
MARGARET WILDER AND SCOTT WHITEFORD

Flowing Uphill Toward Money

Groundwater Management and Ejidal Producers in Mexico's Free Trade Environment

The opening of the Mexican economy involves not only efficient production, but also changes in the environment that occur as the crops produced change in response to free trade agreements. Wilder and Whiteford examine the impact of free trade on groundwater irrigation districts in northern Mexico. In particular, they consider two trade agreements in different contexts, the North American Free Trade Agreement (NAFTA) (in Baja California and Sonora) and Mexico's free trade agreement with Chile (in Sonora). These case studies are important because agriculture uses approximately 80 percent of Mexico's water, and groundwater districts are threatened by water shortages from natural and human causes. The free trade agreements have had an uneven impact throughout Mexico, especially in major irrigation districts where producers have disproportionately benefited from production of more water-intensive crops, and binational concerns about water supply and quality are increasingly critical. The demands for water conservation and less intensive agriculture are directly in conflict with the demands of the market, which call for water-scarce arid regions such as those in northern Mexico to produce water-consumptive export crops, such as asparagus, which are benefited by free trade agreements, and profits have fallen under competition from the Chilean free trade agreement with Mexico. Asparagus uses as much water as grapes; its production is helping to deplete the valley of Caborca's groundwater aquifer at a very fast rate. Asparagus has therefore become a conflictive crop within the region because of the presence of transnational companies and other "outsiders" in the asparagus sector and the impunity of asparagus producers in observing required water restrictions. In addition to a prolonged drought, the Caborca aquifer has become severely overdrafted due in large part to state policies that supported and promoted cultivation of more water-consumptive crops. Moreover, grape produc-

ers have complied with water-use restrictions more than have asparagus producers, and grape production has more local economic impact than asparagus production. Wheat producers in Mexicali and Sonora have suffered from increased wheat imports from the United States under NAFTA, and binational water quality and supply issues threaten the source of high-quality irrigation water in Mexicali. Wilder and Whiteford call for greater engagement between Mexico and the United States to find sustainable solutions to binational groundwater issues, to increase control of pumping groundwater and inclusion of water management issues in new trade treaties.

Free trade and liberalization strategies have ushered in a new era of significant challenges for Mexico's ejidal producers.¹ Even in northern irrigation districts with a relative wealth of advantages, including a location close to Mexico's major trade partner, the United States, use of advanced technological packages, and especially access to irrigation water, ejidal farmers face nearly insurmountable obstacles to remaining on their land as active producers. Water management in the ejido sector has been dramatically transformed not only by explicit revisions to federal water legislation (first adopted in 1992, the same year as the ejido reforms), but also by the Article 27 ejido reforms that allowed ejidatarios legally to rent or sell their property, and by a host of free trade accords into which Mexico has eagerly entered over the last decade.²

Although NAFTA is the best known of these initiatives, other free trade accords have been as important or even more so within specific local regions and particular crop sectors in shaping changes in resource use and economic and social relations. The relationship between free trade and groundwater use and management has, to date, received insufficient attention. In the contemporary moment, Mexico is experiencing challenges to the future environmental sustainability of its productive and urban sectors, and, to risk an understatement, water is a significant component of the environmental landscape. In this chapter, we examine the impacts of free trade agreements on groundwater use and management by ejidal producers within Mexican irrigation districts. We argue, first, that the role played by water in the transformation of agriculture is integral to understanding major shifts in Mexico's political-economic landscape, and second, that Mexico's hearty embrace of free trade has intersected with other components of its liberalization strategy to create an economic straitjacket for ejidal producers. As Mexico enters into more free trade agreements with countries that enjoy comparative advantages in distinct areas, ejidal producers are exposed in increasingly complex ways to volatile international market prices and rules. Moreover, the imperatives of free trade that lead to the intensification of groundwater use and movement into more highly water-consuming crops are on a collision course with the contravening demands of more sustainable use of water resources.

The first section of this chapter provides an outline of Mexican liberalization strategies, including the sweeping water reforms and adoption of multiple free

trade agreements. The second section analyzes the current water situation in Mexico. In the third section, we focus on case studies of ejidal groundwater use and management in northern irrigation districts in the states of Sonora and Baja California, which are among the largest irrigators in Mexico. In the fourth and final section of the chapter, we assess the implications of our findings for the sustained economic viability of ejidal producers.

Free Trade and Water Reforms

In recent years, Mexico has vigorously pursued a free trade agenda, entering into a total of twelve free trade agreements in the eleven-year period of 1994 to 2005 (Mexico, Secretaría de la Economía 2005).³ Beginning with its 1986 entry into the General Agreement on Tariffs and Trade (now the World Trade Organization, WTO), Mexico began an economic opening that was crowned by its entry into NAFTA with Canada and the United States on January 1, 1994. As important as NAFTA assuredly is, it is not the only significant free trade accord, and in particular regional contexts, other free trade accords can be distinctly more influential, as we will see in our case studies. The economic liberalization strategy encompassed a broad range of measures beyond free trade, including changes in fiscal policy, privatization of state-owned industries, elimination of many subsidies, reduction in state-provided rural credit, the disappearance of guaranteed crop prices, and a reduced role for the state. After seventy-one years of control by the Party of the Institutionalized Revolution (PRI), economic liberalization was accompanied by political opening during this period, culminating in the July 2000 election of President Vicente Fox of the opposition National Action Party (PAN). Liberalization was also applied to the environmental sphere, as major land and water reforms were introduced to legislation governing water rights, water management, and ejido land tenure. It is within the scope of other chapters in this volume to address the implications of the ejido reforms per se; however, we will provide a brief overview of the water reforms to set the context for understanding their impact within the ejido sector.

The National Water Law of 1992

A new National Water Law (*Ley de Aguas Nacionales*) was published in the *Diario Oficial* (Mexico's Congressional Record) on December 1, 1992, and became effective the following day.⁴ The new law profoundly altered Mexico's prevailing water policy through its emphasis on greatly increased water user participation in managing the resource; its vision of a retrenched role for the federal government in managing water and an enhanced role for state and local governments; its emphasis on private investment in waterworks infrastructure and private sector management of urban water systems; its establishment of formal water rights markets; and its focus on recuperation of full costs of systems management and operation

from water users. Within the urban sphere, the law called for decentralization of water services to the municipal or state (from the federal) level, and allowed for privatization of urban water services.⁵ Within the rural sphere, the law established a “transference” program to transfer management authority from the federal government to water users in irrigation districts, and implemented full cost recovery policies. The law established formal water markets and allowed for private sector participation in irrigation works construction, operation, and maintenance.

In order to design and implement the new water program, a redesigned federal water management agency, the National Water Commission (or *Comisión Nacional del Agua*, CNA) was created in 1989 and in 1995 merged as part of the Secretariat of the Environment and Natural Resources (*Secretaría de Medio Ambiente y Recursos Naturales*, SEMARNAT). Several other major organizations constitute the state framework for water management: the River Basin Councils (*Consejos de Cuenca*), the Mexican Institute of Water Technology (IMTA), the Technical Committees of Underground Water (COTAS), and the Autonomous Users’ Organizations. (An excellent discussion of how these organizations ideally interface is presented in Chapter 17 of this volume.)

The free market orientation of Mexico’s water reform should be understood in the context of a global water reform prescription being written by the World Bank and other international financial institutions for developing countries around the world. For example, a 1998 World Bank study of bank-financed water user management programs, such as the transference program in Mexico, involved projects in twenty countries, including Mexico, Chile, Peru, and Colombia in Latin America, as well as Egypt, Tunisia, Albania, Armenia, China, the Phillipines, Nepal, Turkey, Mali, Niger, and Senegal (Easter 1998). The World Bank provided Mexico with US \$350 million as a loan, supplemented by another US\$200 million from the Inter-American Development Bank to finance the water reform program, representing close to 50 percent of total projected costs (Pineda Blancarte 2000, 67).⁶ Given the global reach of World Bank influence in shaping water reform programs, Mexico’s experience may be illuminative for other regions experimenting with dramatic market-oriented reforms in water management and policy.

Apart from financial pressure applied by the World Bank, Mexico had its own reasons for choosing to institute dramatic changes in water management and policy. By the early 1980s, Mexico’s irrigation infrastructure was in a state of serious deterioration. Although irrigation had been the largest single item in agricultural budgets over the previous six decades, most of the money had been channeled into extension of irrigation, rather than maintenance of the existing infrastructure. It was estimated that half the irrigation supply never reached the intended cultivated lands (Cummings et al. 1989; Buras 1996). Distribution canals were silting up in areas affected by erosion; salinization was a growing problem, especially in coastal areas; and there was a perennial insufficiency of water supply, exacerbating rural–urban conflicts (Buras 1996; Yates 1981). A World Resources Institute study called

the rehabilitation required by the failing infrastructure a “staggering” problem, estimated to cost 302 billion pesos (Cummings et al. 1989). Maintenance of the systems was often neglected by the users, who had the responsibility for upkeep, and this led to expensive water loss. The distribution of water was conducted within particular social contexts, underscoring the fact that irrigation communities are complex social systems. For example, in Mexico, district committees in charge of distributing water were often highly political. Although in some cases water was distributed equitably, in others it was allocated according to acreage sown, or directly to local bosses and their friends (Yates 1981; Whiteford and Enge 1989). Mexico’s irrigation system required an overhaul that the federal government was financially unable to address, setting the stage for a new approach to water management that involved transferring the huge budgetary outlays associated with modernization to entities other than the federal government.

The Water Situation in Mexico

Mexico’s uneven distribution of water supply and demand represents a final element critical to understanding the drive toward modernization of irrigation systems. Mexico’s water resources are distributed very unequally among its geographic regions, and water is available almost in inverse proportion to where it is needed to serve the population. Mexico has a population of 97.3 million (INEGI 2000), of whom 75 percent live in urban areas and 25 percent live in rural areas (CNA 2001). The Southeast of Mexico, which occupies 20 percent of the land surface and contributes about 10 percent of gross domestic product (GDP), receives more than half the rainfall, while the North, with 30 percent of the surface and nearly 30 percent of GDP, receives only 4 percent of the country’s annual rainfall. The Central Region with 11 percent of the surface, contributes nearly 55 percent of GDP (Romero Lankao 2001). This pattern of mismatch between supply and demand results in “a profound division between a ‘south’ rich in water and a ‘north’ subject to chronic scarcity” (Búrquez and Martínez 2000). Climatic conditions such as highly variable precipitation due to periodic and prolonged droughts and extreme hydrologic phenomena such as hurricanes and floods affect much of Mexico. Adequately meeting water needs is difficult under these natural supply conditions, especially in periods of drought (CNA 2001). In 2000, twelve Mexican states were declared federal emergencies due to the prolonged drought (Becerril, Muñoz, and Camacho 1999).

The quality of both surface and groundwater is a growing issue in Mexico. With over 70 percent of residential wastewater and 85 percent of industrial wastewater not treated, natural water systems have become increasingly contaminated. In agriculture, the use of black waters, high levels of pesticides, and fertilizers, in particular nitrogen, in irrigated regions combined with natural salinity in soils has contributed to water quality problems. The contaminated water is both a public health problem and a threat to many agricultural regions.

Overall, water usage in Mexico is highly inefficient, with as much as 40

percent of total water supply unaccounted for and not recovered through revenues (Wilder 2002). Approximately 38 percent of water is lost through system inefficiencies, and water revenue recovery is low. Agriculture consumes far more of Mexico's water than any other sector, approximately 80 percent of the total, followed distantly by urban/public use at 12 percent and industrial use at 8 percent (CNA 2001). Agriculture generates a disproportionately small share of national GDP, at just 4 percent, yet it is a significant employer at about 21 percent of the economically active population (CNA 2001). Although agriculture's contribution to national GDP is modest, irrigated agriculture is responsible for 50 percent of the value of total national production; it represents 70 percent of Mexico's agricultural exports and 80 percent of employment within the rural sector (Contijoch 1999). With 6.3 million hectares (ha) under production, Mexico is the seventh-largest irrigator in the world in terms of area irrigated (CNA 2001).

The groundwater situation is especially imperiled. Nationally, natural groundwater recharge is estimated to be 75 km³/year with use estimated at 28 km³. As a national average, the extraction rate is equivalent to only 37 percent of the natural recharge (renewable volume of water through rainfall and absorption runoff). However, the CNA cautions that this global figure does not reveal the "critical situation that exists in arid regions," where the balance between extraction and recharge is negative (i.e., more groundwater is extracted than is naturally recharged) and the groundwater aquifers are being mined to serve growing urban and agricultural needs. Groundwater resources are important for both urban and agricultural uses. Seventy percent of the water delivered to cities is from groundwater sources, serving approximately 75 million people. Fully 66 percent of the groundwater extracted is destined to irrigate one-third of the total irrigated surface of the country (CNA 2001). Aquifer overdrafting has steadily worsened over the last twenty-five years, tripling from 32 aquifers in states of overdraft in 1975 to 96 in 2000 (CNA 2001). Overdrafting of aquifers has resulted in severe ecological damage, including the exhaustion of natural springs, the disappearance of lakes, the reduction in underground rivers, and the elimination of native vegetation and loss of ecosystems (CNA 2001).

Aquifer water quality has declined due to saline intrusion and industrial and agricultural contamination. For example, aquifer water in some parts of the Mexicali Valley contains levels of pesticides that pose serious health problems for residents who consume the water for drinking (Whiteford and Cortez forthcoming). In other regions of Mexico, the water has become too saline to use directly on the fields for irrigation.

Many irrigated zones have seen abatement of groundwater levels of dozens of meters, increasing the cost of extraction (due to the need to use higher-powered and higher-energy-consuming pumps), thereby making traditionally grown crops much more expensive to cultivate. Urban population growth contributes to aquifer overdrafting as well.

Regional Groundwater Situation

Within the CNA's northwest region (containing all of Sonora and seven municipalities in the border state of Chihuahua), 88 percent of the water extracted from surface and groundwater sources is for irrigated agriculture. One-third of the groundwater aquifers within the northwest region are overdrafted, the most severely being those of Caborca, Guaymas, Costa de Hermosillo, and Sahuaral. In the arid Sonoran desert, average annual rainfall is only 476 mm, falling even lower in the northern half of the state around Caborca and along the western coast of Sonora. Similarly, the Mexicali aquifer is one of six severely overdrafted aquifers in Baja California and 85 percent of water supply is used for agriculture. Average annual rainfall in Baja California, at only 196 mm, is even lower than the Sonoran average, and only about one-quarter of Mexico's national average (CNA 2001).

Ejidal Producers, Water Management, and Free Trade: Cases From Northern Irrigation Districts

The fundamental assumption that underlay Mexico's water reforms, ejidal reforms, and free trade agenda was that entrepreneurial producers could take advantage of the market opportunities opening to them—the country's most efficient producers would advance and progress under the modernization strategy. Producers in northern irrigation districts like Mexicali and Altar-Pitiquito-Caborca (hereafter Caborca) are among the nation's most advantaged, given their proximity to U.S. markets, access to irrigation, sophisticated technological package and training, and experience with commercial production.⁷ In short, these producers ought to be among the strongest and most competitive. We argue, however, that the liberalization strategies have not benefited producers and have particularly disadvantaged the ejidal sector of farmers. Caborca is located in the northwest coastal region of Sonora, with groundwater irrigation from a total of 831 wells. The irrigation district includes a total of about 3,800 producers, with approximately two-thirds *ejidatarios* and one-third private farmers (IMTA 1990). Half of the *ejidatarios* have very small landholdings averaging 3.03 ha, and only 2 percent of *ejidatarios* have holdings greater than 20 ha. Among private farmers, 24 percent have average parcels of about 89 ha, and 21 percent have very small holdings averaging 3.3 ha (IMTA 1990). The actual amount of land in private control is much larger than these official figures indicate due to renting of ejidal land and the common use of *prestanombres*—a practice whereby persons allow private producers to use their names as landholders—to avoid parcel size limitations imposed by agrarian law. In Caborca, 60,000 ha are open to cultivation, but only about half are currently under cultivation due to water restrictions. Caborca producers are organized into two water modules, operated by an Association of Water Users. Caborca's crop production is quite diverse, with asparagus, raisins, fresh grapes, industrial grapes, olives, and wheat as the district's principal crops. About one-third of Caborca's

cultivable area (12,500 ha) is in pressurized irrigation systems—such as drip (*goteo*) and sprinkler (*aspersión* and *micro-aspersión*) systems—which allow a high degree of crop diversification due to the ability to control more precisely water and fertilizer applications.

Production costs vary widely among different crops produced in Caborca, and thus production is highly stratified among different kinds of producers and land tenure groups. Asparagus, by far the most lucrative crop grown in Caborca, is dominated by large private producers who sell on a contract basis to transnational companies (such as Dole Foods and Lee Brands). Fresh grapes are grown by private and ejidal producers, as well as *colonos* (colonists) who, as smallholders with clear title to their land parcels, share characteristics with both private and ejidal farmers. Wheat production is similarly the province mostly of private farmers. Relatively lower production costs induce ejidatarios and colonos to produce mainly industrial grapes (for sale to brandy producers like Domecq), raisins, and olives. Ejidatarios and colonos in Caborca dominate Mexico's raisin market, producing fully 95 percent of all raisins consumed in Mexico (Wilder 2002). The land tenure structure of production is critical to understanding the complex nexus of relations between distinct free trade agreements and producer groups in Mexico.

The Mexicali Valley is located in the northwestern states of Baja California and Sonora, bordering the U.S. states of California and Arizona. The rich alluvial soils of the Colorado River delta and water from the Colorado River, supplemented by pumped groundwater, support the region's vast agricultural activity. It is one of the major wheat-producing areas in Mexico, but growers in the Mexicali Valley also cultivate cotton, vegetables, and alfalfa and sorghum for cattle feed. The city of Mexicali, one of the fastest growing urban centers in Mexico and a major maquiladora (assembly plant) location, dominates the area. The valley has over 200,000 ha. of irrigated land, with 13,349 ejidatarios and smallholders in over 200 communities scattered throughout the region. Ejido lands represent about 61 percent of this total, with ejido holdings averaging 15.25 ha., compared with 12.69 ha. for smallholders (Whiteford et al. 1998).

While the Colorado River provides 85 percent of the water for agriculture, groundwater is of particular importance because of its high quality. The Mexicali–Mesa de Andrade aquifer that provides water for Mexicali Valley also passes under the Imperial Valley on the U.S. side of the border. Ten to 12 percent of the recharge of the aquifer comes from water that seeps from the irrigation canals and ditches in the Imperial Valley. The Metropolitan Water District, which includes much of Los Angeles and San Diego, has purchased 106,000 acre-feet of water annually from the Imperial Irrigation District, which would capture water by the use of water conservation methods, especially the paving of the All American Canal and other major canals. In the first years of the agreement a maximum of 200,000 acre feet will be transferred from the Imperial Valley to major urban centers for domestic use. Because conservation methods have been adopted on the U.S. side of the border, the water table in the Mexicali Valley is not being recharged at the same rate and it is

dropping rapidly, threatening production of ejidatarios growing water-intensive vegetables for the U.S. markets. Nevertheless, there are no international agreements to govern the management and regulate the use of binational groundwater. Some have called the competitive pumping of binational groundwater the beginning of border water wars. For ejidatarios whose livelihood depends on the groundwater, the binational resource management collaboration has been called into question.

One of the consequences of the modifications of the Mexican Water Law in 1992 is that ejidatarios and small private producers (*pequeños propietarios*) are organized into water modules for water management (Whiteford and Bernal 1996). Despite initial opposition in some regions, the modules have, in some regions, evolved into potentially significant political units capable of pressuring and influencing the CNA, municipal governments, River Basin Councils (Consejos de Cuenca), and even international negotiations. The pumping of groundwater and the transfer of water in the Imperial Irrigation District has sparked political mobilization of impacted modules.

Because Mexicali is located next to the United States, NAFTA has the potential to influence water use in a second significant way. Once water becomes a good in commerce, which can happen in a number of ways, it has the potential to reduce the control of the federal government and local organizations of access to and allocation of water. Given the scarcity of water in the region and discussions in California about water markets and privatization of water rights, it is very possible that farmers in Mexicali or the Imperial Valley could sell water to their counterparts on the other side of the international border. Of equal concern are the rights of foreign companies to pollute water resources in Mexico if antipollution regulations are put in place after the signing of NAFTA.

The North American Free Trade Agreement

The North American Free Trade Agreement is, of course, the 800-pound gorilla in any discussion of free trade and water management in Mexico. However, we argue that as significant as NAFTA is, Mexico's other major forays into free trade agreements with major competitors has exposed producers to a more complex array of challenges that particularly affect ejidatarios.

NAFTA and other trade agreements, as we mentioned earlier, have created the potential for the Mexican government and local water user associations to lose control of water management. According to the text of NAFTA, "unless water, in any form, has entered into commerce and become a good or product, it is not covered by the provisions of any trade agreement including NAFTA. And nothing in the NAFTA agreement would obligate any NAFTA Party to either exploit its water for commercial use, or begin exporting water in any form" (Joint Statement of NAFTA Countries, December 1993, quoted in Gleick et al. 2002, 18) Yet when water is packaged and sold—in plastic bottles, tanks, or for agriculture—it is immediately covered by the NAFTA rules. It is possible that a single license or permit to export water could open up water to be sold as a commodity.

Ongoing trade and investment regulations have the potential to “place restrictions on the ability of governments to manage water resources and services” (Mann 2003, 4). The potential implications of these agreements for sovereign management of Mexican water, and even for local and watershed management of water resources, are significant and must be addressed.

The impact of NAFTA on Mexican agriculture has been uneven, with specific regions and producers of specific commodities absorbing the negative impacts while others prosper. For example, when faced by highly subsidized rice production in the United States, more than 30,000 rice producers in Mexico had to abandon rice cultivation and almost half of the rice processing mills closed. Since NAFTA was enacted, corn exports by U.S. farmers to Mexico have grown by over 240 percent. On the other hand, vegetable production for the U.S. market has expanded by 80 percent and fresh fruit production by 90 percent. Both fresh and frozen vegetables are grown predominately by large producers, while corn and to a lesser degree rice producers are *ejidatarios* and small landholders.

Wheat is a principal battleground in the NAFTA wars, and farmers in Sonora and Baja California, the two major wheat growing states in Mexico, are in the advance guard, trying to shore up defenses against their well-subsidized U.S. and Canadian competitors. Due to the significance of wheat for a powerful set of Mexican farmers and to the need to protect a critical grain producing sector, the government has ironically—in this era of free trade and elimination of subsidies—been forced to continue offering a supported price for wheat that is considerably higher than international market prices, which fail to cover wheat growers’ costs. For example, in 2000, although the international price for wheat was US\$96/ton, the Mexican government was forced to pay about US\$133/ton to stave off social unrest among wheat farmers, who were closing highways in protest over the untenable low prices (Wilder 2002). While contending with low international wheat prices, wheat growers must deal at the same time with rising water and agricultural input costs.

Wheat exports to Mexico from the United States have expanded rapidly during the NAFTA era, by 182 percent. Equally significant is the shift from the export of wheat for bread to durum wheat, which is used for pastas. Within Mexico too, there has been a significant shift to durum wheat for the production of pasta, much of which is exported to the United States: “Since enactment of NAFTA, pasta processing has been among the largest recipients of foreign direct investment (FDI) inflows in Mexico, aside from the manufacturing and service sector. Mexico’s exports of all pasta types to the United States have increased by approximately 50 percent since NAFTA took effect” (Vaughan 2003, 62). Wheat production in Caborca and Mexicali is based on irrigation, with much of the water coming from groundwater from rapidly lowering aquifers. Of course, the same could be said for the United States, where major wheat production is dependent on the Ogallala Aquifer, a huge aquifer threatened by unsustainable use.

In Caborca, the cost of producing a hectare of wheat increased by 134 percent

from 1994 to 2004, and water costs increased by 89 percent over the same period. In 2000–2001, the Fox administration eliminated the subsidy for wheat transport, amounting to a reduction of almost 10 percent of the national wheat price per ton (Wilder 2002). Due to Caborca's severe water restrictions, which were implemented after the 1994 transference of the irrigation district to water users, most ejidatarios in Caborca have fallowed their wheat fields in favor of continuing their more lucrative grape production. Thus, the private sector dominates the remaining wheat production in the region now. Mexican wheat growers are losing domestic market share to their international competitors, who sell at lower prices than the government-supported price industries must pay to buy Mexican wheat, resulting in increased wheat imports into Mexico.

Grapes and Asparagus

The tale of grapes and asparagus in the Caborca region is an intertwined and convoluted one involving both groundwater use and free trade. In August 1999, five years after NAFTA adoption, Mexico signed a free trade agreement (FTA) with Chile. Like the wheat growers, grape producers are concerned about free trade and the loss of government protections, but in their case it is the Chilean FTA that is problematic. With the stringent grape quality standards imposed by U.S. buyers, Mexican producers were already wary of the barriers to exporting their fresh grapes. Local officials voiced concern that Mexican grapes were experiencing a suspiciously high rejection rate at the border, based not upon quality problems but "lack of a perfect shape" or similarly insignificant reasons, leading officials to believe that U.S. inspectors were looking for ways to stem grape imports (Wilder 2002). Prior to the free trade accord with Chile, grape buyers were standing on Caborca curbsides ready to buy grapes at good prices as soon as they were harvested. Since the entry of Chilean raisins into the Mexican market, the price of raisins has dropped and Chile has made inroads on Mexico's market share. As 95 percent of Mexico's raisins come from Caborca alone, the "globalized" issue of raisin trade has a very specific regional impact. Even more, the effects of increased free trade with Chile has affected one particular kind of producer, the ejidatario and colono who are heavily invested in raisin production since raisins cost less to produce than fresh grapes. The global linkage with Chile translates into a very specific local impact not only on a particular *region* of Mexican production but on a very particular *group* of ejidatario producers (Wilder 2002). Fresh grape growers have also expressed their grave concern about the entry of Chilean grapes into the Mexican market, and are urging the federal government to pursue allegations of dumping against Chilean growers. A morning in November 2001 found Caborca's grape producers awaiting a first-ever visit by the secretary of agriculture to the region, during which Secretary Javier Usabiaga Arroyo was to be presented with a report voicing concerns over Mexico's free trade policies, beginning with the statement that "The initiation of these treaties

has provoked, since the year 2000, the most severe crisis that regional agriculture has ever suffered from,” and arguing that “the treaties with Chile and the European Union need to be reviewed to find some way of establishing safeguards that protect our activity” (ASUDIR 2001). On the other hand, fresh grape growers benefited from NAFTA court protection in June of 2000 when they were cleared of any wrongdoing after Coachella County growers in California accused their Mexican counterparts of dumping grapes on the U.S. market.⁸ If they had been found guilty of dumping, access to U.S. grape markets might have been closed to Mexican producers for a period of three years. The failed U.S.–Mexico dumping allegation, the allegations by Mexico that Chile is dumping grapes and raisins on its domestic market, and the anecdotes about informal reasons for the U.S. rejecting of grape imports from Mexico all underscore the uneasiness of producers on both sides of the border about agricultural protection. This points to agricultural protection as a two-edged sword that cuts both ways, depending upon one’s geo-economic positioning. Thus, we see Caborca farmers campaigning for new protections for their crops with the Mexican government, while in the same breath calling for protections against Chilean produce (Wilder 2002).

Asparagus and fresh grape growers have benefited from the removal of import duties under NAFTA. Duties placed on the importation of asparagus into the United States that had been set at 25 percent in 1993 were completely phased out during the 1990s, creating a boon for Caborca producers. The region has about 5,700 ha. in asparagus, representing 41 percent of the surface in asparagus nationally (ASUDIR 2000). Mexicali is also a major source of asparagus for the export market, with the number of hectares of asparagus under cultivation rising rapidly since the signing of NAFTA. Caborca fills a critical gap in the world asparagus market as it is able to supply asparagus during the January through March period when neither the other Mexican regions nor California can do so. Asparagus production is concentrated virtually entirely within the private producer sector, including a large amount of activity from transnational companies; only one ejido is involved in asparagus production. Asparagus costs 2.5 times as much to produce as fresh grapes, and 5 times as much as industrial grapes and raisins. The cost of producing one hectare of asparagus rose 130 percent from 1996 to 2002, and the cost of irrigation for asparagus rose by 186 percent over the same period (Wilder 2002).

Asparagus is helping to deplete the valley of Caborca groundwater aquifer at a very fast rate. It has therefore become a conflictive crop within the region. Two other factors help fuel the conflict that has developed between grape and asparagus producers: the presence of transnational companies and other “outsiders” in the asparagus sector, and the impunity of asparagus producers when it comes to observing required water restrictions. In 1994, after the irrigation district was transferred from the federal government to the Irrigation District Water Users’ Association (Asociación de Usuarios del Distrito de Riego, ASUDIR), the association promptly implemented a strict water reduction plan due to the falling

water table and severely overdrafted state of the aquifer. In addition to a prolonged drought, the Caborca aquifer has become severely overdrafted due in large part to state policies that supported and promoted cultivation of more water-consumptive crops.

State-sponsored grape production in the region began in the 1960s, even while it was recognized since the mid-1950s that the aquifer was in danger. In the 1980s, new arrivals from the Mexicali Valley—"outsiders"—came into the region and began cultivation of asparagus, a much more water-consumptive crop than grapes. Asparagus water demands affected water levels and supply throughout the region, not just those of asparagus producers themselves. Although asparagus and grape production were well under way when the free trade accords of the 1990s were signed, NAFTA made attractive the option of expanding production with the elimination of U.S. import tariffs. By 1995, under the water reduction program, each water rights holder was required to reduce consumption every year, meaning in practice that cultivated area had to be reduced as well. Although the area in grapes declined slowly but steadily from 1995 on through 2000, the area in asparagus continued to climb throughout the same period. Clearly asparagus producers were expanding production and using more water (by renting ejidal or other well rights) commensurate with the expansion, a fact that angered grape producers in the region. As one prominent private grape producer stated,

Asparagus has become a very conflictive crop for this region. The American [e.g., Dole Foods] and Japanese [e.g., Lee Brands] transnational companies are involved in asparagus production, and they manage things differently. They use tons of water and buy up water rights. . . . If it goes well with grape farmers, we feel it in the community. People buy a new car or open a little business. But with the asparagus business, we don't feel anything. Thousands of workers come in from other parts of Mexico and the buses come and drop them off with their checks at the door of the bank or the changing house, and they cash their checks, get back on the bus, and leave town. Something like four-fifths of the area in asparagus is owned by foreign companies. (personal interview, private producer/community leader, June 20, 2001)

A local ejidal producer said: "The worst thing is that the American companies are buying up ejidal lands. They've got too many wells. They take away our water and they're going to leave us without any water. But everything they're doing is legal" (personal interview, ejidatario, June 26, 2001).⁹ An official with the ejidatario producers' union noted pointedly: "The problem of the region is asparagus." (Wilder, personal interview, ejidal producers' union official, June 20, 2001). Despite lax enforcement in earlier years, there was some evidence in 2001 that local irrigation district officials had stepped up enforcement on the asparagus producers to bring them in line with the water reduction plan requirements.

The current water situation for Caborca ejidatarios is bleak, based upon a number of considerations. Water supply is dominated by private producers who own

86 percent of the 831 wells in the irrigation district. On average, there is only one well to support every twenty-seven ejidatarios, where there are 1.29 wells for every private producer. Moreover, 85 percent of the largest, most powerful wells (of 8 to 12 inches in diameter) are owned by private producers. Added to this picture of private sector control of irrigation water supply is the existence of numerous long-term (typically ten-year) well rentals by ejidos seeking money to pay off accumulated debt. According to a senior irrigation district official, "one hundred percent" of those who rent wells are private producers. Many ejidatarios have had their electricity (for pumping water up from irrigation wells) cut off due to inability to pay, a situation worsened by the phased elimination of electrical subsidies, which means that electrical costs actually increase each month, even for the same amount of water pumped. According to a local official with the federal electricity commission, about half of the community had its electricity cut off at some point during the year 2001 (Wilder 2002). The ejidatario sector was responsible for three-fourths of the 450 million pesos in accumulated overdue debt in Caborca in 2001. Many ejidatarios have therefore abandoned production, unable to keep the pumps turned on and needing to make payments on their debt, and have turned to working in the asparagus fields for the private producers. One woman ejidataria stated that debt is the reason her ejido has rented out its well: "Just one well is rented. . . . The contract is with a private asparagus producer." She stated that the well is commonly owned by twenty-one families in two groups (societies of productive responsibility). The group receives 80,000 pesos (about US\$8,000) annual rent, divided among the twenty-one families, meaning that each family earns only about US\$381 each year from the well rental. Many of the families stated they use the income earned from the well to pay off some of their debt; thus, although the income does ease their financial burden, the well rental does not translate into disposable income that helps ejido families advance (Wilder, personal interview, June 21, 2001).

Implications and Conclusion

The Mexican water legislation passed to help Mexican agriculturalists be more efficient has changed the organization of large irrigation districts. In concert with the host of other liberalization strategies the government has pursued throughout the last ten years (including entry into numerous free trade agreements and the ejido reforms), this has created a raft of challenges for ejidatario producers. Although groundwater is a rapidly declining resource in some of the most productive agricultural regions of the country, its management and mismanagement has not received sufficient attention from Mexican authorities. The increased population pressure in large cities in central and northern Mexico translates into rising water demand and greater rural–urban conflict over scarce water resources. In Mexico, cities have priority rights to water over agriculturalists, which intensify the pressure on groundwater resources. Mexico's wholehearted embrace of free trade has

benefited some producers and regions while creating new obstacles for many others, particularly ejidatarios who frequently are concentrated in lower-value crop production due to lack of resources and limited access to credit.

NAFTA and other FTAs have had an uneven impact throughout Mexico, even in major irrigation districts where producers have shifted production to more water-intensive crops that require a greater investment of capital, including funds needed to pay for pumping groundwater. Subsidies paid to farmers in the United States have created an uneven field of competition for grains. Apart from NAFTA, other trade agreements, such as Mexico's FTA with Chile, can have specific sectoral impacts on particular crop sectors and producer groups, even while others in the same local region are benefiting from other free trade agreements. The demands of nature, which call for water conservation and less intensive agriculture, seem to be directly in conflict with the demands of the market, which call for water-scarce arid regions such as those in northern Mexico to produce water-consumptive export crops.

The benefits and losses associated with free trade will become increasingly complex as producers are exposed to competition from more markets with the entry into additional free trade agreements. There is a need for greater government control over the pumping of groundwater and, in the border region, creative engagement with the United States to manage groundwater in a sustainable, transparent, and equitable fashion. This is especially important as pressures on groundwater sources grow with increased agricultural trade and urban demands for water.

Finally, Mexico has to engage with the water management issues inherent in the NAFTA agreement itself. New agreements are now being drafted, providing an opportunity for Mexico to build on what it has learned about the trade and investment agreements. Governments' sovereign rights and those of local water management organizations must be protected in a fashion not presently in use. In the process, greater transparency and accountability need to be built into the system. Given the critical importance of water in Mexico, these changes should be a priority.

Notes

1. An ejido is a communal landholding organization that normally has at least twenty members. Ejidos were created in the decades following the Mexican Revolution (1910–1920) to redistribute productive land to landless peasants. The massive land redistribution and creation of the ejido system is a major legacy of the revolution.

2. The terms “ejido reform(s)” or “Article 27 reform(s)” are generic expressions that refer to three separate legal reforms that took place in 1992 and 1993 (Jones 1996, 189). The principal change was the reform of Article 27 of the Constitution, adopted January 6, 1992. The second was the new Agrarian Law (*Ley Agraria*) of February 26, 1992. Finally, new Agrarian Law regulations (*reglamentos*) were adopted January 6, 1993.

3. Mexico has the following active free trade agreements: NAFTA (with the United States and Canada), January 1, 1994; G-3 (with Colombia and Venezuela), January 1, 1995;

Bolivia and Costa Rica, both on January 1, 1995; Nicaragua, July 1, 1998; Chile, August 1, 1999; European Union and Israel, both on July 1, 2000; Northern triangle (with El Salvador, Guatemala, and Honduras), on March 15, 2001, and June 1, 2001; Northern European nations, July 1, 2001; Uruguay July 15, 2004; and Japan, on April 1, 2005 (Mexico, Secretaría de la Economía 2004).

4. The law was the regulatory structure (*reglamentaria*) that had been established in paragraphs 5 and 6 of Article 27 of the Mexican Constitution (Tellez 1993, 104). It replaced the former Federal Law of Waters (Ley Federal de Aguas) that had been in effect since 1972, with several modifications in 1986 (Vargas and Sanchez 1994, 9), which in its turn had supplanted the earlier water legislation titled the Law of National Property Waters (Ley de Aguas de Propiedad Nacional) dating to 1936 (Vargas and Sanchez 1994, 9).

5. See Pineda 1999 for an excellent discussion of the limitations of municipalization and privatization in a multiple-city study.

6. The transference program was carried out in Mexico by the National Water Commission (CNA) under the auspices of the World Bank's Program for Investment in Irrigation and Drainage, and had a total budget of US\$1.195 billion. The World Bank provided 29 percent (US\$350 million) as a loan to Mexico (World Bank Loan 3419 ME) and the Inter-American Development Bank lent another 17 percent (US\$200 million) (Pineda Blancarte 2000, 67). The original loan was for the period 1991–1994, and was subsequently extended through June of 2000 (Pineda Blancarte 2000, 67). The World Bank loan was directed toward three areas: (1) development and technology transfer; (2) capacity-building; and (3) communication and user participation. The loan funded Mexico's Institute of Water Technology (IMTA) to carry out the ambitious program (Pineda Blancarte 2000, 66–72).

7. The Caborca case study is based primarily upon a dissertation study focusing on the impacts of national water reforms on local producers, primarily ejidatarios, completed in two irrigation districts in Sonora, Mexico, the Rio Yaqui Irrigation District (041) and Altar-Pitiquito-Caborca Irrigation district (037) (see Wilder 2002). The Mexicali case study is based upon a decade of work looking at the impacts of water and agricultural reforms on ejidatario producers in the Mexicali Valley (Baja California and Sonora) (see Whiteford and Bernal 1996; Whiteford et al. 1998).

8. "Dumping" is defined as selling a product in a country's national market at prices lower than those at which the same product is sold internationally, or selling a lower-quality product. For example, Mexican grape producers complained that Chileans were dumping their raisin backlog—*rezaço*—at cheap prices on the Mexican market.

9. Both this comment and the prior one reflect a local belief that foreign companies own land and operate within Caborca. In a strictly legal sense, however, this may not always be the case. For example, a Dole Foods official I met with stated that they own no land in Caborca and do not even officially have an asparagus operation in Mexico, nor do they actually buy the asparagus until it crosses the U.S. border. The role of the Dole Foods official and his tiny staff was strictly to ensure quality control so that the asparagus harvest would be sure to meet Dole's quality standards. Similarly, a group of Mexican entrepreneurs (originally from Mexicali) also has a major asparagus operation and although it sells to Lee Brands, it is not strictly speaking controlled by Lee Brands. Nevertheless, despite these strict legal distinctions, there clearly is a strong sense within the larger community that these two transnational companies are actively benefiting from local production based on water from the shared groundwater aquifer. For a more in-depth discussion, see Wilder (2002).

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