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TAMRC REPORT

THE ENVIRONMENT AND U.S.-MEXICO AGRICULTURAL TRADE*

by

Teofilo Ozuna, Jr. and Gary W. Williams**

*TAMRC International Market
Research Report No. IM-3-93
July 1993*

TEXAS AGRICULTURAL MARKET RESEARCH CENTER REPORT

**Department of Agricultural Economics
Texas Agricultural Experiment Station
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* Presented at the Council on Foreign Relations Environment and Trade Study Group, Austin, Texas, January 14, 1993.

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THE ENVIRONMENT AND U.S.-MEXICO AGRICULTURAL TRADE

Texas Agricultural Market Research Center (TAMRC) U.S.-Mexico Free Trade Issue Paper Series, TAMRC International Market Research Report No. IM-3-91, July 1993 by Dr. Teofilo Ozuna, Jr. and Dr. Gary W. Williams, Texas Agricultural Market Research Center, Department of Agricultural Economics, Texas A&M University.

ABSTRACT: Trade policies have increasingly well-recognized environmental consequences through altering the location and relative levels and value of production, consumption, and trade. Without question, the elimination of the trade barriers required by the proposed North American Free Trade Agreement (NAFTA) will force shifts in production, consumption, and resource use patterns within and among the United States, Canada, and Mexico that could have significant environmental implications. This paper first provides some background on agriculture and the NAFTA. Current environmental problems related to Mexican agriculture are then identified and the likely environmental implications of freer U.S.-Mexico agricultural trade are explored.

The Texas Agricultural Market Research Center (TAMRC) has been providing timely, unique, and professional research on a wide range of issues relating to agricultural markets and commodities of importance to Texas and the nation for more than two decades. TAMRC is a market research service of the Texas Agricultural Experiment Station and the Texas Agricultural Extension Service. The main TAMRC objective is to conduct research leading to expanded and more efficient markets for Texas and U.S. agricultural products. Major TAMRC research divisions include International Market Research, Consumer and Product Market Research, Commodity Market Research, and Contemporary Market Issues Research.

THE ENVIRONMENT AND U.S.-MEXICO AGRICULTURAL TRADE

EXECUTIVE SUMMARY

Trade policies adopted by both developed and developing countries have increasingly well-recognized environmental consequences through altering the location and relative levels and value of production, consumption, and trade. The elimination of the trade barriers under the North American Free Trade Agreement (NAFTA) will force shifts in production, consumption, and resource use patterns within and among the three countries that could have significant environmental implications.

Agriculture and the NAFTA

Mexico is the third largest market for U.S. agricultural exports while Mexico is second only to Canada as a supplier of foods to the United States. Canada-Mexico agricultural trade is relatively small. Recent growth in U.S.-Mexico agricultural trade is primarily the result changes in Mexican economic and trade policy which included dramatic unilateral reductions in trade barriers and which helped boost Mexican economic fortunes.

The NAFTA addresses many but not all U.S. and Mexican policies affecting the agricultural trade of the two countries. NAFTA proponents claim that the proposed agreement will expand trade, boost economic growth, and lead to a net increase in employment in all three countries. Critics warn, however, that lowering trade barriers with Mexico could encourage many U.S. industries to move to Mexico to take advantage of low cost labor and lax enforcement of environmental regulations.

Mexico may be a potentially large, new market for U.S. agricultural products, but the proposed NAFTA is not the primary reason. The unilateral opening of Mexican markets means that relatively few explicit barriers remain to be eliminated. The remaining trade barriers will be only gradually eliminated with special safeguards to protect against import surges for some important commodities. Also, sales of U.S. food processor affiliates in Mexico are directed primarily to local rather than to U.S. markets. U.S. food processing firms investing in Mexico are more interested in Mexico as a potential market for their products rather than in any opportunities for exporting to the United States.

Over the long run, the effects of the proposed NAFTA on U.S.-Mexico agricultural trade will depend on several factors, including: (1) the underlying pattern of comparative advantage in U.S.-Mexico agricultural trade, (2) Mexican economic growth, (3) foreign investment in Mexico, (4) Mexican farm size and structure, (5) Mexican labor markets and costs, and (5) the availability of new production inputs in Mexico.

Current Environmental Problems Related to Mexican Agriculture

Current Mexican agricultural and livestock practices have contributed significantly to the degradation of the natural resource base of Mexico. Some of the more salient environmental problems related to Mexican agriculture include the following:

- Inefficient irrigation practices in Mexico result in a 65% loss of irrigation water and poor crop productivity levels due to the flooding of crops, land salinity, and erosion.
- Mexico's few groundwater aquifers are being severely depleted which has led to the presence of arsenic in the water in some areas due to the geological configuration of those regions. In other areas, the depletion of the aquifers has led to the intrusion of salt water rendering the groundwater unfit for agriculture or human consumption.
- The agricultural use of water containing effluents or industrial residuals in Mexico is problematic and leads to soil degradation and contamination of crops.
- The misuse of pesticides in Mexican agriculture has led to the contamination of groundwater and surface water which has negatively impacted aquatic life, wildlife, and human health.
- Continued degradation and erosion of the available pasture land is resulting from overgrazing and other forms of pasture mismanagement.

Environmental Implications of Freer U.S.-Mexico Agricultural Trade

The expected agricultural trade consequences of the proposed NAFTA will likely have both positive and negative impacts on the environment. The overall magnitude of the negative impacts, however, will likely be considerably less than those created by the existing environmental problems related to current agricultural and livestock practices in Mexico. The major environmental implications of NAFTA will likely include the following:

- A net reduction in environmentally damaging agricultural production practices in Mexico from increased imports from the U.S. and greater incentives to adopt environmentally acceptable production practices for goods exported to the U.S.;
- Little effect on current environmental problems in Mexico related to the livestock sector; and
- Few U.S. resource use adjustments and environmental impacts given that the direct impacts of the NAFTA on U.S. agricultural and food production and trade are likely to be small.

The actual environmental impacts of freer U.S.-Mexico agricultural trade will depend crucially on the likely changes in a number of important factors, including: (1) Mexican environmental laws, (2) economic-based Mexican policies to manage environmental problems, (3) Mexican producer chemical use behavior, (4) Mexican land reform, (5) the security of property rights in Mexico, and (6) Mexican macroeconomic and sectoral policies.

THE ENVIRONMENT AND U.S.-MEXICO AGRICULTURAL TRADE

The crux of the so-called North-South trade debate is the distortions in the commodity composition, value, and flow of trade between developed and developing countries induced by their respective domestic and trade policies. For developed countries (DCs), trade has been an "engine of growth" with gains from that trade playing a crucial role in expanding their real incomes. At the same time, many of the less developed countries (LDCs) have long been exporting primary products but have seen the gap between their own real incomes and those of DCs widen continuously. As a consequence, DCs generally promote trade while LDCs tend to restrict trade and promote domestic production consistent with their respective social welfare objectives.

LDCs generally complain that the domestic and trade policies of DCs have severe negative consequences for their import competing sectors and force a redistribution of scarce resources to the production of exportables. At the same time, they argue that DCs tend to restrict imports of their exportables. In the case of agriculture, LDCs contend that DC agricultural policies have reduced their production of food and shifted resources into the production of a few exportables of low value, primarily tropical products such as coffee, cocoa, sugar, tea, and tropical fruits and oils. In this view, the end result for LDCs has been reduced food self-sufficiency, increased economic dependence on exporting countries, and an increasing income gap between their rural and urban sectors.

On the other hand, DCs counter that the import substitution development policies of many LDCs and the low level of income and purchasing power in those countries have precluded a significant level of commercial, non-concessionary trade between the two sets of countries. Consequently, world trade in feedgrains, meat, and processed food products is primarily a developed-country-to-developed-country phenomenon with a few exceptions. A large portion of the food grains like wheat, rice, and other food products imported by LDCs from DCs are shipped under some DC government concessionary export program. Likewise, much of the products imported by DCs from LDCs enters under preferential trading arrangements.

The trade policies adopted by both DCs and LDCs have increasingly well-recognized environmental consequences through altering the location and relative levels and value of production, consumption, and trade. Some view trade and liberalization of trade among countries as a vehicle for improving the environment through raising both incomes to provide greater environmental protection and the interest in doing so (Anderson and Blackhurst). Others argue that trade and trade expansion only worsen environmental problems because they expand consumption and intensify potentially environmentally polluting production.

The North American Free Trade Agreement (NAFTA) can be considered to be a North-South experiment in realigning trade and prices more along the lines of comparative advantage with all the environmental consequences that such trade liberalization entails. The NAFTA will require two developed countries (the United States and Canada) and one developing country (Mexico) to eliminate the barriers that have hampered trade between them. Without question, the elimination of these trade barriers will force shifts in production, consumption, and resource use patterns within and among the three countries that could have significant environmental implications.

This paper first provides some background on agriculture and the NAFTA. Particular emphasis is given to the agriculture provisions of the NAFTA and the likely consequences for U.S.-Mexico agricultural trade. After discussing the current environmental problems related to Mexican agriculture, the paper then focuses on the environmental implications of freer U.S.-Mexico agricultural trade. The paper concludes with a few closing comments.

BACKGROUND ON AGRICULTURE AND THE NAFTA

Mexico is already a major trading partner of the United States. Mexico has emerged as the third largest market for U.S. agricultural exports in recent years, purchasing food and fiber valued at \$2.9 billion in 1991, up 9% from 1990. Major U.S. export sales to Mexico in 1991 included grains, meats, fruits, nuts, vegetables, hides and fats, live animals, and dairy products. Mexico represents the largest market for U.S. grain sorghum and the second largest market for U.S. meat and meat products after Japan.

U.S. agricultural imports from Mexico have also risen dramatically to \$2.5 billion in 1991, making Mexico second only to Canada as a supplier of foods to the United States. Mexico is the major foreign source of fresh fruits, vegetables, and live animals for the U.S. market, the second largest source of orange juice, and the third largest source of coffee after Brazil and Colombia.

Canada-Mexico agricultural trade is relatively small, with Mexico accounting for only 1% of Canadian exports and supplying only 2% of Canadian imports. Canadian exports to Mexico were valued at \$100 million in 1990, including mainly wheat, canola, dairy products, barley, beef, pork, live cattle, and hogs. Mexican agricultural exports to Canada were valued at \$175 million in 1990 and included cucumbers, cotton, coffee, and beer. Because Canada-Mexico agricultural trade is so small, this paper focuses primarily on the implications of U.S.-Mexico agricultural trade under the proposed NAFTA.

Recent growth in U.S.-Mexico agricultural trade is primarily the result of a shift in Mexican economic and trade policy in the mid-1980s. For many years, Mexico embraced an economic development strategy emphasizing import substitution typical of many developing countries. However, mounting external debt and the economic crisis of the early 1980s forced Mexico to undertake major economic reforms based on more open markets, lower subsidies to major industries and partial privatization, less reliance on oil exports, increased foreign investment, lower inflation, and debt reduction. As part of that process, Mexico acceded to the General Agreement on Tariffs and Trade (GATT) in 1986 which obligated Mexico to reduce its average import tariff level from 80% to 50%. Mexico, however, unilaterally went much further than required, reducing the average import tariff level to about 10% to 20% on all products. Mexico has also unilaterally reduced quantitative import restrictions through import licensing. About 79% of the value of all Mexican imports required import licenses in 1985. By 1989, that percentage had dropped to 43% (Gordillo de Anda). Currently, only a little over 25% of all U.S. agricultural exports to Mexico is still subject to import licensing.

Besides remaining tariffs and quantitative restrictions, U.S.-Mexico agricultural trade continues to be affected by other U.S. and Mexican policies, including internal producer price supports and subsidies, and a divergence between U.S. and Mexican commodity grades and standards, chemical use regulations, food residue regulations, insect and disease control standards, sanitary and phytosanitary regulations, and similar regulations and their enforcement. Mexico also employs more passive forms of trade restriction such as trucking regulations which prevent U.S. trucks from operating within Mexico. Poor infrastructure, such as lack of adequate cold storage, handling facilities, and inadequate and poorly maintained roads, also restricts U.S. agricultural exports to Mexico. Mexico views U.S. marketing orders as trade restrictions. Inconsistent, complex, and lengthy administrative procedures at border crossings also restrict the flow of goods between the two countries.

NAFTA Provisions for Agriculture

For agriculture, the proposed NAFTA creates separate bilateral agreements, one between the U.S. and Mexico and the other between Canada and Mexico. NAFTA addresses many but not all policies affecting U.S.-Mexico agricultural trade. The specific trade provisions of the U.S.-Mexico bilateral agreement on agriculture include the following:

- Immediate elimination of all import tariffs on a broad range of agricultural products already facing low or negligible duties. About one-half of current U.S.-Mexico agricultural trade will be duty free when the NAFTA takes effect. These commodities represent about \$1.5 billion in current U.S. exports to Mexico and \$1.6 billion in Mexican exports to the United States.

- Systematic reduction of all remaining tariffs on U.S.-Mexico agricultural trade over a various time periods depending on the commodity. These commodities were deemed too politically or economically "sensitive" for their tariffs to be immediately eliminated. A small share of trade (about 10%) will be liberalized over a 5-year period. These products were deemed too sensitive for immediate liberalization but not sensitive enough to require more than five years of transition to free trade. Tariffs for most sensitive products will be eliminated over a 10-year or 15-year transition period.
- Special safeguard provisions in the form of a tariff-rate quotas (TRQs) for the most sensitive products during the transition period. The TRQs will facilitate the transition to free trade for producers of these products by charging a low or zero duty on a specified amount of imports but a higher tariff (the current or original) will be "snapped back" into place for imports over the specified TRQ level. Both the within-quota and the over-quota tariffs will decline to zero over the specified time period. The initial TRQ levels will be determined by recent average trade levels and will expand at a 3% annual compounded rate over the transition period. The U.S. will use 10-year TRQs entirely for selected fruits and vegetable imports from Mexico currently valued at \$330 million. Mexico will use ten-year TRQs on \$155 million in imports from the U.S., mainly hogs, pork, potatoes, and apples. A 15-year period with TRQs is provided for U.S. imports of sugar, peanuts, and frozen orange juice. Mexico will employ a 15-year transition with TRQs for corn, dry beans, and non-fat dry milk.
- Phased elimination of quantitative import restrictions. Mexico will eliminate its import licensing requirements on U.S. products. The United States will replace Section 22 (Agricultural Adjustment Act of 1933) quotas on imports from Mexico with TRQs during the transition period. Mexico will also be exempt from the U.S. Meat Import Act.

Domestic agricultural policies and export subsidies are covered by a trilateral agreement among the NAFTA countries. Each country "will endeavor to move toward domestic support policies that are not trade-distorting" but is not required to change any domestic policies. While the NAFTA provides for the establishment of a working group to eliminate all export subsidies, the U.S. and Canada may use export subsidies in the Mexican market to counter subsidized competition from non-NAFTA countries. U.S. countervailing duties against subsidized imports from Canada or Mexico will be allowed.

The NAFTA also confirms the right of each country to establish and maintain the level of sanitary and phytosanitary (SPS) protection considered appropriate to protect human and animal health and plant life. Trade measures related to SPS protection must be based on scientific principles and a risk assessment and not simply result in disguised restrictions to trade.

"Rules of origin" are included in the agreement to prevent non-NAFTA countries from taking advantage of the preferential trading arrangements afforded NAFTA countries. In general, the *de minimis* requirements of the Canada-U.S. Free Trade Agreement are used which allow all products to receive NAFTA benefits as long as foreign ingredients make up less than 7% of the value of a processed commodity. These rules are also intended to protect and ensure the integrity of U.S. farm programs and to reduce the possibility of unfair competition. Rules of origin will be permanently in place and will not expire at the end of the transition period.

The U.S.-Mexico Agricultural Trade Implications of the NAFTA

NAFTA proponents claim that the proposed agreement will expand trade, boost economic growth, and lead to a net increase in employment in all three countries. Critics warn, however, that lowering trade barriers with Mexico could encourage many U.S. industries to move to Mexico to take advantage of low cost labor and lax enforcement of environmental regulations. For agriculture, proponents argue that the NAFTA will open the door to a large new market in Mexico for U.S. agricultural and food products, especially feedgrains, beef, and processed foods. Critics claim that the agreement will primarily stimulate Mexican production and exports to the United States and a relocation of U.S. agricultural production and processing to Mexico.

Will the NAFTA Significantly Boost U.S. Agricultural Exports to Mexico?

Although Mexico may be a potentially huge, new market for U.S. agricultural products, the proposed NAFTA is not the primary reason, at least not in the short run. Over the last 5 years, Mexico has unilaterally opened markets long closed to international trade. The effects on U.S.-Mexico agricultural trade are already evident. In contrast, the additional exports of U.S. agricultural commodities created by the NAFTA will likely be small because relatively few explicit import barriers remain to be eliminated and the remaining trade barriers are to be only gradually eliminated over 5, 10, or 15 years. In addition, the agreement provides for special safeguards to protect against import surges for some of the most important commodities traded between the two countries.

Over the longer run, however, the effects of the proposed NAFTA on U.S.-Mexico agricultural trade depends crucially on several factors, including: (1) the underlying pattern of comparative advantage in U.S.-Mexico agricultural trade, (2) Mexican economic growth, (3) foreign investment in Mexico, (4) Mexican farm size and structure, (5) Mexican labor markets and costs, and (5) the availability of new production inputs in Mexico.

Comparative advantage in U.S./Mexico agricultural trade: Removing barriers to trade allows underlying comparative advantage to more directly influence the direction and pattern of trade between two countries. Research has provided some limited evidence that

Mexico has an advantage over the U.S. in many fruits and vegetables, including asparagus, fresh strawberries, fresh tomatoes, bell peppers, squash, broccoli, and cucumbers (Cook, et al.). Besides horticultural products, Mexico appears to have an advantage in feeder cattle production. The U.S., on the other hand, has an apparent advantage in deciduous fruits such as apples and peaches, a few vegetables and melons, feedgrain production, livestock feeding, meat production, and dairy operations.

Economic Growth in Mexico: Future growth in U.S.-Mexico agricultural trade will depend crucially on the pace of economic development in Mexico. A NAFTA that helps generate a sufficient rate of economic growth in Mexico to sustain long-term growth in Mexican employment and per capita income and, consequently, demand for agricultural commodities could provide the basis for adjustments and investments in U.S. agriculture to service the Mexican market. Such growth, however, would likely also stimulate domestic and foreign investment in Mexican agricultural production and processing. Absent significant growth in income and food demand, however, the Mexican market will likely continue to be serviced mainly by local suppliers with little or no significant increase in capital investments or technology improvements despite the implementation of a NAFTA.

Foreign Investment: Foreign, private capital to lift Mexican capacity, technology, and infrastructure constraints is needed for Mexico to achieve its agricultural export potential. Also, such investments are key to U.S. export potential to Mexico. Foreign capital is an important source of expected growth in employment, income, and, in turn, the demand for food in Mexico.

Mexican farm size and structure: Although popular in Mexico, especially among the rural poor, the land tenure laws that created the *ejido* system in the 1930s have been blamed for the poor performance of the Mexican agricultural sector and are considered one of the biggest constraints on productivity growth in Mexican agriculture. The Salinas Administration recently pushed historic land reform legislation through the Mexican Congress. If effectively implemented, the legislation could promote increased production efficiency, growth in farm size, a decline in the total number of farmers in Mexico, and increased competitiveness of the Mexican farm sector.

Mexican labor markets and costs: The relatively low cost of Mexican labor provides Mexico with a relative advantage in labor-intensive industries like agriculture. In fact, a short term effect of the proposed NAFTA may be downward pressure on Mexican wage rates as increased agricultural imports from the United States displace Mexican agricultural labor in import-competing sectors. The consequence could be increased competitive advantage of Mexican labor-intensive sectors like fruits and vegetables in Mexico and greater pressure for migration of undocumented labor to the United States. Over the longer run, if the NAFTA fostered sufficient economic growth in Mexico to absorb the displaced labor, wage rates could recover and eliminate the short-run Mexican gains from low-cost labor. Again, however, the role of the NAFTA in generating economic growth in Mexico is critical.

New Production Inputs: The NAFTA will enhance the availability of critical agricultural inputs, such as new and used farm equipment, spare parts, improved seeds and breeding stock, feeds and additives for animal nutrition, and technical consulting to help lower production costs and improve land and labor productivity. The Mexican Government, however, is continuing to reduce government subsidies for irrigation, fertilizer, fuel and lubricants, credit, and technical assistance. The net effect may be relatively less availability of these critical inputs to small farmers than to larger, commercial farms in Mexico.

Will the NAFTA Drive U.S. Agricultural Production and Processing to Mexico?

Neither patterns nor trends in agricultural production, processing, or trade among NAFTA countries are likely to be altered significantly by the NAFTA. Any changes are more likely to result from increased market efficiency and growth in Mexico as economic restructuring continues, and as increased domestic and foreign capital investments are made in productive activities in the Mexican economy.

A NAFTA will facilitate continued expansion of U.S. exports to Mexico of feedgrains, wheat, oilseeds, meats, dairy products, selected fruits and vegetables, cotton, tobacco, and a wide variety of further processed and consumer-ready food products. NAFTA will also strengthen the competitiveness of several Mexican agricultural industries, including labor-intensive melon and vegetable production and possibly cow-calf production.

Although U.S. processed food exports to Mexico have increased in recent years, many U.S. firms are opting for direct investment strategies to take advantage of the growing market in Mexico (Handy). Recent changes in Mexican investment laws have eased Mexican restrictions on foreign ownership of Mexican businesses and land leading to a sharp increase in foreign direct investment (FDI) in the Mexican economy. FDI in the Mexican agricultural production and food processing sectors has also increased but still only account for about 0.1% and 1.8%, respectively, of overall FDI in Mexico. The NAFTA will provide additional incentive for the direct investment strategy.

There are some concerns that growing U.S.-Mexico trade and integration is creating an incentive for U.S. firms to relocate their operations to Mexico to lower costs and take advantage of looser and less strictly enforced environmental regulations with the intention of shipping their products back to the U.S. for sale. With some exceptions, however, sales of U.S. food processor affiliates in Mexico are directed primarily to local rather than U.S. markets. U.S. food processing firms investing in Mexico are more concerned about Mexico as a potential market for their products rather than as a "platform" for export sales back to the United States (Handy). Increasing competition with multinational corporations has created some incentive for Mexican food processors to seek out joint venture opportunities with U.S.-based food processors, particularly since the majority of the competition is from Mexican affiliates of U.S. food processors rather than direct exports from the United States.

CURRENT ENVIRONMENTAL PROBLEMS RELATED TO MEXICAN AGRICULTURE¹

Current Mexican agricultural and livestock practices, such as unwise use of available water supplies, inefficient land use practices, poor farm and livestock management practices, overuse of pesticides and agricultural chemicals, and overgrazing, have contributed significantly to the degradation of the natural resource base of Mexico. Some of the more salient environmental problems related to agriculture in Mexico are discussed in this section.

Environmental Problems Related to Mexican Crop Production

Although Mexico has abundant water supplies, the distribution of water is a problem. About 20% of the water in Mexico is located where 75% of the population resides and where 80% of the industrial activity takes place. Because of this maldistribution of the water supply, only 6 million hectares of land are irrigated for agriculture. At the same time, inefficient irrigation practices result in a 65% loss of irrigation water and poor crop productivity levels due to the flooding of crops, land salinity, and erosion.

Mexico's groundwater aquifers are also being severely depleted. Several examples are worth mentioning. The aquifers which support the agricultural region of the Comarca Lagunera are being depleted at rates between 2 and 7 meters per year. The depletion of these aquifers not only has resulted in increased pumping costs to Mexican agricultural producers but also has led to the presence of arsenic in the water due to the geological configuration of the region. In another case, the recharge rate of the aquifers which support the Valle de Santo Domingo in the state of Baja California is below 50%. Finally, the aquifers in the Valle de León, Río Turbio, and Silao in the state of Guanajuato are being depleted at a rate of 1, 2.5, and 3 meters per year, respectively. These depletion rates have also led to the intrusion of salt water into these aquifers rendering the groundwater unfit for agriculture or human consumption.

The agricultural use of water containing effluents or industrial residuals in Mexico is problematic and leads to soil degradation and contamination of crops. This is a serious problem given that pathogenic agents and heavy metals such as lead, mercury, zinc, and cadmium contained in these waters enter the food chain causing health problems in humans. This health problem has become so severe that in 1991 the Comisión Nacional de Agua (National Water Commission) suspended the use of this contaminated water for the production of lettuce, cabbage, carrots, watercress, coriander, and radish. Untreated water is still being used for other crops, however.

¹THIS SECTION DRAWS HEAVILY ON A PAPER BY O.N. FLORES.

Mexican agriculture also makes substantial use of pesticides which are produced in Mexico or are imported. For example, of the total amount of pesticides used in 1984 in Mexico, 71% was produced in Mexico and 29% was imported. Of the total pesticides imported between 1978 and 1984, 77% were from the United States. Of the 11 major crops grown in Mexico in 1984, 7 had pesticide applications on more than half of the area planted. In 1983, cotton, corn, sorghum, and soybeans used 71% of the insecticides. Corn, sorghum, sugarcane, rice, and pasture used 71% of the herbicides. Tomatoes, potatoes, other horticultural crops, and fruit used 58% of the fungicides (Nacional Financiera).

The misuse of pesticides in Mexican agriculture has led to the contamination of groundwater and surface water which has negatively impacted aquatic life, wildlife, and human health. About 42% of the pesticides produced in Mexico are severely restricted or prohibited in the United States, Japan, or the European Community. Additionally, at least a third of the 90 or so pesticides whose use has been restricted or suspended in the United States are being used in Mexico.

Environmental Problems Related to Mexican Livestock Production

Overgrazing is a serious problem in Mexico and is a direct result of incentives to livestock producers to increase their herd sizes. Additionally, the lack of adequate infrastructure, such as corrals and fences, has resulted in substantial pasture mismanagement. The end result has been the continued degradation and erosion of the available pasture land.

Other livestock management practices have also led to environmental problems. For example, in the northern part of Mexico, there has been substantial clearing of land for pasture. The result has been the loss of habitat for many species, some of which are endangered. The burning of some pasture land has also had this same effect. Use is also made of growth hormones in livestock and poultry production. The intensive production systems used in raising poultry, pork, and cattle also contaminate the surrounding air and water. Milk production has also led to water and air problems as well as human health concerns.

Environmental Problems Related to Mexican Agribusiness

The principal water and air contaminants in this sector are cattle and poultry slaughter houses, milk pasteurizing plants, livestock feeding operations, sugar mills, coffee and cacao plants, hide and skin tanners, and grain mills. The environmental problems vary depending on the particular agribusiness. For example, in coffee plants the two important environmental problems are the disposal of coffee pulp and the excessive use of water

needed to wash a kilo of coffee (12 liters). Mexican canning and meat packing plants are known to have food safety problems. The runoff from livestock feedlots in Mexico also creates significant problems for local water supplies.

ENVIRONMENTAL IMPLICATIONS OF FREER U.S.-MEXICO AGRICULTURAL TRADE

The Mexican government has enacted numerous policies and programs designed to minimize natural resource degradation resulting from agricultural and livestock production practices in Mexico, but much more needs to be done. The expected agricultural trade consequences of the proposed NAFTA as discussed earlier will likely have both positive and negative impacts on the environment. The overall magnitude of the negative impacts, however, will likely be considerably less than those created by the existing environmental problems related to current agricultural and livestock practices in Mexico. After discussing the possible environmental implications of freer U.S.-Mexico trade for Mexico and the U.S. in this section, the factors likely to condition the environmental impacts are analyzed.

Environmental Implications for Mexico

If the NAFTA increases Mexican exports of crops that use substantial pesticides, Mexico's environment will be negatively impacted. This reasoning will probably hold true for tomatoes and other horticultural crops whose exports are expected to increase and which are high users of fungicides. On the other hand, if the NAFTA leads to increases in Mexican imports of crops currently produced in Mexico with substantial pesticides, then the impact on the Mexican environment will more likely be positive. Thus, additional Mexican imports of U.S. potatoes, fruit (such as apples, pears, and peaches), corn, wheat, barley, sorghum, and cotton will help reduce the negative environmental impact of Mexican agriculture.

Since the direct effects of the NAFTA on livestock and meat exports between Mexico and the United States are likely to be small, the current environmental problems in Mexico related to the livestock sector are not likely to be affected to any extent by the NAFTA. Any growth in Mexican meat demand stimulated by the NAFTA would provide incentives for both additional U.S. meat exports to Mexico and the diversion of Mexican feeder cattle exports into domestic meat markets. Increased meat imports would reduce the pressure of livestock slaughtering, livestock feeding, and feedgrain production on the Mexican environment. At the same time, increased incentives to produce feeder cattle is likely to induce the conversion of crop land to pasture, a net gain to the Mexican

environment. Increased feeder cattle production, however, could also lead to increased overgrazing of current pasture land or the conversion of Mexican wildlife habitats to pasture.

If those feeder cattle are slaughtered domestically rather than exported to the U.S., however, the negative environmental effects of additional livestock feeding and slaughter in Mexico could outweigh the positive effects of the conversion of cropland to pasture. The final outcome will depend on the growth rate in Mexican meat demand and the way in which Mexican livestock producers respond to the current decapitalization in their industries. Schulthies and Williams argue that Mexico will likely continue to specialize in feeder cattle production and export while the U.S. will continue to export meat, breeding stock, and genetic material to Mexico.

Environmental Implications for the United States

Because the direct impacts of the NAFTA on U.S. agricultural and food production and trade are likely to be small, so also are the expected U.S. resource use adjustments and environmental impacts. The more important factor is likely to be the future economic performance of Mexico and growth in Mexican per capita incomes. The NAFTA is expected to facilitate that growth to some extent. In any event, the tendency will likely be a reduction in U.S. production of fruits and vegetables in favor of imports from Mexico and increased production and export of feedgrains, meat, and processed food products. The reduction in the use of environmentally harmful agricultural chemicals from a reduction in U.S. fruit and vegetable production will be offset to some extent by an increase in the use of agricultural chemicals in the production of other commodities.

A primary U.S. concern is that the NAFTA could encourage U.S. imports of agricultural products containing pesticide residues. Additionally, there is concern that harmonization of U.S.-Mexico food safety regulations might induce a softening of U. S. standards for pesticide residues in food. U. S. government, however, has made a firm commitment to maintain stringent health, safety, and environmental standards, and to prohibit imports of products that do not meet such requirements. Hence, standards, technical regulations, and conformity assessment procedures based on a scientific justification or acceptable risk levels will not be subject to challenges under the NAFTA. Thus, as long as products imported from Mexico meet U.S. standards, no additional health hazards would result from increased agricultural trade under the NAFTA (USTR).

Environmental Impact Conditioning Factors

An implicit assumption often made in discussing the likely effects of the NAFTA is that nothing will change except trade policies. In fact, however, the environmental implications of freer U.S.-Mexico agricultural trade depend crucially on the likely changes

in a number of important factors, including (1) Mexican environmental laws, (2) economic-based Mexican policies to manage environmental problems, (3) Mexican producer chemical use behavior, (4) Mexican land reform, (5) the security of property rights in Mexico, and (6) Mexican macroeconomic and sectoral policies.

Mexican Environmental Laws: An important change in Mexican environmental protection efforts occurred in 1988 with the passage of the *General Law of Ecological Balance and Environmental Protection*. This wide-ranging law addresses a number of environmental issues such as air, water, and soil pollution; management of hazardous waste and materials, pesticides and toxic substances; and conservation of wildlife, habitats and natural resources. Although the new law is quite extensive with respect to protecting the environment, the greatest limitation currently facing Mexico is monitoring pollution and enforcement of the existing laws. Limited funds, the lack of personnel trained in environmental sciences, and limited laboratory testing capabilities, environmental data, and other scientific needs are serious constraints on Mexico's ability to manage its environmental problems. In this respect, a more efficient allocation of resources under the NAFTA may free up resources for dealing with environmental problems.

Economic-Based Policies: Mexico could choose to resolve some of the more pressing environmental problems by moving away from the current focus on command and control policies for protecting the environment to economic-based policies. Such a move would eliminate the costs of command and control policies and possibly generate funds to support other environmental control policies. A tax on pesticide use in Mexico, for example, could be implemented to control the use of pesticides and facilitate the harmonization of U.S. and Mexican environmental standards if the U. S. adopted a similar tax.

Producer Chemical Use Adjustments: Agricultural producers in Mexico are already adjusting their chemical use behavior for products planned for export to the United States even without the inducements of tighter controls or the implementation of the NAFTA. There is growing awareness among producers that they must change their use of agricultural chemicals to ensure entry through inspection points into U.S. markets.

Land Reform: The recent Mexican land reform legislation will have profound significance for the Mexican environment. First, because many *ejidos* consist of low quality land which is intensively cropped and subject to extensive erosion, the legal right of *ejidatarios* (*ejido* farmers) to convert crop land into pasture under the new laws will help ameliorate some of Mexico's most difficult erosion problems. Second, the consolidation of small *ejidos* into larger farming units made possible by the recent land reform legislation will likely lead to more modern and intensive farm and livestock management practices and skills resulting in more efficient farm and livestock operations. Given adequate training, the result could be savings of scarce resources such as water and the reduced use of agricultural chemicals in crop production and growth hormones in livestock operations.

Security in Property Rights: Changes in Mexican policies, such as the land reform laws and more liberal foreign investment laws, provide some degree of property right security for land owners. Property right security is vital to efficient resource management by providing an incentive to properly manage land. Without secured property rights, Mexican agricultural producers have had an incentive to mine their land resources, leading to high rates of erosion and degradation of wildlife habitats. There was no incentive to make investments to maintain or improve the productivity of the land for fear of government expropriation. More secure land rights may provide producers with an incentive to make such investments and adopt more sustainable production practices.

Macroeconomic and Sectoral Policies: National economic policies play a significant role in the rate of natural resource depletion and the level of environmental degradation in a country. For example, real currency devaluations increase international competitiveness and raise the production of internationally tradable goods. The environmental implications for agriculture depend on whether the increased production harms or benefits the environment and whether the increased production is the result of farming on new land or of more efficient use of existing farmland. Other macroeconomic and sectoral policies have similar positive or negative impacts on the environment.

CONCLUDING COMMENTS

Little remains for the proposed NAFTA to liberalize because of recent unilateral Mexican trade liberalization and other Mexican economic reforms. Consequently, little additional growth in U.S.-Mexico trade in most agricultural commodities is expected as a direct result of the agreement. Continued growth in U.S.-Mexico agricultural trade will depend primarily on the pace of overall economic and per capita income growth in Mexico as the result of continued economic reform and capital investments in productive activities in Mexico. NAFTA will be instrumental in facilitating and institutionalizing that process. For the environment, the implication is that the agricultural provisions of the NAFTA will not likely create significant new environmental problems in either the United States or Mexico. Most of the environmental impacts of NAFTA are more likely to result from economic reforms and growth in Mexico. Nevertheless, the NAFTA will result in some change in agricultural production patterns and resource use in both Mexico and the United States. The primary environmental impacts relate to likely shifts in fruit and vegetable production to Mexico and feedgrain and meat production to the United States. Whether the net effects are positive or negative for the environment is unclear. Empirical analysis of the likely extent, magnitude, and direction of the environmental impacts is difficult because the necessary data and models are not available. Disentangling the specific trade and environmental impacts of the NAFTA from those related to Mexican economic growth, land reform, and other factors further complicates the empirical measurement problem.

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