MEXICO-U.S.-CARIBBEAN MELON TRADE: PRODUCTIVITY, COMPETITION AND MARKET SHARE

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Texas Agricultural Market Research Center (TAMRC) International Marketing Report IM 3-00, by Jose de Jesus Espinoza-Arellano and Drs. Stephen W. Fuller and Jaime Malaga. All are in the Department of Agricultural Economics, Texas A&M University except Jose de Jesus Espinoza-Arellano who is a Researcher at the National Institute of Agricultural Research (INIFAP), Torreon, Coahuila, Mexico, May 2000.

Abstract: This study analyzes the U.S., Mexican, and Caribbean markets for melons, including cantaloupe, honeydew melons, and watermelon to better understand the effects of important economic variables on these markets and on U.S. melon imports. The analysis is accomplished with an estimated price equilibrium econometric simulation model that represents critical features of the U.S., Mexico, and Caribbean cantaloupe, honeydew melon, and watermelon industries. The model is used to generate a baseline forecast of U.S.-Mexico-Caribbean melon trade as well as simulations of the relative effects of several key factors likely to affect that trade, including (1) the Mexican peso/U.S. dollar exchange rate, (2) U.S. melon import tariff phase-out under NAFTA, (3) Mexican per capita income growth, (4) Mexican melon yield growth, and (5) Mexican wage rate growth. The simulation results indicate that the 1994-1995 devaluation of the Mexican peso has the greatest short-run influence on Mexican melon exports to the United States whereas higher Mexican melon yields have the greatest long-run impact. The tariff-reducing provisions of NAFTA have a comparatively modest influence on Mexican melon exports.

Key Words: Mexico, Caribbean, melon, trade, productivity, market share.

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 over thirty years. 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.
MEXICO-U.S.-CARIBBEAN MELON TRADE: 
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Executive Summary

This study analyzes the U.S., Mexican, and Caribbean markets for melons, including cantaloupe, honeydew melons, and watermelon, some of the most important Mexican and Caribbean agricultural exports, to better understand the effects of important economic variables on these markets and on U.S. melon imports. The analysis is accomplished with an estimated price equilibrium econometric simulation model that represents critical features of the U.S., Mexico, and Caribbean cantaloupe, honeydew melon, and watermelon industries. The model is used to generate a baseline forecast of U.S.-Mexico-Caribbean melon trade as well as simulations of the relative effects of several key factors likely to affect that trade, including (1) the Mexican peso/U.S. dollar exchange rate, (2) U.S. melon import tariff phase-out under NAFTA, (3) Mexican per capita income growth, (4) Mexican melon yield growth, and (5) Mexican wage rate growth.

Because of the variety of climates in Mexico, melons are produced during the entire year. For both cantaloupe and watermelon, the Fall-Winter months are the main production and export season. The Spring-Summer has supplied the domestic market. The low productivity of the Mexican cantaloupe sector is often attributed to increasing incidence of insects and virus in selected production areas as well as limited access to public and private credit by smaller farmers. Watermelon production and area harvested have grown at lower average annual rates than those of cantaloupe likely due to the lower rate of growth in domestic watermelon consumption as compared to that of cantaloupe. As in the cantaloupe case, watermelon yields grew at a modest annual rate between 1970 and 1994.

In general, U.S. melon production is concentrated in a few states. Cantaloupe and honeydew production is concentrated in California, Texas, and Arizona while watermelon is concentrated in Florida, California, Texas, and Georgia. Florida, California, Texas and Georgia account for over 70% of total U.S. watermelon production. The growth and development of melons require warm temperatures. Optimal growing temperatures range from 65-75 Fahrenheit degrees (Tamaro). Because these temperature requirements are not met for most of the U.S. during the late fall, winter, and early spring seasons, domestic production during this period is low and domestic consumption is supplied mainly with imports.

Although encountering little competition from U.S. producers in the Fall-Winter period, Mexican cantaloupe and honeydew exports to the U.S. face stiff competition from CBI countries (in particular, Costa Rica, Guatemala, and Honduras). In contrast, Mexico watermelon production encounters some competition from U.S. production during April and May.
The Caribbean Basin Initiative (CBI) offers twenty-seven Caribbean and Central American countries duty-free access to U.S. markets. Chief CBI suppliers of horticultural products to the United States are Costa Rica, Guatemala, and Honduras. Excluding bananas and plantains, these CBI countries supplied 85% of all U.S. imports of horticultural products from the Caribbean region.

The scant literature available on melon markets suggests that U.S. imports of agricultural commodities like melons from Mexico and, by expansion, from Caribbean countries, depend on not only on U.S. demand for the commodities but also on the interplay of supply and demand among all producing and trading countries. In particular, changes in economic conditions impacting the consumption and production of melons in the exporting countries may have as much impact on the growth of U.S. melon imports as changes in the domestic U.S. melon supply and demand. At the same time, the relative seasonality of production in the U.S., Mexico, and Caribbean countries plays an important role in the level of annual U.S. melon imports.

For the analysis of melon markets and trade in the U.S., Mexico, and the Caribbean, a three-region, three commodity (cantaloupe, honeydew, watermelon), non-price equilibrium, econometric simulation model was estimated and utilized. The data to estimate the model consists of twenty-five annual observations covering the period 1970-1994. The 3SLS estimator was used to estimate the parameters of the model. The model included 19 behavioral equations, 16 identities and 70 estimated parameters. In general, regression results indicated a good fit of the data for most equations. The estimated model was validated through historical simulation.

The model was first used to generate a baseline forecast of the endogenous variables in the model over the 1996-2004 period. The baseline forecast was conditioned on a forecast of the exogenous variables in the model. The baseline forecast provided a projection of the endogenous variables over the 1996 through 2004 period given both the phase-out of tariffs under NAFTA which began in 1994 and the devaluation of the peso which occurred in 1994/1995.

To determine the effect of selected forces on the competitiveness of Mexico in supplying U.S. winter melon markets, the baseline forecast of the endogenous variables was contrasted with melon model projections reflecting changes in exogenous variables thought to be important in determining the competitiveness of Mexico, including (1) changes in the Mexican peso/U.S. dollar exchange rate, (2) the phase-out of U.S. melon import tariffs under NAFTA, (3) a higher rate of per capita income growth in Mexico, (4) higher growth in Mexican cantaloupe and watermelon yields, and (5) a higher rate of Mexican wage rate growth.

The simulation results suggested that over the short run, the most favorable impact on Mexican melon exports results from the 1994/95 Mexican peso devaluation. Over the longer run, the most favorable impact is caused by improvements in Mexican melon yields. Increases in the cost of Mexican agricultural labor and growth in Mexican per capita income have unfavorable long-run impacts on Mexican melon exports but the effect is of a lower order of magnitude than an increase in melon yields. In general, the tariff-reducing provisions of NAFTA have a comparatively modest influence on Mexican melon exports over the forecast period.
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Although historically the dominant foreign source of melons for the U.S. market, Mexico has slowly been losing its competitive position. During the 1970s and early 1980s, for example, Mexico supplied more than 90% of U.S. cantaloupe imports. In recent years, however, Mexico has supplied about 30% of the U.S. market. Similar declines in market share have been observed for honeydew melons and watermelon.

Government policies and adoption of better production technologies in countries involved in melon trade are responsible for changes in their competitive positions. Policies dealing with exchange rates, trade policies, production costs and investments in improved production technologies have had important effects on melon trade.

The general objective of this study is to analyze the U.S., Mexican, and Caribbean markets for melons, including cantaloupe, honeydew melons, and watermelon, some of the most important Mexican and Caribbean agricultural exports, to better understand the effects of important economic variables on these markets and on U.S. melon imports. The analysis is accomplished with an estimated price equilibrium econometric simulation model that represents critical features of the U.S., Mexico, and Caribbean cantaloupe, honeydew melon, and watermelon industries. The study is of particular interest to developing regions who envision opportunities to market agricultural products to developed economies in an expanding free trade environment. After presenting some background information on the melon industries in the three regions, an analysis of previous research related to those industries is discussed. Based on that information, a model of U.S.-Mexico-Caribbean melon trade is presented, the empirical results of estimating the parameters of the model are discussed, and the results of validating the model through historical simulation analysis are presented. The model is then used to generate a baseline forecast of U.S.-Mexico-Caribbean melon trade as well as simulations of the relative effects of several key factors likely to affect that trade, including (1) the Mexican peso/U.S. dollar exchange rate, (2) U.S. melon import tariff phase-out under NAFTA, (3) Mexican per capita income growth, (4) Mexican melon yield growth, and (5) Mexican wage rate growth.

Melon Industry Characteristics

An adequate understanding of the flow of melons between Mexico and Caribbean countries and the U.S. requires a detailed understanding of the characteristics of the melon industries in all three regions. Information on levels of production, seasonality, productivity and consumption provide valuable information to better understand the level and direction of trade. This section provides a descriptive analysis of melon production and trade in Mexico, the United States, and Caribbean Basin Initiative (CBI) countries as background to the subsequent empirical analysis.
Mexico Melon Industry

Because of the variety of climates in Mexico, melons are produced during the entire year. For statistical purposes, Mexican Agricultural Statistics divide annual production into two seasons: Fall-Winter (December through May) and Spring-Summer (June through November). For both cantaloupe and watermelon, the Fall-Winter months are the main production season. Nearly 67% of Mexican cantaloupes are produced each year during the Fall-Winter season with the remainder during the Spring-Summer period. For watermelons, the Fall-Winter season accounts for an even larger share of annual production at nearly 74%. The Fall-Winter production of both cantaloupe and watermelon has been traditionally oriented to the export market while that of the Spring-Summer has supplied the domestic market.

The pattern of Mexican melon exports follows the production seasons. Between 80% and 94% of all Mexican melon exports occur during the Fall-Winter season during which March, April, and May are the most intensive export months. The behavior of Mexican melon production and exports is closely related to the seasonality of U.S. melon production. U.S. melon production during the late fall, winter, and early spring is relatively small forcing the U.S. to turn to foreign markets to supply domestic demand.

An average of 26,800 hectares (ha) of cantaloupes were harvested in Mexico over the 1970-1994 period with average yields of 12.5 metric tons (mt) per hectare and a corresponding total production of 336,667 mt (Secretaría de Agricultura y Recursos Hidráulicos, SARH). During 1970-1991, production increased at an average annual rate of 5.4%. After 1991, production declined significantly. Changes in production through time are explained by changes in harvested area and not by changes in yields. Cantaloupe yields grew at an annual average rate of only 0.57% over the same period. The low productivity of the Mexican cantaloupe sector is often attributed to increasing incidence of insects and virus in selected production areas as well as limited access to public and private credit by smaller farmers.

The average area of watermelon harvested in Mexico during 1970-1994 was 30,291 ha with average yields of 13.09 mt/ha and total production of 397,481 mt (SARH). Over that period, watermelon production and area harvested grew at a lower average annual rates than those of cantaloupe (2.1% and 1.6%, respectively) likely due to the lower rate of growth in domestic watermelon consumption as compared to that of cantaloupe. As in the cantaloupe case, watermelon yields grew at a modest annual rate of only 0.5% between 1970 and 1994 from 10.4 mt/ha to 14.7 mt/ha.

Unfortunately, information on Mexican honeydew area, production and yields are not available from the Mexican Ministry of Agriculture, Livestock, and Rural Development (SAGAR). Mexican honeydew export behavior, however, will be discussed later in connection with the U.S. melon industry and imports based on information from the U.S. Department of Agriculture (USDA) and the National Confederation of Vegetable Producers of Mexico (CNPH).
U.S. Melon Industry

In general, U.S. melon production is concentrated in a few states. Cantaloupe and honeydew production is concentrated in California, Texas, and Arizona while watermelon is concentrated in Florida, California, Texas, and Georgia. California, Texas and Arizona account for over 90% of U.S. cantaloupe production and virtually all of the U.S. honeydew melon production. Florida, California, Texas and Georgia account for over 70% of total U.S. watermelon production.

The growth and development of melons require warm temperatures. Optimal growing temperatures range from 65-75 Fahrenheit degrees (Tamaro). Because these temperature requirements are not met for most of the U.S. during the late fall, winter, and early spring seasons, domestic production during this period is low and domestic consumption is supplied mainly with imports.

Early U.S. domestic shipments start in April or May, depending on the type of melon, with supply peaking from June to September. Only 14%, 10%, and 22% of cantaloupe, honeydew and watermelon annual production, respectively, occurs and is shipped during the December-May season which corresponds to the peak U.S. import season.

A relevant question regarding U.S. imports and domestic shipments is: Do imports compete with or complement U.S. domestic production during the December-May period? Monthly export data of Mexico and U.S. monthly domestic shipments indicate an overlapping in May for cantaloupe and honeydew and in April and May for watermelon. However, more detailed information provided by the USDA on weekly melon movements (USDA 1989, 1993) helps to provide a more precise answer to the question.

The analysis of weekly cantaloupe loads during May indicate that imports supply 74% of consumption in the first two weeks of May while early shipments from the Imperial Valley of California supply the remaining 26%. For the last half of May, the situation changes and while the domestic shipments from California, Texas and Arizona increase significantly, imports decrease to levels close to zero. The reduction in imports is, in part, a response to a decline in U.S. market prices during this period which reduces the profitability of Mexican cantaloupe exports to the United States. As a consequence, during the last half of May, domestic shipments supply 95% of the market and imports only 5%. During the December-April period, cantaloupe imports supply 100% of U.S. demand and, even in May, a complementary situation is observed. Imports supply the first half of May while domestic shipments provide consumption for the second half of May. The obvious conclusion is that cantaloupe imports complement domestic U.S. production during the December-May period.

For honeydew, the situation is similar to that of cantaloupe. An apparent overlap in May exists between imports from Mexico and domestic shipments. However, domestic shipments, during the first two weeks of May account for about 8% of May domestic shipments while the remaining 92%
of domestic May shipments are shipped during the last half of May. Thus, as in the cantaloupe case, honeydew imports are complementary to domestic U.S. honeydew production.

During April and May, watermelon imports and domestic shipments tend to compete. Domestic shipments in April are supplied by Florida. Domestic shipments in May are supplied by Florida, California, and Texas. Although only about 5% in early April, the share of U.S. watermelon consumption accounted for by domestic shipments increases to 34% by late April, 50% in the first week of May, and 90% by late May.

Although encountering little competition from U.S. producers in the Fall-Winter period, Mexican cantaloupe and honeydew exports to the U.S. face stiff competition from CBI countries (in particular, Costa Rica, Guatemala, and Honduras). In contrast, Mexico watermelon production encounters some competition from U.S. production during April and May.

CBI Countries Melon Industry

On August 5, 1983, President Reagan signed Public Law 98-67. Title II of this act, commonly referred to as either the Caribbean Basin Initiative (CBI) or the Caribbean Basin Economic Recovery Act (CBERA), offers twenty-seven Caribbean and Central American countries duty-free access to U.S. markets (Brown and Suarez). The CBI was intended to generate regional political stability and economic growth via trade, economic assistance, and tax incentives for private sector investments.

Chief CBI suppliers of horticultural products to the United States are Costa Rica, Guatemala, and Honduras. Excluding bananas and plantains, these CBI countries supplied 85% of all U.S. imports of horticultural products from the Caribbean region.

More than 93% of CBI melon exports to the U.S. are shipped during the December-May period. Mexican exports to the U.S. are shipped during the same season and, thus, compete for the U.S. market. CBI countries have increased their share of the U.S. cantaloupe and honeydew market at the expense of Mexico melon exports. Over the 1970-1994 period, CBI cantaloupe exports to the United States increased dramatically from 11.6 million pounds to 341 million. Over the same period, CBI honeydew exports increased equally dramatically from 1.2 million pounds to 141.2 million pounds.

Previous Research Related to Melon Markets

Little empirical analysis of melon markets or international melon trade has been done. One exception was an estimated demand equation for U.S. watermelon by Suits in 1955. The U.S. farm-level watermelon demand estimation was based on national data covering the 1930-1951 period and
was estimated using a double logarithmic functional form. The estimated income and own-price elasticities for watermelon were 1.37 and -0.90, respectively.

A number of descriptive analyses, however, provide useful insight into the structure and behavior of the market for melons. Buxton (1992) estimated supply response equations for 14 vegetable commodities including honeydew and watermelon. The estimated distributed lag adjustment models were based on data extending over the 1970 to 1991 period and provide U.S. supply elasticities for watermelon and honeydew of 0.34 and 1.16, respectively. Cross-price effects were not statistically significant in the analysis. That is, production levels were largely dependent on lagged own price.

Cook et al. (1991) explored the likely implications of NAFTA on the U.S. horticultural sector. They conclude that melon production in Mexico is generally complementary to U.S. production in December through April but note some competition in May. Fuller and Hall (1991) suggest that the tariff-reducing provisions of NAFTA and the U.S./Mexico exchange rate may have an important influence on U.S.-Mexico melon/vegetable trade. Brown and Suarez (1991) found U.S. consumption of cantaloupe to be seasonal with consumption greatest in June and lowest in December. California, Texas, and Arizona producers were found to dominate the U.S. market from May to December while Mexico and Caribbean nations were primary suppliers from January through April. Further, they conclude that real melon prices in the U.S. market have been declining over time.

A few studies not specifically focused on melons indirectly provide some insight for an empirical analysis of melon markets. Simmons and Pomareda (1975) and, more recently, Zabin (1997) examined the effect of Mexican wage rates on winter exports of fresh vegetables to the United States. Simmons and Pomareda concluded that a 10% increase in Mexican wage rates would lower exports to the U.S. by 7%. Zabin concluded that the real cost of labor per unit of harvested vegetable is considerably smaller than the differential in wage rate paid by growers in Mexico and California. Taylor and Wilkowske (1984) show that productivity growth is central to the ability of U.S. vegetable producers to compete with foreign producers in the domestic market. Cook (1992) identifies technological developments as important in determining the competitiveness of Mexican producers in the U.S. market. Similar hypotheses regarding melon markets could be expected to hold.

Schuh (1987) demonstrates the potential importance of the exchange rate in affecting U.S.-Mexico trade. Fuller et al. (1991) found the real peso/dollar exchange rate to have a statistically significant effect on Mexican onion exports to the United States. Schulthies and Williams (1992) suggest the rapidly growing demand for fresh vegetables and melons in Mexico may limit the ability of that country to export these commodities as a result of growing per capita consumption of these commodities and increased urbanization and income levels. Finally, several studies emphasize the importance of U.S. vegetable tariffs in shaping trade. Hammig and Mittelhammer (1982) estimate that removal of U.S. tomato tariffs would reduce domestic supply 24%. Other studies conclude that tariffs increase the cost of Mexican exports to the U.S. beyond total Florida producer costs for many fresh vegetable imports (e.g., Buckley et al.).
In summary, the scant literature available provides little substantive support for an in-depth empirical analysis of U.S., Mexican, and Caribbean melon markets and trade. What previous research does suggest is that U.S. imports of agricultural commodities like melons from Mexico and, by expansion, from Caribbean countries, depend on not only on U.S. demand for the commodities but also on the interplay of supply and demand among all producing and trading countries. In particular, changes in economic conditions impacting the consumption and production of melons in the exporting countries may have as much impact on the growth of U.S. melon imports as changes in the domestic U.S. melon supply and demand. At the same time, the relative seasonality of production in the U.S., Mexico, and Caribbean countries plays an important role in the level of annual U.S. melon imports.

U.S.-Mexico-Caribbean Melon Model

This section first presents a conceptual model of the U.S.-Mexico-CBI countries (UMCC) melon trade. The empirical results of estimating the parameters of the model are then discussed followed by a discussion of model validation.

The Conceptual Model

A number of alternatives for modeling international agricultural trade have been developed. The selected model should be consistent with the underlying theory and the commodity sector being analyzed, and allow the researcher to focus on variables that are critical to the analysis.

The model developed for this study is in the context of neoclassical trade theory that reflects conditions of perfect competition in a partial equilibrium framework. Virtually all empirical models must be classified as partial equilibrium because not all economic factors that bear on the solution are included. Excluded elements are assumed to remain constant during an adjustment process (Tweeten). The selection of this approach is based on characteristics of the international melon market. The standard assumptions of perfect competition, such as many producers, price-takers in output and input markets, homogeneous good, domestic factor mobility, and many buyers and sellers, tend to characterize the melon industry in all three regions.

Neoclassical trade theory holds that each trading region has an excess supply or excess demand function for a commodity. Supply and demand functions for each region determine the excess functions in the world market. When the world market clears, imports equal exports at the world price. In the absence of restrictions to trade, the world price determines the quantities consumed and produced in each region.

The model to be used includes three regions (United States, Mexico, Caribbean nations) and three commodities (cantaloupe, honeydew, watermelon). The conceptual model includes U.S. demand
and supply equations, Mexican supply and demand equations, and demands and supplies representative of Caribbean nations. Because U.S. honeydew and cantaloupe production during the December through May period are complementary with U.S. imports, the domestic supply of these melons are viewed as exogenous in the specified model. In contrast, U.S. watermelon supply is treated endogenously since imports compete with U.S. production. Price linkage equations connect retail and farm-level prices in each region. Price transmission equations link Mexico and Caribbean nations to the U.S. market and include tariffs and exchange rates. Mexico and Caribbean Nations excess supplies are equated with U.S. excess demands to determine market clearing conditions.

The data to estimate the model consists of twenty-five annual observations covering the period 1970-1994. The 3SLS method was selected to estimate parameters of the model. The 3SLS method of estimation takes into account the correlation of errors across equations and restrictions in all equations of the system to generate consistent and asymptotically normal and efficient estimators (Kmenta). Therefore, the 3SLS method was selected to estimate parameters of the model.

To estimate model parameters the complete model was divided into five economic blocks and parameters estimated for the equations making up each block. The blocks included: (1) Mexican supply, (2) Mexican demand, (3) U.S. supply, (4) U.S. demand, and (5) CBI countries excess supply. The separation into blocks was only for purposes of estimating model parameters. For simulation and forecast purposes, the estimated blocks were reassembled into the complete model. Model parameters estimated in blocks proved to be useful for simulation purposes since the model was able to successfully track historical data and generate acceptable validation statistics. A similar procedure has been used by Malaga (1997), Garcia-Vega (1995), and Tsai (1994) to estimate model parameters. The parameters were estimated using the SYSNLIN procedure in the SAS econometric package. The SIMNLIN procedure in SAS was used for simulation.

Parameter Estimation Results and Model Validation

The UMCC fresh melon model included 19 behavioral equations, 16 identities and 70 estimated parameters. In general, regression results indicated a good fit of the data for most equations. Of the 70 estimated parameters, 44 were statistically significant at the 0.05 level as indicated by their t-ratios. The adjusted R squared ranged from 0.35 to 0.94. The signs of the estimated coefficients were consistent with expectations. Estimated elasticities were, in general, in the expected range and in agreement with the results of the few studies that have been done. No evidence of autocorrelation was found. The full model equations and all regression statistics are provided in Appendix Table 1, and the variable definitions in Appendix Table 2.

The estimated UMCC melon trade model was validated through historical (i.e., within sample) simulation. Several validation statistics, including the root mean square error percentage (RMS% error), Theil forecast error statistics, MSE decomposition proportions, and sensitivity analysis (dynamic multipliers) were used to evaluate the performance and stability of the model. The model
proved to be useful for simulation purposes since it was able to successfully track historical data and generate acceptable validation statistics. Table 3 provides the model validation statistics.

**Forecast Simulation Analysis of Key Factors Affecting Melon Trade**

The first step in conducting a forecast simulation analysis is to establish a baseline forecast simulation against which the results of the simulation scenarios can be measured. In this study, the UMCC model was used to generate a baseline forecast of the endogenous variables in the model over the 1996-2004 period. The baseline forecast is conditioned on a forecast of the exogenous variables in the model. The projected values of macroeconomic exogenous variables included in the baseline estimates were based on the published forecasts of the Food and Agricultural Policy Research Institute (FAPRI). Projected prices and yields for the various regions were based on historical trends. The baseline forecast includes both the scheduled NAFTA tariff phase-out that commenced in 1994 and the 1994-1995 Mexican peso devaluation. In other words, the baseline forecast provides a projection of the endogenous variables over the 1996 to 2004 period given both the phase-out of tariffs under NAFTA which began in 1994 and the devaluation of the peso which occurred in 1994/1995.

The baseline forecast shows aggregate U.S. consumption of cantaloupe and honeydew increasing over the 1996 to 2004 period while aggregate U.S. consumption of watermelon edges downward. Imports of cantaloupe and honeydew by the United States are projected to increase about 16% and 5%, respectively, over the 1996-2004 period while watermelon imports decrease. The decline in watermelon imports is due to increased market share held by U.S. producers in combination with a modest decline in per capita consumption (Espinoza).

The baseline forecast (1996-2004) also projects that Mexico will account for a declining share of U.S. imported winter melon consumption, a continuation of the historical trend (Table 1). Over the forecast period, the Mexican share of U.S. imported cantaloupe consumption is projected to decrease from 36% to 16% while the share accounted for by Caribbean countries (in particular, Central America) increases from about 64% to 84%. Similarly, Caribbean countries are projected to supply an increasing share of U.S. imported winter honeydew consumption by boosting their market share from 56% to 63% over the 1996 to 2004 period. Over this time period, the Mexican share of imported U.S. honeydew supply is projected to decline from 40% to 33%. Mexico and U.S. producers compete for the U.S. winter watermelon market. Based on the baseline forecast, the Mexican share is expected to decline from 30% to 13% over the forecast period (1996-2004) while the share accounted for by U.S. producers increases from 65% to 82%.

The baseline forecast is contrasted with simulations of the UMCC model reflecting varying assumptions regarding the exogenous variables. Comparing the baseline results with those of the various scenarios provides insight as to the relative importance of those factors on Mexico-U.S.-CBI melon markets and trade. To determine the effect of selected forces on the competitiveness of
Mexico in supplying U.S. winter melon markets, the baseline forecast for selected endogenous variables was contrasted with melon model projections reflecting changes in exogenous variables thought to be important in determining the competitiveness of Mexico, including (1) changes in the Mexican peso/U.S. dollar exchange rate, (2) the phase-out of U.S. melon import tariffs under NAFTA, (3) a higher rate of per capita income growth in Mexico, (4) higher growth in Mexican cantaloupe and watermelon yields, and (5) a higher rate of Mexican wage rate growth.

The effect of the 1994/95 Mexican peso devaluation on the ability of Mexico to export to the U.S. melon market was evaluated by assuming that the peso/dollar exchange rate had been fixed at the 1993 level throughout 1996 through 2004, and then, contrasting that simulated outcome with a forecast that reflected the 1994/95 devaluation. Results show, as expected, that the 1994/95 devaluation had an important short-run effect on Mexican melon exports to the United States (Table 2). The results suggest that as a result of the 1994/95 peso devaluation, Mexican watermelon, honeydew, and cantaloupe exports to the United States in 1996 were higher by 36%, 18%, and 4% than would have otherwise been the case. The 1994/95 devaluation is estimated to have increased Mexican share of the U.S. imported watermelon, honeydew, and cantaloupe market 11, 7, and about 2 percentage points, respectively, in 1996. However, by 2004, the effect of the 1994/95 devaluation is more modest which is expected given a comparatively rapid rise in Mexican price levels over the forecast period.

To evaluate the effect of scheduled reductions in U.S. honeydew and watermelon tariffs under NAFTA on Mexican melon exports to the United States in the winter season, the baseline forecast which assumes implementation of the NAFTA tariff reductions was compared with the results of simulating the model assuming no reductions in tariffs over the same 1996 to 2004 period. As expected, the greatest influence of the tariff phase-out occurs at the end of the period when all tariffs are scheduled to be removed (Table 2). For watermelon, the U.S. tariff phase-out is projected to increase Mexican exports to the U.S. about 17% above the baseline estimate by 2004 whereas honeydew exports are projected to increase by about only one percent.

The comparatively low cost of Mexican labor is generally believed to be critical to the competitiveness of Mexico in international vegetable/melon markets. To evaluate this notion, the baseline forecast was contrasted with the results of simulating the UMCC model assuming that real Mexican agricultural wages grow at an increasing annual rate of 2.3% up to 4.9% over the 1996 to 2004 period rather than at the average annual rate of 1.5% as in recent years as assumed in the baseline simulation. The results suggest a higher rate of growth in agricultural wages would likely have an important negative effect on Mexican melon production and trade over the long run (Table 2). Given the higher rates of Mexican wage rate growth assumed in this simulation, Mexican exports of watermelon, cantaloupe, and honeydew decline by about 32%, 15%, and 7%, respectively, relative to baseline estimates in 2004.

The baseline forecast assumed a Mexican annual real per capita income growth rate of 2% over the forecast period. Many believe Mexico’s economic growth over the next decade will be considerably higher than the baseline estimate which could reduce Mexican melon exports since higher incomes
would increase domestic melon demand and reduce the availability of melons for export. To measure the effect of higher incomes, the baseline simulation results were contrasted with those from a simulation of the UMCC model assuming an increasing rate of real Mexican per capita income growth of 2.3% up to 4.9% over the 1996 to 2004 period rather than the average annual growth rate of 2% assumed in the baseline estimate. The results demonstrate the importance of Mexican economic growth on U.S. imports of melons from Mexico. By the year 2004, according to the simulation results, Mexican cantaloupe and watermelon exports to the United States could be lower by as much as 60% and 92%, respectively, than otherwise might be the case with a high level of economic growth in Mexico reducing the Mexican share of the U.S. winter melon imports by about 10 to 11 percentage points.

Finally, the effects of yield-enhancing technology on the competitiveness of Mexico in the U.S. melon market were considered. In the baseline simulation, Mexican cantaloupe and watermelon yields were assumed to increase at the historical trend rates of 0.9% and 1.5%, respectively. To evaluate the effect of yield-improving technology on Mexican competitiveness, Mexican cantaloupe and watermelon yields were projected to increase annually over the 1996 to 2004 period at the higher average growth rates for competing regions (1.8% and 3%, respectively). The results indicate that over the short-run, Mexican exports of cantaloupe and watermelon would be 22% and 9%, respectively, than otherwise in 1996 as a result of higher yields. By the end of the period, Mexican cantaloupe and watermelon exports would be about 79% and 119% higher than would be the case given trend rates of increase in Mexican yields as in the baseline simulation. As a result, the Mexican share of the U.S. winter cantaloupe and watermelon market would be higher by 13 and 15 percentage points, respectively, relative to the baseline solution in 2004.

Conclusions

Although Mexico has historically been the dominant foreign source of melons for the U.S. market, the Mexican share of the U.S. cantaloupe, honeydew, and watermelon markets has significantly declined in recent years. This study provided a comprehensive analysis of Mexican, U.S., and Caribbean country melon markets to better understand the effects of important economic variables on melon production, quantities traded, prices, and consumption in and among those three regions.

Alternative approaches to modeling international agricultural trade were considered. The selected approach, a partial equilibrium framework, is based on neoclassical trade theory and is consistent with study objectives and commodity market characteristics. Key variables influencing melon trade such as tariffs, exchange rates, agricultural labor cost, production yields, and income growth were incorporated and analyzed in the theoretical model.

The baseline forecast generated with the model over the 1996 through 2004 period suggested that Mexican melon exports to the U.S. would continue declining through 2004. Further, the Mexican share of the U.S. melon market was forecast to decline while the share supplied by producers in the
U.S. and CBI countries (in particular Costa Rica, Honduras and Guatemala) was forecast to increase under specific assumptions regarding tariff reduction, exchange rate changes, and growth in real incomes and wages in the three regions.

Simulation analysis of the effects of the key exogenous variables suggested that over the short run, the most favorable impact on Mexican melon exports results from the 1994/95 Mexican peso devaluation. Over the longer run, the most favorable impact is caused by improvements in Mexican melon yields. Increases in the cost of Mexican agricultural labor and growth in Mexican per capita income have unfavorable long-run impacts on Mexican melon exports but the effect is of a lower order of magnitude than an increase in melon yields. In general, the tariff-reducing provisions of NAFTA have a comparatively modest influence on Mexican melon exports over the forecast period.

<table>
<thead>
<tr>
<th>Year</th>
<th>Volume 1000 lb</th>
<th>Share %</th>
<th>Volume 1000 lbs</th>
<th>Market Share %</th>
</tr>
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<tr>
<td></td>
<td>Imports from Mexico</td>
<td></td>
<td>Imports from Caribbean</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td>Share</td>
<td>Volume</td>
<td>Share</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td></td>
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<tr>
<td>1996</td>
<td>256,993</td>
<td>36.0</td>
<td>456,061</td>
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<tr>
<td>2000</td>
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<td>25.3</td>
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<tr>
<td>2004</td>
<td>133,737</td>
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<td>691,674</td>
<td>83.8</td>
</tr>
<tr>
<td>Honeydew</td>
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<td></td>
<td></td>
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<tr>
<td>1996</td>
<td>119,398</td>
<td>40.3</td>
<td>166,478</td>
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<td>2000</td>
<td>109,544</td>
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<tr>
<td>2004</td>
<td>103,746</td>
<td>33.5</td>
<td>195,214</td>
<td>63.1</td>
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<tr>
<td>Watermelon</td>
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<td></td>
<td></td>
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<tr>
<td>1996</td>
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<thead>
<tr>
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<th>NAFTA</th>
<th>Peso Devaluation</th>
<th>Higher Annual Growth Rate Assumption</th>
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<tr>
<td></td>
<td></td>
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<td>Mexican Yields</td>
</tr>
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<td>%</td>
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**Cantaloupe**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1996</td>
<td>NA</td>
<td>3.9</td>
<td>22.0</td>
<td>-1.0</td>
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<tr>
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<td>79.2</td>
<td>-60.2</td>
<td>-14.8</td>
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**Honeydew**

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1996</td>
<td>0.2</td>
<td>17.7</td>
<td>NA</td>
<td>NA</td>
<td>-0.3</td>
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<tr>
<td>2000</td>
<td>0.8</td>
<td>9.7</td>
<td>NA</td>
<td>NA</td>
<td>-2.7</td>
</tr>
<tr>
<td>2004</td>
<td>0.9</td>
<td>4.7</td>
<td>NA</td>
<td>NA</td>
<td>-7.4</td>
</tr>
</tbody>
</table>

**Watermelon**

<p>| | | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1996</td>
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<td>36.0</td>
<td>8.7</td>
<td>-1.1</td>
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<tr>
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<td>32.9</td>
<td>38.0</td>
<td>-16.0</td>
<td>-7.2</td>
</tr>
<tr>
<td>2004</td>
<td>17.5</td>
<td>23.5</td>
<td>119.5</td>
<td>-92.4</td>
<td>-32.4</td>
</tr>
</tbody>
</table>

NA = Not applicable. For cantaloupe, the provisions of NAFTA have inconsequential effects on U.S. winter cantaloupe tariffs. For honeydew melons, Mexican data was not available to estimate Mexican honeydew supply so that the influence of higher Mexican yields and Mexican wages could not be measured.
Table A1. Estimated Structural Equations of the U.S.-Mexico-CBI Countries Melon Trade Model.

**Mexican Supply**

[5.1] \( \text{MXAHXCN}_t = 17482 + 4812 \ \text{MXFPCN}_{t-1} - 392 \ \text{MXL}_{t-1} + 4910 \ \text{MXSDCN}_t \)

\[
\begin{array}{llllr}
(4.85) & (1.22) & (-3.73) & (5.40) & \text{Adj. } R^2=0.74 \\
[0.69] & [-0.38] & & & \text{DW}=1.21
\end{array}
\]

[5.2] \( \text{MXAHXWT}_t = 12731 + 22323 \ \text{MXFPWWT}_{t-1} - 528 \ \text{MXL}_{t-1} + 5310 \ \text{MXSDWWT}_t \)

\[
\begin{array}{llllr}
(2.38) & (2.85) & (-3.39) & (3.53) & \text{Adj. } R^2=0.60 \\
[0.74] & [-0.56] & & & \text{DW}=1.52
\end{array}
\]

[5.3] \( \text{MXSXSXCN}_t = \text{MXAHXCN}_t \times \text{MXYIWXCN}_t \)

[5.4] \( \text{MXQSXSXWT}_t = \text{MXAHXWT}_t \times \text{MXYIWXWT}_t \)

[5.5] \( \text{MXESHD}_t = 83581056 + 194249882 \ \text{MXFPHD}_{t-1} - 5159483 \ \text{MXL}_{t-1} \)

\[
\begin{array}{llllr}
(1.30) & (1.52) & (-2.75) & \text{Adj. } R^2=0.81 \\
[0.99] & [-1.41] & & & \text{DW}=1.63
\end{array}
\]

[5.6] \( \text{MXFPCN}_t = 0.259 + 0.556 \ \text{USCPCN}_t + 0.049 \ \text{MXRER}_t + 0.135 \ \text{MXLDNCN}_t \)

\[
\begin{array}{llllr}
(1.75) & (3.62) & (0.80) & (2.47) & \text{Adj. } R^2=0.50 \\
& & & & \text{DW}=1.26
\end{array}
\]

[5.7] \( \text{MXFPHD}_t = -0.039 + 0.497 \ \text{USCPHD}_t + 0.100 \ \text{MXRER}_t - 0.059 \ \text{USRTHD}_t \)

\[
\begin{array}{llllr}
(-0.50) & (3.67) & (5.31) & (-1.67) & \text{Adj. } R^2=0.86 \\
& & & & \text{DW}=1.22
\end{array}
\]

[5.8] \( \text{MXFPWT}_t = 0.275 + 0.461 \ \text{USCPWWT}_t + 0.069 \ \text{MXRER}_t - 0.053 \ \text{USRWTWT}_t + 0.083 \ \text{MXLDWWT} \)

\[
\begin{array}{llllr}
(2.26) & (3.09) & (1.89) & (-1.33) & \text{Adj. } R^2=0.60 \\
& & & & \text{DW}=1.28
\end{array}
\]

**Mexican Demand**

[5.9] \( \text{MXCOCN}_t = 0.921 - 0.951 \ \text{MXCPCN}_t + 0.0002 \ \text{MXI}_t + 0.941 \ \text{MXDDCN}_t \)

\[
\begin{array}{llllr}
(1.74) & (-1.61) & (3.35) & (7.36) & \text{Adj. } R^2=0.73 \\
[-0.61] & [1.02] & & & \text{DW}=1.64
\end{array}
\]
Table A1. Continued.

\[
[5.10] \text{MXCOWT}_t = 2.961 - 1.905 \text{MXCPWT}_t + 0.0002 \text{MXI}_t + 1.520 \text{MXDDWT}_t, \\
\quad (4.02) \quad (-7.05) \quad (2.78) \quad (4.69) \quad \text{Adj. } R^2=0.69 \\
\quad [-0.78] \quad [0.69] \\
\quad \text{DW} = 1.95
\]

\[
[5.11] \text{MXQDCN}_t = \text{MXCOCN}_t \times \text{MXPOP}_t
\]

\[
[5.12] \text{MXQDWT}_t = \text{MXCOWT}_t \times \text{MXPOP}_t
\]

\[
[5.13] \text{MXCPCN}_t = 1.030 + 0.319 \text{MXFPCN}_t - 0.185 \text{MXPDCN}_t, \\
\quad (6.48) \quad (1.33) \quad (-2.40) \quad \text{Adj. } R^2=0.35 \\
\quad \text{DW} = 1.46
\]

\[
[5.14] \text{MXCPWT}_t = 0.357 + 1.440 \text{MXFPWT}_t + 0.615 \text{MXPDDWT}_t, \\
\quad (1.72) \quad (3.28) \quad (6.83) \quad \text{Adj. } R^2=0.77 \\
\quad \text{DW} = 1.51
\]

U.S. Demand

\[
[5.15] \text{USOCN}_t = -2.091 - 2.454 \text{USPCN}_t + 0.0003 \text{USI}_t, \\
\quad (-1.36) \quad (-2.41) \quad (5.12) \quad \text{Adj. } R^2=0.80 \\
\quad [-0.93] \quad [2.01] \\
\quad \text{DW} = 1.46
\]

\[
[5.16] \text{USOHD}_t = 1.687 - 3.234 \text{USPCHD}_t - 0.602 \text{USPCN}_t + 0.00005 \text{USI}_t, \\
\quad (2.96) \quad (-8.59) \quad (-2.14) \quad (2.04) \quad \text{Adj. } R^2=0.81 \\
\quad [-2.65] \quad [-0.66] \quad [1.36] \quad \text{DW} = 2.19
\]

\[
[5.17] \text{USOWT}_t = 7.136 - 8.462 \text{USPWT}_t + 0.00001 \text{USI}_t, \\
\quad (9.79) \quad (-9.35) \quad (0.52) \quad \text{Adj. } R^2=0.45 \\
\quad [-2.32] \quad [0.12] \\
\quad \text{DW} = 1.91
\]

\[
[5.18] \text{USQDCN}_t = \text{USOCN}_t \times \text{USPOP}_t
\]

\[
[5.19] \text{USQDHD}_t = \text{USOHD}_t \times \text{USPOP}_t
\]

\[
[5.20] \text{USQDWT}_t = \text{USOWT}_t \times \text{USPOP}_t
\]

U.S. Supply

\[
[5.21] \text{USAHWT}_t = 20496 + 826.856 \text{USFPWT}_t + 52.571 \text{USL}_t + 13644 \text{USSDWT}_t, \\
\quad (1.40) \quad (1.43) \quad (-0.54) \quad (3.05) \quad \text{Adj. } R^2=0.37 \\
\quad [0.39] \quad [-0.50] \\
\quad \text{DW} = 2.00
\]

15
Table A1. Continued.

[5.22] USQSWT<sub>t</sub> = USAHWT<sub>t</sub> * USYIWT<sub>t</sub>

[5.23] USFPWT<sub>t</sub> = 4.662 + 0.218 USCPWT<sub>t</sub>  
(3.99) (3.92)  

\text{Adj. } R^2 = 0.42  
\text{DW} = 1.61

\textbf{CBI Excess Supply}

[5.24] CBIESCN<sub>_t</sub> = -12165416 + 11616865 CBIFPCN<sub>_{t-1}</sub> + 1835665 CBIYICN<sub>_t</sub>  
(-0.75) (0.55) (1.13)  
[0.10]  
+ 0.912 CBIESCN<sub>_{t-1}</sub> + 40130444 CBIDUMCN<sub>_t</sub>  
(9.07) (3.85)  

\text{Adj. } R^2 = 0.94  
\text{Dh} = 1.26

[5.25] CBIESHD<sub>_t</sub> = -4639207 + 2541342 CBIFPHD<sub>_{t-1}</sub> + 3096550 CBIYIHId<sub>_t</sub>  
(-0.43) (0.22) (1.69)  
[0.17]  
+ 0.587 CBIESHD<sub>_{t-1}</sub> + 20719283 CBIDUMHd<sub>_t</sub>  
(3.12) (2.56)  

\text{Adj. } R^2 = 0.92  
\text{Dh} = 1.42

[5.26] CBIFPCN<sub>_t</sub> = 0.120 + 0.387 USCPCN<sub>_t</sub> + 0.470 CBIRER<sub>_t</sub>  
(0.86) (1.56) (2.70)  

\text{Adj. } R^2 = 0.49  
\text{DW} = 1.22

[5.27] CBIFPHD<sub>_t</sub> = -0.660 + 1.184 USCPHD<sub>_t</sub> + 1.588 CBIRER<sub>_t</sub>  
(-2.86) (1.86) (5.70)  

\text{Adj. } R^2 = 0.75  
\text{DW} = 1.52

\textbf{Trade Equations}

[5.28] USED<sub>DCN<sub>_t</sub></sub> = USQDCN<sub>_t</sub> - USQSCN<sub>_t</sub> + USEXCN<sub>_t</sub>
[5.29] USED<sub>HD<sub>_t</sub></sub> = USQDHD<sub>_t</sub> - USQSHD<sub>_t</sub> + USEXHD<sub>_t</sub>
[5.30] USED<sub>WT<sub>_t</sub></sub> = USQSWT<sub>_t</sub> - USQSWT<sub>_t</sub> + USEXWT<sub>_t</sub>

[5.31] MXESC<sub>N</sub> = MXQSCCN<sub>_t</sub> + MXQSDCN<sub>_t</sub> - MXQDCN<sub>_t</sub>
[5.32] MXESP<sub>WT</sub> = MXQSWT<sub>_t</sub> + MXQSDWT<sub>_t</sub> - MXQDWT<sub>_t</sub>

[5.33] USED<sub>DCN<sub>_t</sub></sub> = MXESC<sub>N</sub> + CBIESCN<sub>_t</sub> + OTESC<sub>N</sub><sub>_t</sub>
[5.34] USED<sub>HD<sub>_t</sub></sub> = MXESP<sub>H</sub> + CBIESHD<sub>_t</sub> + OTESH<sub>D</sub><sub>_t</sub>
[5.35] USED<sub>WT<sub>_t</sub></sub> = MXESP<sub>WT</sub> + CBIESWT<sub>_t</sub> + OTESWT<sub>_t</sub>

*\textit{t} values are in parentheses and gross effect elasticities are in brackets
Table A2. Estimated Fall-Winter Melon Trade Model: Definition of Variables and Units.

**Endogenous Variables**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>MXAHXCN=</td>
<td>Cantaloupe Harvested Area Intended for Export in Mexico (ha)</td>
</tr>
<tr>
<td>MXAHXWT=</td>
<td>Watermelon Harvested Area Intended for Export in Mexico (ha)</td>
</tr>
<tr>
<td>MXQSNB=</td>
<td>Cantaloupe Production Intended for Export in Mexico (ton)</td>
</tr>
<tr>
<td>MXQSNWT=</td>
<td>Watermelon Production Intended for Export in Mexico (ton)</td>
</tr>
<tr>
<td>MXFPWN=</td>
<td>Mexican Cantaloupe Farm Price (pesos/kg)</td>
</tr>
<tr>
<td>MXFPBH=</td>
<td>Mexican Honeydew Farm Price (pesos/lb)</td>
</tr>
<tr>
<td>MXFPWT=</td>
<td>Mexican Watermelon Farm Price (pesos/kg)</td>
</tr>
<tr>
<td>MXCOCN=</td>
<td>Cantaloupe Per-capita Consumption in Mexico (kg)</td>
</tr>
<tr>
<td>MXCOWT=</td>
<td>Watermelon Per-capita Consumption in Mexico (kg)</td>
</tr>
<tr>
<td>MXQDCN=</td>
<td>Cantaloupe Aggregate Consumption in Mexico (ton)</td>
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<td>MXQDWT=</td>
<td>Watermelon Aggregate Consumption in Mexico (ton)</td>
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<tr>
<td>MXCPWC=</td>
<td>Mexican Cantaloupe Consumer Price (pesos/kg)</td>
</tr>
<tr>
<td>MXCPWCT=</td>
<td>Mexican Watermelon Consumer Price (pesos/kg)</td>
</tr>
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<td>MXEESC=</td>
<td>Mexican Cantaloupe Excess Supply (Export) (ton)</td>
</tr>
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<td>MXESHD=</td>
<td>Mexican Honeydew Excess Supply (Export) (lb)</td>
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</tr>
<tr>
<td>USQDCN=</td>
<td>Cantaloupe Aggregate Consumption in United States (lb)</td>
</tr>
<tr>
<td>USQDHD=</td>
<td>Honeydew Aggregate Consumption in United States (lb)</td>
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<td>USQDWT=</td>
<td>Watermelon Aggregate Consumption in United States (lb)</td>
</tr>
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<td>U.S. Cantaloupe Consumer Price (dol/lb)</td>
</tr>
<tr>
<td>USCPWHD=</td>
<td>U.S. Honeydew Consumer Price (dol/lb)</td>
</tr>
<tr>
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<td>U.S. Watermelon Consumer Price (dol/lb)</td>
</tr>
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<td>U.S. Watermelon Harvested Area (acres)</td>
</tr>
<tr>
<td>USOSWT=</td>
<td>U.S. Watermelon Production (cwt)</td>
</tr>
<tr>
<td>USFPWT=</td>
<td>U.S. Watermelon Farm Price (dol/cwt)</td>
</tr>
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<td>U.S. Cantaloupe Excess Demand (Imports) (lb)</td>
</tr>
<tr>
<td>USEDHD=</td>
<td>U.S. Honeydew Excess Demand (Imports) (lb)</td>
</tr>
<tr>
<td>USEDWT=</td>
<td>U.S. Watermelon Excess Demand (Imports) (lb)</td>
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<td>CBI Countries Cantaloupe Excess Supply (Export) (lb)</td>
</tr>
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<td>CBIESHC=</td>
<td>CBI Countries Honeydew Excess Supply (Export) (lb)</td>
</tr>
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<td>CBI Countries Cantaloupe Farm Price (index)</td>
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</tr>
<tr>
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<tr>
<td>MXL=</td>
<td>Mexican Labor Cost (pesos/day)</td>
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<tr>
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<td>Mexican Cantaloupe Harvested Area Eqn. Dummy Variable (0,1)</td>
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<td>Mexican Watermelon Harvested Area Eqn. Dummy Variable (0,1)</td>
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<tr>
<td>MXYIWCN=</td>
<td>Mexican Cantaloupe Yields of Area Intended for Exports (ton/ha)</td>
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<td>MXRER=</td>
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<td>Other Countries Watermelon Excess Supply (Exports to U.S.) (lb)</td>
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*Values of Commodity Prices, Inputs, Exchange Rate, and Income are all at their 1990 Value.
References


