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Resumen

La inclusión del sector agropecuario en el Tratado de Libre Comercio de América del Norte (TLCAN) ha provocado polémica desde el inicio de las negociaciones. La visión oficial mexicana ha sido que el libre comercio, así como las reformas internas en materia agropecuaria iniciadas a fines de los ochenta transformarían el sector y aumentarían el ingreso de los mexicanos; por su parte, los críticos argumentan que el TLCAN ha provocado la dependencia alimentaria, una emigración rural masiva y el aumento de la pobreza. El artículo presenta los principales resultados de nuestras indagaciones econométricas sobre cuáles han sido en realidad las tendencias de los precios, del comercio y de la producción interna agrícola, así como de la emigración rural, después de casi diez años del TLCAN y de alrededor de quince años de reformas internas en materia de política agropecuaria. Se puede concluir que la esperada transformación del sector agropecuario mexicano no ha ocurrido.

Abstract

The inclusion of the agrarian sector in the North American Foreign Trade Agreement (NAFTA) has created controversy since the beginning of negotiations. Mexico's official vision has been that free trade, as well as agricultural reforms initiated in the country in the late eighties would transform the sector and increase national income; NAFTA opponents, on the other hand, claim that the Agreement has resulted in food dependency, massive rural migration and aggravated poverty. This paper present the main results of our econometric research on the true outcomes of nearly ten years into the NAFTA and around fifteen years of agrarian reforms, in terms of prices, trade and domestic agricultural production. Our findings suggest that the much-expected transformation of the Mexican agricultural sector has not occurred.

We thank the support of Gabriela Soto and Fabiola Rivera in data gathering and the review of articles. This paper has been presented at the joint Central Bank of Chile-World Bank Conference "The Future of Trade Liberalization in the Americas" on March 22 and 23, 2004 in Santiago, Chile.
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1 Introduction

The inclusion of agriculture in the North American Free Trade Agreement (NAFTA) has, since the beginning of negotiations with the USA, provoked a deep controversy in Mexico. In one extreme is the official view arguing that trade liberalization helps to promote the structural transformation of the agriculture of Mexico; in the other extreme there are the critics, maintaining that this policy reform hits Mexican farmers and puts in danger food self sufficiency in the country.

The basic economic reasoning behind the expected effects of a liberalization policy is that this reform will affect relative prices, leading to changes on resource allocation of the country in question. If liberalization is profound, major changes in prices are expected, leading to structural transformation in trade and domestic supply.

In this paper we use the above proposition as the framework to extend and deepen our evaluation of the impacts of the North American Free Trade Agreement (NAFTA) –as well as other economic policy reforms— on the agriculture of Mexico. With this basis we will also present a reflection on the political economy of trade liberalization in agriculture, on current policy changes and on the possible future trends of the sector.

Due to its overwhelming weight, our study emphasizes Mexico-US agricultural trade; it is done for agriculture as a whole, and for its major imported and exported crops.

The article is divided into five parts. In Part I we summarize trade liberalization and domestic agricultural reforms in Mexico, and briefly discuss the expected impacts of these policy changes in which our empirical study focuses. In Part II we present econometric results intended to test whether or not structural change in agricultural prices and trade has happen during NAFTA. Part III is dedicated to revise the trends of domestic production of major exported and imported crops, and in Part IV we briefly contrast our findings with expectations. [1] Since our results show that –contrary to predictions—the Mexican production of some major imported crops has not collapsed, in Part V we discuss several hypotheses that we propose could explain this. Part VI is dedicated to revise the changes in agricultural policies decided by the current Administration, and to reflect on the political economy behind these changes and their implications for the future.

2 NAFTA, internal reforms and their expected effects

After more than four decades of deep state involvement in agriculture, since the mid-eighties the governments of Mexico have dismantled their direct interventions. Liberalization has covered almost all areas of the agricultural sector: from the abolition or sale of food-related public enterprises, to the elimination of agricultural producer price supports and subsidies, to the *Ejidal* Reform and to trade liberalization under GATT's Uruguay Round and NAFTA (Table 1 and Yunez-Naude: 2003).

[1] Our evaluation of the expected impacts varies according to their nature and data availability.

In relation to NAFTA and agriculture, some commodities were liberalized in January 1994, when NAFTA implementation began; others –considered as sensitive by the signing governments—were subject to a process of year to year liberalization, so that full free trade will be reached either in January 2003 or 2008. As for the latter group of commodities, tariff rate quotas (TRQs) and/or seasonal tariffs were used: Mexico imposed TRQs for the imports of barley, beans, maize and powdered milk, whereas the US included seasonal tariffs as well as TRQs for several fresh vegetables and fruits imported from Mexico (Tables 2 to 4, details are in Yunez-Naude and Barceinas: Dec. 2002).

Parallel to liberalization, some institutions and programs related to agriculture were created by the Salinas (1989-94) and Zedillo Administrations (1995-2000).

Since 1991, ASERCA (Agricultural Marketing Board), gives supports commercial producers of some basic crops in surplus producing regions of the country (first to sorghum and wheat, then to maize, barley for forage, cotton, rice and safflower).

In the winter season of 1993 –just before the beginning of NAFTA—, PROCAMPO began to be implemented. PROCAMPO is a decoupled program, consisting in direct income transfers to farmers producing basic crops, that is: barley, beans, maize, cotton, rice, sorghum, soy, sunflower and wheat. The transfer is per hectare, independent of productivity and, up to 2002, the granted amount was the same to all farmers producing the above mentioned crops.

In 1995 Alliance for the Countryside was created. Alliance main objective is to increase agricultural productivity and to capitalize farmers by participating with funds in farmers' investment and sanitary projects leading to integrate farmers with the food chain. When created, the major purpose of Alliance was to promote farming efficiency through crop substitution (mainly from basic crops to vegetables and fruits) for farmers who have a potential comparative advantage in producing such crops in the context of an open economy. Other important features of Alliance include its decentralized character with state-level control of its programs and contribution to the funding by participating farmers (see www.sagarpa.gob).

In summary, PROCAMPO, ASERCA and Alliance were created as policies of transition for farmers to face foreign competition and for transforming the structure of agricultural production in Mexico. The main purposes of these programs and institutions were to support the income of domestic producers of basic staples, as well as to help commercial producers to switch to cultivate competitive crops in a trade liberalized context.

In addition to these three set of programs and policies, in 1991 the Ministry for Social Development was created, and with it, a social program designed specifically to attend the rural poor (see Adato, M. *et. al.*: June 2000).

The main expected effects on the agricultural sector of Mexico arising from NAFTA and policy reforms can be summarized as follows. [2]

[2] See for example: Calva: 1995, Levy and van Wijnbergen: 1992 and Robinson, et.al.: 1991. There are other predictions related to agriculture, such as a raise of rural out-migration, and of private credit and

1) Prices

- The "law of one price" for traded agricultural goods will rule (that is, domestic prices of Mexican agricultural products will follow closely international or USA prices).
- Prices of imported crops by Mexico will decrease
- The elimination of industrial protection will reduce agricultural input prices.

2) Trade

- Agricultural trade in North America will grow considerably, and specially so for that between Mexico and the USA.

3) Domestic production

- In general, the agricultural supply of Mexico will be restructured and production will experience efficiency gains.
- In particular:
    - Domestic producers of importables will be forced to compete with Canada and US farmers, and greater competition will increase productivity and/or reduce the domestic supply of these crops.
    - Farmers would tend to substitute their production of exportables for importables, and the supply of the former crops will grow. [3]

3 The impacts of NAFTA on prices and trade

Our comparative study of facts and expectations about the impacts of NAFTA and domestic reforms begins with a revision of the trends in prices. We then present an empirical model aimed to test if, as expected, domestic prices of major exportables and importables have followed USA prices more closely during NAFTA. This part ends by revising the trends of agricultural trade before and after NAFTA and with a summary of results obtained by an econometric study by which we test if structural change in agricultural trade and in major imported and exported crops has been present during NAFTA implementation. [4]

3.1 Trends in prices

As expected, domestic prices (in constant pesos) of major imported crops have been diminishing (Figure 1). However –with the exception of a raise during the macroeconomic crisis of 1994-6—, this trend appears to have been present since 1987. A statistical analysis as the one discussed below is needed, since a simple description of domestic price trends does not say much about the existence of NAFTA effects on domestic prices of basic crops. [5]

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foreign investment in agricultural production. See J. E. Taylor contribution to the Carniege NAFTA project and Yunez-Naude, A. and F. Barceinas: Dec. 2002.

[3] In addition, this was expected that employment created by increasing production of exportables will be insufficient to absorb the displaced workers from the importables sector, leading to a raise of rural out-migration (see J. E. Taylor contribution).

[4] The notion of structural change used in this Part is statistical. It is based on time-series data and tells us if a change of model parameters between two periods is permanent or not.

[5] Domestic prices of major exported vegetables and fruits were not expected to change much, since the trade of these commodities with the USA has been fairly firmly established before NAFTA.

3.2 Analysis of price convergence

As we argued in the introduction, domestic prices following international prices is a basic tenant of the effects of liberalization policies, and the evolution of these two sets of prices indicate that this has happen. Figures 2 to 13 suggest that there is a general tendency of domestic prices of major exported and imported crops to follow more closely USA prices, at least for the first years of NAFTA implementation. However, the figures also point that this tendency could have be present before NAFTA began. Because of this, and of our purpose to study rigorously whether or not domestic prices have followed more closely international prices, we did an econometric analysis to study if structural change in the relation between domestic and foreign prices of major traded crops happened during NAFTA.

The model

Our statistical evaluation of price tendencies is based on the theory of Parity Purchasing Power (PPP). According to this theory, under free trade and perfect markets a good should be sold at the same price in two countries.

Let P_t be a price index for Mexico at time *t* (of, say pesos per agricultural product), P_t^* the corresponding price index in the USA (in dollars per product), and S_t the nominal exchange rate (pesos per USA dollar). The theory of PPP would hence say that:

$P_t = S_t \ P_t^*$

Or, in logarithm terms,

$p_t = s_t + p_t^*$

where $p_t = \log (P_t)$, $s_t = \log (S_t)$ and $p_t^* = \log (P_t^*)$.

If we define z_t, as:

$z_t = p_t - s_t - p_t^*$

then, the strict version of PPP implies that z_t is zero at any period (also meaning that the real exchange rate would not change). In this sense z_t could be taken as a proxy for the real exchange rate.

However and in practice, several factors (such as errors in the estimation of prices, the existence of transport costs and/or quality differentials in the commodities in question) make PPP not to happen. That is, in general z_t has values different from 0. Taking this into account, a weak version of the PPP hypothesis follows if we consider that z_t is stationary, notwithstanding that every of the individual elements defining z_t (p_t, s_t and/or p_t^*) have not this property.

An alternative to test the theory of PPP is to form a sequence $\{s_t + p_t^*\}$ and to prove that it is cointegrated with the sequence p_t. In particular, let $f_t = s_t + p_t^*$, then the theory of PPP proposes that there is a linear combination of the form:

Notwithstanding this we include these commodities in our empirical analysis of next section, in order to test if domestic prices have followed USA prices before and during NAFTA.

$p_t = \beta_0 + \beta_1 f_t + \mu_t$

such that $\{\mu_t\}$ is stationary and the vector of cointegration is such that $\beta_1 = 1$.

The limit of this proposition is that it just considers the long run trend of the relationship between domestic and international prices, ignoring its possible variations in the short run.

An approach that summarizes short run and long run relationships is given by the "Error Correction Model" (ECM), which can be stated as:

$\Delta p_t = \alpha_1 + \alpha_2 \Delta f_t + \alpha_3 [p_{t-1} - \beta_0 - \beta_1 f_{t-1}] + \varepsilon_t$

Given the identification problem with α_1 y $\alpha_3\beta_0$, our estimations were done using the following specification:

$$\Delta p_t = \alpha_1 + \alpha_2 \Delta f_t + \alpha_3 [p_{t-1} - \beta_1 f_{t-1}] + \varepsilon_t \qquad (1)$$

In this approach, the stationarity of the difference $(p_{t-1} - \beta_1 f_{t-1})$ implies the existence of an ECM, and so, α_3 has to be significantly different to zero. [6]

In this type of models α_2 can be interpreted as the short run transmission to the domestic price (p_t) of the change in the foreign price (p_t^*) adjusted for the exchange rate and for the first period. However, the most important feature of the model is the interpretation of the parameter α_3, because it tells us how the difference between the two prices (adjusted by the exchange rate) is eliminated in each subsequent period (this effect is called "error correction" or "speed of adjustment").

In theory, the short run coefficient (α_2) may take any value different from zero, but the value of α_3 has to be between zero and 2 in absolute terms.[7] Finally, it is a necessary and sufficient condition for long run convergence that α_3 to be significantly different from zero, but no requirement is needed for the value of α_2.

One convenient feature of the ECM approach is that its estimated parameters have a straight forward interpretation of the existing relation between internal and foreign prices. This means that the model estimations allow us to test whether or not the "law of one price" is present in a market of a specific commodity. In addition, and more important for our purposes to study Mexico-USA price convergence, the estimations provide information on the speed of adjustment of the internal price with respect to its foreign counterpart.

So, if *n* is the period during which a percentage *k* of an adjustment takes place, it can be shown (Baffes and Ajwad: 1997) that the accumulated adjustment in period *n* is given by:

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[6] See Baffes and Ajwad: 1997 for the proof of this argument.

[7] The closer the value of α_3 to unity, the faster the speed of adjustment. A symmetric value with respect to 1 (say 0.8 and 1.2) indicates that the speed of adjustment is the same, but that the path differs: monotonous in the first case, and oscillatory in the latter case.

$$k = 1 - (1- \alpha_2)\,(1 - \alpha_3)^n \quad (2)$$

In addition, equation (2) can be solved for *n*:

$$n = \frac{\log(1-k) - \log(1-\alpha_2)}{\log(1-\alpha_3)} \quad (3)$$

From equation (3), *n* can be interpreted as the number of periods required to reach a certain level of adjustment *k* in percentage terms.

The proposed methodology allows us to evaluate the changes in the degree of market integration arising from policy reforms. In particular, using internal and foreign prices, the methodology permits to estimate whether or not the levels of agricultural market integration between Mexico and the USA increased during NAFTA with respect to previous period (this using the F statistics to test for the existence of structural change between the two periods, or simply, by comparing the speed of adjustment between the two periods).

Data

The PPP analysis was done for major crops imported by Mexico from the USA (barley, maize, sorghum, soy and wheat), and for important crops exported by Mexico to the USA (carrots, cucumbers, onion, tomatoes, avocadoes, oranges and watermelons). The data used are monthly. The data for imports it is from January 1981 to March 2003 (the exception is soy, because the available data begins in January 1994), and the data for exportables begins in January 1989 (with the exception of that for avocadoes and watermelon, which begins in August 1990 and January 1996, respectively). [8]

For the information of Mexican prices for the studied crops we used the National Price Index of Producer Prices from Bank of Mexico (1994=100). To build the time series data for USA prices, we used the monthly and season-average f.o.b. shipping-point price, from the US Department of Agriculture.

Since data for Mexico are indices and for USA are prices, we made the data homogeneous by building indices for USA prices using 1994 as the base.

When the time series data allowed, the econometric estimations of the ECM were done for the whole period, beginning in 1981 or 1989 and ending in March 2003, and for the pre-NAFTA and NAFTA periods. Since the regressions for onions and avocadoes showed autocorrelation, we followed the common procedure to add to equation (1) for these two crops an additional term Δp_{t-1}, which originated parameter α_4.

Results: Exported crops [9]

[8] So, the study for soy and watermelons is partial (see below, sections on results). The analysis of exports does not cover important crops sold to the USA (cauliflower, garlic, peppers, cantaloupe and grapes) because of data restrictions.

[9] The findings for exports and imports presented in Tables 5 and 6, respectively were obtained by assuming that $\beta_1=1$. We proceeded this way based on the result of a statistical test, by which we did not rejected the null hypothesis stating that $\beta_1=1$ for all but one of the studied crops

The results are in Table 5, whose components are the following. Columns 2 to 5 present the estimations of the parameters of equation (1), (their corresponding *t student* statistic is below the value of each estimated parameter); columns 6 and 7 present, respectively, the R^2 and the Durbin-Watson statistic; in column 8 the p-value of the statistical F test is written for the null hypothesis stating that no structural change happen for the period beginning with NAFTA (i.e. January, 1994); in column 9 we present the estimated percentage of adjustment *k* that is reached after 5 periods (equation (2)); finally, in the last column there are the results of our estimations on the number of periods (months) required for the adjust to reach 95%.

Our estimations for the coefficient for error correction show that during the last fifteen years there is a tendency for the internal price of exportables to converge to USA prices (the estimated α_3 are significantly different from zero, 4th column of Table 5). Our results when we divide the period into two also apply, but for carrots and cucumbers for the pre-NAFTA period.

Notwithstanding the above, we found that NAFTA accelerated the convergency of internal prices to those in USA in two ways. First the percentage of adjustment of the internal price change to a modification in international price of exports increases after five periods during NAFTA with respect to previous period (for example, from 62% to 76% for tomatoes, column 9 of Table 5). Second, the number of periods required for the domestic price of exports to adjust to 95% of a change of their international price change is lower during NAFTA (last column of Table 5): before NAFTA, it took 49 periods for the internal price of carrots to cover a 95% of the initial difference with its export price, and the period decreased to 26 during NAFTA; the figures for cucumbers are 41 and 27, respectively, for tomatoes 21 and 12, and for oranges 48 and 21.

The exemptions of this trend are for the cases of onions and avocadoes. However, the raise in the period of convergence increases very slightly for the first crop (by two months), whereas Mexico exports of avocados to its northern neighbor have faced phitosanitary restrictions and the USA price of this fruit is much higher than in Mexico.

Results: Imported crops

Table 6 presents our model results for imports, which are organized as in previous Table (note however, that it has nine instead of 10 columns, since for imports the estimation of the additional parameter α_4 was not required).

Our findings of the evolution of the prices of imported crops contrast with those obtained for exported crops. Furthermore, they are quite different from what has been an accepted wisdom about the impacts of NAFTA on their prices.

The estimations of the coefficient for error correction (α_3) are significantly different from zero for the whole period under study. This result means that during the last 22 years there is a tendency for the internal price of the studied crops to follow the USA price. Since the coefficient for error correction is also significant when dividing this period into two, we can say that price convergence before and during NAFTA is also present.

However the adjustment takes a long time (at least 20 months), and the periods for the adjustment to take place do not decrease during NAFTA (see last column of Table 6). So, we get two indications quite different from what was expected to happen with NAFTA.

First, the F test of absence of structural change beginning in January 1994 is not rejected at a 5% significance level. This means that, in terms of domestic and international prices of the studied crops, NAFTA has not changed the nature of their relationship. Second, and more striking, is that our estimations of the period of adjustment of domestic to international prices show that this period has become longer after January 1994. This is shown in the last two columns of Table 6 for each of the studied crops. Column 8 indicates that, after five periods (months), the percentage of adjustment of an internal price change to a modification in the USA price is never greater than 50% (the only exception is wheat, for the pre-NAFTA period). In addition, Column 9 shows that the number of periods required for the domestic price to adjust to 95% of the international price change is not only very high (from 20 to 77 months, for wheat and soy, respectively), but that the number is higher for the post-NAFTA period. For example, after five months, the percentage of adjustment of the domestic price of maize to a change in its international price is just 46% during the pre-NAFTA period, and this percentage is even lower (27%) during the post-NAFTA period (Column 8). In addition, whereas before NAFTA it took 33 months for the domestic price of maize to adjust to 95% of the change of its international counterpart, the number of months raised to 51 during NAFTA (last Column).

With the above evidence we can conclude that the beginning of NAFTA did not alter the way that domestic prices of major imported crops are related to international prices.

3.3 Structural change in agricultural trade

The participation of trade in the agricultural supply of Mexico has increased considerably: from an average of 18.7% during the four years previous to NAFTA, to 23% during 1994; this weight jumped to more than 39% during the macroeconomic crisis of 1995-96 and has remained high since then (35.3% from 1997 to 2001, Figure 14).

Agricultural trade between Mexico and the USA has also increased during NAFTA, and this has been specially so since 1997-2002. During this period the value of imports at constant USA dollars has grown faster than that of exports, and so, the agricultural trade deficit of Mexico with the USA (Figure 15). The data show that fresh and prepared vegetables and fruits are the group of commodities whose exports have grown faster since 1997-2002 (Figure 16), and the same applies to imports of oilseeds and vegetables and preparations (Figure 17).

In terms of volume, Mexican exports of major fresh vegetables and fruits have grown considerably during NAFTA: by almost 80% and 90%, respectively, from 1994-2002 with respect to 1990-93 (Table 7). This jump is also shown by the weight of exports in the domestic production of these crops, which passed from 14.1% to 20.8% during the same periods (Figure 18).

The volume of imports of major basic crops has grown even faster: by a total of more than 100% during NAFTA with respect to the previous three-year period (Table 8). This has meant that the weight of these crops imports on total domestic demand has also grown: from 23.2% during 1991-93 to 36.3% during 1994-2001 (Figure 19).

So, the evolution of Mexico agricultural trade indicates that, as expected, it has increased during NAFTA. However, this trend could have been present before NAFTA. We conducted an empirical study to test if NAFTA caused structural change in agricultural trade, based on a model developed by Vogelsang: 1997 (for an application of the model see Ben-David and Papell: 1997) is convenient since if structural change is present, the date when this happen is determined endogenously (details are in Yunez-Naude and Barceinas: 2003).

The variable for estimating the equation of structural change in agricultural trade was the value of agricultural monthly exports and imports (totals and per crop) in constant pesos using the real exchange rate index for 1990. For the case of total agricultural exports and imports the period we considered was from January 1980 to August 2002. Due to data restrictions, the period considered for specific crops or groups of crops was from January 1991 to August 2002.

As with price tendencies, our results show that there is a contrast between agricultural exports and imports: whereas, as expected, the former have experienced structural change, imports have not. In particular, agricultural total exports were subject to structural change in the last month of 1994, and the same was true for tomatoes, fresh vegetables, melon and watermelon, and other fresh fruits (structural change in Mexico exports of these commodities happen, respectively, in December, 1994, November 1994, September, 1994 and June, 1995). In contrast, there is not evidence of structural change for total agricultural imports, neither for the major imported crops considered in the analysis (maize, sorghum, soy, other oilseeds and seeds and wheat).

In addition, the dates of structural change for exports make us to suspect that this could have been due to the sharp devaluation of the peso during the end of December 1994 and beginning of 1995 (our findings about the trends of the agricultural trade of Mexico are similar to those expressed by the Economic Research Service of the US Department of Agriculture, ERS: 1999 and 2000).

4 Evolution of the agriculture of Mexico

We now pass to study the evolution and characteristics of agricultural production in Mexico. This includes trends in production, cultivated area and yields of major crops traded with the USA. [10] This will be the basis to complete our evaluation on the expected impacts of NAFTA, and also for relating the evolution of domestic production with our results of section II.1 of previous Part. With our findings we will propose hypotheses aimed to explain why some of the expected impacts of NAFTA and domestic reforms have not materialized.

4.1 Production and yields of Exportables

[10] We studied the evolution of total factor productivity before and after NAFTA. However, and due to data restrictions, our results are too preliminary to report here.

As expected, the volume of production of major exported vegetables and fruits has grown: by 39.3% and 19.4% respectively during NAFTA with respect to previous three-year period. This is explained by an increase of both, total area planted and yields (Figures 20 to 22) and for each of the major exported crops (Table 9). [11]

4.2 Production and yields of Importables

In contrast with the previsions, domestic production of the most imported and important basic crops grown in Mexico (barley, beans, maize, sorghum, soybeans and wheat) increased during NAFTA (Figure 23). This is explained by both, rises in cultivated area and in yields of these crops (Figures 24 and 25). [12]

In terms of each of the six basic crops considered we observe the following (Table 10).

Production and cultivated area of barley and beans have not experienced major changes during NAFTA (although yields grew for both irrigated and rain-fed barley).

The evolution of maize production follows the same trend as when the six basic crops are considered together. This is not surprising since: maize production accounted for almost 50% of total production and cultivated area in irrigated lands dedicated to produce the six basic crops for both 1991-93 and for the NAFTA period, and the figures for rain-fed maize are around 70% during the same periods.

As for maize, the production of sorghum has increased under NAFTA: for irrigated sorghum this is due to increasing yields, and for rain-fed sorghum this is explained by a raise in cultivated area.

The case of soybeans is special, because it suffered a disease in 1995 and its production has not recuperated yet.

Finally, wheat production and the irrigated land cultivated with this crop sharply decreased during NAFTA, while yields grew (15.7%, 24.7% and 11.6%, respectively; production of wheat under rain-fed conditions is negligible).

5 Expected impacts and the trends

In summary, our evaluation of the expected effects of NAFTA and the reforms on the agriculture of Mexico shows that only some predictions have materialized.

1) Prices of major traded crops

We have econometric evidence that there is a long run tendency for Mexican prices of importables to follow their international counterparts before and after NAFTA.

[11] The only exception is the cultivated area with tomatoes. However, yield in the production of this crop has grown during NAFTA.

[12] There are different trends when we distinguish production under irrigated conditions from production under rain-fed lands, something that is considered below, in Section V.2. As compared with 1991-93, domestic supply and cultivated area of basic crops produced under irrigated lands decreased during NAFTA (by 4.1% and 18.5%, respectively), but yields raised considerably (by 15.4%). In contrast, both, the supply of basic crops in rain-fend lands and cultivated area increased during the same period (16.3% and 17.8%) and yields did not suffer considerable changes (they raised by just 1.7%).

However, and as opposed to expectations, we have also found that, during NAFTA, domestic prices of barley, maize, sorghum and wheat have not had a tendency of more convergence with international prices.

In contrast, we have found evidence that with NAFTA, prices of Mexico's some of the most important exported vegetables and fruits have become more linked with their international prices.

2) Agricultural trade

As anticipated, overall agricultural trade has grown during NAFTA implementation, and this has been also the case for each of the major exported and imported crops. Notwithstanding this, our econometric study shows that only Mexican exported vegetables and fruits have experienced structural change.

3) Structure of production

As predicted, domestic production, cultivated area and yields of the mot important exported vegetables and fruits have grown. The same is not the case for importables, since, taken together the domestic supply of the six major imported crops has not collapsed (this trend is basically explained by the evolution of the supply of maize and, to a lesser degree of sorghum).

As expected, yields in the production of basic crops have increased during NAFTA, but this has only happen to those crops obtained under irrigated conditions.

It is important to add there has been some tendency in the agricultural sector to substitute exportables for importables, but the compostiton of agricultural supply of Mexico has not radically changed (Rosensweig, A.: 2000).

6 Hypotheses

To answer the question of why the production of staples in Mexico has not collapsed and agricultural supply has not been transformed and/or diversified by NAFTA, one has to consider two phenomena: the effects on domestic production of the new agricultural policies and, for the case of maize and beans, the dual character of the agriculture of Mexico.

Duality refers to the coexistence of entrepreneurial farmers with peasant or family producers. The later are rural households doing jointly production and consumption decisions for staples; agriculture being just part of their income-earning activities. In addition and in general terms, peasant producers have limited land (their plots have less than 2.5 hectares), do not have access to irrigation and, due to poor communications and transport limitations, these producers face high transaction costs in some markets. By contrast, entrepreneurial or commercial farmers´ decision making process is the same as any other farmer in the developed world: their production is specialized, produce for a profit and for the market in a context of no or low transaction costs (Table 11).

Our first hypothesis is that these distinguishing features make the supply of peasant products inelastic or less elastic than that of entrepreneurial farmers (see section 6.2 below).

6.1 The role of agricultural policies

Both, commercial and peasant farmers producing basic staples have benefited from PROCAMPO, and there is evidence that these direct income transfers have promoted the domestic production of major crops imported by Mexico. [13]

We propose that –together with direct income transfers (PROCAMPO)—new governmental programs and policies directed towards commercial or entrepreneurial farmers explain why the production of some basic crops has not collapsed or has even increased during NAFTA implementation, and also why the prices of staples have not followed more closely USA prices during the same period. These policies are the marketing subsidies granted through ASERCA and other supports related to Alliance for the Countryside.

As sated in Part II above, ASERCA gives marketing supports to commercial producers of basic crops in surplus regions. It began covering wheat and sorghum, was extended to maize in 1995, and, in some years has also included forage barley, cotton, safflower and rice. Since its creation in 1991 until the spring-summer season of 2000 the government and surplus producers negotiated a certain price. Then, in a public bid, interested buyers asked for a subsidy in order to commit themselves to buy a certain amount of the crop in question at the negotiated price. In general, and in a context of freer trade, negotiated prices of the crops included in ASERCA take into account international prices, hence reflecting in some way market conditions. However, the negotiated prices are by its own nature not market clearing prices (Rosensweig: 2003).

Hence, and as opposed to a decoupled program as PROCAMPO, marketing supports of ASERCA could have pressed upwards the prices paid to commercial producers. This is precisely what Figures 3 and 4 indicate for maize and sorghum (and for wheat to a lesser extent, Figure 6) around the beginning of 1997, when macro-stabilization was attained. [14] From this we can hypothesize that marketing supports helped to maintain or even promoted the production of these crops. [15]

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[13] In relation to maize, García Salazar presents statistical evidence that this direct income transfer have promoted the production of this grain: he estimates that if PROCAMPO were not created, the annual average production of maize during 1994-1996 would have been 2.86 millions of metric tons less than actual production (García Salazar: 2001). In relation to peasant producers and in a general equilibrium framework, Taylor *et. al.* show that PRCAMPO reduces the impacts of negative price shocks in maize production (see for example Taylor, J. E. *et.al.*; 1999).

[14] The devaluation of the peso in 1995 and 1996 raised the value of imports in dollars. This allowed the government to reduce price supports during this period (see Yunez-Naude and Barceinas: 2002). When stability was reached, marketing supports raised again (see footnote 18 below).

[15] This is the case of the northern Mexico surplus producing States, where most of the marketing assistance budget has been directed to (89% during 2002). This has been specially so for maize in the State of Sinaloa; sorghum in the State of Tamaulipas and wheat in the State of Sonora. If we combine the figures for 2002 of Rosensweig on the marketing supports by State and by crop, we get that almost 86% of the budget to support maize prices were received by Sinaloa producers; and 67% of the support for wheat were directed to Sonora producers. Rosensweig: 2003, Tables 6 and 7. A recent study of the impacts of NAFTA in grain production in Sinaloa shows that price supports for maize commercial farmers explain the increase of maize production in this State during the past ten years. De Ita: 2003.

Due to its importance in the agriculture of Mexico, of particular interest is maize. The commercial producers of the grain have received price supports, first and until 1994-95 through warrantee prices of CONASUPO and afterwards through ASERCA. [16] If we take into account that, during NAFTA, over quota tariffs have not been charged when maize imports exceeded the quota, we can propose that governmental supports to commercial maize producers are one of the main reasons explaining why its domestic supply have not collapsed. [17]

To the PROCAMPO and ASERCA supports, subsidies granted to commercial farmers by Alliance for the Countryside have to be added as explanations of why the production of staples by entrepreneurial agriculture has not collapsed and/or why the structure of commercial farmers supply has not transformed with NAFTA. According to the evaluation of Alliance made by FAO and SAGARPA, the supports granted by this program are mainly to commercial farmers, which, instead of substituting staples for competitive crops have used the supports to face the credit crisis that Mexican farmers have been suffering since the macroeconomic crisis of 1994-95 (FAO-SAGAR: 2000, and Yunez and Barceinas: Dec. 2002).

That governmental support policies have played an important role in maintaining the structure of agricultural supply in Mexico is illustrated by the evolution of subsides. . Producer Subsidy Equivalents (PSE) have been steadily rising during NAFTA implementation,[18] and since 2001, the budget of the Ministry of Agricultural (SAGARPA) has experienced the same trend (see Rosensweig: 2003 and below).

6.2 The role of small farmers

A complementary reason that could explain why, the production of maize has not collapsed during NAFTA is related to what we said about the heterogeneous nature of the agriculture of Mexico and, in particular to the characteristics of peasantry. [19]

Unfortunately, there is not data to distinguish peasant from commercial producers of maize. An approximation is required, and we can do it with the available data on the

[16] For example, during 2002, 46.4% of ASERCA´s budget was used to support maize, Rosensweig: 2003.
[17] A complementary hypothesis is presented below. There is yet another reason that could explain why maize production has not sharply declined: the evolution of demand. First, consumption of maize in Mexico increased from an average of 16.58 millions of metric tons during 1990-93 to 22.15 millions during 1994-2000, and this tendency is based on higher demand from animal feed processors and other agro-industry (García Salazar and Williams: in print). Second, white maize is somehow a different commodity than yellow maize (the imported type), since the Mexican population prefers the former for their consumption, which is supplied mainly by Mexican producers. These propositions are a fundamental theme requiring empirical research.
[18] For example, total PSE increased from 5% in 1996, to 14% for 1997 and 1998, to 15% for 1999 and to 19% for each of the following two years (the devaluation of the peso make PSE negative for 1995). In terms of crops, maize PSE was 28% in 1995, 7% in 1996, raised to 30%, 32% and 39% in the following three years, and reaching 47% and 50% during 2000 and 2001; a similar trend was experienced by oilseeds and wheat and other grains PSE have also increased although at a lower rate. For example, PSE for wheat was 22% in 1996 and raised to 44% in 2001 and other grains PSEs passed from 13% to 30% during the same years (OECD estimations, quoted by Knuston and Ochoa: 2003, Tables 1 and 2).
[19] Beans are a by-product in peasant rain-fed production. In traditional maize production beans (as well as squash and edible weeds) are planted combined with maize (in Mexico this system is called "the milpa"). Since no data is available to distinguish this feature in rain-fed agriculture, the hypotheses that follow only considers maize.

production of staples under irrigated and non-irrigated lands, and taking the former being the type of lands owned by entrepreneurial farmers and the latter by the peasantry.

Table 10 shows that maize production and cultivated area under rain-fed lands has grown during NAFTA, whereas yields have remained practically the same.

One explanation of this trend is related to PRCAMPO. With these income transfers the small farmers can face competition and continue to produce maize. However, this hypothesis is insufficient since not all small farmers have benefited from PROCAMPO and case studies in peasant communities show that PROCAMPO income transfers are insufficient for maintaining previous production levels (Taylor *et. al.*: 1999).

There are two additional and alternative hypotheses that have been proposed in the literature to explain why this has been so. The first one is that, due to high transaction costs, peasant agriculture is relatively isolated from markets. As well as producing these staples for own consumption, this means that as producers of them the peasantry is not directly affected by its price changes (see for example, de Janvry *et. al.*: 1991). The alternative hypothesis follows from the results obtained by a general equilibrium model applied to a Mexican village. Based on the observation that the reductions of maize prices have affected peasants producing this crop for the market, the results show that this has decreased local land and labor prices, leading to subsistence farmers to lease in local land to produce maize for their family own consumption (Taylor and Dyer: forthcoming). As well as giving reasons of why, production of maize has not collapsed, both hypotheses are consistent with the observation that maize yields under rain-fed conditions have not increased.

6.3 Summary

The above leads us to propose that agricultural policies in Mexico for major basic crops have transformed: from direct price interventions to direct income payments and region-specific marketing supports. However, subsidies have not been eliminated, and have grown during the last years. The latter, together with the peculiarities of rural household production, are two reasons explaining why the production of major basic staples and of maize in particular has not declined during NAFTA.

7 Political economy of agricultural policies

The election of President Fox, marks a radical change in the political arena of Mexico. Since December of 2000, for the first time in seventy years, the executive is leaded by a member of a party (Partido de Acción Nacional or PAN) different from the one that ruled Mexico during its modern history. In addition, no party has now the majority in Congress (before, the Partido Revolucionario Institucional or PRI, controlled both the executive and the legislative). Before Fox, practically all changes in Mexican law proposed by the president were passed by Congress. In contrast, during the first year of the current administration, Congress rejected the Fiscal Reform proposed by the executive.

The political change has also been present in matters related to agriculture. This is reflected by the increases in the public budget to the rural sector and to agriculture in particular: the participation of the budget to the Ministry of Agriculture (SAGARPA) on

agricultural GDP increased from 12.1% during 2000 to 14.2% and to 16.6% during the two first years, respectively, of the Fox Administration. The budget to SAGARPA increased further in 2003 (by 10.6% with respect to 2002), following previous year political pressures from farmer and farm workers organizations (Rosensweig: 2003).

Ties of agricultural organizations with political parties different from PAN (together with differences between PAN and the President), the new USA Farm Bill and the perception that problems faced by the Mexican agricultural sector have been caused by NAFTA and that they will become worst with the further liberalization of the sector beginning in January 2003, lead to protests and huge demonstrations during the second half of 2002. Amongst other demands, the protestors asked for a renegotiation of the agricultural chapter of NAFTA and for increasing subsidies to the sector (Dyer, G. and D. Dyer: 2003).

The study conducted in this paper indicates that NAFTA accelerated a process that had been present since the second half of the eighties, when agricultural reforms began to take shape. So, the protestors could be wrong in blaming NAFTA as the cause of their problems (at least for the case of the field crop component of agriculture). However, this is not to say that they have not an economic basis baking their worries. Figure 26 shows that both, the consumer national price index and the price index of agricultural inputs have grown faster than the agricultural price index and, in general, this means lower profitability to farmers.

It could be possible that these facts – and not NAFTA—were taken by the Fox Administration in the so called "Agricultural Armour" that was announced in November, 2002 and designed to face the political pressures of the farmers.

Basically, the Agricultural Armour is a reaction to the USA Farm Bill, having two main components. The first is related to internal agricultural policy changes. As in the USA Farm Bill, it proposes and an income safety net for the producers of main grain and oilseeds on a multi-year basis. It also includes the need to equalize the energy costs of Mexican farmers with those of their other North American countries counterparts (electricity and diesel), and a promise to increase access to credit and lower interest rates for Mexican farmers. The second component of the Agricultural Armour is related to trade policy and asks for an effective framework to face unfair competition of imports and, in particular to change the Foreign Trade Law to reduce the maximum time frame in which decisions in Countervailing Duty cases must be solved. In addition, as a reaction to the incorporation into the USA Farm Bill of Country of Origin Labeling, the document of the Armour also calls for changes in the "Law and Grade Standards". [20]

The policy changes were translated into a budgetary increase for 2003 of around 13% approved by Congress in December 15th 2002.

[20] For a summary of the USA Farm Bill of 2002 in the context of NAFTA, see Knuston and Ochoa: 2003. Hobbs, J. .E.: 2003, discusses the implications of the incorporation of country of origin labeling in the above mentioned Bill. The basis to increase the credit access to farmers and to reduce interest rates is the creation of "Financiera Rural", which substituted former BANRURAL, a governmental credit substitution with an enormous default record. A difference between this institutions is that Finaciera Rural will no longer grant credits to the social or ejidatarios sector.

However, the "social sector" (formed by ejidatarios and small farmers) was not appeased with the new budget. The same day the 2003 budget was announced, the "Permanent Agrarian Congress" (CAP) and 14 other peasant organizations expressed their disillusionment to the Congress and vowed to take northern international ports of entry the 1st of January. This did not happen, but protests did: on the 1st of February the largest peasant-led demonstration in Mexico City since the 1930s took place in coordination with workers and teachers unions. The mobilization –together with the start in April 15th of the campaigns for the midterm elections of July—, lead the government to set a commission formed by several Ministries and eight peasant leaders to negotiate the National Agreement for the Countryside (ANC). In practice, and up to the present, the ANC has meant 1,580 million of pesos of fresh resources in addition to the 116,100 millions of the budget approved by Congress; additional 100 pesos per hectares of PROCAMPO to producers with less than five hectares, and the expansions of several programs benefiting the poorest sections of the rural society (Dyer, G. and D. Dyer: 2003).

It is convenient to say that neither the Armour nor the ANC contemplate to renegotiate with the USA the agricultural component of NAFTA.

In financial terms, the political pressures lead the Fox administration to raise the budget for agriculture and the rural sectors. In real terms, total budget to SAGARPA increased by more than 10.50% for 2003 with respect to 2002; after sharp reductions of the agricultural budget during 1995-99, it is likely that the 2003 budget will reach the level of 1994 as a percentage of agricultural gross domestic product. Of the three most important components of SAGARPA´s budget, PROCAMPO´s and ASERCA´s will increase the most from 2003 with respect to 2002 (9.3% and 9.2% respectively), whereas the budget for Alliance will remain practically the same.

In 2003, as well as raising PROCAMPO direct income transfers to the producers of basic crops, this transfer will be differentiated according to farm size: in constant, 2003 pesos, the payment will rise from 866 pesos per hectare to 1030 for farmers with less than 5 hectares of land, and to 905 pesos to farmers with more than 5 hectares for the spring-summer season (and from 912 to 1030 pesos for the Autum-winter season and to farmers with less than 5 hectares (in addition, farmers with less than one hectare will receive a transfer equivalent to one hectare, data obtained from Rosensweig:2003).

In relation to ASERCA, the government intends to extend marketing supports to all surplus producing regions.

Notwithstanding the above, agricultural policies of the new Administration have not substantially change the spirit of NAFTA and agricultural reforms. With this basis one can say that the trends that have experienced the agriculture of Mexico during NAFTA will remain for at least the three years to come (that is, until the end of the Fox administration) and perhaps until the end of PROCAMPO in 2008. The above means that the challenges required for the transformation of the agriculture of Mexico remain. In general, with this we are referring to the restructuring of commercial agriculture to produce competitive crops and the creation of income options in Mexico for peasant producers that could allow them to get out of poverty. Yet another challenge is to solve the dilemma of whether or not this structural transformation is compatible with food

self-sufficiency in Mexico, a policy that is followed in one way or another by the partners of Mexico in North America and in other parts of the world.

Our view for the long run is, however, no so pessimistic. The deepening of democracy in Mexico means more governmental commitment towards the majority of Mexicans, and changes in the government conception about the development process of Mexico.

In relation to the countryside, the change is reflected in the Law for Sustainable Rural Development, proposed by the Fox Administration and approved by Congress. In this Law the traditional approach of agricultural development is substituted by an integrated purpose to promote rural development. With this Law, the Fox administration has amplified and deepened the process of decentralization of government actions, and has a serious commitment on increasing participation of producers in the design and finance of governmental programs. In addition, the Executive has reshaped the Ministry of Social Development Program towards the poor (formerly called PROGRESA and now called OPORTUNIDADES) to add productive opportunities to the poor to PROGRESA supports for better health, education and sanitary conditions for the rural poor.

We are convinced that these reorientations of polices are in the correct direction in their purposes to attain rural development. We are also aware of the conditions that they require to be effective. An important one is the coordination of the programs and actions of the 11 Ministries involved in the budget for Rural Development, where the States and Municipalities or Counties of Mexico also participate. Another requirement is to get an effective participation of farmers and other subjects of the programs, as opposed to the historical paternalistic character of public actions towards the sector and their actors.

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Figure 1. Mexico. Average Producers Prices of Selected Basic Crops (1994=100)

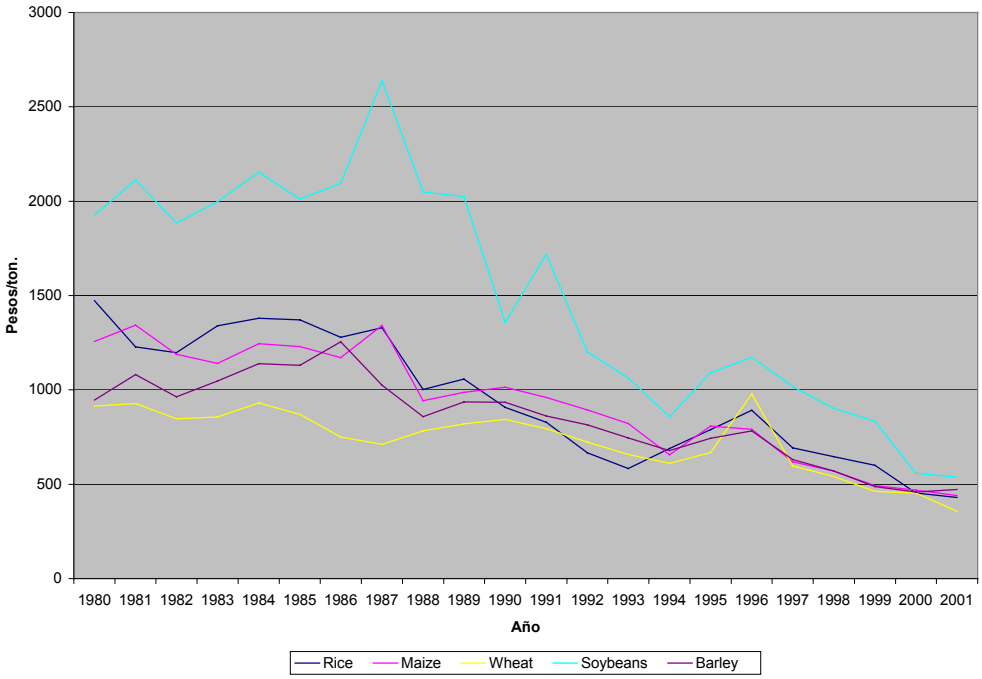

Figure 2. Price Indexes of Barley

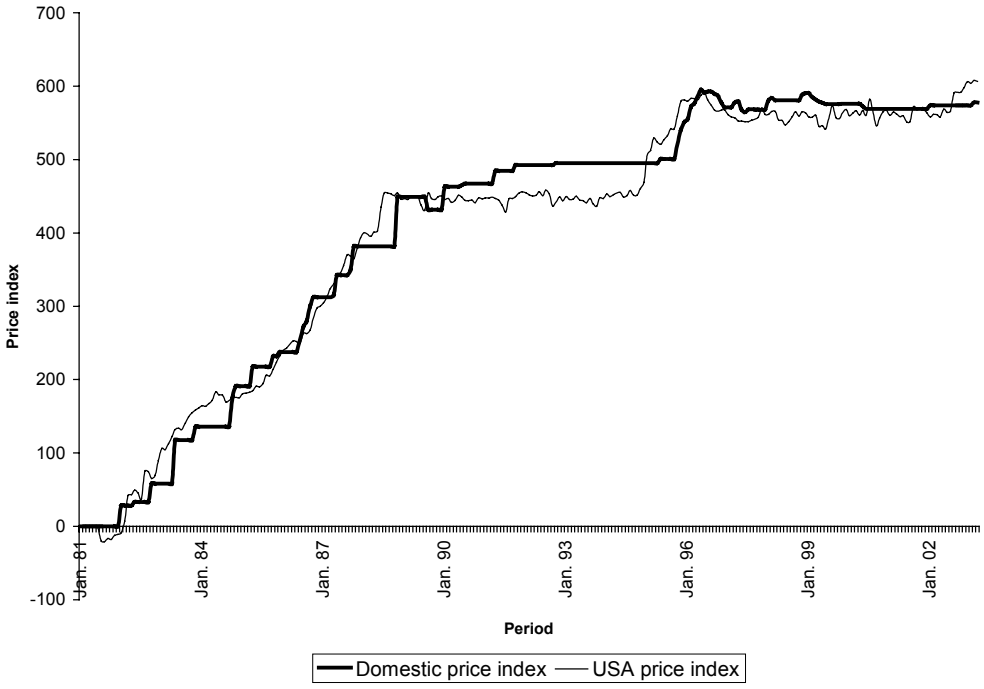

Figure 3. Price Indexes of Maize

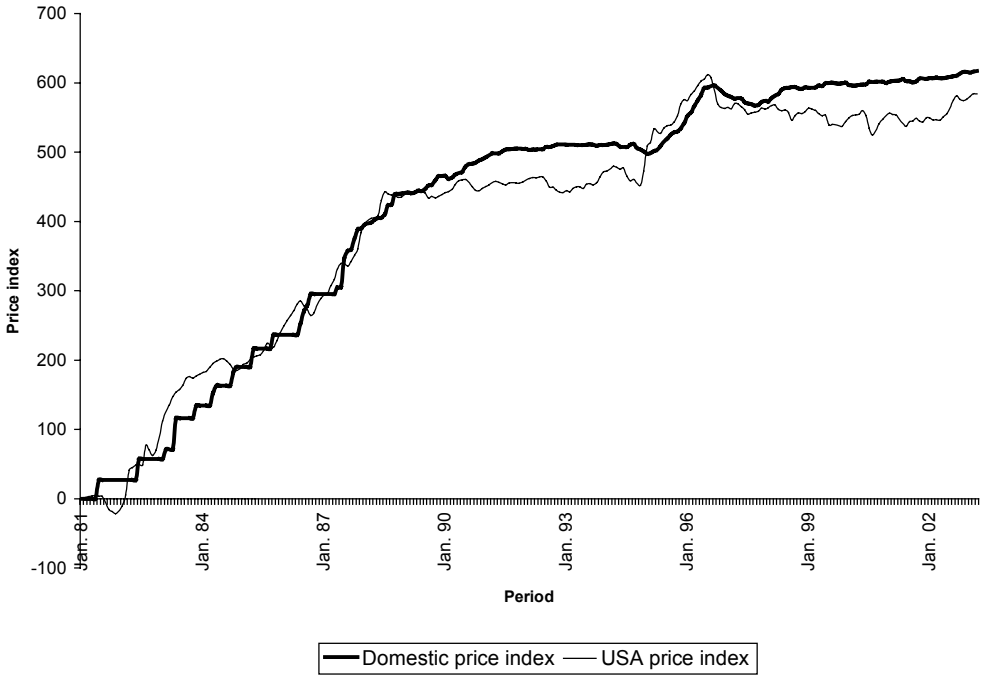

Figure 4. Price Indexes of Sorghum

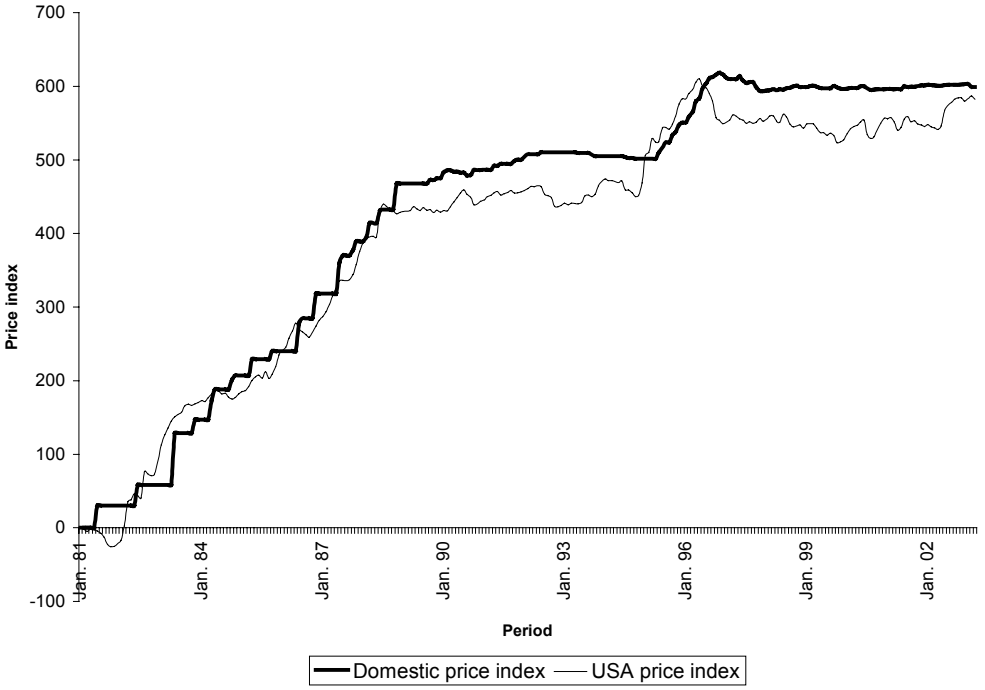

Figure 5. Price Indexes of Soybeans

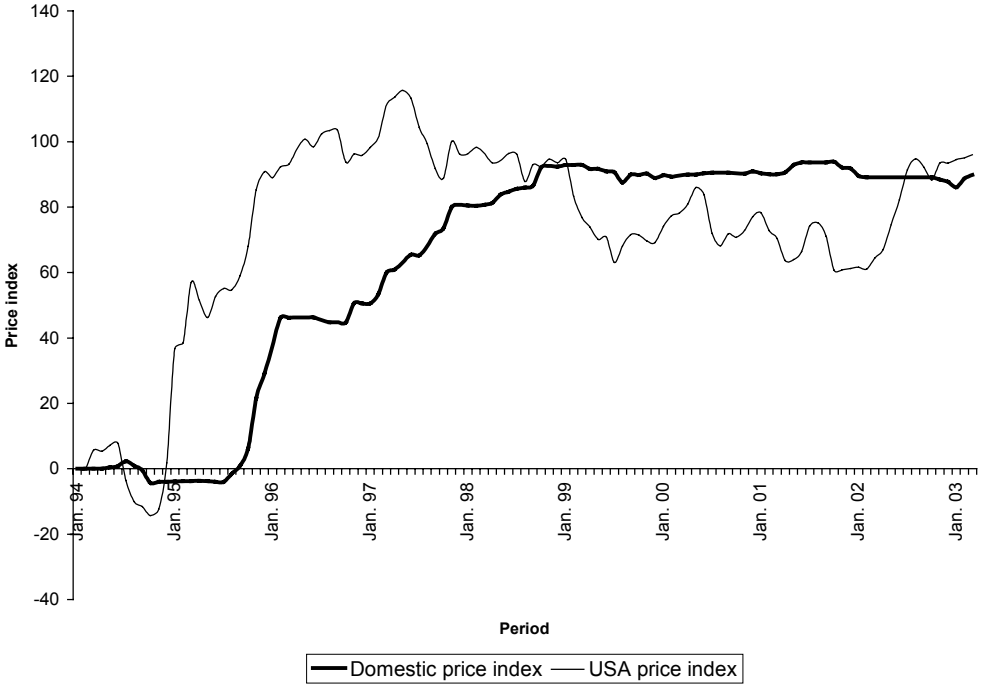

Figure 6. Price Indexes of Wheat

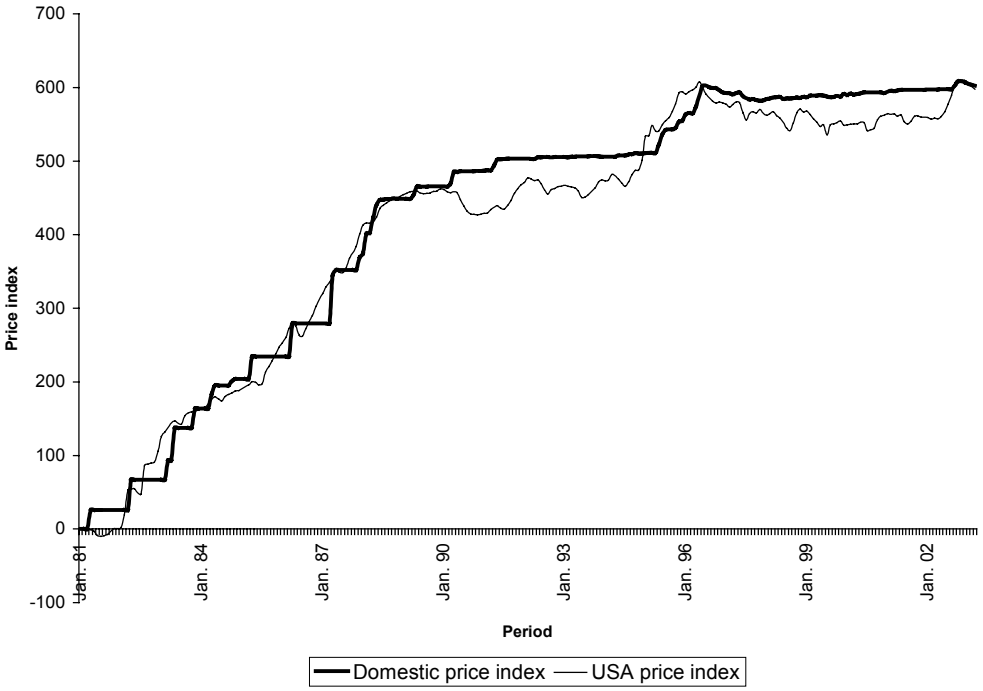

Figure 7. Price Indexes of Carrots

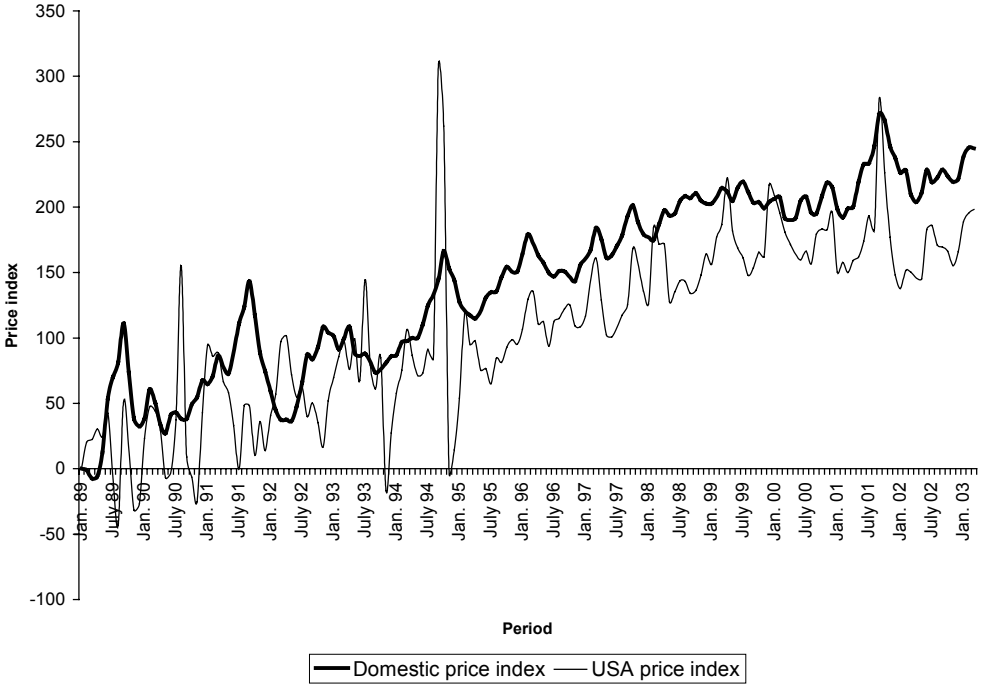

Figure 8. Prices Indexes of Cucumbers

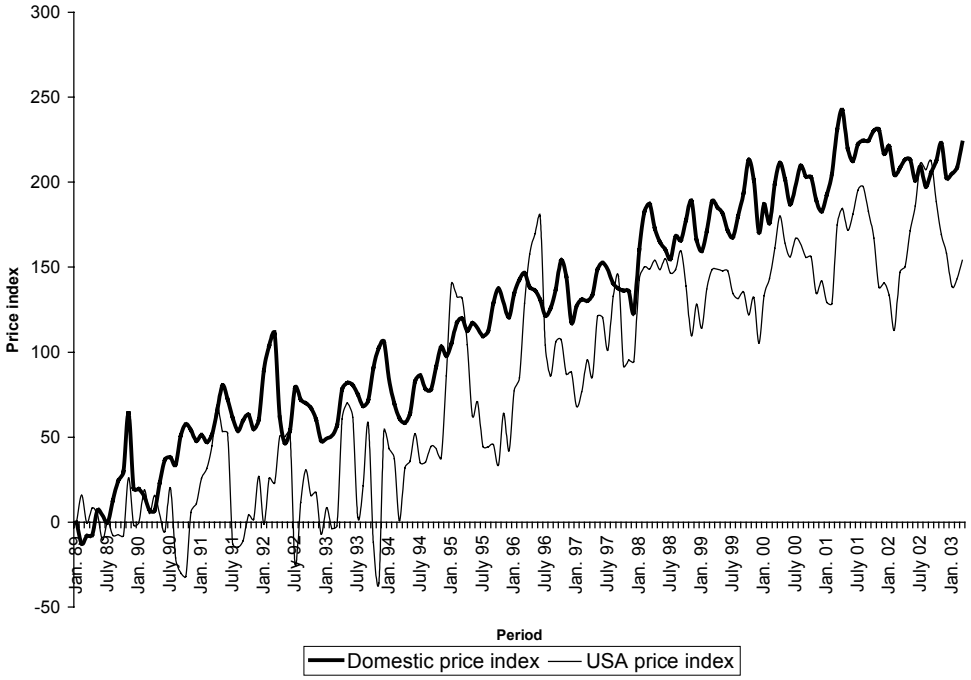

Figure 9. Price Indexes of Onions

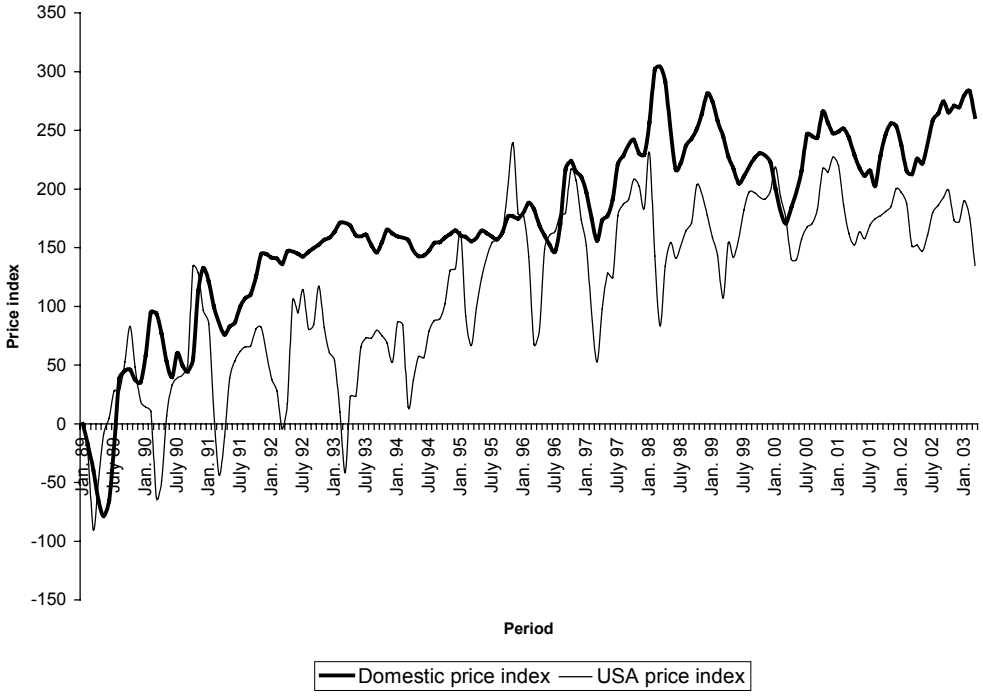

Figure 10. Price Indexes of Tomatoes

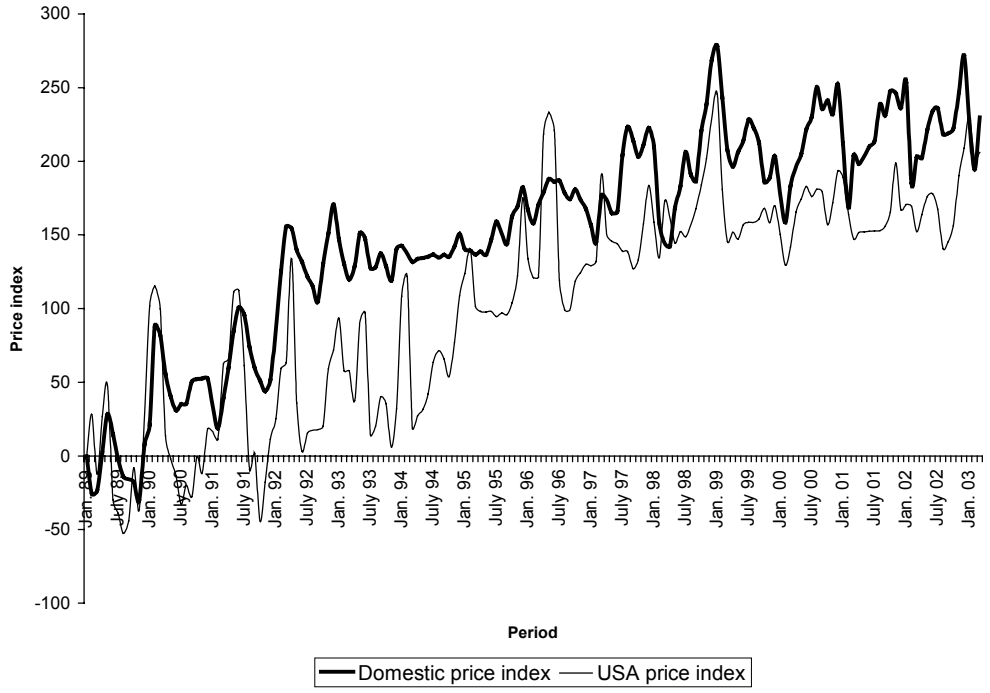

Figure 11. Price Indexes of Avocados

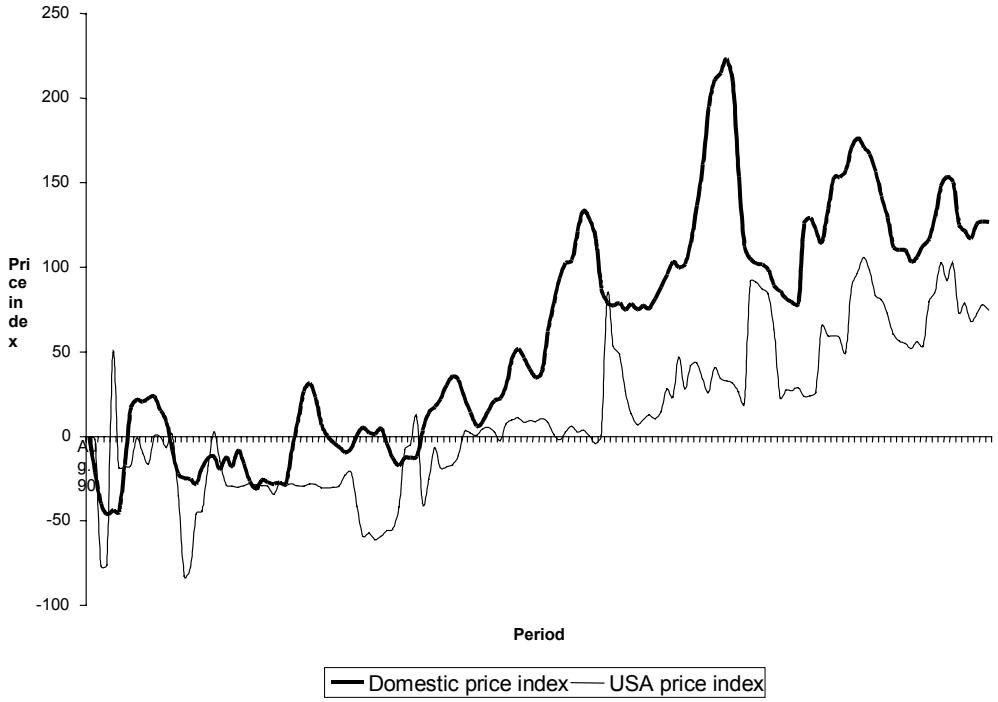

Figure 12. Price Indexes of Oranges

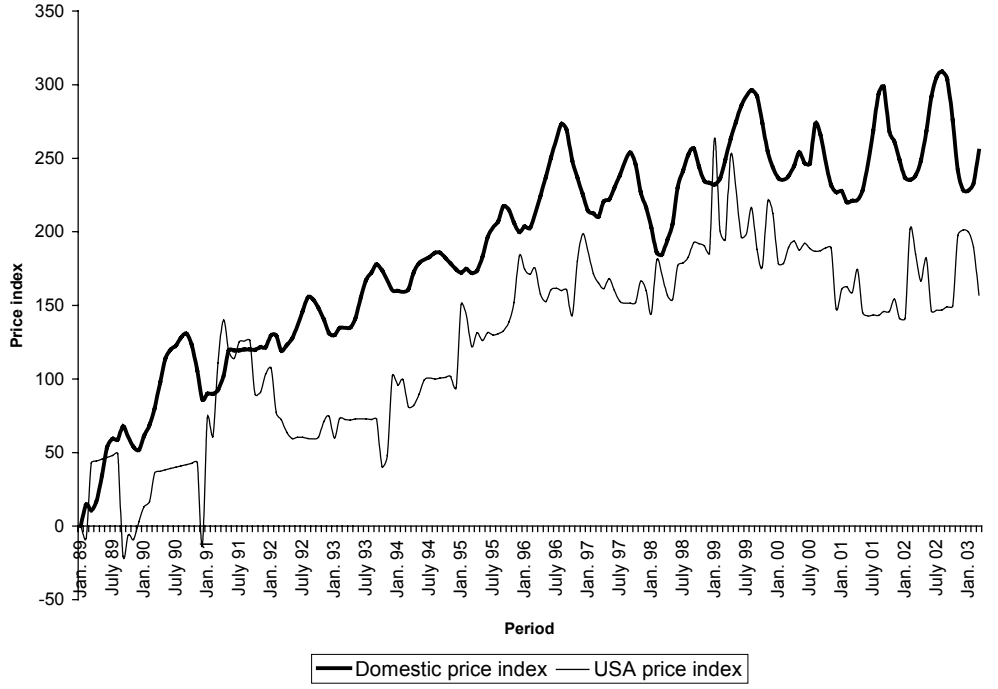

Figure 13. Price Indexes of Watermelon

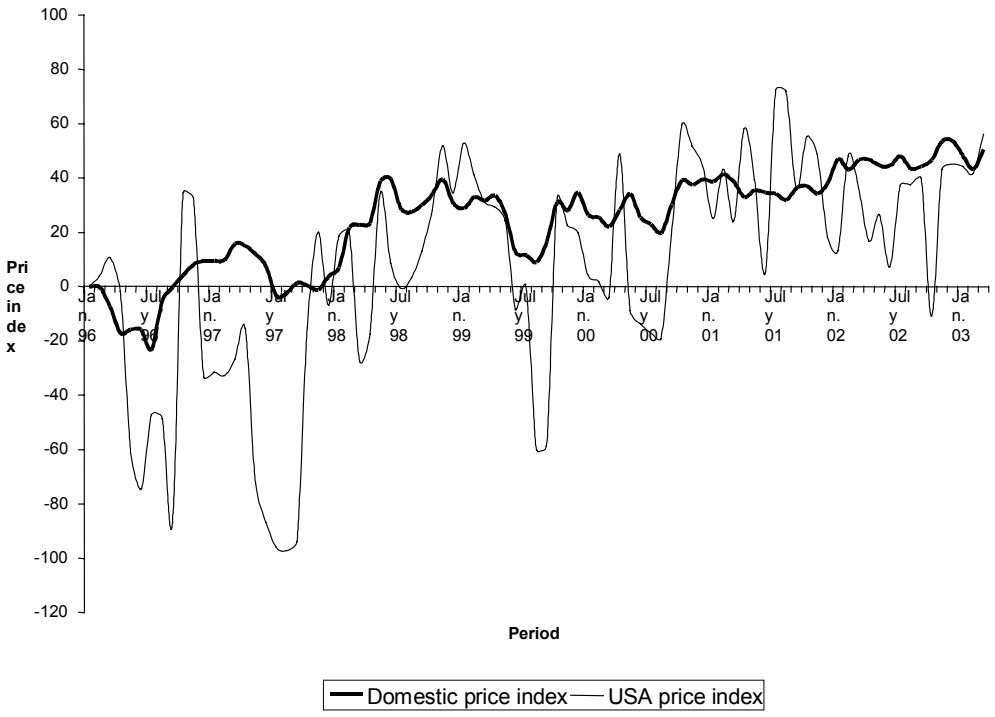

Figure 14. Mexico. Participation of Agricultural Trade in Agricultural Production: 1990-2001

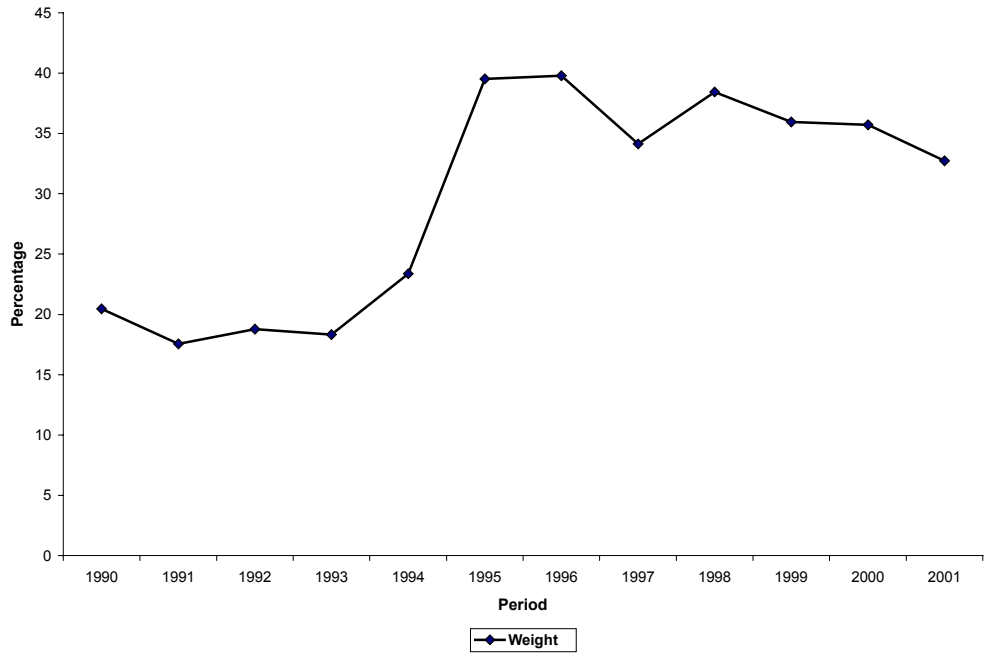

Figure 15. Mexico. Total Agricultural Exports and Imports to and from USA (Annual Averages)

Figure 16 Mexico. Agrciultural Exports to the USA (Annual Averages)

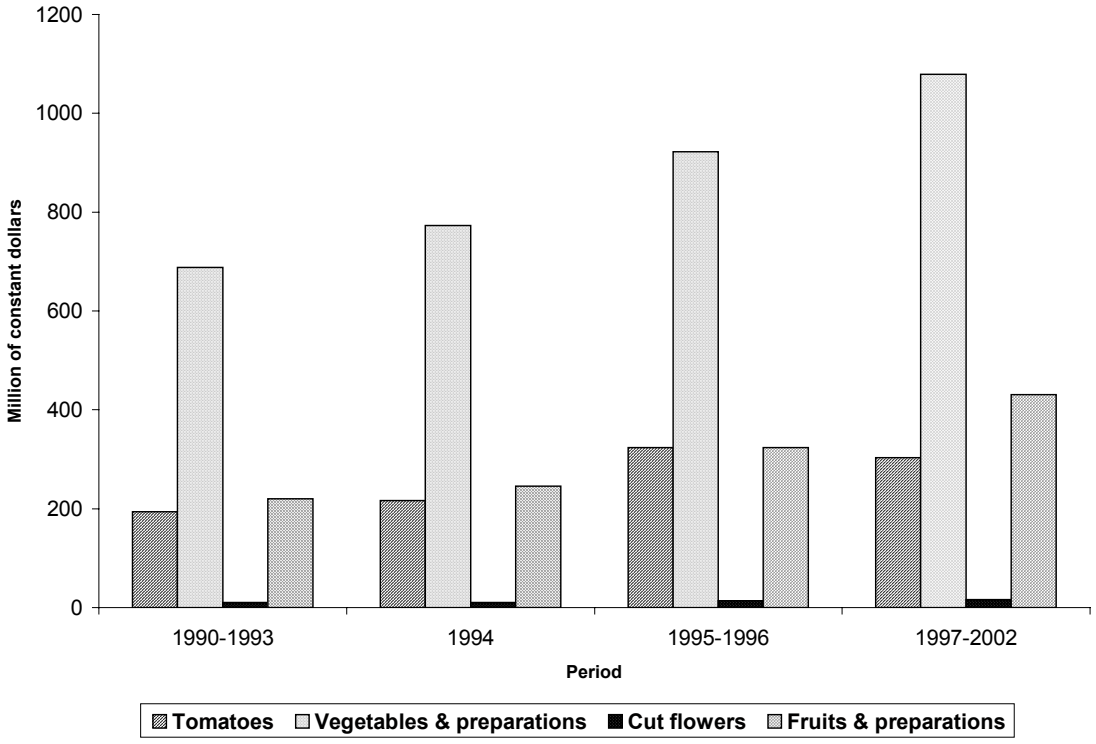

Figure 17. Mexico. Agricultural Imports from the USA (Annual Averages)

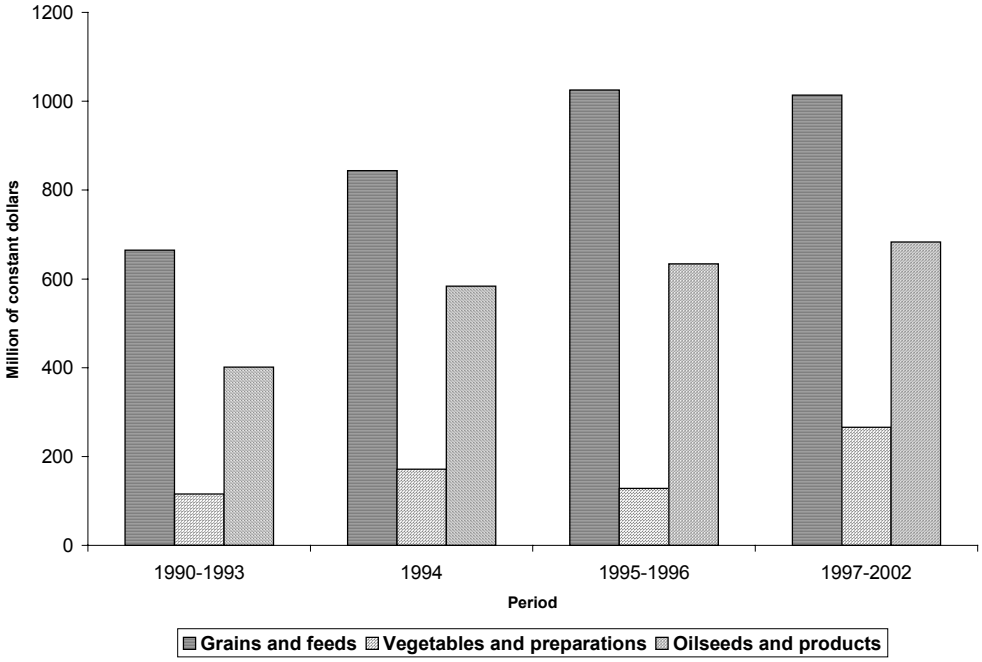

Figure 18. Mexico. Vegetables and Fruits. Participation of Exports on Volume of Production

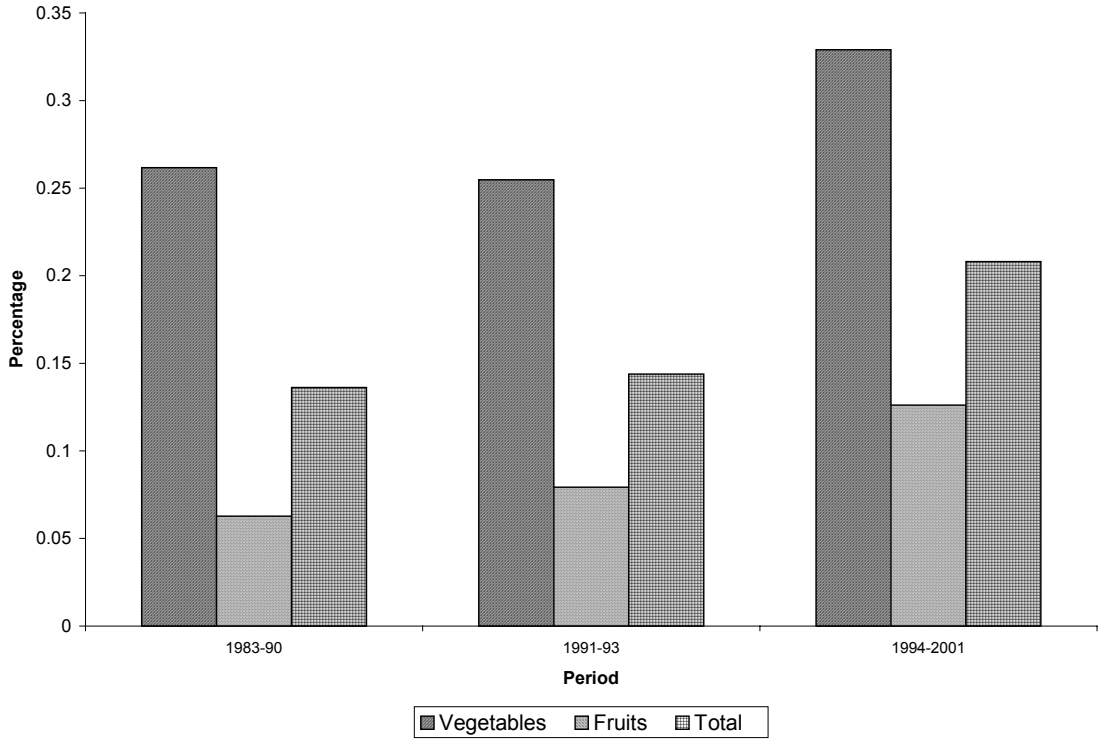

Figure 19. Mexico. Basic Crops. Participation of Volume of Imports on Domestic Demand

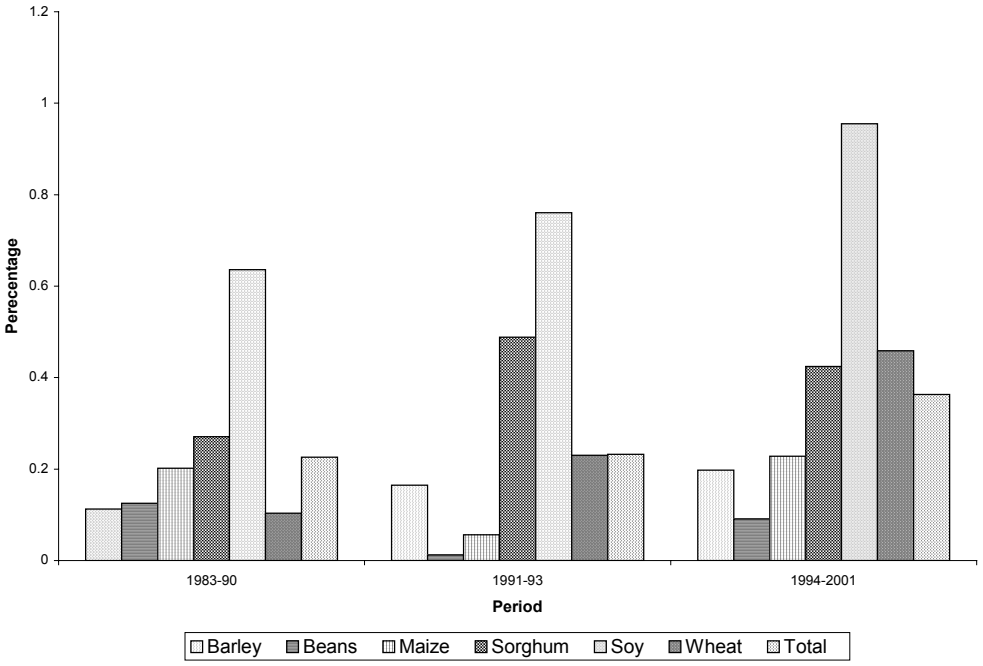

Figure 20. Mexico. Production of Major Exported Vegetables and Fruits

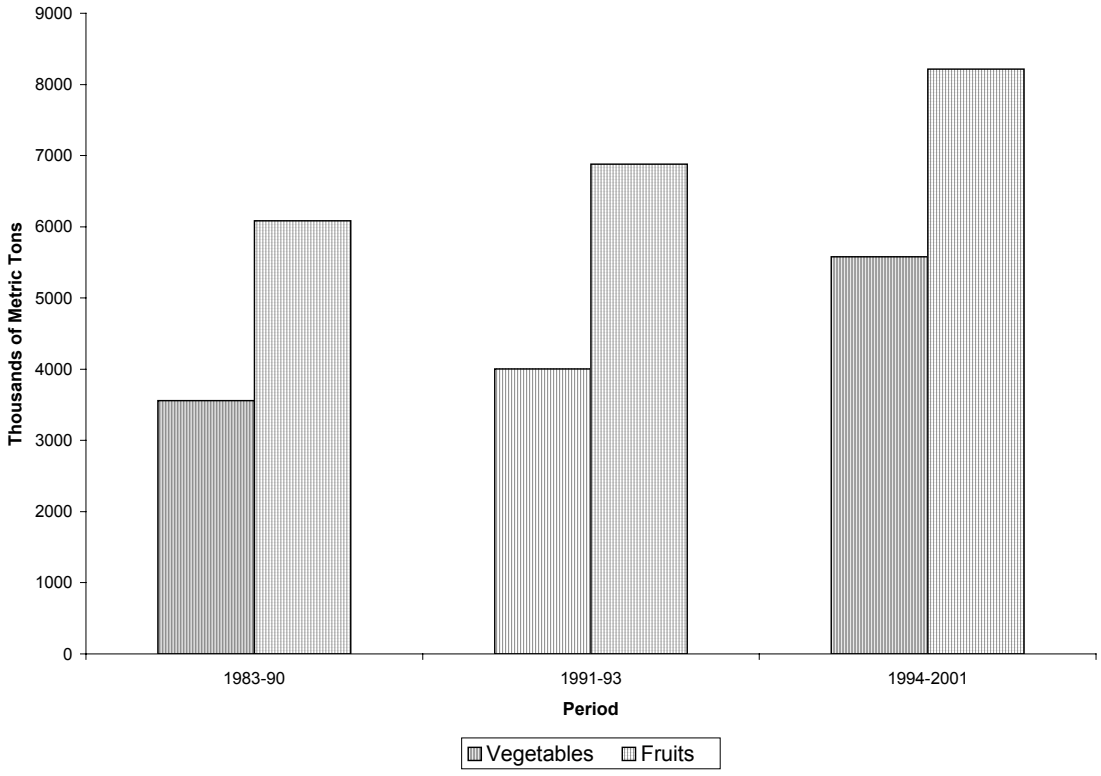

Figure 21. Mexico. Cultivated Area of Major exported Vegetables and Fruits

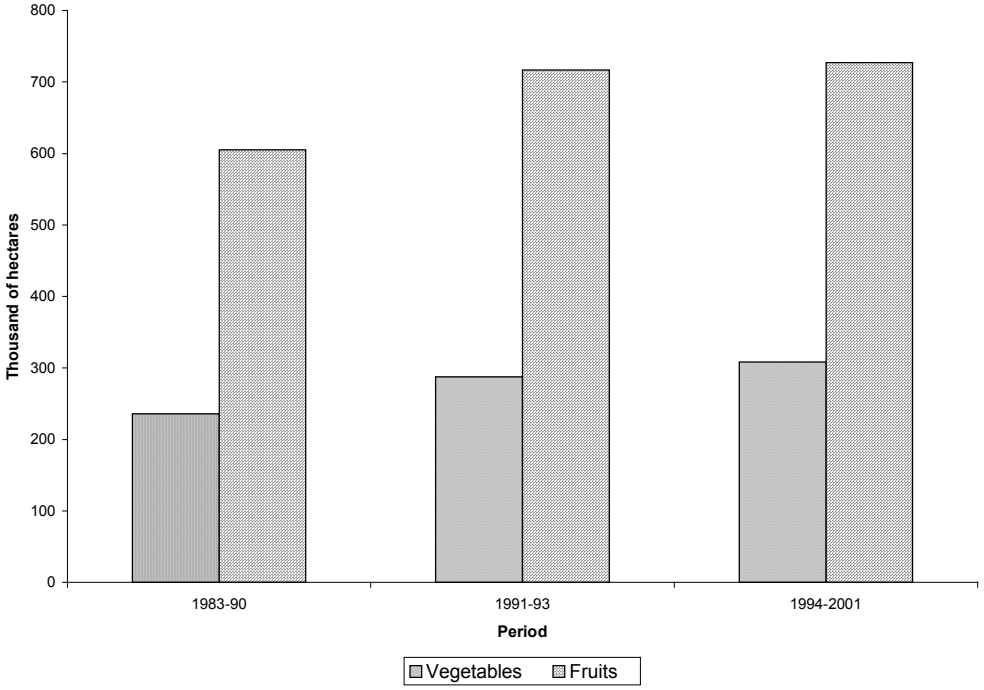

Figure 22. Mexico. Yields of Major Exported Vegetables and Fruits

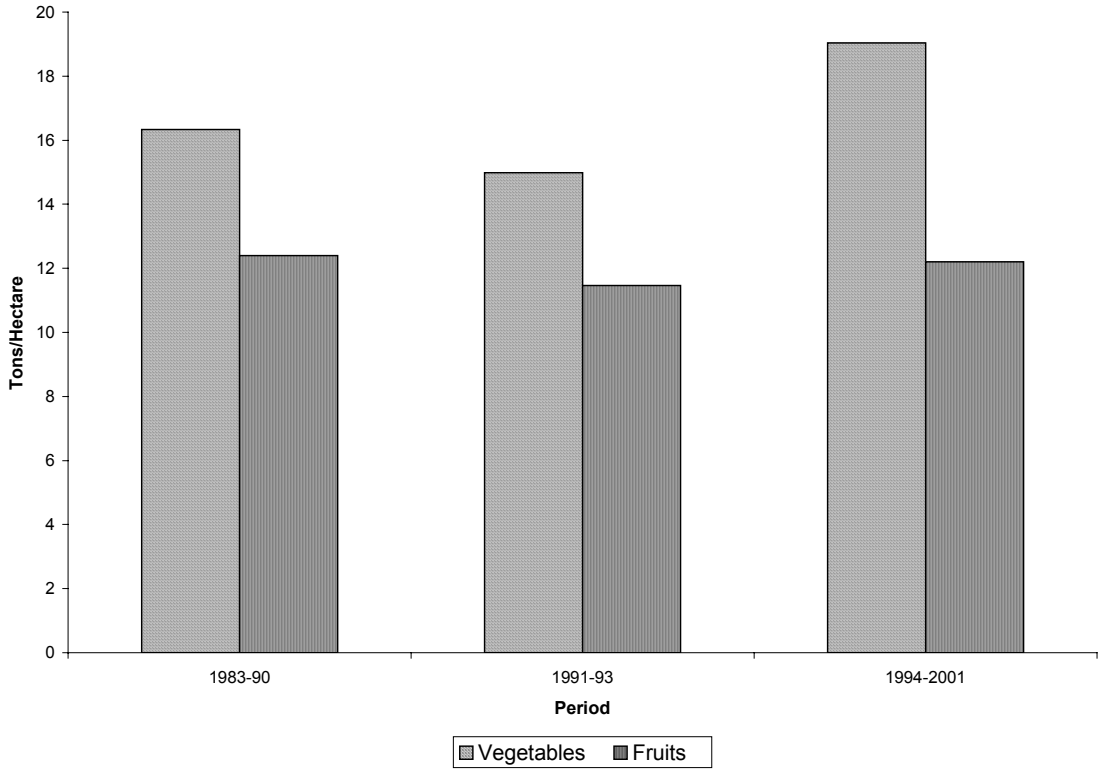

Figure 23. Mexico. Production of six Basic Crops (barley, beans, maize, sorghum, soy and wheat)

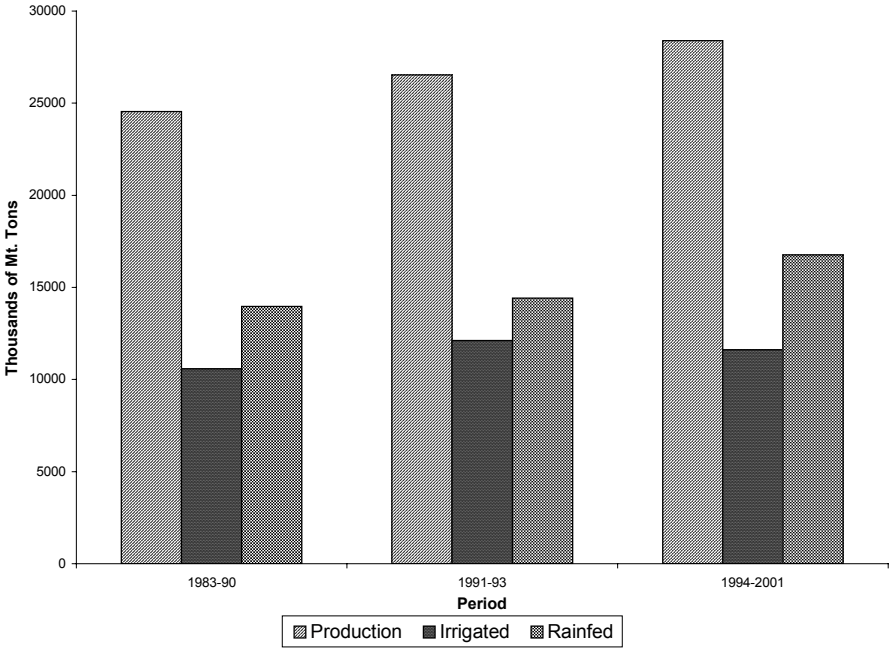

Figure 24. Mexico. Cultivated Area of six Basic Crops

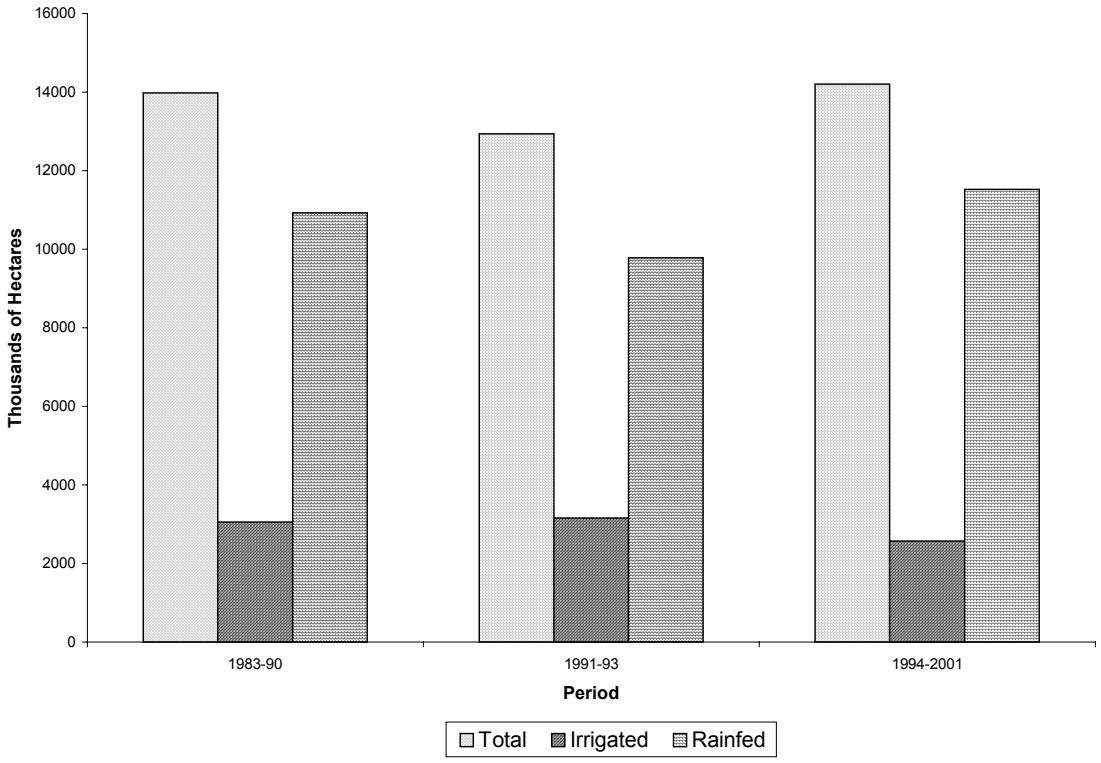

Figure 25 Mexico. Yields of six Basic Crops

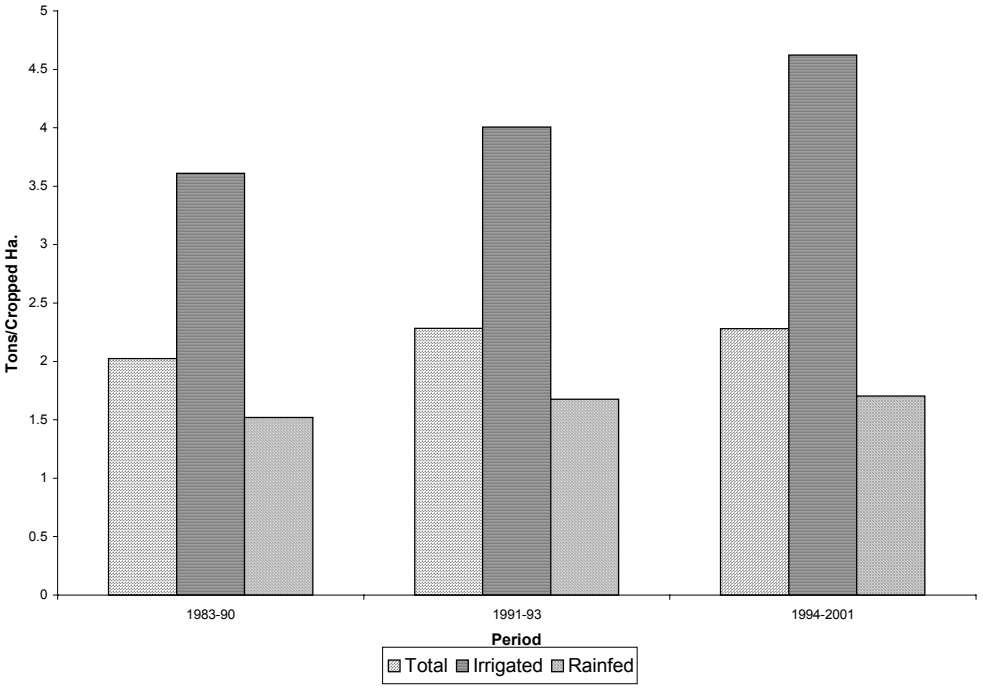

Figure 26. Mexico, Price Indexes (PI): National Consumer PI, Inputs PI and Agricultural Producer PI

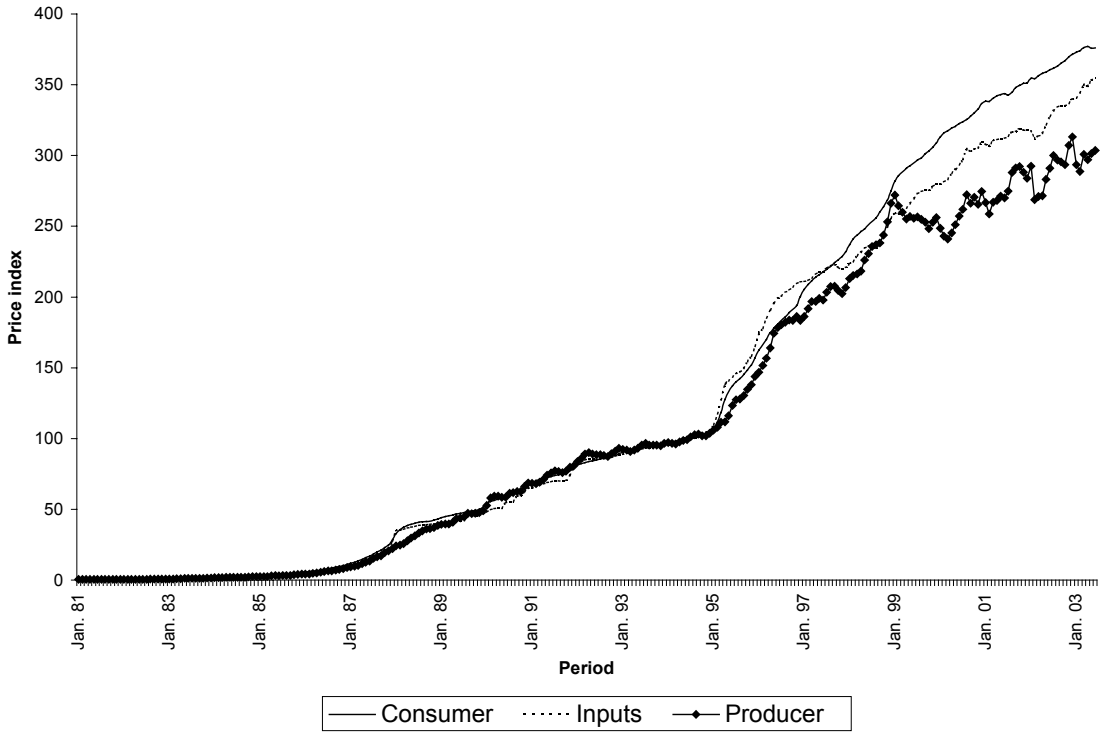

Table 1. Major Agricultural Policy Reforms: 1985-99

POLICY	DESCRIPTION	YEARS
Mexico joins GATT	• By 1990/1, most licenses to import agricultural products were abolished. In 1991-1994 most agricultural commodities were subject to tariffs fluctuating between 0% and 20%.	1986/94
Institutional reforms and the government's new role	• All State seed and fertilizers' companies were privatized. • State storage companies were privatized. • Elimination of all State companies involved in the commercialization of sugar, tobacco and coffee. • New institutions, such as ASERCA (1991) were created in order to give support and services to producers.	From 1988/9
Reform of the Agrarian Law	• Land redistribution ends. • Guarantees freedom of choice and management to the ejido and its members. • Recognizes the individual rights of each ejido. • Members of each ejido can, if they wish: buy, sell, rent or use their lands as a warrant; when before they could only usufruct it. • The, above makes commercial associations for ejidos possible.	1992
North American Free Trade Agreement (NAFTA)	• Defines which are the obligatory conditions for market access and for export subsidies. • Each country has the right to choose its own internal subsidies, phytosanitary measures, rules of origin and regulations for packing and tagging products. Each nation is responsible for making these rules as clear as possible, and it has to give the, and it has to give the exporter the opportunity to express his opinion when regulations are changed. When rules change, reasons have to be scientifically demonstrated • Consistency with the World Trade Organization and with the Uruguay Round. • Import and export licenses are abolish and substituted by tarification. • In 15 years, all tariffs will be eliminated by NAFTA members.	1994
PROCAMPO (Program of Direct Support for the Countryside), part of ASERCA (see below)	• Direct payments to the producers of basic crops that compensate producers for the loss of input subsidies, price supports and import protection. • Grants annual direct payments per hectare to those producers who continue to produce, based on historical acreage for nine crops. • Works as a "security net" for rural income. • Supports rural capitalization since it works as a guarantee for production. • The program helps around 3.3 million producers, covering 14 million hectares.	1994-2008
Elimination of producer price supports, abolition of CONASUPO (the National Company for Popular Subsistence) and creation of ASERCA for marketing supports to producers	• In 1991 guaranteed prices for wheat, sorghum, soy beans, rice, barley, safflower, sesame seed and sunflower were eliminated, and in 1999 support prices for beans and maize producers were abolished. • Prices of most grains began to be determined considering its international references. • Began granting supports for wheat and sorghum producers, then extended to producers of forrage barley, cotton, maize, safflower and rice • Since 1995, subsidies to grain producers to buy options at international markets in other to help them to handle market risks.	1991-1999 (ASERCA: 1991 up to date)
Alliance for the Countryside (Alianza para el Campo)	• A set of programs designed to support farmers with productive potential in an open economy. • Its major goals are: to raise producer's income, to improve agriculture balance of trade, to make food production grow twice than population growth, and to ensure the country's food security. • Federalized. Each state is responsible for the application of Alliance's programs. • Grants subsidies for in-farm investments and and for technology transfers and extension services, including sanitary campaigns .	1995 …

Source: Yunez-Naude and Barceinas (Dec. 2002), revised.

Table 2. Structure of Protection: Major Crops: 1985-1995

TARIFF FRACTION No.	DESCRIPTION	Status between 1985 and 1989/90		Status: NAFTA and Uruguay Round NAFTA (January, 1994)*			MFN (January, 1995)**	
		Tariff (%)	Import Licence	Tariff (%)	Quota (US)	Quota (Canada)	Tariff (%)	Quota
10051001	Maize for corpping	0	X	Nil			Nil	
10059001	Maize for popcrons	20	X	10.0			20	
10059002	Maize Kernels	0	X	5.0			10	
10059099	Maize others	0	X	215.0	2,500	1.0	198	10.0
07133301	Beans for cropping (Phaseolus vulgaris)	0	X	Nil			Nil	
07133399	Beans, other	0	X	139.0	50	1.5	128	5.0
10030001	Barley for cropping	0	X	Nil			10	
10030002	Barley	5	X	128.0			118	
11071001	Malt	10	X	175.0	120	30.0	161	1.2
10011001	Hard Wheat (durum)	10		7.5			67	98.0
10019099	Wheat (other)	0	X	7.5			67	
10061001	Rice (paddy with husk)	10		5.0			10	
10062001	Rice peeled	20		10.0			20	
1063001	Rice, whitened	20		10.0			20	
10064001	Rice, broken	10		5.0			10	
10070001	Sorghum (Dec. 16th to May 15th)	0	X	Nil			Nil	
10070002	Sorghum (May 16th to Dec. 15th)	15	X	Nil			15	
12010001	Soy bean for cropping	0	X	Nil			Nil	
12010002	Soy bean (Feb. 1st to July 31st)	0	X	Nil			Nil	
12010003	Soy bean (August 1st to January 31st)	15		5.0			15	
12030001	Copra	10	X	10.0			45	
12060001	Sunflower seed (for cropping)	0	X	Nil			Nil	
12060099	Sunflower other	0	X	Nil			Nil	
12072001	Cotton seed for cropping	0	X	Nil			Nil	
12074001	Sesame seed	0	X	Nil			Nil	
12076001	Suflower seed for cropping	0	X	Nil			Nil	
12076002	Suflower seed (Jan. 1st to Sept. 30th)	0	X	Nil			Nil	
12076003	Suflower seed (Oct. 1st to Dec. 31th)	10	X	5.0			10	
	Milk Powder		X	139.0	40		128	80.0

* When TRQs apply, the figures are for above-quota tariffs (in quota- tariffs are nil). Quotas are in thousand mts.

** When TRQs apply, the figures are for above-quota tariffs (consolidated in-quota tariffs are 50%). Quotas are in thousand mts.

Source: Yunez-Naude and Barceinas: 2002 (revised)

Table 3. Process of Liberalization of Mexico for commodities Subject to TRQs under NAFTA (Thousands of mts. and Percentages)

	1998		2000		2003		2008	
PRODUCT	QUOTA	Over Quota Tariff (%)	QUOTA	Over Quota Tariff (%)	QUOTA	Over Quota Tariff (%)	QUOTA	Over Quota Tariff (%)
Maize	2,814.90	172.00	2,986.32	145.20	3,263.24	98.80	0.00	0.00
Beans	57.96	111.20	61.49	93.90	67.20	58.70	0.00	0.00
Barley (grain and malt)	182.33	102.40	201.01	72.90	0.00	0.00	0.00	0.00
Milk Powder 1/	45.02	111.20	47.76	93.90	52.19	58.70	0.00	0.00

1/ Excluded from negociations with Canada, but with a quota of 80 thousand Mts for the rest of the world.

Source: SECOFI: 1994

Table 4. Liberalization by the U.S.A. of Mexican major exported agricultural commodities

Fraction	Commodity	Tariff reductions	Tariff Rate Quotas
	Vegetables		
0709.20.10	**Asparagus**	Some sesonal tariffe eliminated in Jan. 1994, others in 1998 and the 25% tariff from Feb. 1 to April 30 will be reduced gradually until its elimination in Dec. 2008	
0706.10.05	**Carrots and turnips**	A seasonal tariff eliminated in Dec. 1998 and from Oct to April tariff will be eliminated in Dec. 2003	120,800 mt. from Oct to April
0704.10	**Cauliflower and brocolli**	Tariff reduced to 15% in 1994 and will be eliminated in Dec. 2003	
0707.00.50	**Cucumbers**	Seasonal tariffs to be eliminated in Dec. 2008	
0703.20.00	**Garlic**	Tariffs eliminated in 1994	
0703.10	**Onions**	Seasonal tariffs to be eliminated in Dec. 2003	130,700 mt from I-1 to VI-30
0709.60.00	**Peppers**	A seasonal tariff to be eliminated at the end of 2003 and other seasonal tariff in Dec. 2008	
0702.00.60	**Tomatoes (fresh and frozen)**	A seasonal tariff eliminated in Dec. 1998 and other seasonal tariff in Dec. 2003	165,000 mt from III-1 to VII-14 and 172,300 from XI-15 to II-28(9)
Fruits			
0804.40	**Avocados**	Annual tariff reductions until eliminatred in XII-30-2003. Phytosanitary restrictions	
0806	**Grapes**	Free beginning in Jan. 1994	
0805.30	**Limes and lemons**	Annual tariff reductions until eliminatred in XII-30-2003	
0804.50	**Mangoes**	Tariffs eliminated in 1994	
0807.10	**Cantaloupe**	The tariff for XII-1 to V-15 eliminated in 94; the tarif for VIII-1 to IX-15 to be eliminated in 2003, and free trade until Dec. 2008 for the rest of year	
0805.10.00	**Oranges**	Trade resttictions will be gradually reduced until eliminated in XII-30-2008	40 millones of SSE galons of FCOJ and 4 millones of SSE, plus a snapback provission
0807.20.00	**Papaws**	Tariff will be gradually eliminated until Dec. 2003	
0804.30	**Pineapples**	Tariffs eliminated in 1994	
0810.10	**Strawberries**	Tariffs eliminated in 1994	
0807.10	**Watermelon**	Tariff from V-1 to IX-30 will be eliminated in Dec. 2003	54,400 mt, increasing 3% per year until 2008

Sources: ERS and SECOFI

Table 5. Results of the ECM for Major Exported Vegetables and Fruits*

Product and period (1)	α_1 (2)	α_2 (3)	α_3 (4)	α_4 (5)	R^2 (6)	DW (7)	P-Value (F) (8)	t=5 (9)	*n* for k=0.95 (10)
Carrots									
1989:01 2003:03	4.0213	0.0984	-0.0774		0.10	1.30	0.57	0.40	36
	3.5	*4.3*	*-3.3*						
1989:01 1993:12	2.7432	0.0702	-0.0579		0.01	1.24		0.31	49
	1.2	*1.4*	*-1.2*						
1994:01 2003:03	5.6133	0.1213	-0.1060		0.22	1.46		0.50	26
	4.4	*5.5*	*-4.1*						
Cucumbers									
1989:01 2003:03	4.6777	0.1184	-0.0908		0.05	1.77	0.23	0.45	30
	2.9	*2.7*	*-2.6*						
1989:01 1993:12	4.3129	0.0255	-0.0695		-0.01	1.79		0.32	41
	1.5	*0.4*	*-1.1*						
1994:01 2003:03	4.6862	0.2014	-0.0974		0.11	1.75		0.52	27
	2.4	*3.7*	*-2.4*						
Onions									
1989:01 2003:03	6.7126	0.0917	-0.1057	0.4596	0.35	1.69	0.98	0.48	26
	4.6	*2.9*	*-5.4*	*7.3*					
1989:01 1993:12	7.7233	0.0855	-0.1090	0.4472	0.38	1.60		0.49	25
	3.2	*1.7*	*-3.7*	*4.2*					
1994:01 2003:03	6.1255	0.0950	-0.1027	0.4616	0.29	1.75		0.47	27
	3.2	*2.3*	*-3.7*	*5.7*					
Tomatoes									
1989:01 2003:03	7.7240	0.2958	-0.1470		0.23	1.86	0.67	0.68	17
	3.8	*6.9*	*-4.2*						
1989:01 1993:12	7.5100	0.2962	-0.1165		0.34	1.73		0.62	21
	2.7	*5.3*	*-2.7*						
1994:01 2003:03	9.1411	0.3079	-0.1917		0.17	1.86		0.76	12
	3.0	*4.6*	*-3.3*						
Avocados									
1990:08 2003:03	3.9168	0.0852	-0.0722	0.5812	0.35	1.90	0.33	0.37	39
	3.1	*2.1*	*-3.6*	*8.8*					
1990:08 1993:12	2.4241	0.0902	-0.1248	0.5216	0.33	2.04		0.53	22
	1.4	*1.5*	*-2.0*	*4.0*					
1994:01 2003:03	5.7154	0.1206	-0.0899	0.6148	0.37	1.94		0.45	30
	3.3	*2.0*	*-3.6*	*7.9*					
Oranges									
1989:01 2003:03	6.1793	0.0199	-0.0900	0.6370	0.46	1.75	0.04	0.39	32
	5.1	*0.7*	*-5.4*	*11.0*					
1989:01 1993:12	4.0576	0.0494	-0.0599	0.4839	0.34	1.61		0.30	48
	2.7	*1.3*	*-2.6*	*4.4*					
1994:01 2003:03	9.5882	0.0201	-0.1327	0.7222	0.52	1.95		0.52	21
	5.2	*0.5*	*-5.4*	*10.3*					
Watermelon									
1996:01 2003:03	0.9472	0.0577	-0.0223		0.06	1.88		0.16	130
	1.3	*2.6*	*-1.0*						

*We assummed that $\beta_1 = 1$

Note: t-student statistic is below the value of each estimated parameter

Sources: Own estimations

Table 6. Results of the ECM for Major Imported Crops

Product and period (1)	α_1 (2)	α_2 (3)	α_3 (4)	R^2 (5)	DW (6)	P-Value (F) (8)	t=5 (9)	*n* for k=0.95 (10)
Barley								
1981:01 2003:03	2.7233	0.032	-0.0956	0.09	1.85	0.14	0.41	30
	5.3	*0.5*	*-5.4*					
1981:01 1993:12	3.7468	-0.0368	-0.096	0.07	1.97		0.42	29
	4.5	*-0.4*	*-3.8*					
1994:01 2003:03	1.3875	0.096	-0.0852	0.2	1.19		0.42	32
	3.4	*2.2*	*-5*					
Maize								
1981:01 2003:03	3.7655	-0.0744	-0.0763	0.17	1.91	0.09	0.38	37
	9.3	*-1.5*	*-7.4*					
1981:01 1993:12	4.4775	-0.1688	-0.0815	0.14	2.04		0.46	33
	7.1	*-2*	*-5*					
1994:01 2003:03	2.5613	0.0205	-0.0564	0.28	0.92		0.27	51
	7.4	*0.6*	*-6.6*					
Sorghum								
1981:01 2003:03	4.9906	0.0028	-0.1001	0.16	2.07	0.4	0.41	28
	8.2	*0*	*-7*					
1981:01 1993:12	5.718	-0.0282	-0.1105	0.12	2.1		0.46	25
	6	*-0.3*	*-4.7*					
1994:01 2003:03	3.4534	0.0277	-0.0738	0.43	1.56		0.34	39
	9	*0.9*	*-8.9*					
Soybean								
1994:01 2003:03	-17.7556	0.0806	-0.037	0.24	1.16	0.24	77	
	-5.1	*2.4*	*-5.3*					
Wheat								
1981:01 2003:03	4.0073	0.0371	-0.1167	0.17	2	0.06	0.48	24
	7.4	*0.6*	*-7.1*					
1981:01 1993:12	5.12	-0.0319	-0.138	0.16	2.08		0.54	20
	5.8	*-0.3*	*-5.4*					
1994:01 2003:03	2.1162	0.0705	-0.0673	0.27	1.14		0.34	42
	6.2	*1.8*	*-6*					

Note: t-student statistic is below the value of each estimated parameter
Sources: Own estimations

Table 7. Mexico. Exports of Major Vegetables and Fruits (Thousands of Metric Tons)

	Vegetables								
Period	**Asparagus**	**Cauliflower and brocolli**	**Carrots and Turnips**	**Cucumbers**	**Garlic**	**Onions**	**Peppers**	**Tomatoes**	**Total ***
1983-90	10.95	10.18	8.06	221.22	15.00	120.89	68.82	452.74	**930.92**
1991-93	19.21	26.17	14.21	207.96	13.06	193.87	153.14	367.45	**1,019.61**
1994-2001	35.47	48.21	50.26	347.41	17.26	241.52	309.47	733.05	**1,834.98**
	Fruits								
Period	**Avocados**	**Lemons and Limes**	**Mangoes and Guabas**	**Cantaloupe**	**Oranges**	**Strawberries (fresh&frozen)**	**Watermelon**		**Total ****
1983-90	6.59	41.52	37.04	133.17	6.95	9.64	129.38		**381.90**
1991-93	16.27	94.52	96.19	171.34	11.34	11.04	126.97		**545.09**
1994-2001	66.71	119.77	185.11	222.49	16.54	30.18	231.78		**1,035.62**

* Includes eggplants and spinach
** Includes papawas and pineaples
Sources: Exports FAO, production and cultivated and cropped areas SAGAR (Data Bases SIACON, and "Anuario estadístico de la producción agrícola 1999-2000")
Advance of sowing and crop, agricultural year 2003.

Table 8. Mexico. Imports of major basic crops (Thousands of Metric Tons)

Period	Barley	Beans	Maize	Sorghum	Soybeans	Wheat	Totals
1983-90	66.22	143.10	3,159.55	2,063.93	1,230.99	493.34	7,157.12
1991-93	105.59	13.52	979.34	3,890.75	1,920.59	1,119.64	8,029.44
1994-2001	129.27	114.94	5,222.79	4,137.07	3,863.37	2,717.48	16,184.92

Falta la fuente (creo que son de FAO)

Table 9. Major exported Vegetables and Fruits: Production, Cultivated Areas and Yields (annual averages)

Period	Vegetables	Production (Thousands of Mt. Tons)	Cultivated Area (Thousands of Hectares)	Yields (Tons/Cropped Ha.)	Fruits	Production (Thousands of Mt. Tons)	Cultivated Area (Thousands of Hectares)	Yields (Tons/Cropped Ha.)
1983-90	**Asparagus**	31.09	9.60	4.63	**Avocados**	552.95	83.70	8.35
1991-93		33.15	11.76	3.40		738.07	92.48	8.75
1994-2001		52.29	14.39	4.04		869.27	93.78	9.44
1983-90	**Cauliflower and brocolli**	119.98	10.52	11.76	**Lemons and Limes**	780.52	83.27	10.69
1991-93		212.82	19.17	11.32		772.21	89.98	9.69
1994-2001		260.58	20.30	13.02		1,358.40	103.68	14.30
1983-90	**Carrots and Turnips**	157.40	6.82	23.65	**Mangoes and Guabas**	1,023.27	114.87	10.55
1991-93		239.20	9.57	25.99		1,115.00	138.13	9.40
1994-2001		319.24	13.54	23.93		1,412.64	138.25	10.90
1983-90	**Cucumbers**	251.24	15.64	17.01	**Cantaloupe**	394.57	36.55	12.48
1991-93		257.40	15.88	17.26		511.73	46.79	12.41
1994-2001		417.24	17.73	23.85		565.25	30.27	19.48
1983-90	**Garlic**	52.81	6.94	7.74	**Oranges**	2,014.14	211.32	12.62
1991-93		55.37	7.70	7.26		2,608.22	274.87	12.25
1994-2001		58.05	7.28	8.04		2,751.98	257.66	11.59
1983-90	**Onions**	593.36	37.01	16.78	**Papaws**	514.78	22.49	28.29
1991-93		715.50	40.19	18.24		363.15	18.72	24.13
1994-2001		932.56	42.40	22.91		320.28	12.17	30.14
1983-90	**Peppers**	593.06	72.75	9.06	**Pineapple**	288.94	8.82	41.48
1991-93		834.93	98.84	9.22		258.36	8.95	38.76
1994-2001		1,656.21	121.48	14.73		430.98	13.54	42.47
1983-90	**Tomatoes**	1,759.11	76.29	24.49	**Strawberries (fresh&frozen)**	71.97	4.74	16.56
1991-93		1,655.43	84.36	21.46		86.47	7.13	13.79
1994-2001		1,882.21	71.30	27.33		121.96	6.76	19.02
					Watermelon	441.76	39.38	12.98
						426.43	39.59	12.63
						761.00	40.66	20.44
1983-90	**Total**	3,558.05	235.56	16.34	**Total**	6,082.90	605.12	12.40
1991-93		4,003.79	287.46	14.98		6,879.65	716.63	11.47
1994-2001		5,578.38	308.42	19.04		8,216.99	727.10	12.20

Sources: Exports FAO, production and cultivated and cropped areas SAGAR (Data Bases SIACON, and "Anuario estadístico de la producción agrícola 1999-2000")
Advance of sowing and crop, agricultural year 2003.

Table 10. Basic Crops: Production, Cultivated Areas, and Yields (annual averages)

(1) Product	(2) Period	(3) Production (Thousands of Mt. Tons)			(4) Cultivated Area (Thousands of Hectares)			(5) Yields (Tons/Cropped Ha.)		
		a. Total	b. Irrigated	c. Rainfed	a. Total	b. Irrigated	c. Rainfed	a. Total	b. Irrigated	c. Rainfed
Barley	1983-90	520.64	185.39	335.25	303.04	53.39	249.65	1.89	3.66	1.49
	1991-93	536.15	213.48	322.67	295.87	51.93	243.94	1.99	4.19	1.47
	1994-2001	523.75	154.56	369.19	282.08	33.59	248.49	2.13	4.67	1.70
Beans	1983-90	997.53	269.87	727.66	2,163.85	226.80	1,937.05	0.55	1.28	0.45
	1991-93	1,128.22	375.68	752.54	2,070.25	298.59	1,771.66	0.64	1.42	0.50
	1994-2001	1,147.97	395.05	752.91	2,258.36	281.36	1,969.88	0.62	1.46	0.47
Maize	1983-90	12,472.19	2,932.05	9,540.13	8,076.36	994.49	7,081.86	1.79	3.13	1.58
	1991-93	16,435.37	5,792.44	10,642.93	7,993.44	1,438.16	6,555.28	2.28	4.15	1.83
	1994-2001	17,699.01	5,913.30	11,785.71	8,717.77	1,242.44	7,378.48	2.31	4.90	1.85
Sorghum	1983-90	5,566.17	2,548.40	3,017.77	1,950.09	579.53	1,370.56	3.25	4.55	2.62
	1991-93	4,080.70	1,806.38	2,274.32	1,313.81	377.25	936.56	3.32	4.99	2.64
	1994-2001	5,624.51	2,179.81	3,444.70	2,027.90	393.45	1,634.45	3.11	5.67	2.42
Soybeans	1983-90	704.05	604.64	99.41	401.09	317.02	84.07	1.84	1.97	1.40
	1991-93	605.36	536.23	69.13	305.51	253.00	52.52	2.02	2.14	1.42
	1994-2001	182.51	106.34	76.16	126.51	65.07	61.44	1.53	1.64	1.44
Wheat	1983-90	4,292.31	4,036.00	256.30	1,086.64	886.86	199.78	4.15	4.67	1.53
	1991-93	3,754.56	3,397.67	356.90	953.49	734.09	219.40	4.05	4.70	1.76
	1994-2001	3,207.30	2,864.48	342.82	789.01	553.00	230.68	4.33	5.25	1.73
Totals	**1983-90**	**24,552.89**	**10,576.37**	**13,976.52**	**13,981.07**	**3,058.09**	**10,922.97**	**2.02**	**3.61**	**1.52**
	1991-93	**26,540.36**	**12,121.87**	**14,418.48**	**12,932.38**	**3,153.02**	**9,779.36**	**2.28**	**4.00**	**1.68**
	1994-2001	**28,385.06**	**11,613.55**	**16,771.50**	**14,201.62**	**2,568.92**	**11,523.42**	**2.28**	**4.62**	**1.70**

Sources: FAO and Mexican Ministry of Agriculture: Data Bases (SAGAR SIACON) and "Anuario estadístico de la producción agrícola 1999-2000"

Table 11. Structure of Mexican Agriculture

Peasant agriculture	**Entrepreneurial agriculture**
Formed by rural households	Formed by captilist farmers
Units of production and consumption (a portion of staple production (maize) for family consumption)	Produce for the market
Diversified income sources	Specialization
Small and rainfed plots	Medium and big sized (and irrigated) plots
Facing high transaction costs in some markets	Low or no transaction costs
Inelastic supply	*Elastic supply*

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