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Woodrow Wilson International Center for Scholars
Mexico Institute

Agricultural Production Trends and the Future Of the Trans-boundary Río Grande/Río Bravo Basin

Conference Proceedings
September 2004

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I. Introduction

Forming a lifeline through the arid Chihuahuan desert, the Río Grande/Río Bravo is one of North America's most important river basins. Its allocation between the U.S. and Mexico is governed by a treaty signed in 1944, when population was a fraction of what it is today, and when large-scale irrigated agriculture was just coming into its own. Sixty years later, the trans-boundary portion of the basin is now home to over 10 million people and growing, but irrigated agriculture still accounts for 80 to 90% of surface water diversions. The vulnerabilities of this system have been on display for the last several years, as a deep and persistent drought in northern Mexico—combined with an inadequate binational water management framework—led to a serious binational dispute over Mexico's water delivery obligations under the 1944 Treaty. Because it accounts for so much water use and because it provides a livelihood for tens of thousands of basin residents, irrigated agriculture has been at the center of this dispute.

In May 2004, Environmental Defense and the Mexico Institute at the Woodrow Wilson International Center for Scholars co-sponsored a binational conference on agricultural production trends and the future of water management in the trans-boundary Río Grande/Río Bravo basin. The day and half gathering was held in San Antonio, Texas with support from the William H. and Flora Hewlett Foundation and the North American Development Bank.

Our purpose was to bring together a group of experienced practitioners and researchers from both the U.S. and Mexico to examine key trends in the basin's irrigated agriculture, with a focus on the Río Conchos and the Lower Río Grande Valley. The conference explored recent production trends in three of the basin's major irrigated crops (pecans, sugar cane and alfalfa). Presentations and discussions examined how those trends have been and might be influenced by: domestic agricultural policies, including subsidy programs, trade policy and water availability and pricing. Conference participants also discussed various public and private sector adjustment efforts, including options for moving production to more water-efficient, higher value crops; the role of conservation payment programs in lieu of traditional subsides; and mechanisms for providing producers with appropriate technical and financial assistance. The conference agenda is reproduced on the following page.

Section II of these proceedings highlights major findings of the presentations made at the conference. Complete presentations are available on CD.[1] While the conference was not designed or intended to produce consensus recommendations, concrete suggestions for future action frequently came to the fore in the presentations and in the question and answer sessions. The conveners' observations and the overall findings, based on the presentations and discussions, are summarized in Section III.

[1] Contact: Alicia Isaac-cura at Environmental Defense, (512) 478-5161 or aisaac-cura @environmentaldefense.org.

AGENDA

Agricultural Production Trends and the Future Of the Trans-boundary Río Grande/Río Bravo Basin

Day One: Thursday, May 20th

9:00 to 9:30 **Welcome, Introductions and Purpose of Conference: Mexico Institute and Environmental Defense**
9:30 to 10:00 **Background/Overview** Mary Kelly, Environmental Defense
10:00 to 10:30 **BREAK**
10:30 to 12:30 **Panel 1: Projected Trends in three major crops.** Moderator: Flynn Adcock, Texas A&M University

Projected Dairy Industry Trends in Mexico
Dr. Luis Arturo García Hernandez, Researcher, Universidad Autónoma Metropolitana-Xochimilco

Projected Sugar Industry Trends in the United States
Andy Schmitz, University of Florida, International Agriculture and Trade Policy Center

Projected Pecan Production Trends in Mexico
Arturo Puente Gonzalez, Independent Consultant.
Comments: Dr. Esteban Herrera, Extension Horticulturist, New Mexico State University

12:30 to 2:00 **Lunch—Keynote Speech**—*Roberto Newell, President, Instituto Mexicano para la Competitividad, A.C.* Moderator: Roger W. Wallace, Mexico Institute.
2:00 to 5:00 **Panel 2: Adjustment Policies (with 20 min. break).** Moderator: Andrew Selee, Mexico Institute

(***Exploring options for helping farmers adjust to trends, while reducing agricultural water use)***

Dr. Joe Outlaw, Co-Director, Agriculture and Food Policy Center, Texas A&M
Lic. Ernesto Cervera Gómez, Grupo de Economistas Asociados (GEA)
Dr. Fernando Barceinas, Professor, Universidad Autónoma Metropolitana

Day Two: Friday, May 21st

9:00 to 9:30 **Reconvene and summarize results of Day One**
9:30 to 11:00 **Role of the Government.** Moderator: Dr. Carlos Rincón, Environmental Defense

(***Exploring government assistance programs)***

Dr. Jesus Moncada de la Fuente, Director General, INIFAP
Raul Rodriguez, General Manager, North American Development Bank
Wayne Maresh, Director, Resource Inventory Division, NRCS, U.S. Department of Agriculture
Comments: Javier Cabrera, Border Environment Cooperation Commission

11:00 to noon **Wrap-Up:** Identify findings/conclusions/recommendations to be included in final proceedings

II. Major Findings (Highlights of Presentations)

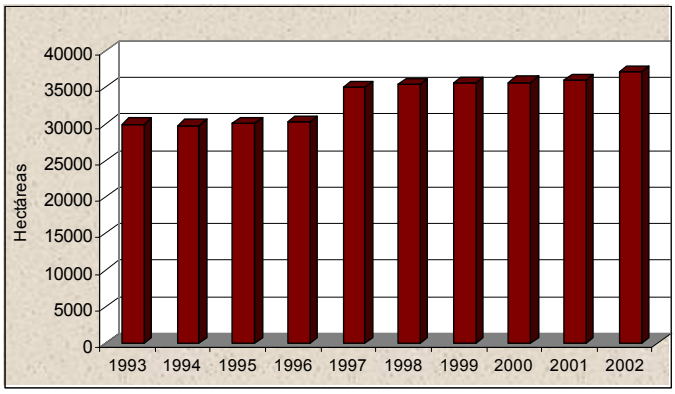
Projected Dairy / Alfalfa Industry Trends in Mexico – Luis A. Garcia

1. Milk production in Mexico has increased substantially, from about 5 billion liters per year in 1989 to 10 billion liters per year in 2003. The state of Chihuahua, (some portions of which are in the Rio Grande basin) and nearby Comarca Lagunera (located in southwestern Coahuila and northern Durango, outside the Rio Grande basin) are important dairy production centers. About 800 million liters of milk were produced in Chihuahua in 2002.

2. Dairy production in northern Mexico has a high water demand, requiring about 2700 liters (713 gallons) of water per cow per day. This includes the amount of water used to cool dairy herds and for alfalfa irrigation.

3. There has been an increase in the amount of alfalfa cultivated in the Comarca Lagunera area[2]:

Hectares of Alfalfa Cultivated in Comarca Lagunera



4. Irrigated alfalfa production in northern Mexico presents several challenges from a water use standpoint, including:

- Large amount of water used for irrigation (86% more water than sorghum)
- Lack of information [for producers on water conservation methods]
- Lack of set of criteria for harvest time
- Large amount of water loss (conductivity, evaporation, percolation)
- Water application based on schedule rather than on evapotranportation needs

[2] Although the Comarca Lagunera itself is not in the Rio Grande/Rio Bravo basin, it is representative of dairy trends in northern Mexico. Much of the alfalfa produced in the Río Conchos basin is actually exported to the Comarca Lagunera.

5. There is potential for water conservation by improving the efficiency of alfalfa irrigation methods. Leveling land with laser technology can reduce the amount of water use for alfalfa by 20 to 30%. Other water conservation measures include more precise control of irrigation schedules and amounts.

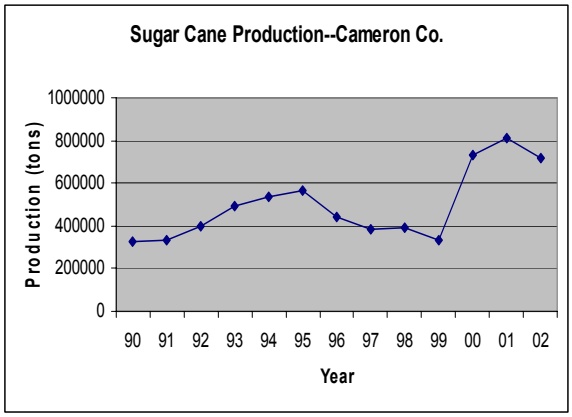
6. Some experimental data show that applying irrigation water at a depth of 1.6 meters produces a yield of 120 ton/ha of green alfalfa, compared to 70 ton/ha with application depth of 2.7meters.

7. Alfalfa producers need financial and technical assistance to improve irrigation methods, otherwise the price of improvements are too expensive for most farmers.

8. New Zealand, which exports about 80% of its dairy products, poses a growing competitive challenge to Mexican cheese exports.

Projected Sugar Industry Trends in the United States – *Andrew Schmitz*

1. Sugar cane production in south Texas has increased over the last decade. As water availability was reduced, there was a move from cotton to more profitable sugar cane cultivation.



2. Sugar is highly subsidized in the U.S. through import limits. The U.S. Federal Farm Program sustains the domestic price of sugar through Tariff Rate Quotas (TRQ) that limit the quantity of sugar that can be imported into the U.S.

3. The world sugar market is generally considered saturated.

4. The U.S. is involved in trade negotiations with several countries, some of which are major sugar producers and exporters. If sugar were to be included in these agreements, there is a possibility that the U.S. would have to increase the sugar

import quotas, creating a larger supply of sugar and therefore reducing the price paid to U.S. sugar producers.

5. The U.S. internal sugar price is set at a minimum of $0.18/lb. The world price of sugar is $0.07/lb.

6. A drop in sugar prices negatively affects the high fructose corn syrup market, which in turn hurts corn farmers in the U.S.

7. Under Tariff Rate Quotas, the U.S. has to import a minimum of 1.23 million tons of raw sugar cane. The maximum quotas are adjusted annually to insure the balance between the domestic supply and demand of sugar.

8. World sugar prices are near record low and will remain so for the near term unless there is a reduction in sugar exports. This is unlikely to happen since the European Union appears to have no immediate intention of changing sugar export policies and the U.S. sugar policies were set in the 2002 Farm Bill, which is to be in effect until 2007.

9. The two major sugar exporters in the world are the European Union and Brazil, and sugar production is heavily subsidized in both. The EU sugar produces get a price in excess of $0.30/lb of raw sugar. Brazil production has increased by more than 50 percent since 1990-1991. By way of government mandates, Brazil uses half of its sugar production for the production of ethanol, which represents an "implicit subsidy" to sugar producers.

Projected Pecan Production Trends in Mexico – Arturo Puente

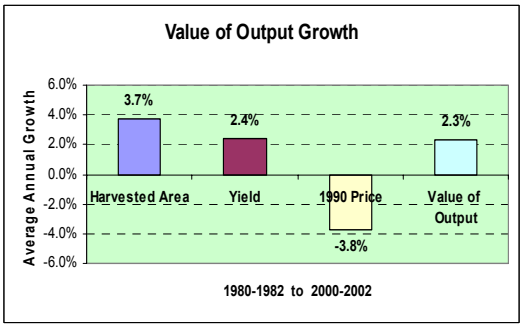
1. The State of Chihuahua is the major pecan production center in Mexico, accounting for between 50 and 60 percent of national production.

2. About 96 percent of pecans harvested in Mexico are irrigated; about 75% of the total is irrigated with groundwater.

3. On a national basis, harvested areas and yields have increased between 1980/82 and 2002, while real prices paid to producers have shown a steady drop.

Value of Output Growth

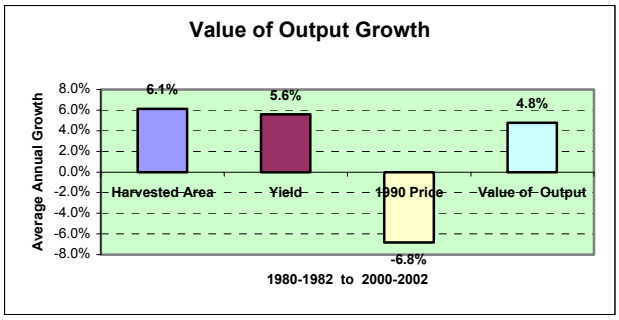
Average annual growth (log) in the value of output was 2.3%. The main source for this growth was a 3.7% increase in harvested area, and, to lesser extent, a yield increase of 2.4%. These positive growth rates compensated for a price reduction of 3.8%.



4. These same trends are seen in pecan production in Chihuahua.[3]

Value of Output Growth

Annual average growth in the value of output (log) was 4.8%. Both harvested area and yield growth were the main sources for this increase, 6.1% and 5.6%, respectively. These positive growth rates compensated for a price reduction of -6.8%.



5. In Chihuahua, it is estimated that 391.6 million of cubic meters (Mm3) (317,475 acre-feet) of water are use to irrigate 26,698 hectares (65,944 acres) of pecans. About 68.7% of the irrigation supply comes from groundwater wells, with the remainder from surface water.

6. The main producing regions for pecans in Chihuahua are Río Florido (Jimenez) (22% of harvested area) and Delicias (49%), both in the Río Conchos basin.

[3] The Río Conchos basin accounts for at least 71% of Chihuahua's total pecan harvested area.

7. In Delicias and Jimenez, pecans are a relatively profitable crop.

Delicias: Financial Budget, 2001

Pecans in the irrigated area of Delicias showed a net profit of Mex$ 5,556/ha (US$585/ha). Real return on capital was 25.3%, which is an attractive investment.

The main production cost item was machinery, 49.4%, while water cost represented 8.7%, when land rent is excluded.

DELICIAS. PECANS CROP IN SURFACE IRRIGATION AREA
INCOME ANALYSIS 2001. PRODUCER´S PERSPECTIVE

TOTAL REVENUE	Excluding Land Rent MX$/ha	%	Including Land Rent MX$/ha	%
TOTAL REVENUE	**22,500**	**100.0**	**22,500**	**100.0**
TOTAL PRODUCTION COST	**16,935**	**75.3**	**19,935**	**88.6**
NET PROFIT	**5,565**	**24.7**	**2,565**	**11.4**
TOTAL COST	**Excluding Land Rent** MX$/ha	%	**Including Land Rent** MX$/ha	%
I. TRADED INPUTS	**2,408**	**14.2**	**2,408**	**12.1**
FERTILIZERS	1,756	10.4	1,756	8.8
HERBICIDES	73	0.4	73	0.4
INSECTICIDES	579	3.4	579	2.9
II. DOMESTIC FACTORS	**5,644**	**33.3**	**8,644**	**43.4**
LABOR	2,500	14.8	2,500	12.5
WATER	1,481	8.7	1,481	7.4
LAND	0		3,000	15.0
INTEREST	1,663	9.8	1,663	8.3
III. MACHYNERY	**8,358**	**49.4**	**8,358**	**41.9**
TRACTOR/EQUIPMENT	8,358	49.4	8,358	41.9
IV. SERVICES	**525**	**3.1**	**525**	**2.6**
INSURANCE	525	3.1	525	2.6
TOTAL COST	**16,935**	**100.0**	**19,935**	**100.0**
RETURN ON CAPITAL (%)				
Nominal	**32.9**		**12.9**	
Real */	**25.3**		**6.5**	

*/ Nominal return deflated by the 2001/2002 inflation rate. 6.0%

Jimenez: Financial Budget, 2001

Pecans business in the irrigated area of Jimenez is even better than in Delicias. It showed a net profit of Mex$ 9,904/ha (US $1,042/ha). Real return on capital was 40.8%, which is a very attractive investment.

The main production cost item was machinery, 45.7%. No water cost needs to be accounted for (underground water), but the electricity (for pumping) cost share was 14.7% of production cost, when land rent is excluded.

JIMENEZ. PECANS CROP IN UNDERGROUND IRRIGATION AREA
INCOME ANALYSIS 2001. PRODUCER´S PERSPECTIVE

TOTAL REVENUE	Excluding Land Rent MX$/ha	%	Including Land Rent MX$/ha	%
TOTAL REVENUE	**30,000**	**100.0**	**30,000**	**100.0**
TOTAL PRODUCTION COST	**20,096**	**67.0**	**24,096**	**80.3**
NET PROFIT	**9,904**	**33.0**	**5,904**	**19.7**
TOTAL COST	**Excluding Land Rent** MX$/ha	%	**Including Land Rent** MX$/ha	%
I. TRADED INPUTS	**3,034**	**15.1**	**3,094**	**12.6**
FERTILIZERS	1,594	7.9	1,594	6.6
BIOLOGICAL CONTROL	1,110	5.5	1,110	4.6
INSECTICIDES	330	1.6	330	1.4
II. DOMESTIC FACTORS	**4,370**	**21.7**	**8,370**	**34.7**
LABOR	2,580	12.8	2,580	10.7
WATER	0	0.0	0	0.0
LAND	0	0.0	4,000	16.6
INTEREST	1,790	8.9	1,790	7.4
III. MACHYNERY	**9,179**	**45.7**	**9,179**	**38.1**
TRACTOR/EQUIPMENT	7,307	36.4	7,307	30.3
WELL/EQUIPMENT	1,872	9.3	1,872	7.8
IV. SERVICES	**3,513**	**17.5**	**3,513**	**14.6**
INSURANCE	565	2.8	565	2.3
ELECTRICITY	2,948	14.7	2,948	12.2
TOTAL COST	**20,096**	**100.0**	**24,096**	**100.0**
RETURN ON CAPITAL (%)				
Nominal	**49.3**		**24.5**	
Real */	**40.8**		**17.5**	

*/ Nominal return deflated by the 2001/2002 inflation rate. 6.0%

8. The primary facts on pecan production in Chihuahua are summarized below:

    - Chihuahua is the main producing State for pecans in Mexico.
    - Delicias and Jimenez are the main producing areas.
    - Underground water is the main source for irrigation.
    - Harvested area shows continuous growth.
    - Value of output growth is based on harvested area and yield increases.
    - Pecan production entails high water use.
    - But also: relatively high water productivity, high profitability and medium to low risk.
    - Pecan producers are primary actor in agricultural systems.

9. It is projected that pecan harvested area might reach 35,000 hectares (86,487 acres) in Chihuahua in the next 10 years, though water availability could be a limiting factor. The Delicias area aquifer is barely in balance, and there is already significant mining of Jimenez area aquifer (580 Mm3 annual withdrawals vs. 440 Mm3 estimated annual recharge).

10. Technological improvements, mainly more efficient irrigation techniques (drip irrigation system) will be necessary in order to maintain projected growth of pecan production. Currently about 32% of pecan producers in Chihuahua use drip irrigation, which can result in a 28 to 47% reduction in irrigation application rates. It is expected that most producers will make the shift to drip irrigation as water shortage become more critical. The high cost of technological improvements can be [at least partially] offset by the profitability of pecan production.

Summary of Q&A:

The discussion after the morning panel touched on several topics, including:

- Whether the pecan acreage for Chihuahua was potentially even greater than reported;
- The degree to which irrigation rates for pecans can be reduced, given the tree's inherent water needs;
- The extent to which eliminating the TRQ s for sugar in the U.S. would affect U.S. sugarcane production;
- Efforts in Mexico to investigate alternatives to alfalfa as a protein source for dairy cows and to provide producers with information on alternative, less-water intensive crops;

- The need to ensure that water conserved with irrigation efficiency improvements is not all used to expand irrigated acreage;
- The central fact that irrigation water is under-valued and thus its real cost is not factored into the agricultural production/crop selection equation; and
- The complexity and political difficulty of addressing water price distortions.

Keynote Speaker: *Roberto Newell*

1. The NAFTA vision for agriculture was a single integrated market, with each country focusing on its respective competitive advantages. This implied deep transformations in the agricultural sector in Mexico. The 2008 time frame was designed to provide transition time for making these adjustments.

2. For example, U.S. corn yields are significantly higher than in Mexico, but Mexico has higher wheat yields. The U.S. is quite competitive in sorghum, oranges, dry beans, among other products, while Mexico is competitive in sugar, avocadoes and bananas, among other products.

3. The results of the agricultural aspects of NAFTA have been mixed.

    - **Trade grew 80% to 33 billion**
    - **US agricultural balance of trade grew significantly:**
        - Exports grew over 60% to 15.7 billion
        - Imports doubled to 15.5 billion
    - **Mexico became 3rd largest export market for US and 2nd largest agricultural exporter to the US**

4. Mexican exports of various fruits and vegetables to the U.S. have increased significantly since NAFTA, but so have imports of such major products as maize (2300% increase between 1993 and 2000), beans and meat.

5. However, agricultural GDP in Mexico was relatively flat between 1994 and 2000 and foreign direct investment in Mexican agriculture has been far below expectations.[4]

6. Several factors are combining to place Mexico, including its agricultural sector, in a weak competitive position, including:

[4] Note: Mexico's agricultural GDP did grow by 3.9% in 2003.

- **Disappointing progress on Art.27 reforms**
- **Economic crisis of 1994 and its after-effects**
- **Relative strength of the peso**
- **Global economic slowdown starting in 2001**
- **Rising input costs, especially of oil and its derivatives**
- **Year 2000 political transition effects**
- **Lack of resolution of outstanding issues**

7. Both public and private financing for agriculture in Mexico have plummeted, from an estimated total of 46 billion pesos in 1994 to 13.5 billion pesos in 2002, a 70 % decrease (real 1993 pesos).

8. Other external factors currently in play include lack of progress in WTO agricultural negotiations; several agricultural trade disputes between the U.S. and Mexico (sugar/sweeteners; rice; chicken; beans; avocado; various phytosanitary measures etc.); reaction in Mexico to 2002 U.S. Farm Bill crop subsidies; effect of 9/11 on U.S. priorities; and border water disputes.

9. There are undeniable agricultural advantages for both countries under NAFTA. Nevertheless, as 2008 approaches there will be more potential for agricultural trade disputes, highlighting the need for better conflict resolution procedures. The 2006 reauthorization process for the U.S. farm bill will be quite important, and Mexico won't hesitate to offer its views.

NAFTA and Mexican Agriculture – Fernando Barceinas

1. Since the mid-1980s, Mexico's agricultural sector has been affected by several domestic reform initiatives and by trade agreements.
    a. 1986-1994 – **Mexico joints GATT**
        i. Permits to import agricultural products eliminated.
        ii. The majority of imported agricultural products where subject to tariff oscillating from 0 % to 20%.
    b. 1988-1999 – **Institutional Reform**. CONASUPO's[5] activities were reduced, eventually disappearing.
        i. Elimination of state-run organizations that were dedicated to the commercialization of sugar, tobacco and coffee.
        ii. 1991-elimination of price guarantees for wheat, sorghum, oat, sesame, safflower and sunflowers.
        iii. 1999-elimination of price guarantees for corn and beans.
        iv. Prices set in accordance with international market price.
        v. Reduction of rural credit subsidies.

[5] CONASUPO was a state-run enterprise that provided price supports for and purchased a variety of crops produced by small producers and helped maintain low consumer prices for basic staples.

c. 1991 – **Reforms to Art. 27 of the Constitution, reform of ejido land tenure system and creation of ASERCA** (technical support and subsidies for agricultural commercialization-see below)
    i. Abolishment of redistribution of land system.
    ii. Individual rights to ejidatarios
    iii. Allows for ownership of mercantile associations
d. 1994-2008 – **NAFTA. Creation of PROCAMPO** (see below)
e. 1995 – Creation of **Alianza para el Campo** (see below)

2. The three programs mentioned above where created to help producers:[6]

a. ASERCA
- Promotes marketing of various crops and in charge of PROCAMPO.
- Benefits a small number of producers (228,000 in 2003).
- Absorbed 15% of sector's public finance budget in 2003.
- Even though there is some support for the production of alternative crops, producers prefer not to take the risk and continue cultivating traditional crops like wheat, corn and sorghum.

b. PROCAMPO
- Provides direct payments to producers of basic crops.
- Provides compensation for loss of investment, subsidies and price supports (incentives to keep producing).
- 2.8 million producers and 14 million hectares enrolled in 2003.
- Absorbed 42% of agriculture sector's public finance budget in the period 1994-2000 and 35% in period 2001-2003.

c. Alianza para el Campo
- Set of programs to support producers with achieving their production potential.
- Each state is responsible for application of programs.
- Requires producer contribution.
- The objectives of this program were to foster producer investment, improve Mexico's agricultural trade balance, and enhance Mexico's food security.
- Absorbs 15% of sector's public finance budget.

3. Overall results of current agricultural support programs include the following:

a. Neither ASERCA nor PROCAMPO have improved productivity or fostered conversions away from basic crops to higher value, more specialized crops.

[6] For more information see http://www.infoaserca.gob.mx/ and www.sagarpa.gob.mx .

b. Alianza para el Campo and PROCAMPO have helped commercial growers to deal with credit crisis and take advantage of trade-related opportunities.
c. The programs have generally provided support to growers that already had a commercial orientation, but not to growers with commercial potential, much less to poor/small producers.

4. Some of the challenges for Mexico regarding its agricultural sector include:
    a. Reducing rural poverty.
    b. Coordinating the efforts of more than 10 public entities that have a share of the federal government's agricultural/rural development budget (one effort in this direction is the 2002 Law for Sustainable Rural Development.)
    c. Ensuring that the new decentralized *Financiera Rural*[7] creates a sufficient number of rural finance intermediaries, especially in the less-developed regions of the country.
    d. Designing policies that meet the diversified needs of Mexico's agricultural sector and that increase the sector's competitiveness.
    e. Dealing with producer pressure that has developed as a reaction to the 2002 Farm Bill in the U.S. The government's first response to this pressure, known as Blindaje Agropecuario,[8] was supposed to help producers diversify and become more competitive, but its effectiveness is not assured.

Adjustment Policies – Joe Outlaw

1. Overview of Agricultural and Food Policy Center at Texas A&M:
    a. The Center is a consortium that collects financial and production data from representative farms across US.
    b. It analyzes farm-level effects of policy decisions.
    c. The Center has a broad knowledge base useful to national farm policymakers.

2. The Center has one model farm in the Lower Rio Grande Valley. With cotton as the base crop, the farm's 2004-2008 outlook is classified as "vulnerable." The following table shows relative net profits on a model LRGV farm with irrigated cotton and sugarcane and dryland sorghum.

[7] See www.financierarural.gob.mx for more information.
[8] The "blindaje" is a series of measures designed primarily to reduce the costs to producers of various agricultural inputs, including diesel fuel; provide for additional, targeted price supports for certain crops and help integrate production chains.

Crop	Acres/per-acre Yield	Net Return	Total/acre
Irrigated sugar cane	225/40 tons	$ 3.34/ton	$ 133.60
Irrigated cotton	500/875 lb	$0.24/lb	$ 210.00
Dryland sorghum	1888/39.2 cwt	$ 1.35/cwt	$ 52.90

3. There is resistance among farmers to adjustment that involves crop switching, especially without an acreage base in more traditional crops such as cotton or grain sorghum. Investment in processing and transport facilities will also have a major influence on adjustment decisions (e.g. tie of LRGV sugar cane production to investment in LRGV sugar mill).

4. The 2002 Farm Bill allows significantly more flexibility for farmers to plant whatever crops they like and receive:[9]
    a. Direct payments
    b. Marketing loan gains/loan deficiency payments
    c. Counter-cyclical payments

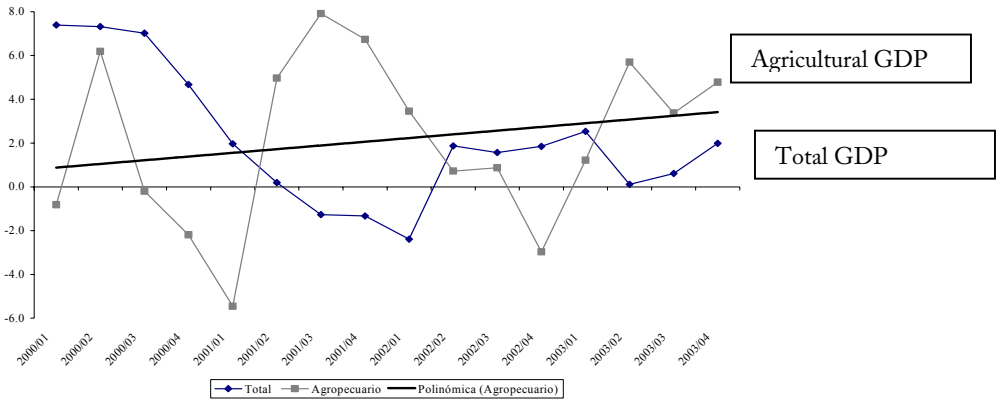
5. This structure has the potential to encourage water conservation and better land and pest management by not inadvertently forcing farmers to plant and irrigate certain crops.

6. There could be major shifts in planting on the horizon, with upcoming revisions of the 2002 Farm Bill and increasing controversy over sugar and cotton in trade negotiations. Revisions to the Farm Bill could begin as early as late 2004/early 2005. There are likely also to be cuts in FY 06 payments because of the federal budget deficit.

Mexico's Farm Sector 2004 Situation – Ernesto Cervera

1. At a macro-level, 2003 was a relatively good year for the agricultural sector in Mexico. The agricultural Gross Domestic Product grew by 3.9% compared to 1.3% growth in total GDP. However, this growth was not enough to rejuvenate employment in the sector. Moreover, the growth has largely been a function of commodity prices rather than production increases tied to agricultural reforms.

[9] For details on the crop subsidy portions of the 2002 Farm Bill, see http://www.ers.usda.gov/Features/farmbill/titles/titleIcommodities.htm.



2. Even with the continuous decline of credit / loans to the agriculture sector, the agricultural trade deficit decreased in 2003 and average profitability increased slightly.

3. Public financing of the agriculture sector decreased by 9% – 10% in 2004 compared to 2003, though there was a slight increase of public financing for rural development.

4. Political paralysis in the Mexican Congress has stalled important agricultural reform initiatives, including those related to: regulating the introduction of genetically-engineered crops; responding to emergencies in some sectors of the agricultural economy; nutrition labeling; and reform and capitalization of the PROCAMPO producer payment program.[10]

5. Mexico's agriculture sector still faces many of the same problems that have plagued it for years: lack of markets, lack of clarity and coordination among various government support programs, lack of inter-governmental cooperation and lack of incentives.

6. There is a high degree of heterogeneity in the Mexican agricultural sector, requiring tailored and diversified solutions.

7. Investments will be required for conversion in the agricultural sector. Relative price differences are not enough to force change. Investments are required to:

   - Develop businesses providing services and products to the agricultural sector
   - Increase training and capacity
   - Improve rural quality of life
   - Develop urban-rural networks [for marketing]
   - Provide social services and infrastructure
   - Improve agricultural financing

[10] PROCAMPO includes direct payments, subsidies, price supports and loss compensation for producers.

Summary of Q&A:

The discussion following the afternoon panel touched on several topics, including:

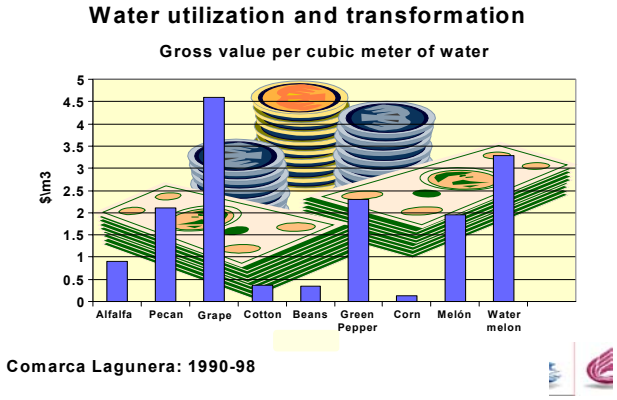
- Potential developments in the U.S. Congress on farm bill issues after the 2004 Presidential election;
- Potential U.S. response to WTO ruling in cotton case brought by Brazil;
- Treatment of conservation payments under WTO and other trade agreements;
- The perennial nature of major water consuming crops in the Río Grande/Río Bravo basin and how that makes rotation/conversion more difficult;
- The effect of agricultural subsidies on water use.

Rational Use of Water in Rio Grande Basin – Dr. Jesus Moncada

1. Most of Mexico's water is in the south of the country but most of the people and agricultural production is in the relatively arid north.

2. Fair and effective water pricing is critical to good water management.

3. INIFAP has focused on characterizing water value vis a vis the type of crop produced, through the use of a "net benefits" analysis. The following present this analysis for the Comarca Lagunera and two of the main irrigation districts in the Río Conchos basin.



NET BENEFIT ANALYSIS - WATER PRODUCTIVITY AND CROPPING PATTERN FOR IRRIGATION DISTRICTS IN CHIHUAHUA

DR. 05 DELICIAS

Traditional pattern							INIFAP pattern					
Crop	Gross water depth	Yield	Area	Net Benefit	Gross Volume	Water Productivity	Gross water depth	Yield	Area	Net Benefit	Gross Volume	Water Productivity
	cm	t/ha	ha	$	m^3	Kg/m^3	cm	t/ha	ha	$	m^3	Kg/m^3
COTTON	173.1	3.5	1,458	5,451,462	25,236,522	0.20	107.1	3.8	1,458	8,558,460	15,621,429	0.35
PEANUTS	174.7	3.5	1,561	5,017,054	27,276,914	0.20	121.4	3.5	1,561	5,017,054	18,955,000	0.29
GREEN PEPERS	295.8	25	2,388	16,462,872	70,646,592	0.85	171.4	30	2,388	37,954,872	40,937,143	1.75
ONION	276.7	35	575	3,151,575	15,910,825	1.26	164.3	45	575	8,901,575	9,446,429	2.74
MAIZE	131.3	48	1,592	7,800,800	20,895,000	3.66	78.6	50	1,592	8,596,800	12,508,571	6.36
ALFALFA	295.0	16	7,741	62,028,633	228,336,277	0.54	185.7	16	7,741	62,028,633	143,761,429	0.86
PECANS	222.3	1.5	3,088	34,678,240	68,633,888	0.07	171.4	1.8	3,088	52,279,840	52,937,143	0.11
WATERMELON	130.0	25	940	4,712,220	12,220,000	1.92	107.1	30	940	8,237,220	10,071,429	2.80
GRAPES	203.4	18	219	5,207,820	4,454,022	0.89	128.6	18	219	5,207,820	2,815,714	1.40
Total			19,562	144,510,676	473,610,040				19,562	196,782,274	307,054,286	
	Benefit/m^3	0.31					Benefit/m^3	0.64				
							Water savings	166,555,754 m^3				

D.R 090 BAJO RIO CONCHOS

Traditional pattern							INIFAP pattern					
Crop	Gross water depth	Yield	Area	Net Benefit	Gross Volume	Water Productivity	Gross water depth	Yield	Area	Net Benefit	Gross Volume	Water Productivity
	cm	t/ha	ha	$	m^3	Kg/m^3	cm	t/ha	ha	$	m^3	Kg/m^3
COTTON	145.0	3.5	220	984,500	3,190,000	0.24	110.00	3.5	22.0	82,258	242,000	0.32
RYE GRAS	285.4	35	500	642,000	14,269,000	1.23	185.00	48	742.0	3,364,228	13,727,000	2.59
MAIZE	110.0	45	80	332,000	880,000	4.09	85.00	48	18.0	1,283,436	153,000	5.65
ALFALFA	289.0	16	1,010	8,093,130	29,189,000	0.55	185.00	16	1,010.0	3,245,130	18,685,000	0.86
PECANS	226.0	1.3	174	1,292,820	3,932,400	0.06	180.00	1.6	174.0	2,284,620	3,132,000	0.09
OTHERS	166.0	25	100	501,300	1,660,000	1.51	150.00	30	10.0	114,640	150,000	2.00
Total			2,084	11,845,750	53,120,400				1,976.0	10,374,312	36,089,000	
	Benefit/m^3	0.22					Benefit/m^3	0.29				
							Water savings	17,031,400 m^3				

4. INIFAP is examining various options for increasing water use efficiency.

CATEGORY	OPTIONS
Management	Water - Decision support system, inter institutional projects. Irrigation districts optimization.
Engineering	Irrigation methods, water use efficiency, climatology.
Agronomic	Minimum tillage, crop breeding, planting methods.

5. On-going improvements in the Delicias district are designed to improve efficiency from the current 35% to 47%.
6. INIFAP is also researching irrigation efficiency techniques for alfalfa.

Component	Traditional technology	INIFAP technology
Irrigation system	Surface	Buried drip tape
Irrigation interval (days)	One irrigation after each harvest	One deficit irrigation every three days
Dry forage yield (Ton/ha /year)	14-16	22-24
Yearly volume applied (m^3/ha/year)	18,000-21,000	14,000-16,000
Water productivity (kg dry forage/m^3)	0.77	1.53

7. High-energy corn silage may provide a viable partial substitute to more water-intensive alfalfa in the dairy cow diet. INIFAP is investigating this possibility in cooperation with producers in the Comarca Lagunera area.

8. INIFAP's research on pecan irrigation has also shown increased water use efficiencies are attainable, though with some yield loss. INIFAP is conducting similar research on cotton, watermelons, vegetables and fruit.

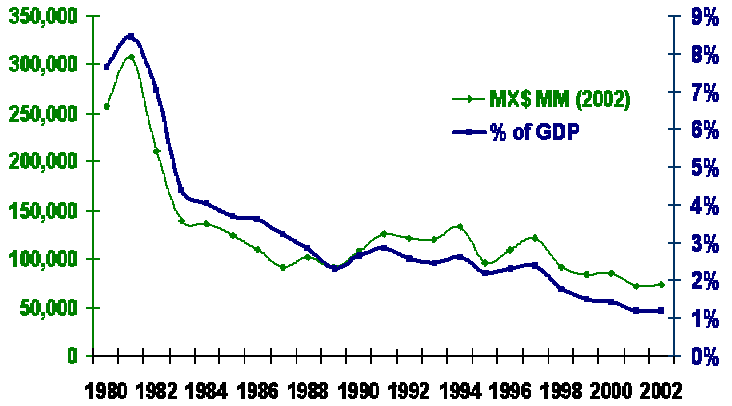
9. INIFAP supports increased binational collaboration to improve water management in the Río Grande/Río Bravo basin, including the use of decision-support systems, promoting conversion to less water-intensive crops and research on wastewater management and reuse.

10. From a broader perspective, trade forces and other economic drivers will increase pressures on the rural sector. Institutions like INIFAP will have to respond appropriately, including investigating new areas such as carbon sequestration, payment for ecological services and better use of innovative efficiency indicators.

Rio Grande / Rio Bravo Basin: Role of Governments – Raul Rodriguez

1. Mexico has not grown in GDP, while its poorer cousins of 40 years ago (Spain and Portugal) have doubled or tripled their GDP.

2. The Mexican federal government's investment in infrastructure has been declining since the early 1980s:



3. There is an estimated $ 25 billion/year in infrastructure investment needs in Mexico, with $3.5 billion needed for water and wastewater. Current funding is only about 30% of this level, and private investment has not made up the gap. In 2003, Mexico ranked 29th out of 30 countries in terms of infrastructure as a key component of competitiveness.

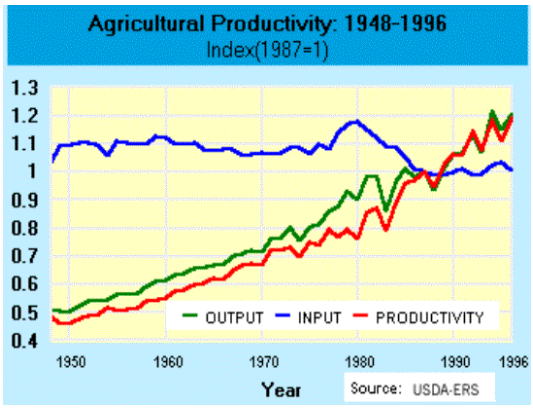
4. Investments are being made in water and wastewater development in the Rio Bravo/Rio Conchos Basins. While NADBank's overall grant to loan ratio has improved (from 24:1 in 2000 to 5:1 in 2004), the potential for loans for irrigation conservation financing in Mexico portion of the Rio Grande is extremely limited.

5. State and municipal reforms are necessary for good use of money and success of projects. For example:
    a. State / municipal reforms to enhance credit rating and capacity:
        i. Regulatory and contractual
        ii. Property rights
        iii. Pricing and administrative
        iv. Labor and political
    b. Independent utilities
    c. Municipal financial market

6. Overall, there is significant infrastructure crisis limiting growth and development (agriculturally and, generally, economically) in Mexico. Some of the problem can be solved with more money, but better use of the money through political and private sector reforms is also critical.

Conservation Programs Under the U.S. Farm Bill– Wayne Maresh

1. Research and development has improved productivity in U.S. agriculture, with both positive and negative environmental effects. For example,
    a. The average irrigation application rate has dropped 25% since 1969 (though irrigated acreage has increased).
    b. Salinity in Colorado River Basin has been reduced.
    c. More erodible land has been been taken out of production and new wetlands have been created.
    d. The use of agricultural chemicals has created water quality issues and concentrated animal feeding operations also present environmental issues.



2. The U.S. farm bill conservation programs are designed to achieve environmental goals and with sufficient flexibility to be adjusted to regional and even local needs.

3. Through a variety of programs, the USDA offers help to achieve environmental conservation in several forms, including research and development; education; technical and financial support and market incentives. The Natural Resource Conservation Service (NRCS) provides technical and financial assistance to farmers across the country and it manages several voluntary conservation programs, including a program for improving conditions in small watersheds.

4. The 2002 Farm Bill significantly increased authorized funding for voluntary conservation practices by farmers. Tools include funding for implementation of specific conservation practices, buying development rights and rewarding conservation practices. Among the key programs:
    a. **Environmental Quality Incentives Program** (EQIP) funding water conservation and other practices, with a FY 2003 budget of approximately $500M and 30,000 farmers.
    b. **Wildlife Habitat Incentives Program** (WHIP) funding creation of on-farm wildlife habitat for threatened and endangered species, with a FY 2003 budget of approximately $16M and 30,000 acres enrolled.
    c. **Conservation Security Program** (CSP) rewarding good overall land and resources stewardship in priority watersheds.
    d. **Wetlands Reserve Program** (WRP) purchasing land for the creation of wetlands. Three million acres of wetlands have been created since the inception of the program in 1985.
    e. **Conservation Reserve Program** (CRP) retiring land for over a decade to ease pressure on surrounding areas and restore floodplains. Currently there are 651,000 CRP contracts, retiring over 35 million acres.
    f. **Grassland Reserve Program** (GRP) preserving and creating grasslands. Currently 800 contracts covering a total of 241,000 acres.
    g. **Farm and Ranch Land Protection Program** (FRPP) purchasing development rights so the land stays in agricultural use (300,000 acres on 1400 farms to date).

5. At least three principles could be put into play to strengthen the voluntary approach to conservation in the trans-boundary Río Grande basin:
    a. Support for improved science on water quality and quantity;
    b. Emphasize development and transfer of technology that sustains the use of natural resources as well as the economy; and
    c. Document the environmental and economic performance of conservation practices and systems.

6. Other needs include determining the incentives that will help producers adopt conservation practices and improving the ability of conservation programs to address critical water resource issues over larger geographical or watershed scales.

Concluding Discussion Session:

The concluding discussion brought out several issues and questions, including:

- Mexico's lack of farm conservation programs, especially at the significant level of funding as those in the U.S. farm bill;
- The continuing and widespread need for technical and extension-type services for Mexican farmers and whether retired USDA/NRCS personnel would be interested in helping provide such services in conjunction with Mexican colleagues/agencies;
- Opportunities for information exchange among irrigation districts and the potential roll for BECC/NADBank in fostering such exchanges (analogy to NADBank's Utility Management Institute which provides training to municipal utility managers); and
- Use of remittances (money sent home from Mexican migrants working in the U.S.) to help fund agricultural improvements (possibly via rural credit unions).

III. Observations and Recommendations

The presentations and discussions at the conference lead to the following observations and recommendations for consideration by the U.S. and Mexican federal and state governments, as well as interested stakeholders throughout the trans-boundary basin.

Production of at least three water-intensive crops grown in the trans-boundary Río Grande/Río Bravo basin (alfalfa, pecans and sugar cane) is unlikely to decrease in the near term. In fact, available information indicates that production of these crops is increasing, though water availability may be a limiting factor. In the Río Conchos basin, pecans are relatively profitable, making them an attractive crop for those producers that can afford the initial investment required. The dairy industry is growing in northern Mexico, and provides a steady market for alfalfa grown in the Río Conchos basin. While less profitable than pecans, alfalfa is still more viable than corn or sorghum, primarily due to competition from U.S. imports. During the last few years, when water availability was limited, many farmers in the Lower Rio Grande Valley shifted water away from cotton to sugar cane and production increased.

Sugar cane is the only one of the three-water intensive crops that might be significantly affected by changes in trade or subsidy policy. There are differing views of how U.S. sugar cane production would be affected by pending and possible trade agreements or

changes in U.S. domestic sugar policy, but it is the only one of the three crops examined where irrigated acreage might be more immediately affected.

Subsidies (whether through price supports, import quotas, direct payments, reduced costs of agricultural inputs or otherwise) can drive production decisions toward inefficient water use. The effect of subsidies on water use, especially in over-taxed basins such as the Río Grande/Río Bravo, should be factored into policy decisions on the level, form and duration of subsidy programs in both countries. More research on this subject would also contribute to better government decision-making on subsidy issues.

Because irrigated agriculture accounts for such a significant portion of water use in the trans-boundary Río Grande/Río Bravo basin, the governments must make significant investments and provide more technical assistance to help producers reduce water use and become more competitive and efficient. These challenges are present on both sides of the border, but they are particularly acute in Mexico, where public funds available for assistance to the agricultural sector have been severely reduced over the last few decades. Without government investment to help producers address water management issues, trans-boundary water crises and disputes are sure to recur.

However, it is crucial that water savings from irrigation efficiency improvements are not merely used to open new irrigated acreage. Instead, there must be clear and enforceable mechanisms for ensuring that the conserved water can be used to meet other human and environmental needs, as appropriate.

While increasing the price of water used in irrigation would effect more immediate changes in practices, doing so is complex and politically difficult. Nevertheless, the governments would be well served by fostering more of "water productivity" type analyses being conducted by INIFAP and others. A better understanding of the value produced by water used for irrigation can be a precursor to creating markets for voluntary leases or sales of water to meet municipal or environmental needs.

The perennial nature of the three major crops makes conversion to other, less-water intensive crops more difficult. Nevertheless, there may still be potential to assist farmers in moving away from alfalfa or sugar cane to higher value fruit and vegetable crops, especially those that are competitive in the North American market. However, these conversions will not happen without substantial financial and technical assistance to producers and improvements in marketing and distribution systems.

The 2002 U.S. Farm Bill's conservation programs may provide a model for consideration by Mexican policymakers. With adequate funding, such conservation programs applied in the Mexican portion of the Río Bravo could help farmers conserve water, take marginal land out of production and restore wildlife habitat, wetlands, riparian areas and grasslands. The habitat restoration programs might also provide an impetus for

development of hunting, nature tourism or other alternative sources of income for rural communities (such as payment for ecological services).

The governments, agricultural producers, academic institutions and non-governmental organizations should find more opportunities to promote cross-border exchanges among agricultural and natural resources experts and to promote irrigation technology transfer.