup> Now, an organization that represents 10% of local farmers and grows 10% of local sugarcane may be recognized as a local association, which allows the group to extend

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<sup>106</sup> Ibid.

<sup>107</sup> "Quienes Somos."

<sup>108</sup> *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*.

<sup>109</sup> Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview; Argüello Zepeda and de la Cruz R., *La privatización de la industria azucarera mexicana y su impacto social*.

<sup>110</sup> , *Tenencia de la tierra e industria azucarera*.

benefits to members and participate in the local planning committee, as discussed below. An organization that nationally represents 10% of farmers and 10% of production in 8 different states is similarly granted access to national committee meetings.<sup>111</sup> Though new organizations have formed locally, none have come near to representing the strength or political clout of the UNPCA or UNC.<sup>112</sup> The regulation particularly discourages small farmers from organizing outside the established associations because a group of small farmers that represent 10% of the cane growers may not produce enough cane to fulfill the production requirement for a new organization. Smallholder farmers who wish to receive the benefits of membership with a farmers' association must choose between the UNC or the UNCPA.

Rules governing the farmers' associations oversight of government policy may have fostered a powerful national lobby that can impact legislation and regulations which structure the sugar industry. By law, the farmers' associations are part of the National Committee for the Sustainable Development of Sugarcane, which oversees and regulates the market for sugar in Mexico.<sup>113</sup> In addition, the organizations participate in the committee meetings of PRONAC, the National Plan for the Sugar Agro-Industry.<sup>114</sup> The Sugar Industry Chamber of Commerce, a representative for the majority of Mexico's sugar mills, also participates in the meetings. Involvement in decision-making at the national level has offered an opportunity for the organizations to take part in the policy-making process, as opposed to receiving and

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<sup>111</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar.*

<sup>112</sup> Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview.

<sup>113</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar.*

<sup>114</sup> "Programa Nacional de la Agroindustria de la Caña de Azúcar (2007-2012)" (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación, 2007).

communicating policy decisions.<sup>115</sup> At the same time, though, rules that include the farmers' associations in government regulatory bodies may limit policymakers' independence and provoke regulations that benefit farmers, mill owners, or both, at the expense of the Mexican people.

It is also possible that weak democratic institutions within the farmers' associations allows leadership to become entrenched, with high levels of cronyism between farmer leaders and politicians at the local, state, and national levels. While the Mexican constitution prohibits re-election among government officials, no such rule was established for the farmers' associations. As a result, some farmer leaders have held their position for more than 20 years.<sup>116</sup> Given that their political lives are much longer than the government's politicians with whom they work to craft policy, it is possible that the farmer leaders are more capable politicians who yield a great deal of power in comparison to elected officials. Farmer leaders can use that power to obtain political benefits for themselves, such as the channeling of subsidies to their own farms or region, in exchange for the promise that the farmers' association will support a given political party in the next election. The rules that shape political representation within the farmers' association and within the Mexican government may allow farmer leaders to wield more power than representatives of society as a whole.

Similarly, farmer leaders can use their position of power to dole out subsidies to farmers in exchange for supporting their re-election within the farmers' association, or the election of a

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<sup>115</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar*.

<sup>116</sup> Peter Singelmann, "La transformación política de México y los gremios caneros del PRI (Political Transformation in Mexico and the PRI's Sugar Cane Workers' Unions)," *Revista Mexicana de Sociología* - , Luis; Professor, Universidad de Chapingo, in person, July 29, 2009.

given political party to a government post.<sup>117</sup> As a result, farmers themselves tend to have to support the policies and politics of the farmers' organization of which they are a member in order to ensure their receipt of subsidies. It's possible that the rules which allow the re-election of farmer leaders means a leader will gain even more support from his base the longer he is in power, because he will become more adept at channeling resources to his region. Nevertheless, leaders may tend to support policy initiatives that bring short-term benefits because the system of political support requires leaders to channel subsidies to farmers in exchange for political support within the farmers' association. As a result, farmer leaders may choose to use their positions of power at the local, state, and national level to push for policy goals that provide immediate dividends to farmers—and which will help them win re-election—over goals that might improve the sector's productivity, but which would require a difficult period of transition.

One example of the short-sightedness of some of the farmers' associations' policy platforms is the *Contrato Uniforme*, or uniform contract between sugarcane growers and mills. The document attempts to regulate the sugarcane market by creating a contract for cane between the mill and farmer that is defensible in court. In the Contract, the farmer is bound to supply all cane grown on contracted lands to the mill, while the mill is bound to purchase all the cane grown and pay the farmer under the regulated pricing structure. The contract also requires mills to export 10% of their total sugar production each year.<sup>118</sup> Since the price of sugarcane is pegged to the price of sugar, as discussed on page 56, the export requirement

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<sup>117</sup> Singelmann, "La transformacion politica de Mexico y los gremios caneros del PRI (Political Transformation in Mexico and the PRI's Sugar Cane Workers' Unions)."

<sup>118</sup> "Contrato Uniforme" (obtained from the Camara Nacional de la Industria Azucarera y Alcoholicera, June 2009).

reduces the domestic sugar supply and drives up the price of sugar and sugarcane. The farmers' associations have an incentive to insert this type of policy regulation because leaders can point to higher sugarcane prices as a benefit they provided their constituents. The policy could reduce domestic demand for sugar, though, making it more difficult for mills to sell all their product each year; it could ultimately bankrupt some mills. The policy is inefficient, since it requires some mills in the middle of Mexico—close to the enormous market in Mexico City—to export the same amount of sugar as mills located near Veracruz's port cities.

By including the farmers' associations (and mill representatives) in national policymaking, inappropriate policies that fail to consider long-term impacts are implemented. The policies affect farmers both directly and indirectly. Farmers who have signed the Contrato Uniforme may feel compelled to sell sugarcane to mills when it is not in their best interest to do so (because, for example, they have found a buyer willing to pay a higher price or because they believe the mill will not pay them for their cane). Farmers are also affected when mills struggle to comply with the 10% export requirement, perhaps facing liquidity constraints as a result that limits their ability to pay farmers. Though transparency in policymaking is important for creating strong markets, the influence that lobby groups are given to establish regulations in the sugar industry limits producer choices and sometimes forces them to make choices that do not benefit themselves or the market.

### **Social Security Benefits**

Sugarcane farmers are guaranteed certain benefits, including social security, which farmers of other crops do not receive. Social security (IMSS) benefits include a monthly pension for the elderly and access to public-run hospitals. The farmers' associations receive each

farmer's IMSS contributions from the mill, which deducts the amount from what it owes the farmer. The associations then submit the total payments along with their list of members to IMSS.<sup>119</sup> Since IMSS payments are automatic if a farmer sells to a mill, most sugarcane farmers contribute to social security. Receipt of benefits from the program is high, with 69% of sugarcane growers reporting that they receive primary care from the IMSS.<sup>120</sup> The remaining farmers mostly see private doctors for medical services, though it is unclear whether they do so out of preference or because an IMSS hospital is inaccessible.

Social security benefits may be an incentive to remain a member of a cane farmer association and to continue growing sugarcane instead of other crops. Unaffiliated cane farmers are unable to obtain social security benefits. Farmers may wish to form their own association, as discussed above, but fail to do so because they do not wish to risk losing benefits, even for a few years. Similarly, since farmers growing another type of crop in Mexico do not receive social security benefits,<sup>121</sup> cane farmers may decide against switching crops or performing non-farm labor because they would lose health benefits now and access to their pension later. It is possible that the way social security benefits are structured for sugarcane growers causes them to forego opportunities to form alternatives to the current farmers' associations or to increase their incomes by switching to a crop from which they could receive higher returns.

Cane farmers only receive social security benefits if they sell their cane to the mill, which constrains producers' choices about where to market their product. If a sugarcane farmer

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<sup>119</sup> Farmer Interviews in Atoyac, Veracruz, interview.

<sup>120</sup> SAGARPA, "Padrón de Productores de la Caña de Azúcar."

<sup>121</sup> , *La agroindustria*

decides to sell his cane to an alcohol distillery or an ethanol plant, social security deductions are not taken from his payments and he will not receive coverage for that year.<sup>122</sup> Even if a distillery offers a higher price for sugarcane, the farmer may choose to sell to a mill because he cannot afford to forego social security benefits. In alternative situations, a cane farmer may choose to sell cane to a distillery to avoid repaying his debts to the mill or to obtain payment for his cane when the sugar mill has a history of delaying payments to farmers. As a result, cane farmers temporarily lose social security benefits, but may take home more money. Since farmers can't carry social security benefits with them, they are sometimes forced to make a short-term decision between greater stability in healthcare and more income. Their decision can change from year-to-year, as anecdotal reports indicate farmers' associations do not punish farmers who "pirate" their sugarcane to a distillery in order to avoid debts.<sup>123</sup> Farmers may decide that they need money one year, so they sell to a distillery, but return to selling to a mill the next year in order to obtain social security benefits. The constraints on producer choices creates a high level of uncertainty during the harvest. Farmers may not be forthcoming about the amount of cane sold surreptitiously and mill owners are unable to forecast how much sugarcane will be delivered to the mill. The lack of information and coordination can affect the efficiency of the sugar-making process and lower overall productivity.

Farmers who receive a pension are not required to retire from sugarcane farming; as a result, many pensioned farmers continue to cultivate cane. In Veracruz, 22% of farming

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<sup>122</sup> \_\_\_\_\_, Luis; Professor, Universidad de Chapingo, interview.

<sup>123</sup> Farmer Interviews in Atoyac, Veracruz, interview.

households receive an IMSS pension for their work as sugarcane farmers.<sup>124</sup> The percentage reflects the advanced age of the farming population. Industry stakeholders also commented that sugarcane farmers are generally old, and unable to perform the onerous tasks required in sugarcane cultivation.<sup>125</sup> No data is available about the amount of money pensioners receive and whether it is enough to support elderly farmers. It's possible that pensioned farmers invest less in their crop because they cannot afford it, because they are unable to perform the manual labor, or because they do not expect to receive long-term payoffs that investing in sugarcane would provide. The pension acts as an income guarantee for farmers, weakening their interest in investing in sugarcane to improve its quality and obtain higher earnings. The aging population of sugarcane farmers, and the fact that they no longer have to depend solely on income from sugarcane, may drive down the cane's quality.

### Access to Credit

As mentioned, government financing to cane farmers has mostly been dismantled, but farmers associations still concentrate efforts on connecting farmers with government credit; they do not assist farmers much with accessing private sector credit.<sup>126</sup> Few cane growers access any credit at all. Survey results for Veracruz show that 60% of farmers received no credit during 2007, while only 1% obtained credit from commercial banks, 4% came from the government, and 28% of loans came from the mill. Often, credit arrives too late in the season to

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<sup>124</sup> It is important to note that the survey was only directed at current sugarcane farmers. The survey reflects how many farmers receive pensions and grow sugarcane. It does not reflect how many households receive pensions but no longer farm sugarcane. SAGARPA, "Padrón de Productores de la Caña de Azúcar."

<sup>125</sup> , Luis; Professor, Universidad de Chapingo, interview; Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview; Enriquez Poy, Manuel; Asociacion de Tecnicos Azucareros de Mexico, interview.

<sup>126</sup> Farmer Interviews in Atoyac, Veracruz, interview.



be useful for purchasing fertilizer and other inputs, and repayment plans are not structured to reflect the farmer's own liquidity.<sup>127</sup> Since many sugarcane farmers work on ejidos, commercial banks may be averse to offering credit because the farmers lack collateral, such as the title to their land or home.

Even though there are fewer opportunities to obtain credit from the government today as compared to 20 years ago, farmers' associations may continue to emphasize their role in obtaining government credit because they have more leverage with the government than with the private sector. By channeling government resources to farmers, the associations' validate their existence: they demonstrate to farmers that the associations provide access to resources, and they demonstrate to the government the demand for those resources from a large electoral base. A well-developed private sector credit market might prefer to use other distribution channels to connect with farmers. Farmer associations may emphasize government credit sources over private sector credit opportunities (or opportunities to develop credit within the private sector) because it serves the organizations' needs best. Farmers are left with very few options to obtain credit, and may be unable to make timely investments in their crops as a result.

Though farmer associations could help their members overcome the burden of creditworthiness by obtaining credit collectively, 92% of farmers who received credit reported

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<sup>127</sup> Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview. Previously, farmers received financing from the state agency FINASA, which extended credit through mills. FINASA structured repayment in accordance with a cane farmer's expected return on investment: that is, a farmer would repay 60% of his loan at his first subsequent harvest, the second year 25%, and the third year 15%. For farmers looking to replant their cane, the structured repayment reflected the fact that they were likely to see the most profit from their investment at their first harvest, while future harvests would produce declining sucrose contents. Commercial lenders today offer no such structured repayment plan.

receiving it individually.<sup>128</sup> Individual credit receipts do not incentivize collective production among smallholders, which could help them overcome some of the coordination problems they face during sugarcane cultivation and harvest. Farmer associations could increase the opportunities and manners in which farmers choose to receive credit; instead, they organize cane growers to collectivize political participation by pressuring the government for access to credit, but fail to coordinate production by providing pathways to access credit collectively.

Though survey results show most farmers obtaining credit individually, anecdotal interviews suggest that when farmer associations access credit collectively, local leaders sometimes use the investment for personal benefit or their political goals. For example, a group may collectively obtain credit to purchase a tractor, which the most powerful member may offer to maintain. He may then limit access to the tractor and charge high rents for it, even once the tractor is paid off. Ultimately, the farmer becomes the tractor's de facto owner, even when several farmers participated in its purchase.<sup>129</sup> The other original owners lose access to the tractor and the funds they originally invested in its purchase. They may be left with less money to make additional investments, and less interest in investing collectively. When the collective use of credit has such negative outcomes, farmers may become discouraged from working collectively on more difficult tasks, such as improving the efficiency of the harvest. At the same time, powerful community members gain strength through increased access to capital and resources. They will continue to support the farmers' associations and their leaders because

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<sup>128</sup> SAGARPA, "Padrón de Productores de la Caña de Azúcar."

<sup>129</sup> Enriquez Poy, Manuel; Asociación de Técnicos Azucareros de \_\_\_\_\_, Luis; Professor, Universidad de Chapingo, interview. This anecdote comes from two separate interviews, though I heard similar stories from farmers in Atoyac, Veracruz as well. Further research would be necessary to quantify the frequency with which joint investments are co-opted by local leaders.

they have benefitted disproportionately from them. As a result, the farmers' associations pursue strategies of accessing credit that benefits a minority at the expense of the majority and at the expense of productivity in sugarcane.

### **Coordination of the Sugarcane Harvest**

A final role for farmers' associations is the organization of the sugarcane harvest at the mill level. Representatives from the local chapter of the UNPCA and UNC (and any other viable farmers' organization), as well as a representative from the mill, form a local planning committee to decide which areas to harvest first and when. The committee divides producers into production groups that work collectively to carry out the harvest. It also determines the technical and labor needs for the harvest, and contracts the equipment or laborers necessary. The committee communicates those needs to the mill, which advances payment for machine rental, wages and the meager benefits that day laborers receive, deducting those costs from what it owes producers.

The UNPCA and the UNC work together during the harvest to organize the *frentes de corte* geographically, rather than by organizational affiliation.<sup>130</sup> However, as mentioned in Section III on page 22, sometimes daily quotas on sugarcane from each organization limit when a truck carrying cane can enter the mill. Though the organizations work together to coordinate some aspects of the harvest, at other moments they may act antagonistically. Since farmers pertaining to both organizations are paid based on the overall quality of sugarcane, not the quality each organization contributes, all farmers suffer from such antagonistic behavior.

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<sup>130</sup> Farmer Interviews in Atoyac, Veracruz, interview.

The farmers' associations coordinate the harvest, but notably no other aspect of sugarcane's cultivation. More than 60% of planting and cultivation is undertaken individually, and not coordinated with other farmers.<sup>131</sup> Since farmers have not cultivated their crops in a coordinated manner, each *frente de corte* may include cane that is immature, mature, or overly mature. It is possible that the institution of a coordinated harvest increases barriers for farmers to coordinate production as a whole. Some of the barriers smallholders face for coordinating sugarcane from planting through harvest are mentioned above: smallholders may hold bitterness and frustration over the decision to privatize or remain an ejido, or they may lack incentives to coordinate because the credit and subsidies they receive are all individually obtained. When the farmers' associations organize the harvest but no other aspect of cultivation, they may create expectations among farmers that the associations would organize other aspects of cultivation if it were necessary. Assuming that farmers are aware that coordinated sugarcane cultivation would increase sucrose levels, farmers may lack incentives to coordinate with neighbors because they lack the authority and structure the farmer organizations provide. Though greater coordination among cane farmers would benefit them and the entire industry, it's possible that the institution of a collective harvest which farmers' associations coordinate may limit cooperative efforts at all moments outside the harvest. Further research on when coordinated cultivation efforts have succeeded, and when such efforts have broken down, would offer greater insight into why there is an absence of institutions supporting cooperative behavior among sugarcane farmers.

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<sup>131</sup> SAGARPA, "Padrón de Productores de la Caña de Azúcar."

Farmer associations could help farmers overcome coordination problems and improve collective production. Instead, the rules regarding receipt of benefits and credit, and the decisions the associations make about the types of policies to pursue limit farmer choices and reduce their incentives to produce collectively, which reduces cane's quality. The rules also create incentives for farmers to continue producing sugarcane when they may be more competitive in other crops.

### Sugarcane Pricing Regulations

The pricing system for sugarcane distributes the rents from sugar production between farmers and mills based upon the following calculation:

Price of Sugarcane = .57(Reference Price)(Average Recuperated Sugar/ ton of sugarcane),<sup>132</sup>

where

**Reference Price of Sugar:** the price of one kilogram of wholesale sugar, calculated from the average of sugar's price in the government-run supply centers and the price in export markets reached by Mexican sugar the year before.

**Average Recuperated Sugar:** the quantity of sucrose obtained from sugarcane, as determined by the overall purity of the cane juice the mill receives, subtracting for the percentage of dirt and fiber in the cane, and calculating a minimum 82.37% efficiency level for each mill.<sup>133</sup>

In other words, mills estimate the amount of sugar they can produce from the farmers' sugarcane by periodically testing the sucrose levels and signs of impurities as the cane arrives at

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<sup>132</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar* interview.

<sup>133</sup> *Ley de Desarrollo Sustentable de la Caña de Azúcar*.

, Luis; Professor, Universidad de Chapingo,

the mill gates. They average the purity of the cane juice across all the cane that farmers deliver throughout the harvest, so a producer's cane is considered in aggregate along with other producers in the region. Mills pay farmers 57% of sugar's wholesale price for the amount of estimated sugar the mill recovers from each ton of sugarcane. Farmers are paid based on the amount of sugarcane they deliver and the average quality of the sugarcane among all the other farmers supplying the mill. The system for determining the price of sugarcane is implemented at the national level, and limits farmers and mill owners from determining a local market price for sugarcane.

The calculation for sugarcane's price contributes to the falling quality of sugarcane by creating disincentives for farmers to increase their cane's sucrose content. Since the calculation method takes an average of cane purity from all the sugarcane in the region, some producers are not paid for all the sugar they deliver, while others are paid more. Farmers have little reason to improve the sucrose content in their cane, and are hindered from collectively improving sucrose levels because of the coordination problems discussed above. They may in fact prefer to invest as little as possible in sugarcane and hope that other farmers have a good year, so they can reap the benefit of high sucrose levels without making the investment themselves. Finally, since farmers know they cannot affect the average recuperated sugar level very much, they may instead concentrate on obtaining high yields of mediocre sugarcane. They concentrate on quantity as opposed to quality in an attempt to improve their own incomes. Increasing yields—possibly by planting sugarcane close together—without making significant investments in land and cultivation would further reduce sugarcane's quality. Indeed, as seen in Section II on page 14, Mexico has historically seen strong yields and low sucrose levels. The

manner in which sugarcane's price is calculated, combined with the high barriers farmers face in working collectively, create incentives for farmers to reduce the quality of sugarcane even though an overall improvement in cane's quality would increase their incomes.<sup>134</sup>

The regulated calculation for the price of sugarcane creates incentives for the government, mills, and farmers' associations to negotiate the reference price of sugar to improve the price they pay or receive. Between 1991 – 2004, the reference price for sugar fell in real terms even as the actual price of sugar rose.<sup>135</sup> The 2005 Law on the Sustainable Development of Sugarcane (LDSCA) attempted to reform the policy by specifying that the reference price for sugar be pegged to the market price of bulk sugar. Representatives from the farmer organizations and the Sugar Industry Chamber of Commerce brokered a deal in 2008 which finalized prices for the 2007 and 2008 harvest (whose payment had been delayed due to disagreements over the reference price) and established specific calculations for determining the reference price in 2009.<sup>136</sup> Despite the agreement to calculate the reference price starting in 2009, once again a new reference price was negotiated in October 2009, indicating that the reference price remains a politicized indicator, and not a market indicator.<sup>137</sup> Both mill and farmer

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<sup>134</sup> Given this hypothesis, it is a puzzle that farmers in the Central region seem to have overcome these disincentives in increased investments in their crop (if it is indeed true that higher production costs reflect high levels of investment). One possible reason is that there are fewer farmers in the region (which contributes only 7% of overall production), such that they are able to overcome coordination problems. This hypothesis is undercut by the fact that farms in the Central region are smaller on average than in any other region; they may produce less but there may well be more farmers. Another hypothesis is that universal irrigation systems implement a minimum level of coordination among farmers as they negotiate water use. Further field research into the production and cultivation practices of farmers in the Central region and their peers in the rest of the country would provide greater insight into the arguments about institutions' impact on productivity that I make here.

<sup>135</sup> *Sugar and Sweeteners Outlook*.

<sup>136</sup> Cámara Nacional de la Industrias Azucarera y Alcohólera, *La agroindustria azucarera en México: Compendio 2007-2008*.

<sup>137</sup> SAGARPA, "Logran gobierno, cañeros e industriales trascendente acuerdo en precio de referencia del azúcar para el pago de la caña," press release (Mexico City, October 25, 2009), <http://calderon.presidencia.gob.mx/prensa/comunicados/?contenido=49865> (accessed November 30, 2009).

associations have incentives to keep negotiating the reference price, since they can report back their efforts to their constituents. However, the negotiated reference price reduces the opportunities mills and farmers have at the local level to establish a price for sugarcane that may reflect local market values.

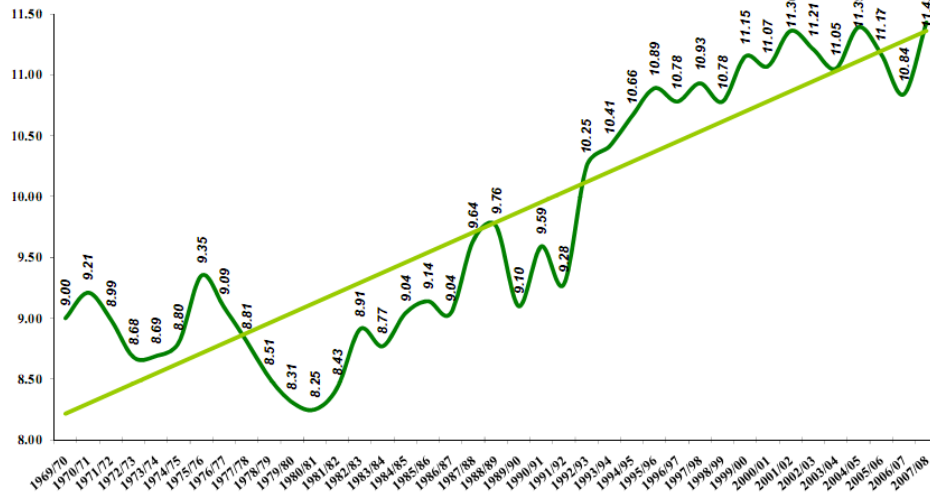
The price calculation also affects sugar mills' choices. Though the regulation may address concerns that sugar mills have monopsony control of the sugarcane market, it also limits mills from implementing a pricing system which could incentivize farmers to improve the quality of their sugarcane. In addition, the method for calculating the price of sugarcane sets an estimated national mill efficiency standard; producers are discounted for their sugarcane based on their buyer's ability to capture sucrose. If mills perform above the standard they are able to extract additional sucrose from sugarcane without reimbursing the farmer for it. Mills are also choosing to improve efficiency in order to reduce the impact of low sucrose, falling yields, and the high costs of cane; since 1992 Mexico's sugar mills improved productivity by more than 10% (see Figure 9).<sup>138</sup> Mills are incentivized to improve their efficiency under the pricing scheme because in doing so they can obtain sugar from sugarcane without paying farmers for it. Similarly, modern mills can diversify their uses of sugar's by-products, such as bagasse for electricity generation. Since the pricing method does not require mills to reimburse farmers for additional income they generate from sugarcane's byproducts. Mills are able to use the pricing policy to improve their productivity through increased efficiency and the diversification of sugar's byproducts. This is partly because farmers are considered in the aggregate under the pricing policy, whereas mills are sole actors.

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<sup>138</sup> *Estadísticas de la Agroindustria de la Caña de Azúcar 2000-2009*; Argüello Zepeda and de la Cruz R., *La privatización de la industria azucarera mexicana y su impacto social*.



Figure 9: Mill Productivity



Source: Unión Nacional de Cañeros. Estadísticas de la Caña de Azúcar 2000-2009. 2009

Note: Graph aggregates productivity increases across publicly and privately owned mills.

As a final note, the pricing policy also affects the ability of other industries, including the emerging ethanol industry, to compete for sugarcane. Sugarcane's price is linked to sugar's price, and as the price of sugar rises so does the price of sugarcane. As a result, the price of Mexican sugarcane was almost twice as expensive as sugarcane in Brazil, a major ethanol producer.<sup>139</sup> Ethanol and alcohol factories must offer cane farmers a domestically competitive price for the raw material, and as a result the ethanol industry in particular is not expected to be very dynamic in Mexico.<sup>140</sup> By creating rules governing the price of sugarcane that offers a high price for sugarcane entering sugar production, the pricing policy impedes growth in other sectors.

<sup>139</sup> "FAOSTAT."

<sup>140</sup> Enriquez Poy, Manuel; Asociación de Técnicos Azucareros de México, interview; María del Pilar Martínez, "Imponer el precio del azúcar "a la mexicana", Blackaller," *El Economista/El Porvenir*, April 3, 2009, <http://www.zafranet.com/imponer-el-precio-del-azcar-a-la-mexicana-blackaller/> (accessed June 20, 2009); Saturnino Arias, "Hay incertidumbre entre cañeros tabasqueños por la producción de etanol," *Tabasco Hoy*, March 2, 2009, <http://www.zafranet.com/hay-incertidumbre-entre-caeros-tabasqueos-por-la-produccion-de-etanol/> (accessed June 20, 2009).

## Insecure Property Rights Among Sugar Mills

Mills and farmers are inextricably linked in the sugar production process; low productivity in the field will affect a mill's ability to produce sugar. Given the constraints farmers face in investing in sugarcane production, mills could increase their own output by assisting farmers in making these investments. Instead, private mills have provided fewer resource such as loans, fertilizer subsidies, etc. to cane farmers.<sup>141</sup> At the same time, mills are investing to improve their own efficiency, as demonstrated in Figure 9. Mills' failure to invest in sugarcane fields further reduces farmers' ability to invest in their crop. While further research is needed to quantify whether similar levels of investments at the mill and field level would produce the same efficiency gains, it seems likely that the expensive capital investments made at the mill level could bring significant increases in productivity if applied to the fields instead. Improved productivity at the field level would improve mills' efficiency during processing. Why, then, do mills choose to invest in themselves and not in improving the quality of sugarcane mills receive? I argue that weak institutions in property rights create some incentives for sugar consortia to increase investments at the mills level. At the same time, given farmer's behavior in response to the institutions discussed above, mills see farmers as a risky investment, and prefer not to direct scarce resources to them.

Privately owned sugar mills were expropriated several times in the last hundred years as governments responded to political pressures to maintain sugarcane farmers' jobs. For much of the 20<sup>th</sup> century, mills were owned by families with centuries of experience in the

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<sup>141</sup> Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview.

industry and significant political power, particularly in areas such as Veracruz.<sup>142</sup> The families used their political strength to channel government subsidies meant for the modernization of the mills to other personal ventures, leaving mills decapitalized and bankrupt.<sup>143</sup> In 1975 President Echeverría expropriated 31 of the 65 mills in Mexico in an attempt to recover some of the misallocated funds and ensure continued employment for farmers and mill laborers. The government also intended to modernize the mills, but the rising cost of sugarcane and intense political pressure from farmers meant most funds went to paying farmers for their crop, and not to modernizing the mills.<sup>144</sup> As part of the shift toward liberalized markets, government-owned sugar mills were sold to private investors in the early 1990s. In 2001, the farmers' associations lobbied the new PAN-led government for assistance as the sugar industry struggled to compete with high fructose corn syrup imports. The government, in power for the first time since the revolution, was unprepared for the strength and capability of the farmers' lobby.<sup>145</sup> It responded by expropriating 27 mills on the grounds that they were not paying government debts or debts to farmers. Currently, 14 mills remain under government control, while the remaining were returned to their owners under a court order that declared the government seizure illegal.<sup>146</sup> The frequency of the government's expropriation of sugar mills undermines mill owners' certainty about the safety of their investment and creates incentives for them to find ways to reduce their risk.

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<sup>142</sup> Singelmann, *Mexican sugarcane growers: economic restructuring and political options*.

<sup>143</sup> , *comercial*.

<sup>144</sup> *Ibid.*

<sup>145</sup> Sergio Puig de la Parra, "The Political-Economy and the Causes of Compliance of Trade and Investment Agreements: NAFTA and the Sweeteners Sector" (Stanford University, 2009).

<sup>146</sup> The remainder of this discussion focuses on the privately owned mills.

Somewhat paradoxically, mills' history of weak property rights lead them to invest more in increasing mill efficiency rather than less. If mills are threatened with expropriation, they face disincentives to undertaking investments, since the money invested could be lost upon expropriation. However, investments at the mill level may reduce the risk of expropriation because vertical integration with multinational corporations increases the government's costs for expropriation. Mills are entering into contracts or vertically integrating with multinational organizations to gain some respite from liquidity constraints, and to secure a market for the mill's sugar production. Table 2 presents examples of major sugar consortia in Mexico and their linkages with international corporations. Multinationals also provide mills with greater security against government expropriation, as foreign investors may sue Mexico under bilateral investment treaties for unfair treatment.<sup>147</sup> When mill owners increase investments in the mills, the government must consider recompensing international investors for the expropriation; a mill with greater levels of investments would be more costly for the government to expropriate. Therefore, though we might expect mills to decrease investments given the history of expropriation, mills with multinational linkages could have incentives to increase investment in order to protect the mill from expropriation. While multinational linkages may offer protection from expropriation, they do not provide a clear reason for why sugar consortia choose to invest in mills to the exclusion of investing in productivity at the field level.

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<sup>147</sup> Indeed, US investors did sue Mexico under a NAFTA Chapter 11 tribunal for its expropriation of the sugar consortium GAM's mills. The suit was unsuccessful, however, as the tribunal found that the Mexican court system has already adequately dealt with the unlawful behavior. The instance demonstrates the additional leverage mills have in protecting themselves against government interference by seeking international investors. Puig de la Parra, "The Political-Economy and the Causes of Compliance."

Table 2: Examples of Vertical Integration and International Contracts with Multinational Corporations

| Consortium                     | Number of Mills | International Linkages  |
|--------------------------------|-----------------|---|
| Grupo Azucarero Mexicano (GAM) | 4               | Originally owned by Pepsi Co. Maintains a contract with Pepsi to source (percentage of production, percentage of Pepsi's sweetener consumption?) from GAM. Vertically integrated with PAM, a Mexican distribution company.  |
| Grupo Piasa                    | 2               | Affiliated with Coca-cola.  |
| SAENZ                          | 3               | Originally purchased by British company Tate & Lyle, which sold its shares in 2007 to ED&F Man, "a leading provider of sugar, molasses, animal feed, tropical oils, rubber, biofuels, coffee and risk management services."<br><br>Saenz formed Domino Sugar, Mexico, and its main client is now Walmart. |
| Santos                         | 5               | Part of the larger Mexican corporation Empresas Santos, which holds property investments, along with entertainment/tourism and telecommunication business.<br><br>In early 2009 Santos entered into a joint venture with US-based Imperial Sugar to commercialize sugar in Mexico and US.                 |
| Zucarmex                       | 5               | Cargill, best known for high fructose corn syrup production, is a minority owner. The company has taken over all of Zucarmex's commercialization concerns.  |
| Grupo la Margarita             | 3               | Recently entered into a one year contract with Imperial Sugar (through Santos) to commercialize sugar.  |

Sources: "GAM - Grupo Azucarero México," <http://www.gamsa.com.mx/pam.htm> (accessed March 4, 2010); "Grupo Piasa," <http://www.grupopiasa.com/inicio.html> (accessed March 4, 2010); "Tate & Lyle sells stake in Mexican sugar producer," *Reuters* (London, October 8, 2007), sec. Mergers and Acquisitions, <http://www.reuters.com/article/idUSL0833378620071009> (accessed March 5, 2010); "Empresas Santos," <http://www.santos.com.mx/> (accessed March 5, 2010); Mertens, *Hacia el trabajo decente en el sector de azúcar*; "Imperial Sugar Mexican venture inks new deal," *Houston Business Journal* (Houston, March 11, 2009), online edition, <http://www.bizjournals.com/houston/stories/2009/03/09/daily17.html> (accessed March 5, 2010).

A second reason mills may face incentives to invest more in their own productivity is because sugar mills' property rights may be less secure when farmer's livelihoods are at stake.

One justification for each expropriation was the government's interest in maintaining the

livelihoods of sugarcane farmers when mills were close to bankruptcy.<sup>148</sup> The government's action also reflected the power farmers' associations have over government policy. The government is less likely to close a mill, since the jobs lost could be a political disaster, and will prioritize paying the farmers over mill maintenance.<sup>149</sup> Even though government interventions can disrupt production and harm many farmers, the farmers' associations tend to support mill expropriations because it increases stability and farmers' leverage over mills.<sup>150</sup> Given the fact that farmers' associations would likely lobby a government to take over a bankrupt mill, and the government has political incentives to listen, it is possible that owners seek to invest more in increasing the efficiency at which the mill processes sugarcane in order to avoid the appearance of bankruptcy and the threat of expropriation. Despite low sucrose levels, a highly efficient mill may be able to produce sugar at a relatively low cost. In this way, the mills may reduce the likelihood it is expropriated because they do not appear to threaten farmers' livelihoods.<sup>151</sup>

Weak property rights creates some unexpected incentives for mills to invest in their own productivity. At the same time, despite the threat of expropriation and loss of investment that mills face, mills may see farmers as an even riskier investment. While it is true that mills have been expropriated several times, the event is fairly infrequent. Moreover, the political tide has shifted from such overt government interventions, and Mexican courts ruled against the

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<sup>148</sup> \_\_\_\_\_, *Tenencia de la tierra e industria azucarera*; Puig de la Parra, "The Political-Economy and the Causes of Compliance."

<sup>149</sup> Argüello Zepeda and de la Cruz R., *La privatización de la industria azucarera mexicana y su impacto social* al.

<sup>150</sup> Paniagua, Anselmo; Unión Nacional de Productores de Caña de Azúcar, interview.

<sup>151</sup> This hypothesis would be bolstered by further research into the amount of debt mills are carrying as a result of their investments in improved efficiency. If the investments mills are making, either by retrofitting older equipment or by gutting outdated equipment, initially leave them highly indebted with small gains in output, then my hypothesis will be weakened. If on the other hand the debt mills take on for each investment is quickly reduced by the gains in efficiency, my hypothesis that mills' investments seek to reduce the threat of expropriation by demonstrating liquidity would be strengthened.

government's actions. Meanwhile, mill owners are probably very aware of the institutions and choices that farmers face, and understand that farmers can choose each year whether or not they will repay a loan or "pirate" their sugarcane. From the mills' perspective, farmers may represent a more immediate investment risk, especially if it is true that mills are only expropriated when they threaten bankruptcy. Weighing the institution of weak property rights against the various institutions farmers face which create disincentives for improving sugarcane's quality, mills choose to invest in their own efficiency. This choice further limits opportunities to improve field efficiency, and sugarcane's quality suffers as a result.

The history of mill expropriation affects farmers' ability to invest in their crop in another way. If mills view their history of expropriation as a history of the government's response to farmers' interests over mills' interests, mills may seek to use farmers as bargaining chips when lobbying for their own needs from the government. For example, Grupo Santos has refused to pay its farmer suppliers for sugarcane since 2005, claiming it never received compensation for the government's 2001 expropriation of its mills. Grupo Santos states it will pay farmers with the money it receives from the government.<sup>152</sup> By withholding farmer payments in exchange for government commitments on policy, the company is leveraging the farmers' political strength to ensure its own recompense. Farmer payments become a bargaining chip for the mills' relatively weaker negotiating opportunities. As mills withhold payments to farmers, though, household liquidity suffers and farmers are constrained to make investments in increasing cane productivity. Farmers may need to take out high-interest loans from local loan sharks to meet

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<sup>152</sup> Matilde Pérez U., "El Gobierno ofrecerá créditos al Grupo Santos para que liquide su adeudo cañero," *La Jornada*, June 15, 2009, <http://www.zafranet.com/el-gobierno-ofrecer-creditos-al-grupo-santos-para-que-liquide-su-adeudo-caero/> (accessed June 22, 2009).

basic needs. They may also choose to reduce their investments in inputs for their sugarcane fields. It's possible that the delays are a major cause of low farmer incomes and reduced well-being.<sup>153</sup> Furthermore, since delayed payments are not reflected in the calculations on farmer incomes cited above, perceived incomes may actually be significantly less than estimated. Even delays of a few months could cause households that earn incomes near the poverty line to fall below it, and households living in poverty will suffer even more. Farmers who go without pay and cannot access credit have less ability, and even fewer incentives, to improve their sugarcane stock.

## VII. A Counter-argument: Unfair Competition Debilitates Mexican Sugar

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When sugar and other sweeteners were included in the North American Free Trade Agreement (NAFTA) negotiations, it was the first time that Mexico opened its sugar market to outside competition. The transition to international competition has not been easy for domestic sugar producers, and some argue that liberalizing trade in sweeteners has jeopardized domestic production.<sup>154</sup> In this section I explore two consequences of trade liberalization for the Mexican sugar industry: lower than anticipated U.S. market access and increased competition in domestic markets from high fructose corn syrup (HFCS). I argue that these consequences

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<sup>153</sup> The CNC farmers' association claims that farmers lose 15% of their incomes because mills haven't paid their farmers on time. No information is available to analyze and/or critique their calculation, so I include it here as an illustration of the potential losses farmer may be incurring as a result of delayed payments. Mariana Norandi, "Retraso en pagos disminuye en 15% los ingresos de productores de caña," *La Jornada*, de agosto 2, 2009, en línea edition, sec. Sociedad y Justicia, <http://www.jornada.unam.mx/2009/08/02/index.php?section=sociedad&article=034n2soc> (accessed August 3, 2009).

<sup>154</sup> , *omercial*; Mestries Benquet, "Globalización, crisis azucarera y luchas cañeras en los años noventa."

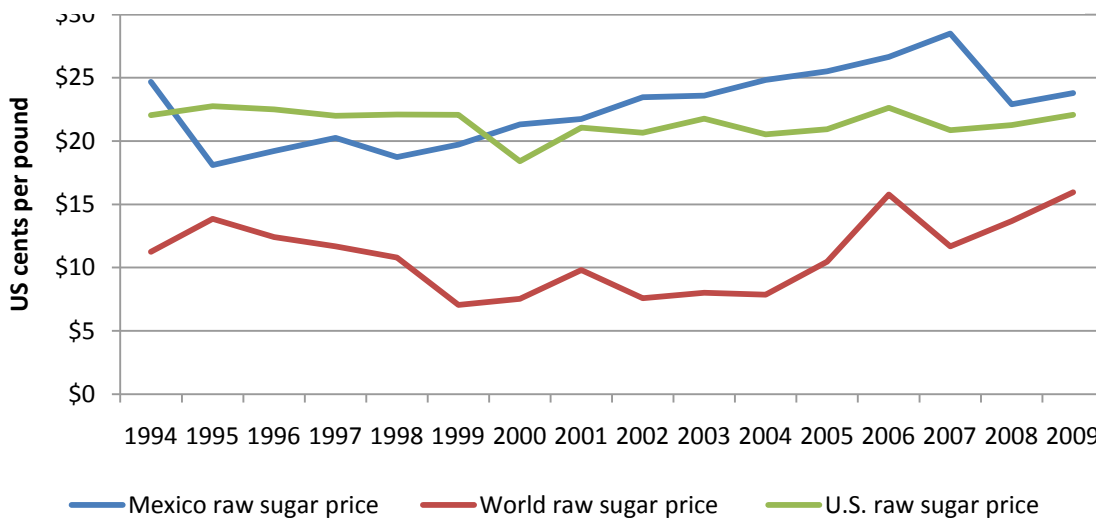


should have provoked efficiency gains in the sector not the stagnating productivity levels discussed here.

### Limited Access to the U.S. Market Limited Export Opportunities

NAFTA allowed for a 15-year reduction on barriers to agricultural trade, with free trade in sweeteners between the United States and Mexico beginning on January 1, 2008. At the time of the negotiations, U.S. sugar prices were higher than Mexican prices (see Figure 10) and Mexican supply surpassed demand. High levels of sugar consumption in the U.S. represented a

Figure 10: Mexican Sugar Prices are Extraordinarily High



Source: FAOStat

potential market for Mexican sugar. However, the U.S. maintained quotas on Mexican sugar during the 15-year transition which did not comply with NAFTA.<sup>155</sup> By the time the transition period ended, Mexico’s prices for sugar had risen above the United States’ prices, and sugar

<sup>155</sup> Puig de la Parra, “The Political-Economy and the Causes of Compliance.”

consumption in Mexico now demands more than the industry produces.<sup>156</sup> High prices in the domestic market discourage exports to the U.S., such that NAFTA has not opened up new markets for Mexican sugar producers.

The United States' non-compliance in sugar during NAFTA's transition denied Mexican sugar access to the U.S. market, but sugar producers did not respond to market forces by decreasing supply. Mexican sugar producers may well have expected to produce for a larger market when NAFTA was negotiated, and the quotas violated those expectations. As a result, some sugar which might otherwise be marketed in the U.S. at higher prices was sold on world markets at lower world prices, as Table 3 demonstrates. One might expect sugar producers to

**Table 3: Exports of Mexican Sugar, in 1000s of metric tons**

|                  | 1997  | 1998  | 1999  | 2000  | 2001  | 2002  | 2003  | 2004  | 2005  | 2006  | 2007  |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Total Production | 4,818 | 5,486 | 4,982 | 4,979 | 5,220 | 5,169 | 5,229 | 5,330 | 6,149 | 5,604 | 5,633 |
| Total Exports    | 966   | 1,076 | 524   | 318   | 155   | 413   | 38    | 14    | 128   | 866   | 160   |
| Exports to US    | 24    | 25    | 24    | 25    | 99    | 108   | 6     | 6     | 2     | 190   | 64    |
| Exports to World | 942   | 1,051 | 500   | 293   | 56    | 305   | 32    | 8     | 126   | 676   | 96    |

Source: USDA Foreign Agricultural Service

reduce their output in order to avoid selling sugar at lower prices. In addition, the need to sell sugar at lower world prices would create incentives to increase efficiency in the production chain; less efficient farmers and mills would be forced to leave the market. Instead, sugar production increased despite the market restrictions, as seen in Figure 2 on page 13; sugarcane output stagnated over the same period (Figure 4 on page 14) suggesting that field productivity

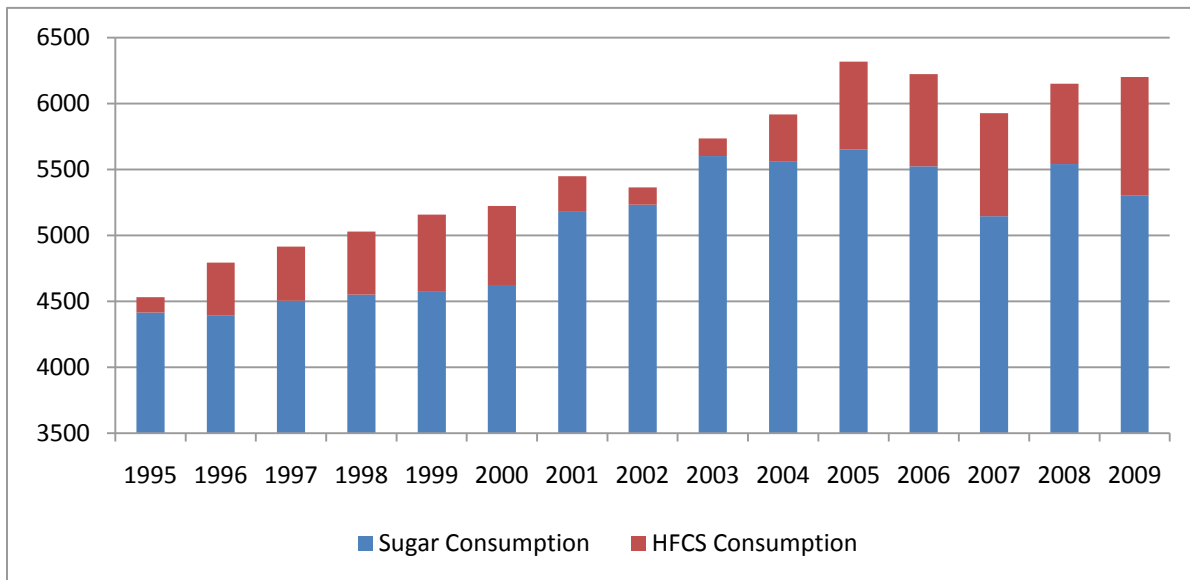
<sup>156</sup> Indeed, in 2009 Mexico imported sugar from Central America when an intense drought affected sugarcane production and created a sugar deficit in the country.

did not respond to the lower prices. Limited access to U.S. markets did not produce the expected reaction by Mexican sugar producers—lower production levels, increased efficiency, and few producers. In fact, the opposite seems to have occurred, suggesting that trade liberalization is not a driving force behind low productivity in sugarcane.

### High Fructose Corn Syrup Has Gained Market Share

NAFTA also liberalized trade in sugar substitutes such as high fructose corn syrup (HFCS), which quickly gained a strong presence in the Mexican sweeteners market. Figure 11 illustrates the uptick in HFCS imports following Mexico’s liberalization of its sweeteners market in 1994. HFCS eventually captured about 15% of the sweeteners’ market.<sup>157</sup> As a cheaper substitute to sugar, HFCS consumption absorbed the growing demand for sweeteners in

Figure 11: HFCS imports capture market share from Mexican sugar



Source: FAOStat

<sup>157</sup> HFCS was about half the price of Mexican sugar, due in great part to U.S. subsidies on corn production. Stephen Haley and USDA Economic Research Service, “ERS/USDA Briefing Room - Sugar and Sweeteners.”

Mexico. It did not cut into sugar's historic consumption levels and as Figure 3 on page 13 indicates, sugar consumption did not drop following HFCS's introduction to the Mexican market. Since domestic sugar prices remained high, sugar production did not fall in response to the increased competition. Nevertheless, HFCS did reduce sugar's growth in the domestic market. Intense lobbying from the sugar sector compelled the Mexican government to implement prohibitively high tariffs and taxes HFCS in 1998 and 2002. NAFTA and the WTO condemned Mexico's protectionist moves,<sup>158</sup> but not before HFCS imports dropped dramatically and sugar consumption enjoyed a spike between 2001-2007, as Figure 3 and Figure 11 demonstrate.<sup>159</sup> Assuming that increased domestic consumption of HFCS reduced the market for Mexican sugar, it could be expected that sugar producers would increase investments in making sugar production more efficient and competitive against cheaper HFCS. Once again the expectation contradicts what has actually occurred in Mexico, suggesting that trade liberalization is not what is causing low productivity in sugarcane.

Trade liberalization should have created incentives for less productive mills and farmers to drop out of sugar production in the face of intensified competition between Mexican sugar and other producers on the world market and between Mexican sugar and HFCS domestically. As fewer inefficient producers participate in the market, we could expect to see overall efficiency in the sector increase. Instead, the institutions in sugar production created incentives for farmers and mills to continue producing even though they were not competitive. Social

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<sup>158</sup> Puig de la Parra, "The Political-Economy and the Causes of Compliance."

<sup>159</sup> Recent increases in the use of corn-based ethanol have driven up the price of corn and corn-based syrups, providing a slight reprieve for sugar producers. However, alternative sweeteners including low-calorie sweeteners have an increasing presence in the market. As the cost of producing such sweeteners drops, and their popularity rises, sugar producers will continue to face the same challenges they saw from HFCS with these new products.

security benefits create incentives for farmers to continue cultivating sugarcane, which households would lose if they stopped cultivating sugarcane; similarly, farmer organizations offered political benefits for cultivating sugarcane. Farmer associations concentrated efforts on requesting trade protection from HFCS and not on mechanisms for increasing Mexico's competitiveness by improving field productivity. The pricing mechanism linked sugarcane prices to sugar prices, and since sugar prices remained the same throughout the period farmers had no incentive to improve production or leave the market. The transition to liberalized trade certainly posed a challenge for growth in the Mexican sugar industry. However, institutional structures in place during the transition to trade liberalization had a more direct impact on low productivity in the sector.

## Indications of Change

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I have argued that institutions in Mexican sugar production create disincentives for farmers to invest in their crop and for mills to invest in farmers. As a result, sugarcane quality is poor and the industry is less competitive internationally. Institutions also create incentives for farmers to continue farming sugarcane, even though the income they receive per hectare is barely above minimum wage. The institutions in sugarcane production appear to keep farmers trapped in a cycle of impoverishment and the industry trapped in low productivity.

Farmers and mills are beginning to make choices that would break the cycle and reshape the system of production described here. In two examples I discuss below, farmers are choosing to migrate to the United States instead of growing sugarcane, and mills are beginning to purchase tracks of land for sugarcane production. The decisions farmers and mill owners

make are rational responses to an institutional framework which reduces their productivity and welfare. Neither action attempts to reform the institutional framework in which producers act; however, they may ultimately provoke institutional change by shifting the ways that farmers and mills interact in sugar production.

Growing emigration from sugarcane regions suggests that farmers—particularly young farmers—are choosing to exit the industry rather than grow sugarcane. Though remittance receipts are still reported at very low levels, Veracruz in particular has seen a recent upsurge in the rate of migration to the United States. Veracruz is not a traditional migrant-sending state like Guanajuato, Zacatecas, or Michoacán. However, the state recently jumped to sixth in the nation, with mostly young men leaving the state to go to northern Mexico or the United States.<sup>160</sup> Data on migration at the household level among sugarcane farmers remains preliminary. In 2007, just 2% of Veracruz’s sugarcane farmers reported receiving remittances, but in Pérez Zamorano’s study of three mills 42% of households had at least one member of the family living in the United States.<sup>161</sup> In addition, many day laborers in sugarcane fields and mill workers are choosing to migrate.<sup>162</sup> Growing rates of emigration and increased dependence on remittances could change sugarcane farmers’ production choices. Much like corn-growing households in other regions of Mexico, households receiving remittances supplement the low income they gain from sugarcane, avoiding poverty. Households may choose to continue to farm sugarcane despite low profitability because they are supported by remittances. If this is the case, emigration from sugarcane-growing regions would support the institutions already in

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<sup>160</sup> Mestries Benquet, “Crisis Agrícola y Emigración en Veracruz.”

<sup>161</sup>

*azucarera.*

<sup>162</sup> Mestries Benquet, “Crisis Agrícola y Emigración en Veracruz.”

, *Tenencia de la tierra e industria*

place. On the other hand, the exodus of young workers to the United States could mean there will be fewer workers interested in receiving low incomes for the hard labor of sugarcane farming. While the current generation of farmers may depend on the remittances of their children to supplement farm incomes, the next generation may choose not to work the land at all. We could expect to see fewer sugarcane farmers in Mexico, and we might hope that a smaller number of farmers would be able to overcome the coordination problems which current institutions in sugarcane production exacerbate. It is also possible that farmers would be able to organize better to advocate for changes to the rules governing production today.

Some mills are buying and consolidating farmlands in an attempt to sidestep the inefficient production incentives sugarcane farmers face. For example, the mill Los Mochis in Sinaloa owns and cultivates its own land<sup>163</sup> while San Nicolas in northern Veracruz recently bought a parcel of land 100 kilometers from the mill for sugarcane cultivation.<sup>164</sup> Currently, very few mills are pursuing purchasing their own land<sup>165</sup> but anecdotal interviews suggest that more mill owners would like to pursue similar investments in the future. However, they also view land purchases as politically risky, since they do not want to be seen as taking jobs from farmers.<sup>166</sup>

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<sup>163</sup> ; Cámara Nacional de las Industrias Azucarera y Alcohólera, June 29, 2009.

<sup>164</sup> Pacheco, Jorge; Zafranet, interview. As Mr. Pacheco commented to me, it is noteworthy for a mill to cultivate sugarcane on land so far from where it will be processed. It suggests a high degree of coordination within the mill, and a lack of coordination with nearby farmers.

<sup>165</sup> L. Mertens, Roberto Wilde G, and Deutsche Gesellschaft für Technische Zusammenarbeit, *Aprendizaje organizacional y competencia laboral: la experiencia de un grupo de ingenios azucareros en México*

, *Tenencia de la tierra e industria azucarera*.

<sup>166</sup> Enriquez Poy, Manuel; Asociación de Técnicos Azucareros de México, interview. The concern over the political risk of buying land strengthens my earlier hypothesis that mills have an incentive to undertake investments that seem to secure cane farmers livelihoods.

To the extent that mills continue to buy more land and cultivate sugarcane under their own direction, they may create more jobs, produce sugar more efficiently, and perhaps change the institutions affecting production. If mills are able to oversee sugarcane production, they will have an incentive to produce high quality sugarcane which is efficiently delivered to the mill. The mills would demand labor both within the field and in the delivery process, offsetting at least some of the jobs that farmers potentially lost as mills vertically integrated sugarcane production. Higher productivity would also allow the industry to be more competitive internationally, which would be better for farmers in the long term. It is possible that mills will buy land from sugarcane farmers who need to pay off debts; in such instances farmers might be left with few opportunities, while working for mills on the land they used to own could be demoralizing.

Much like with out-migration of farmers, the mills' land purchases could have an enormous impact on the way the sector produces. It could also create real hardship for individuals even as the sector itself is strengthened. In the final section, I suggest specific reforms to the institutions in sugar production that aim to improve productivity in the sector while avoiding the hardship that emigration and mill ownership of land could create.

## **VIII. Conclusions and Recommendations for Reform**

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The institutions in Mexican sugar production are a network of rules that create perverse incentives for actors within the sector to produce inefficiently. Land tenure systems were intended to support the livelihoods of small farmers, but create incentives for farmers to



subdivide land. As a result, some farmers live in impoverished conditions. Social security benefits are intended to provide a safety net for farmers, but may be keeping them in sugarcane production when another sector could provide higher returns. Farmers' associations meant to collectivize production and represent farmers in negotiations with mills may create barriers to increased coordination. Association leaders are re-elected every few years to ensure they respond to the needs of constituents, and as a result they prefer policies with immediate benefits to long-term reforms. The government has expropriated mills as a strategy to protect smallholder sugarcane farmers, but mills have responded to such threats by investing more in their own welfare than in improving the welfare of small farmers. Rather than creating opportunities for increasing productivity, and at the same time improving farmers' livelihoods, institutions in Mexican sugar production may be lowering productivity and impoverishing farmers.

While it seems difficult to imagine that Mexican sugar production will increase efficiency without doing away with some institutions entirely, I suggest making specific changes to some aspects of the institutions affecting sugar production. The reforms are aimed at shifting farmers' incentives in sugarcane production in a way that would maintain the government's commitment to securing livelihoods for farmers. A first recommendation is to change the pricing system so that farmers are paid based on the sucrose levels in their own sugarcane, not the sucrose levels of the entire farming community. The pricing regulations should be changed to link increases in sucrose content in sugarcane to higher pay for farmers. Portable technology currently exists to measure sucrose content, so measurements could be

taken in the field, in the line to enter the mill, or at the mill's door.<sup>167</sup> The policy change would create incentives for farmers to improve the sucrose content of sugarcane, increasing the sector's efficiency.

The second policy recommendation is to increase access to credit so farmers have the opportunity to respond to the pricing reform's new incentives to invest in sugarcane. Wealthier farmers with plenty of savings will be able to make investments to increase sucrose content, but poorer farmers may be constrained from improving sugarcane's quality. Credit products would allow farmers to overcome liquidity constraints in order to make investments in sugarcane with the expectations of future profits. Collective credit products could help farmers overcome coordination problems to implement irrigation systems. More research into the extent of elite capture of the benefits from collective credit would be necessary to ensure that all farmers would be able to enjoy a return on their investment.

Third, policymakers should devise a system in which sugarcane farmers can carry social security benefits with them, even if they sell to alcohol distilleries instead of mills or if they transfer out of the sector entirely. A system of "portable" social security benefits would reduce farmers' incentives to remain in sugarcane production even though they are not competitive or do not earn as much as they could from another activity. Under the new pricing system, some farmers will not be able to compete, perhaps because they are working marginal lands. These farmers would be better off leaving the sector but currently they would lose their social safety net if they do. By allowing any cane farmer who received social security benefits during some

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<sup>167</sup>

, Luis; Professor, Universidad de Chapingo, interview.

period before the reform to maintain those benefits, farmers will be able to cultivate another crop or leave farming entirely without concern for a safety net.

The final recommendation involves reforming institutions of land tenure in Mexico. Improved institutions around land tenure would allow farmers to leverage landholdings in order to access credit. Better institutions for demarcation would allow ejido farmers to remove fences that act as barriers for the mechanization of the harvest, since farmers could be confident that more powerful neighbors won't encroach upon their landholdings. Institutional reforms would also ensure that farmers who find they are not competitive in sugarcane would face fewer barriers (and pay fewer bribes) when privatizing and ultimately selling their land.

Pérez Zamorano recommends opening a national dialogue for reforming the Mexican land tenure system.<sup>168</sup> He emphasizes creating a process in which civil society has leadership, and where the idea of fully privatizing the ejidos can be discussed. While civil society should guide the process, he also points out that regulatory changes could lower the transaction costs farmers currently face. For example, by opening government offices that support privatization efforts in areas outside major cities, the government could reduce the time and effort farmers face when undertaking privatization. Also, ejido regulations could be changed to allow households that are farming extra-legally to accede to an ejido, while facilitating the transfer of land rights within and between families.<sup>169</sup> These reforms would strengthen farmers' sense of security in land tenure and ownership, allowing them to pursue investment opportunities with less concern over losing access to their land and their investment. While a larger reform movement is ultimately necessary to secure land rights and provide the foundation for a robust

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<sup>168</sup> , *Tenencia de la tierra e industria azucarera*.

<sup>169</sup> Ibid.

rural land market, immediate actions to lower the transaction costs for farmers would improve their opportunities now and possibly lower some political opposition to land reform in the long term.

The reforms I suggest here aim to offer clearer incentives for farmers to improve the quality of sugarcane by increasing investments in the crop or by exiting the industry. The restructuring the reforms will cause within farming communities and households will likely be very difficult. Farmers who are not as competitive may find they need to send children on the dangerous journey north to earn an additional income. Others may feel forced to move away from their community to look for jobs in large cities. It will be important to consider the impacts on families who must leave the sector following the reforms, and determine what additional programs, if any, could ease the transition process. It can be hoped, however, that more farmers will benefit from the reforms suggested here, so that they will be able to improve the productivity of their sugarcane stock and increase their incomes per hectare. Mills would also become more efficient as they process sugarcane with higher sucrose content, obtaining more sugar per stalk than before. With higher productivity in both field and factory, Mexico would be more competitive internationally while maintaining a commitment to supporting the livelihoods of smallholder farmers.

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