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economic perspectives on Arizona's agriculture and natural resources

THE UNIVERSITY OF ARIZONA.

Dean Lueck

An Interview with the New Bartley P. Cardon Professor

Russell Tronstad

We welcome Dr. Dean Lueck as the Bartley P. Cardon Professor in the Department of Agricultural and Resource Economics (AREC), College of Agriculture and Life Sciences (CALs), University of Arizona. Dean received his first "welcome" to Arizona in the early 1980s when he was brought in from Idaho to fight forest fires on the Tonto National Forest near Lake Roosevelt. A couple days after working the fire lines, Dean's group met up with a local Arizona hotshot crew that invited them to get together that evening to share a few spirits and stories. As the Idahoans sat waiting in a local motel, the door suddenly flew open and the local hotshots tossed what looked and sounded like a live rattlesnake at Dean. His sense of touch confirmed that it was indeed a six-foot rattlesnake—albeit a dead one. The "redneck" locals had gone into the forest with flashlights to capture and kill the reptile before throwing it on Dean's lap. The incident was a memorable introduction to the 48th state.

In spite of this unforgettable experience, Dean continued on with his firefighting to become a smoke-jumper in the summers while he furthered his college education during the academic school year. He received formal training at Gonzaga University (1980 B.A., *magna cum laude*, biology) and the University of Washington (1987 Ph.D., economics). Dean has conducted extensive research in law and economics and contract economics with emphasis on applications in agriculture and natural resources, and has published articles in the *American Economic Review*, the *American Journal of Agricultural Economics*, the *Journal of Law and Economics*, the *RAND Journal of Economics*, and many

other journals and books. His most recent appointment was as professor of agricultural economics at Montana State University in Bozeman. In 1994–1995 he was a John M. Olin faculty fellow in law and economics at Yale Law School. He has also been a visiting scholar at Cornell University (2000) and was a visiting professor at Universitat Pompeu Fabra in Barcelona, Spain (2001). He was visiting professor of law at the University of Virginia School of Law from 2002–2003. He is the author of *The Nature of the Farm:*

Contracts, Risk, and Organization in Agriculture (MIT Press, 2003). The following interview provides more background on Dean's interests and experiences plus some insights into his aspirations for the Cardon Chair.

Arizona Review. *What are some of your experiences and interests that attracted you to the Cardon Chair position?*

Lueck. I was attracted to the position for a variety of reasons. First, many of my current colleagues in AREC have skills and interests that complement mine as do the issues that are important to Arizona. Throughout my career, my work has been at the intersection of agriculture and natural resource issues. Research issues facing Arizona like farmland conversion, urban expansion, water management and policy, federal land management, impacts of endangered species regulations, agricultural production on tribal lands,



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Arizona Review Economic Perspectives on Arizona's Agriculture and Natural Resources

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Welcome

to our third issue of the *Arizona Review*. The *Review* is published biannually (spring and fall) by the Department of Agricultural and Resource Economics and the Bartley P. Cardon Endowment in Agricultural Economics and Policy. Our aim is to provide a practical and reasoned economic perspective on farming and ranching, agribusiness, food, and resource issues. We appreciate the feedback and interest that has been received from you on our first two issues.

In this issue, Dr. Dean Lueck, incoming Bartley P. Cardon Professor, provides some insights into his interests, background, and aspirations for the Cardon Chair. We pay tribute to our colleague and friend Eric Monke, who died from multiple sclerosis on November 18, 2003. Three articles examine our economic relationship with Mexico, focusing on border water quality, cross-border agribusiness trade, and the impacts of NAFTA. Finally, we provide the latest installment of the *Review's* regular feature: an overview of Arizona's agricultural situation.

In upcoming issues we have plans to interview Dr. Jimmie Hillman (professor emeritus and head for many years of our department), Dr. Harry Ayer (recent retiree and founding *Review* editor), and others. As new editors of the *Review*, we look forward to receiving your comments and feedback.

—Russell Tronstad and George Frisvold
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ArizonaReview
economic perspectives on Arizona's agriculture and natural resources

NAFTA's Tenth Birthday

¿Cumpleaños Feliz?

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The North American Free Trade Agreement (NAFTA) recently celebrated its tenth birthday. But few seem to be celebrating. Since the prolonged economic growth of the 1990s has subsided, some politicians have begun to fault trade agreements for causing the flight of blue- and white-collar jobs to destinations outside the United States. Other observers, lamenting the malaise of globalization, view trade agreements as yet another symptom of national governments kowtowing to multinational corporations. Despite the attention paid to NAFTA on its tenth birthday, there seems to be little effort to measure NAFTA's effects on aggregate trade between Canada, the United States, and Mexico. In this article, we attempt to measure these effects.

Evaluating the Effects of NAFTA

Not surprisingly, observers view NAFTA with suspicion or affection depending on their location and source of employment. But to evaluate the track record of NAFTA, let's recall some fundamental but often ignored points: *NAFTA reduced trade restrictions in three countries over an extended period.*

Although NAFTA is often portrayed as a once-and-for-all "one-way" street or even dead end, the trade agreement is, in fact, a gradual "three-way" street. As figure 1 indicates, trade flows in *both* directions between *all three* countries. However, NAFTA's impact has not been uniform across all countries given the differences in size of the domestic economies. As of NAFTA's tenth birthday, most trade restrictions have been removed but some tariffs require a full 15 years before they are completely gone. The most lengthy phase-outs are for the agricultural sector in order to promote a stable transition for displaced farmers in Mexico.

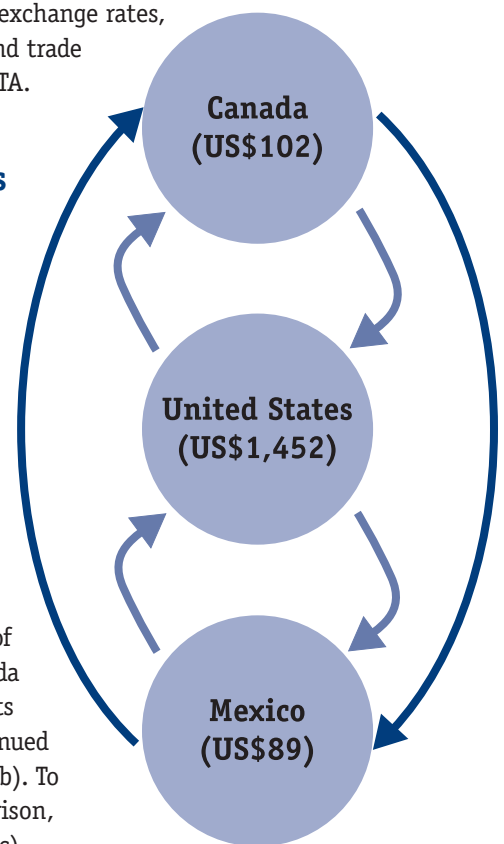
The foregoing suggests that an honest appraisal of NAFTA should first attempt to measure how *trilateral* trade flows have changed through time, before and after NAFTA.

Another fundamental point is that events occurring after NAFTA, whether viewed as good or bad, may not have occurred because of NAFTA. Put simply, *Changes in trade after NAFTA may not have been caused by NAFTA.*

This suggests that a comparison of trade flows before and after NAFTA should not attribute the observed patterns solely to NAFTA. Perhaps it is obvious, but there are a multitude of other trade and macroeconomic factors affecting trilateral trade between Canada, the United States, and Mexico. Statistical methods are applied to disentangle trade-agreement effects from the impacts of changing exchange rates, growing aggregate incomes, and trade among nations outside of NAFTA.

Changes in North American Trade Flows

Before trying to sort out the effects of NAFTA from other economic events, let's look at North American trade before and after NAFTA. The three panels of figure 2 show apparent changes in trade between the three countries. Trends in U.S.-Mexico trade suggest both exports and imports have increased at a quicker pace with the advent of NAFTA (Figure 2a). Since the passage of NAFTA, U.S. imports from Canada have increased but U.S. exports to Canada appear to have continued at the pre-NAFTA rate (Figure 2b). To complete the trilateral comparison, Mexico-Canada trade (Figure 2c) appears to have gained momentum after NAFTA, with imports increasing more markedly than exports.



Arrows Indicate Export-Import Flows.
Note: Figures in parentheses are gross domestic product for 2002 in billions of 1982-1984 dollars.

Fig. 1 NAFTA Trade Flows

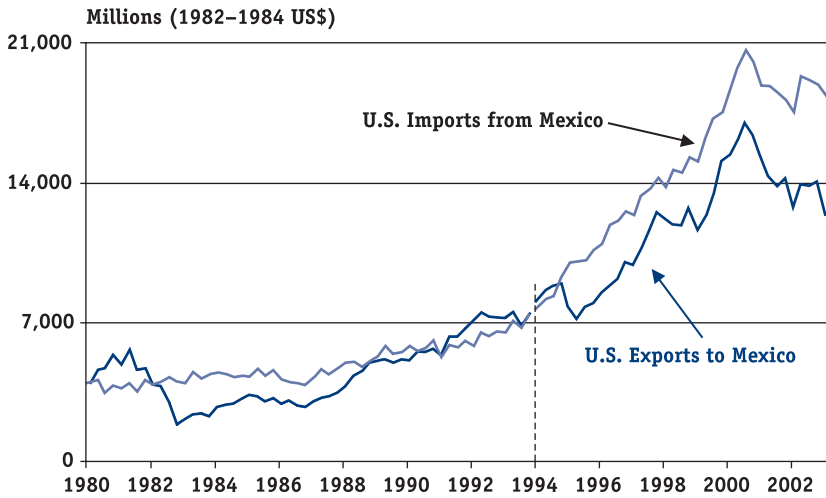


Fig. 2a U.S.-Mexico Trade Flows

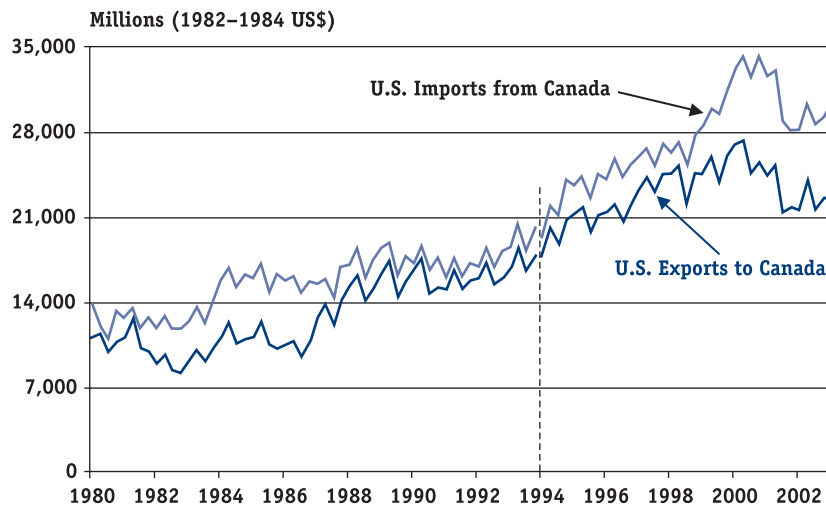


Fig. 2b U.S.-Canada Trade Flows

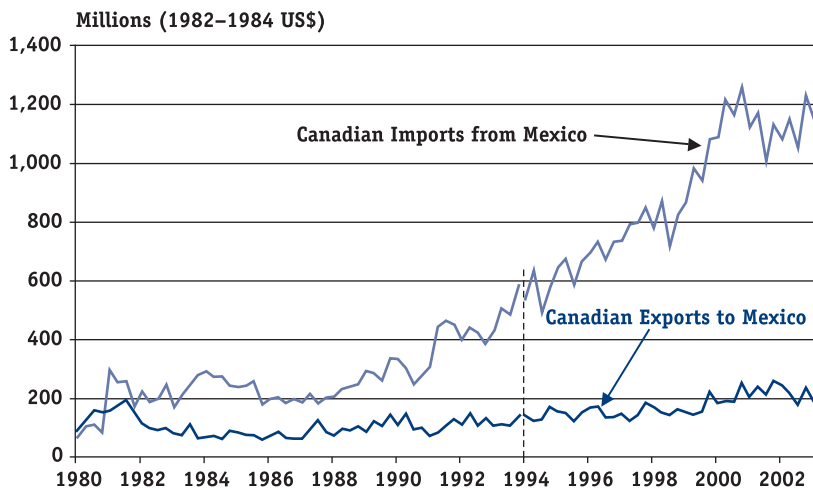


Fig. 2c Canada-Mexico Trade Flows

In the aggregate, trade flows between the three countries have apparently increased in the post-NAFTA era. But what were the causes of these increases? Would they have occurred even if NAFTA had not been implemented? We now turn to answer some of these questions.

Were Changes in Trade Flows Due to NAFTA?

We have just seen that North American trade has expanded substantially in the post-NAFTA era. Unfortunately, we have no economics laboratories in which free trade can be compared with protectionist policies for the same economies at the same time. Although economists cannot conduct controlled experiments, we often employ “econometric” models, which combine economic theory and statistics, in an attempt to “control” statistically the factors which would be held constant in a laboratory experiment.

For purposes of modeling changes in trade, we employ trade and macroeconomic data in our econometric model. We use data that measure gross domestic product (GDP) and GDP per capita to control for aggregate demand in each NAFTA country. The larger the economy as measured by GDP, the larger the demand for imported products. GDP per capita serves as a measure of consumer wealth. Wealthier consumers have less restrictive budgets and, therefore, can purchase more consumer goods, domestic and imported.

Changes in exchange rates are also included in our econometric model to account for the purchasing power of an importer’s currency. When an importer’s currency devalues against the exporting countries’ currency, the importer must spend more domestic currency on imports.

So far, we have ignored the impacts of trading partners outside of NAFTA. But we know trading partners excluded from NAFTA will find their products more competitive with NAFTA products when their currencies depreciate in value relative to NAFTA currencies. To account for some of the costs of trading, we use real exchange rates for two purposes: first, by capturing the purchasing power of currencies, real exchange rates act as the “price” of imports; and, second, real exchange rates measure changes in the competitiveness of other trading partner nations’ products relative to NAFTA products.

To summarize, our econometric model controls for three types of effects independent of NAFTA: the effects of income on demand in NAFTA importing countries, exchange rate effects between NAFTA trading partners, and exchange rate effects between NAFTA and non-NAFTA trading partners. Once these effects are taken into account, any remaining changes observed in imports from NAFTA partners are attributed to the effects of NAFTA itself.

The results of our econometric model indicate NAFTA has increased North American trade in the aggregate. But our modeling results are mixed.

The United States and Mexico are the largest beneficiaries: on average, NAFTA accounted for a 15.2 percent increase in U.S. imports from Mexico while U.S. exports to Mexico grew by 17.8 percent. U.S.-Canada trade was influenced less in percentage terms by NAFTA. U.S. imports from Canada grew by 8.4 percent while U.S. exports increased 9.8 percent as a result of NAFTA. But remember, U.S. imports from Canada averaged over twice those from Mexico during the 1990s. Perhaps surprisingly, our model failed to detect any statistically significant effects of NAFTA on Mexico-Canada trade.

Zero Sum versus Expanding Economic Pies

The unheralded news at NAFTA's tenth birthday is that trade flows—especially U.S.-Mexico and U.S.-Canada trade—have largely expanded as a result of NAFTA. And the magnitudes of the expansion are not just modest; they are appreciable and substantial.

Then why is there such small cause for celebration? Perhaps many observers have lost sight of a subtle but extremely important point: the size of the economic pie in all three countries has grown as a result of NAFTA. This is undoubtedly true in the case of Mexico due to the currency crisis at the end of 1994 that caused a contraction in GDP of 7 percent. After 1994, Mexico's economic recovery was closely linked to export markets in the United States and Canada.

Figure 3 gives an idea how each country's GDP has performed through time. In the post-NAFTA period, all three countries have experienced growth in GDP, with Mexico's GDP increasing at the most rapid rate following its currency crisis of 1994. Not all this growth in GDP for each country is due exclusively to enhanced trade. But North American trade since 1994 has clearly contributed to this growth.

International trade stimulates economic growth by offering more markets for selling intermediate and final products. International trade also permits firms to buy cheaper inputs and manufacture more goods at lower prices. And consumers, often unknowingly, have a wider array of cheaper goods to purchase as a result. These are not glamorous or newsworthy events but they are, in fact, the bricks and mortar with which economic growth is built.

Some NAFTA critics insinuate that trade which creates economic growth must necessarily make someone worse off. These critics imply that trade is a zero-sum game. Critics often find liberalized trade any easy target because many benefits of trade go unnoticed to consumers in the form of cheaper prices. But the track record of NAFTA belies the idea of zero-sum growth. The economic pies of all three North American

economies have expanded, at least in part, because of liberalized trade in North America.

Economic Growth: Winners and Losers

Economic growth, whether as a result of trade, research and development, or entrepreneurial drive, results in winners and losers. Joseph Schumpeter, an Austrian economist, aptly coined these processes of economic growth as "creative destruction." Economic growth always generates winners and losers. Some firms generate huge profits while others go bankrupt. Some consumers enjoy larger incomes while others struggle in poverty. But in focusing on the winners and losers, we should not lose sight of the economic growth created by freer trade in North America.

Instead of blaming freer trade, economic growth, and globalization for the plights of economic losers, governments and politicians could attempt to harness the fruits of economic growth—higher incomes for consumers and more profit for firms—in order to provide social services to ease the economic pain inflicted by growth. Social services are typically the public goods in which only governments are willing to invest. Enhanced education and training, improved health services, and interim economic relief can provide those most harshly affected with the means to becoming more productive workers in a changing global economy. **AR**

Gary D. Thompson conducts research on international trade, agribusiness, and consumer demand. His empirical studies range from the aggregate demand for imports to the retail demand for perishable food products such as bagged salads, organic milk, and fresh tomatoes.

Ricardo Cavazos Cepeda is a Ph.D. student in the Department of Agricultural and Resource Economics at the University of California at Berkeley. His research interests include international trade and development, in particular, the analysis of the effects and impacts of the North American Free Trade Agreement on its members.

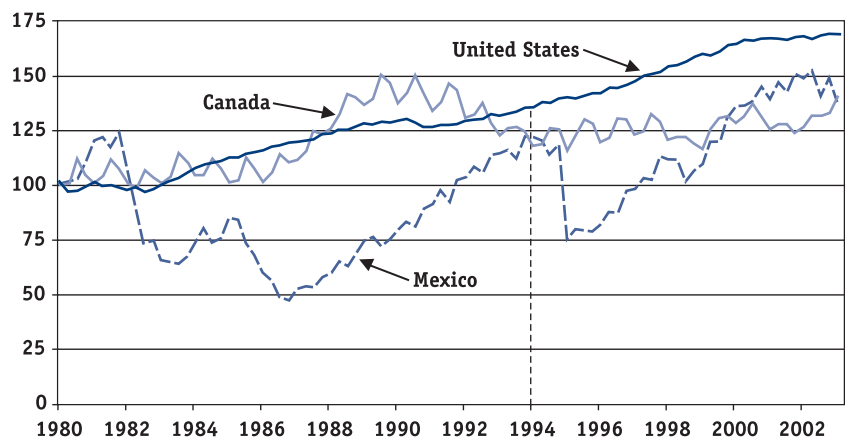


Fig. 3 Indices of Real Gross Domestic Product

Tourism and Cross-Border Trade

A Tale of Synergism

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U.S. agricultural trade with NAFTA partners has grown at a much faster pace in the last decade than with other developed countries such as Japan, Taiwan, and the European Union. Close proximity between NAFTA countries and the phase-out of duties and nontariff trade barriers has allowed for a rapid expansion of trade despite transportation bottlenecks at the border and ongoing trade disputes for some commodities. U.S. agricultural imports from Mexico and exports to Mexico have increased 85 percent and 88 percent going from a 1990–1992 average to levels in 2003, as described in figure 1. Some commodities have experienced tremendous growth in trade over this period. For example, exports of seeds, cotton, vegetables, and beef products to Mexico have increased by 419 percent, 352 percent, 202 percent, and 185 percent. Figure 2 shows how these commodities are the largest components of

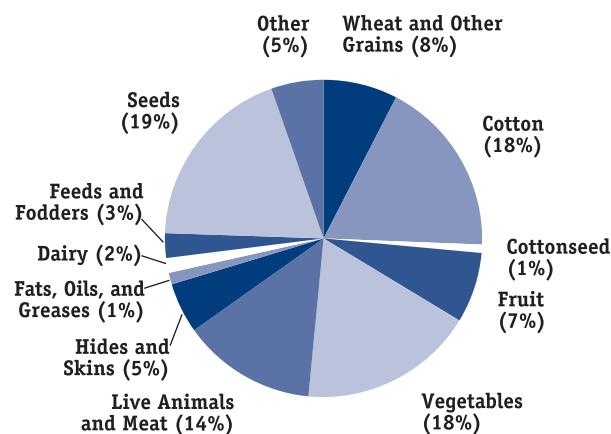


Fig. 2 Composition of Arizona's Agricultural Exports (\$464 million), 1999–2002 Average

Arizona's exports to all countries for 1999–2002 fiscal years. Increases in agricultural trade flows have been in both directions since imports of beverages, fruits, and vegetables from Mexico are up 471 percent, 123 percent, and 96 percent over the period described in figure 1.

While much of the U.S.-Mexico trade has been generated by states along the border, some states and communities have fared better than others at attracting cross-border trading activities. As shown in figure 3, Arizona has not fared as well as other Southwestern border states at increasing its agricultural exports to all destinations over the last decade. What kind of policies, activities, and firms should be targeted for attracting more regional trade?

Cross-border agribusiness tours and venture visits have been used as a vehicle to cultivate regional trade and investment opportunities. However, casual exposure to the general business climate and trading possibilities of a country through tourist visits may also have a positive impact on trade. That is, in addition to the direct and induced economic benefits of tourism, it may also impact economic activity by

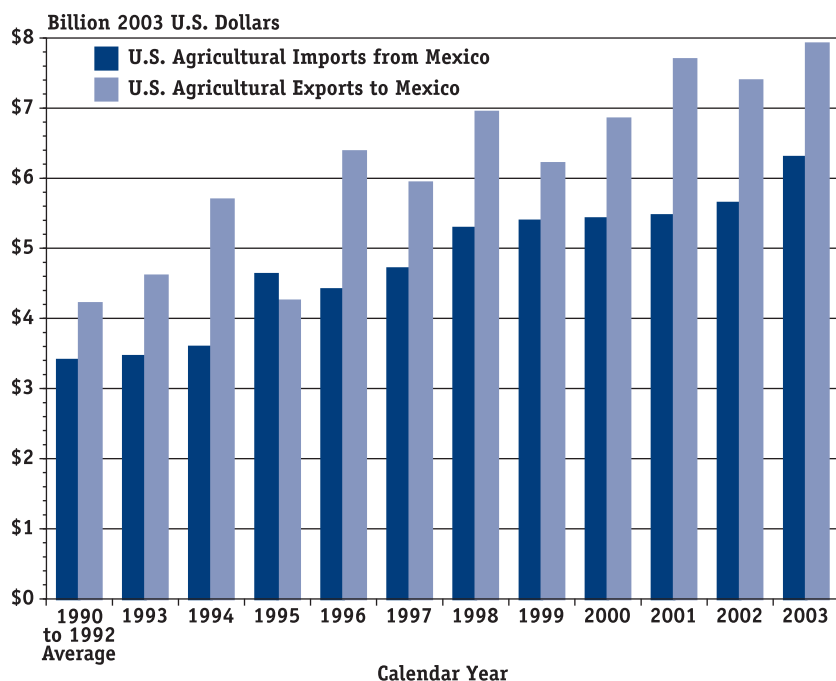


Fig. 1 U.S. Agricultural Trade with Mexico, 1990–2003

influencing a firm's propensity to trade. Many states have expressed an interest in tourism and related recreational activities as a way to increase and diversify their economic base, particularly in rural areas.

What Did We Do?

To address the question of how tourism and venture visits may influence the trading activities of a firm, we surveyed 130 agribusiness firms in Arizona, three years after the implementation of NAFTA. A total of 70 useable responses were received. In selecting the firms, a broad representation in terms of commodities, services, and geographical location was made. We asked these agribusiness firms a series of questions regarding their trading activities in the cross-border state of Sonora, Mexico. Survey responses were analyzed in a statistically appropriate framework for identifying how tourist and venture visits and firm characteristics impact a firm's propensity to trade.

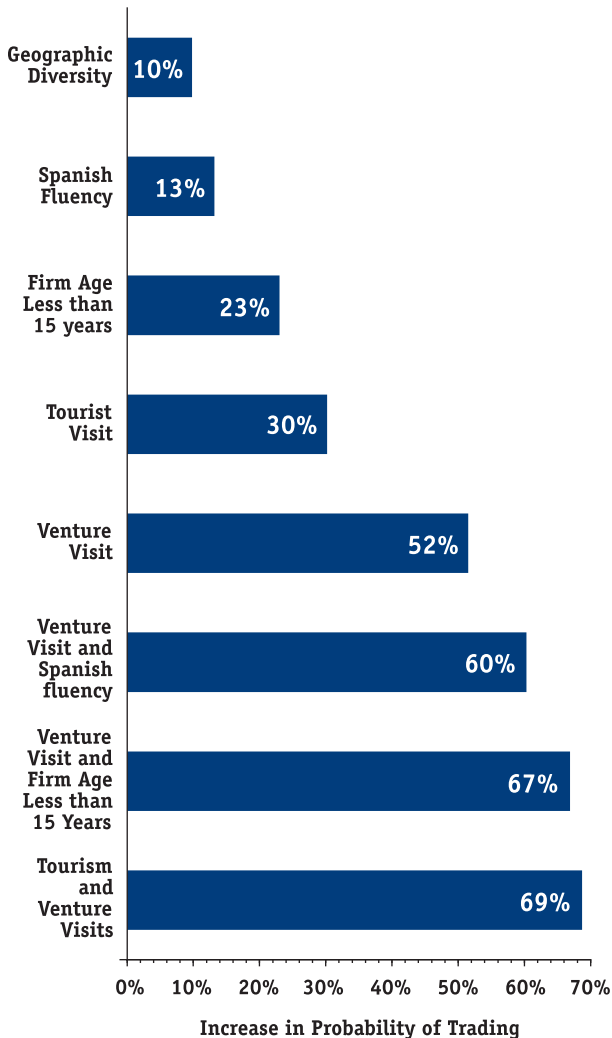


Fig. 4 Effects of Various Factors on the Likelihood of Trading

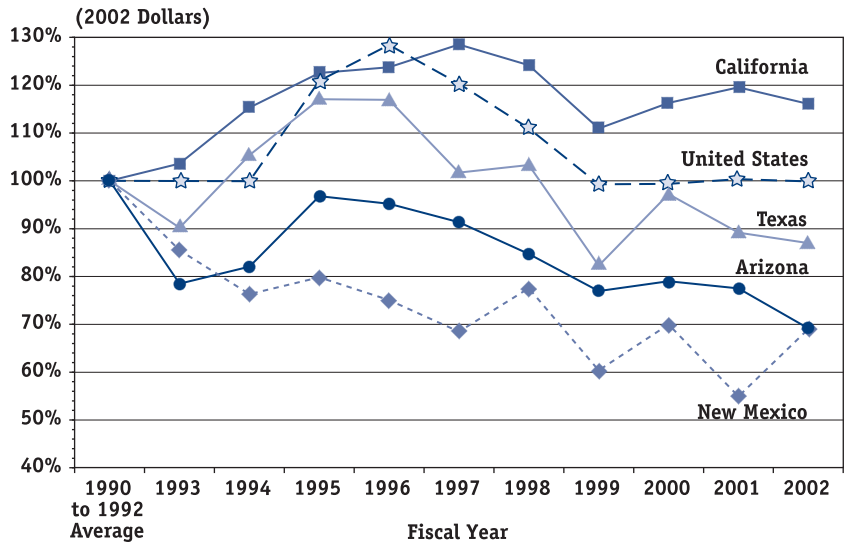


Fig. 3 Index of Agricultural Exports for the U.S. and Selected States, 1990–2002 (1990–1992 Average = 100)

What Did We Find?

Figure 4 describes our estimates of how tourist and venture visits and firm characteristics influence a firm's propensity to trade. Our results strongly support the notion that both formal and casual exposure of cross-border business opportunities impact trade positively. Arizona agribusiness proprietors are 52 percent more likely to trade with Sonora if individuals have ever made a business venture visit to Sonora. Tourist visits increase the probability of cross-border trade for a firm by 30 percent. Tourist and venture visits combined increase the probability of trading by 69 percent. If a firm is less than 15 years old, they are 23 percent more likely to trade than otherwise. A venture visit by a firm less than 15 years of age increases the probability of trading by 67 percent. Note that the combined effect of multiple factors is not the simple sum of individual effects. Foreign language fluency and the importance of geographic diversity to the firm for reducing risk positively impact trading of the firm by 13 percent and 10 percent, individually.

What Could Be Done?

Our results suggest that making it easier for individuals to travel as a tourist can have a positive impact on trade, at least for border states. Streamlining border-crossing formalities for individuals would be a step in this direction, although this also requires a balance with border security. Support is found for the notion that trade missions which expose entrepreneurs to cross-border trading opportunities can positively impact trade. However, a government-sponsored trade mission or tour will not change the risk preferences of the participating individuals. Agribusiness individuals

Continued on page 12.

Investing in Border Water Quality

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In 1994, in response to environmental concerns raised during NAFTA negotiations, the United States and Mexico established the North American Development Bank (NADBank) and the Border Environmental Cooperative Commission (BECC). The NADBank arranges public and private financing of environmental infrastructure projects within 100 km of the border (Recently passed legislation extends the zone 300 km into the interior of Mexico). To qualify for NADBank funding, the BECC must certify projects based on environmental impacts, technical feasibility, and financial feasibility. BECC priorities are water, wastewater, and municipal solid waste projects. Besides making loans, the NADBank administers the EPA-funded Border Environmental Infrastructure Fund (BEIF), which provides grants for border water and wastewater projects. The NADBank, BECC, and other institutions offer the promise of greater federal financing and technical assistance to help border communities address water pollution and other environmental problems. Despite early growing pains, these new institutions have helped both nations plan and implement new projects in a more coordinated manner. Border communities in Arizona and Sonora have received more than \$100 million in grants and loans for water systems and other environmental improvements through BECC/NADBank programs.

Border Population Growth and Pollution

In 1980, 4 million people lived within 100 km (62 miles) of the

U.S.-Mexico border. Today, more than 12 million people live within this border zone with 90 percent clustered in 14 pairs of sister cities (see Figure 1). By 2020, the border population is projected to reach 21 million, with 4.2 million living in the San Diego/Tijuana metro area and 3.3 million in the El Paso/Ciudad Juarez area. Some less obvious population centers will include Mexicali/Calexico (1.8 million) and Reynosa/McAllen (1.3 million). Closer to home, projections show Yuma-Somerton/San Luis Río Colorado approaching 400,000, with Nogales, Arizona and Sonora passing a third of a million people by 2020. In all these metro areas, population growth and size will be much greater on Mexico's side of the border.

Rapid industrial and population growth makes it difficult for border cities to provide adequate environmental infrastructure that supplies water, collects and treats wastewater, and disposes of municipal solid waste and hazardous materials. The task is particularly challenging when metro areas cross an international boundary. Municipal water problems literally become matters of international diplomacy. Although border twin cities share common watersheds and air sheds, large income differences between the countries complicate binational planning of water projects and pollution control. U.S. GDP per capita is 9 times that of Mexico. San Diego's per capita municipal budget is 27 times that of Tijuana. U.S. and Mexican cities have quite different capacities to fund water supply and

treatment projects and to regulate pollution.

Thousands of residents on both sides of the border lack access to safe drinking water and sewage treatment. A report of the U.S. General Accounting Office (GAO) found that, in Mexican border municipalities, 1.7 million people lacked access to potable water, 3.2 million lacked wastewater treatment services, and 4 million lacked solid waste disposal services. In U.S. border counties, 200,000 people lacked access to potable water and 1.7 million lacked wastewater treatment services. In the United States, problems are most acute among the more than in 400,000 people who live in *colonias*—low income, unincorporated subdivisions of substandard housing that lack basic public services. *Colonias* are primarily in New Mexico and Texas, but small settlements also exist in Arizona and California.

Untreated wastewater is a major trans-border health problem. Raw or partially treated wastewater often enters drinking water sources on both sides of the border. A recent U.S. Environmental Protection Agency (EPA) study of surface water quality found that most of the samples taken from the seven border watersheds did not meet federal standards for fecal coliform and dissolved oxygen. The rate of waterborne diseases hepatitis A and shigellosis in the U.S. border region are three times the U.S. national rate. In Mexican border cities, rates of waterborne disease are even higher.

Fig. 1 Sister Cities along the U.S.-Mexico Border



Border Water Institutions: Some History

The United States and Mexico have a longstanding history of bilateral institutions for water resource negotiations and management. The 1944 Water Treaty that apportioned surface waters of the Colorado and Rio Grande Rivers between the two countries also established the International Boundary and Water Commission (IBWC). The IBWC superseded the International Boundary Commission established even earlier, in 1889. The IBWC is composed of a U.S. and Mexican section, each responsible to its own national government. The Commission is primarily a technical agency, focusing on scientific appraisals and engineering solutions to water management problems. Its authority is specific and narrow, extending only to water management issues that are fundamentally binational. The Commission can address water pollution problems and plan projects through agreements known as "Minutes." IBWC Minutes have set salinity standards for Colorado River water reaching Mexico and authorized construction and expansion of the International Wastewater Treatment Plant serving Nogales, Arizona and Sonora.

The Commission earned a reputation for effectiveness in managing

disputes over surface water supplies, but with rapid population and industrial growth, environmental problems grew in size and scope beyond the Commission's capacities and authority. These included lack of sewage treatment, groundwater overdrafting of border aquifers, industrial wastes, and air pollution. While the IBWC had the capacity to formally coordinate with Mexico, its mandate was too narrow to deal with all the emerging border environmental issues. With the 1970s, came the creation of the EPA and state environmental agencies, along with passage of the Clean Air Act, the Clean Water Act, and Safe Drinking Water Act. New state and federal environmental laws and agencies were broader in scope, but did not have a framework to coordinate with their counterparts in Mexico.

In 1983, the United States and Mexico signed the La Paz Agreement, establishing a framework to discuss environmental issues, share information, and coordinate pollution control within 100 km of the border. The agreement established EPA and Mexico's SEMARNAT (Secretariat of

Environment and Natural Resources) as the lead agencies to coordinate and monitor pollution control efforts as well as to collect and share data. The counties established nine workgroups to address a host of environmental problems. The Border 2012 Program (formerly the Border XXI Program) coordinates and reports on workgroup progress.

Role of BECC / NADBank

Historically, IBWC responded to border sanitation problems, such as sewage spills moving from Tijuana to San Diego or from Nogales, Sonora to Arizona, after they arose. As a technical/engineering agency, they focused on engineering and structural solutions to address immediate water pollution problems. The short-term solutions, while certainly necessary, do not address problems of market failures and incentive problems that lead to the water pollution crises in the first

place. Firms located on the border have not had to pay the full social costs of their production and release of industrial wastes into water bodies. Further, border communities have had difficulty financing provision of public goods such as drinking water, sewage treatment, and solid waste disposal.

Mexican border cities, especially, have limited capacity to self-finance water infrastructure. It is difficult to attract private financing because of legal, political, and economic risks associated with investing in Mexican utilities. These include foreign exchange risks, uncertainty about the future of the Mexican economy, and uncertainty about the ability to cover costs by charging higher rates to water users. The Mexican tax system presents additional problems by limiting the taxation authority of local governments. Under Mexican law, local taxes go back to the federal government. Communities depend on uncertain, annual appropriations to fund infrastructure. This prevents local governments from issuing bonds against user fees or property taxes.

In the United States, larger cities can finance projects through tax-exempt municipal bonds or obtain loans from the Clean Water State Revolving Fund at below-market rates. Some smaller U.S. communities, however, may have too limited a tax base to qualify for loans or have the credit rating needed to issue municipal bonds.

The United States and Mexico created the NADBank to help border communities with long-term funding of water and solid waste projects. Capitalized by both governments, NADBank can secure financing at lower commercial rates than would otherwise be possible for border communities. The bank also uses its funds to leverage other private loans and grants that local entities may not otherwise be able to secure. In principle, user fees from water service customers would provide the funds to repay loans.

The BECC must first certify projects before they may receive NADBank financing. BECC certification criteria include human health and environment, technical feasibility, financial feasibility and project management, community participation, and sustainable development. BECC also provides technical assistance for local entities developing projects, analyzing environmental and financial aspects of projects and helping to arrange public financing for projects.

Growing Pains

In its first two years, the BECC failed to secure NADBank funding for any of its certified projects. While there was great debate over the BECC's sustainable development criteria, projects were not meeting NADBank's financial criteria. NADBank identified five

constraints that limited project approval: (1) insufficient community resources for high cost projects, (2) lack of master plans and inadequate proposal preparation, (3) limited financial, administrative, and commercial capabilities of local water agencies, (4) inadequate revenue for the sound operation of existing services and resistance to raising user fees, and (5) lack of private sector involvement in environmental projects.

Financing projects through user fees alone is difficult in poor Mexican communities. To avoid excluding people from basic water and wastewater services, utilities must tie base rates to the earnings of the poorest households in the community. In the United States, an industry benchmark is \$30–\$40 per month per household as an affordable base rate for water and sewer services. The World Bank advises municipalities in developing countries that water and sewer base rates not exceed 5 percent of the poorest 20 percent of the population. By one U.S. Department of Commerce estimate, this rule of thumb would imply a base rate of \$3.25 per household per month in Mexico.

In Mexico, as in other developing countries, public water systems become caught in a "low-level equilibrium trap" that makes it difficult to raise user fees. Systems do not adequately plan for operation and maintenance (O&M) costs. Without O&M, systems deteriorate. As service worsens, people stop paying water bills and increase the level of illegal hook-ups. This starves the system further of money and deterioration of service worsens. This leads to a downward spiral of low fee collection and poor service.

To address these constraints, the EPA and NADBank established the Border Environmental Infrastructure Fund (BEIF). The fund administers grants that may be combined with

San Luis Rio Colorado, Sonora

NADB Funding (Total): \$13.7 million (\$16.7 million)

Purpose: Provide wastewater service to 85% of the population and treat 100% of collected wastewater, which is currently discharged into the Colorado River. Reduce health and environmental problems from insufficient wastewater treatment. Efficient water reuse for irrigation.

San Luis Rio Colorado, Sonora, Mexico

NADB Funding (Total): \$1.8 million (\$4 million)

Purpose: Construct sanitary landfill, close existing open-air dumpsite, and improve solid waste management. Improved sanitation services will provide 100% collection service for residents. Closing open-air dumpsite will reduce environmental pollution and the health risks.

Puerto Peñasco, Sonora

NADB Funding (Total): \$0.5 million (\$2.2 million)

Purpose: Reduce environmental and health risks by constructing new solid waste landfill, purchasing garbage collection and disposal equipment, and closing existing open-air landfill.

El Sásabe, Sonora

NADB Funding (Total): \$0.5 million (\$0.9 million)

Purpose: Provide first-time sewer and sanitation services to entire community. Eliminate health hazards from latrines and septic tanks. Proper wastewater disposal will reduce environmental contamination, benefiting Sasabe, Arizona, and the Buenos Aires National Wildlife Refuge.

Nogales, Sonora, Mexico

NADB Funding (Total): \$8.7 million (\$39 million)

Purpose: Construct new aqueduct, regulating tanks and waterlines; rehabilitate existing aqueduct, water and sewage lines. Provide uninterrupted service to 100% of the population. Eliminate leaks and reduce effluent going to the binational wastewater treatment plant in Nogales, Arizona, extending its useful life.

Naco, Sonora

NADB Funding (Total): US \$1.1 million (\$2.1 million)

Purpose: Improve water quality and wastewater treatment. Protect transboundary watersheds from sewage contamination.

Agua Prieta, Sonora

NADB Funding (Total): \$0.4 million (\$1.9 million)

Purpose: Construct new landfill, acquire garbage collection and disposal equipment, and close existing site for municipal solid waste disposal. Reduced smoke and odors will help Douglas, Arizona, comply with U.S. EPA air quality standards.

Agua Prieta, Sonora

NADB Funding (Total): \$4 million (\$17 million)

Purpose: Street paving to reduce wind blown dust particles to improve the air quality for people living in Agua Prieta and Douglas, Arizona. Improved traffic flows will reduce carbon monoxide concentrations.

Fig. 2 Projects along the Arizona-Sonora Financing

Gadsden, AZ
NADB Funding (Total): \$1.5 million (\$5.3 million)
Purpose: Provide first-time wastewater collection and treatment services to entire community to alleviate health and environmental problems from inadequate on-site disposal systems.

Somerton, AZ
NADB Funding (Total): \$4.0 million (\$7.9 million)
Purpose: Improve water quality in the Yuma Main Irrigation and the groundwater aquifer. Eliminate odors generated by existing lagoons.

Somerton, AZ
NADB Funding (Total): \$1.1 million (\$3.4 million)
Purpose: Water main replacement to reduce malfunctions and health risks. Eliminate clothing discoloration from poor state of the waterlines. Improved water pressure and fire safety.

Yuma County, AZ
NADB Funding (Total): \$3.0 million (\$6.2 million)
Purpose: Line 25 miles of canals and replace turnouts to increase water delivery efficiencies, improve quality of Colorado River flows, and reduce maintenance requirements. Estimated water savings from seepage: 7,583 acre-feet/year.

Nogales, AZ
NADB Funding (Total): \$59.5 million (\$74.1 million)
Purpose: Replace part of sewer system and upgrade and expand Nogales International Water Treatment Plant to accommodate flows from both cities and some flows from Rio Rico and Peña Blanca. Improved effluent treatment will help preserve riparian habitat and groundwater quality downstream.

Nogales, AZ
NADB Funding (Total): To be determined (\$1 million)
Purpose: Replace well contaminating city's potable water supply.

Patagonia, AZ
NADB Funding (Total): US \$1.3 million (\$2.3 million)
Purpose: Construct new wastewater treatment facility and rehabilitate wastewater collection lines. Effluent will comply with U.S. ambient water quality norms. Improved sewage collection will reduce health risks from untreated wastewater leaking from lines.

Bisbee, AZ
NADB Funding (Total): \$11.3 million (\$30.1 million)
Purpose: Rehabilitate wastewater collection system and construct new wastewater treatment plant to eliminate sewage back-ups and overflows to prevent contamination of surface and ground water.

Douglas, AZ
NADB Funding (Total): \$3.7 million (\$8.5 million)
Purpose: Improve delivery and quality of potable water supply. Eliminate untreated sewage discharges from faulty septic systems in 3 *colonias* by connecting them to the sewage system.

ra Border Approved for NADBANK

loans or loan guarantees. Grants may support municipal infrastructure, drinking water treatment plants, and treated water distribution systems. Communities can use grant funds to allow utilities to phase in user fees over time.

The BEIF succeeded in jump-starting border water projects. By fall of 1999, the NADBANK had secured grants and loans for 20 BECC-certified projects. The goal of developing self-financing projects remained elusive, however. Grants accounted for 96 percent of funds spent in the United States and 88 percent of funds spent in Mexico. A GAO study found that interest rates on loans, though lower than could be obtained in many commercial markets, were still higher than rates obtained through municipal bonds or the Clean Water State Revolving Fund. Larger U.S. cities could finance projects this way more cheaply. Though lower than other commercial rates, smaller U.S. communities and Mexican cities still could not afford interest rates offered by NADBANK.

The GAO also noted that many border communities lacked technical capacity and sufficient planning to develop creditworthy projects. In Mexico, local managers often have limited experience conducting the type of technical and financial analyses needed to develop viable projects. Utility managers and other technical personnel stay at their positions less than two years, on average.

Program Changes/ Expanded Mandate

Border institutions have made a number of changes to increase the technical capacity of border communities to construct and run water systems. The BECC established a Technical Assistance Grants Program, funded primarily by EPA, to help disadvantaged communities prepare

project proposals to meet BECC certification. IBWC Minute 294 established a Facilities Planning Program, also funded by the EPA, to assist border communities in developing projects. NADBANK established a Utilities Management Institute to train public utility professionals. The hope is that improved technical capacity will improve the creditworthiness of water projects.

The NADBANK also changed lending practices. It expanded loan eligibility to air pollution-control projects. It also established the Low Interest Rate Facility (LIRF) that charges borrowers below-market interest rates on loans to support core projects for water, wastewater, and solid waste management. Interest rates are comparable to those obtainable from the U.S. tax-exempt municipal bond market or the State Revolving Fund. Because of these changes, the ratio of loans to outright grants has increased substantially in recent years. EPA grants, however, remain a crucial part of NADBANK's portfolio.

In 2002, in response to drought-induced disputes over Rio Grande water, the NADBANK initiated a Water Conservation Investment Fund (WCIF) that provides grants to finance investments in projects to use and transfer water more efficiently. Each country received \$40 million to encourage investment in water conservation. Two new projects funded by the WCIF will encourage conservation of Colorado River water. The Imperial Irrigation District in California, will receive \$2.5 million and Yuma County Water Users' Association will receive \$3 million to repair and line canals. The projects' goals are to conserve over 10,000 acre-feet of water per year.

Arizona and Sonora Take Advantage of Funding Opportunities

Figure 2 shows the different projects approved for NADBANK financing (primarily EPA-funded grants) along the Arizona-Sonora Border. NADBANK funding alone accounts for over \$100 million so far. Some of these projects have received additional funding from the U.S. Department of Housing and Urban Development (HUD), USDA Rural Utilities Service, and the State of Arizona's Water Infrastructure Finance Authority of Arizona (WIFA). Because Arizona and Sonora share air and watersheds, projects implemented in Mexico often have spillover benefits to Arizona residents. **AR**

For More Information

The Border Environmental Cooperative Commission:

<http://www.cocof.org/>

International Boundary and Water Commission:

<http://www.ibwc.state.gov/>

The North American Development Bank:

<http://www.nadbank.org/>

Continued on page 19.

in Arizona that have never made a business venture or tourist visit to Sonora probably have a personality that is quite averse to taking risks. Therefore, one should not expect to see as great an impact from a government-sponsored event as what we show here for venture and tourist visits. Communities seeking to expand cross-border trading opportunities should target younger firms (< 15 years) with a desire to geographically diversify production risk. Firms whose managers possess foreign language fluency and whose size is relatively larger than their competitors' should also be targeted to undertake exploratory visits. Results indicate that the joint effect of several variables exceeds 0.5. By targeting particular firms, the probability of trade can often be increased by as much as 50 percent. **AR**

For More Information

AgExporter. "NAFTA at 10." United States Dept. of Agriculture, Foreign Agricultural Service, January 2004. (Available online at <http://www.fas.usda.gov/info/agexporter/2004/January/January%202004.html>)

Aradhyula, Satheesh, and Russell Tronstad. "Does Tourism Promote Cross-Border Trade?" *American Journal of Agricultural Economics* 85(August 2003):569–579.

Kulendran, N., and K. Wilson. "Is There a Relationship Between International Trade and International Travel?" *Applied Economics* 32(2000):1001–09.

Tronstad, Russell, Satheesh Aradhyula, and Pablo Wong-Gonzalez. "Arizona-Sonora Agribusiness Cluster: Analysis and Recommendations for Development." December 1997:1–200. (Available online at <http://cals.arizona.edu/arec/pubs/azson/agbus.html>)

Russell Tronstad's research and extension activities focus on marketing, management, and policy issues germane to Arizona's production agriculture. Recent activities include work on value-based pricing of beef, economics of restocking for cow-calf producers, biosecurity and animal identification, irrigation termination of upland cotton, cross-border trade, tools for managing production and market risks, and direct farm marketing and tourism.

Satheesh Aradhyula's research shows how agricultural policies affect producers and consumers. He also studies agricultural trade between the U.S. and Mexico, the role of risk in farm production decisions, and issues related to the agricultural sectors of developing countries. Satheesh teaches commodity price analysis and advanced econometrics courses at the University of Arizona.



Eric Monke In Memoriam

The Department of Agricultural and Resource Economics, the University of Arizona community, and international colleagues and friends abroad suffered a great loss with the passing of Eric Monke on November 18, 2003 to multiple sclerosis. He was 51 years old and is survived by his wife Kim, daughter Celeste (16), and son Dylan (14). Eric joined our department in 1980 as an assistant professor. Experiences shared below by his former classmates, advisor, and colleagues provide a glimpse as to why Eric was always a favorite to be around and work with.

Eric Monke's Personality and Brilliance

by former graduate school classmates Professors Gerald (Jerry) Nelson and Laurian Unnevehr, University of Illinois. Dr. Unnevehr is incoming president of the American Agricultural Economics Association.

Eric Monke was a brilliant graduate student, who set a high standard for the rest of us to follow at the Food Research Institute. He entered the program a few years before us, and was in Liberia doing field work for the West African Rice Project when we arrived in 1976. He returned to Stanford in the summer of 1977 to write up his results and to pursue further research on the world rice market. We were the lowly research assistants in the project who aspired to follow in his footsteps someday and listened to his wild tales from the field. We were particularly amused by his characterization of conversations with our major professor—he gave us hope that these rambling sessions might actually lead to a dissertation someday.

Eric went on to write a distinguished dissertation (with Nobel Laureate Ken Arrow as the outside member), and as we all know, made seminal contributions to the field of trade and development. He pioneered the use of the Policy Analysis Matrix and his book with Scott Pearson is still a standard reference.

Eric was a great colleague, too. He had a wonderful sense of humor and always enjoyed a good joke. He was fun to be with as well as intellectually stimulating. Like us, he enjoyed the outdoors, including hiking in the Sierras while at Stanford. He was a unique individual, and he made unique contributions to the profession.

We were saddened to lose his companionship at the international agricultural trade consortium, the AAEEA meetings, and other professional events, as his illness gradually reduced his travel. His untimely passing is a great loss to all of us in the agricultural economics profession and we will miss him.

Eric Monke's Research— A Personal Memoir

*by former advisor Scott Pearson, professor emeritus of
Stanford University*

It is the dream of every academic to have one graduate student become a lifelong collaborator. Eric Monke was my best doctoral student, a close personal friend, and a constant research collaborator for more than 25 years. His incredibly productive career—and his life—was sadly shortened by multiple sclerosis, and he died last November in middle age. With this personal memoir, I want to review Eric's major contributions to the agricultural economics profession.

This task has been a difficult one for me to carry out. Like all of Eric's family, friends, and colleagues, I am deeply grieved by his long suffering and untimely death. I have been saddened by the loss of Eric, but exhilarated by reminders of the quality of his work and by nostalgic memories of our productive collaboration. I also have been reminded of the joys of intellectual discovery and of the serendipity of the process.

Eric and I co-authored six books and numerous journal articles. I have struggled while attempting to sort out his contributions from mine in this lengthy collaboration. In the end, I have given up. Eric and I had a synergistic relationship in which we drew out the best in each other. Together we came up with ideas that neither of us would have discovered independently. In this review, therefore, I have decided to assign joint credit by using the term "we" rather than "he." In those few instances in which I firmly recall that Eric dreamed up the solution, I give him full credit.

I first began collaborating with Eric in the mid-1970s. Having grown up in Maine and attended Williams College, Eric was one of the greenest, most unworldly graduate students ever to go through the doctoral program of the Food Research Institute at Stanford. We sent him off to Liberia to do his doctoral field research

on rice policy in that unpredictable West African country. He often resided at Julia's Hotel in Monrovia, owned by a mercurial and enterprising French woman, and he kept their books in return for room and board. On one visit, Eric confided complete surprise to me when he discovered that several customers were renting their rooms by the hour!

Eric was always good with theory and concepts. Once he overcame his initial naiveté, Eric became one of the most savvy field researchers in the profession. William O. Jones was the director emeritus of the Food Research Institute when Eric was a graduate student there. Bill Jones held all of us to very tough standards in data collection, reminding us sagely that the best models were only as good as the quality of the data used to test them. Eric listened and learned, and he then put together the combination of sound economic logic, always his strong point, with exacting standards for field research. The result was extremely high quality empirical research in three very different parts of the world—Southern Europe, East Africa, and Southeast Asia.

While Eric was a doctoral student, he exhibited his future promise as an empirical researcher. He and I first collaborated on a study of the efficiency of rice production in Asia, a cross-country study directed by Wally Falcon and Peter Timmer. In the mid-1970s, the state-of-the-art technique for evaluating the efficiency of agricultural (and industrial) production systems was the Domestic Resource Cost (DRC) analysis, an approach developed independently by Michael Bruno and by Anne Krueger in the late 1960s. In his first published article, Eric (and I) adapted the DRC approach for application to rice production systems in five Asian countries and wrote a comparative evaluation of the results. Eric's career thus was launched at an early age.

Despite being a New Englander interested early on in lobsters rather than in agriculture (he had come to Stanford to study both applied economics and marine biology), Eric soon found himself immersed in rice agriculture. He wrote his doctoral dissertation and published several fine articles and book chapters on the rice economy of Liberia and on the international rice market. While at Stanford, Eric also began a very productive research collaboration with Todd Petzel (then an assistant professor at the Food Research Institute and later the senior economist at two leading commodity futures exchanges). Eric and Todd did sophisticated econometric analyses of market integration in the international commodity markets, first for rice and later for cotton, and wrote path-breaking articles on whether prices of different qualities moved together consistently.

In the late 1970s, Jimmye Hillman, head of the Department of Agricultural Economics at the University of Arizona, called me and asked, in his inimitably brusque fashion, whether we had anybody good coming onto the job market. I told Jimmye that we had several good people and one extraordinary one. Jimmye went after Eric and hired him as an assistant professor. Eric moved seamlessly from Stanford to Arizona, and his research output continued its impressive ascent. Jimmye soon garnered some funds from the American foreign aid agency (USAID) to study agriculture in Portugal. The issue was to look at what changes would need to be made in Portuguese agricultural structure and policies prior to the accession in 1986 of Portugal to the European Community (now the European Union). So began a 15-year (1980–1995) collaboration involving agricultural economists and anthropologists from the University of Arizona, Stanford University, and the University of Lisbon, which revolutionized the teaching of empirical agricultural economics in Portugal. Members of that incredibly productive and congenial research team included Jimmye Hillman, Eric Monke, Roger Fox, Tim Finan, Mark Langworthy, Dennis Cory, Robert Netting, Tim Josling, Stefan Tangermann, Francisco Avillez, Armando Sevinate Pinto (currently the minister of agriculture in Portugal), and me. All agreed that Eric was the conceptual leader of the pack.

Bill Jones once said that a fortunate academic has one truly innovative idea and then dines out on that idea for the rest of his/her career. Eric and I came up with our best idea, starting in October 1982. Our Arizona-Stanford-Lisbon research team was meeting in Tucson to launch a major study of Portuguese agriculture. We were hosting José Varella, then the head of research and planning in the Portuguese Ministry of Agriculture. Our anthropologist colleagues insisted that Varella should be introduced to Tucson's cowboy bars. The following morning, despite all odds to the contrary, I awoke with an idea of how simply to present our conceptual approach to Varella. Eric liked it and named it the Policy Analysis Matrix (PAM). Eric and I had found our best idea, and we both dined out on it for the rest of our professional careers (I confess that I still do).

The most influential book that Eric co-authored (with me) is *The Policy Analysis Matrix for Agricultural Development* (Cornell University Press, 1989). Like most good ideas, the PAM approach is very straightforward. Its central insight is alarmingly simple. PAM is the marriage of two previously separate analytical methods, placed together in a matrix framework. One method is benefit-cost analysis. The first row of a PAM matrix consists of revenues, costs, and profits measured in private (actual market) prices, akin to private benefit-

cost analysis. This first row is nothing other than farm budgeting. The second row of a PAM includes revenues, costs, and profits measured in social (efficiency) prices, akin to social benefit-cost analysis. This second row incorporates exactly the same kinds of information needed for the Domestic Resource Cost (DRC) analysis, then a popular practice for efficiency analysis. The second method incorporated into the PAM approach is policy analysis. The effects of policies are shown by comparing the values of revenues (or of costs) measured in private (actual market) prices with those in social (efficiency) prices. If the value of rice produced in a farming system, for example, is higher (or lower) than the comparable world price (the efficiency price), the difference must be caused either by policies or by market failures (such as monopoly or external effects). The central contribution of the PAM approach is to put both of these approaches—benefit-cost analysis and policy analysis—together in one matrix. The PAM is a system of double-entry bookkeeping, so analysts are forced to account for and explain all divergences (effects of distorting policies or market failures).

The PAM approach has become a widely-used method of teaching and carrying out efficiency and policy analysis. The PAM is now a standard part of the curriculum in universities throughout the world, and it is used by analysts in research institutions in all corners of the developing world and in numerous multilateral agencies (the World Bank and United Nations development groups). Eric and I spent much of the 1980s and 1990s refining analytical techniques within the PAM—how to come up with comparable world prices of tradable outputs and inputs, find estimates of the social opportunity costs of factors of production (land, labor, and capital), and establish equilibrium foreign exchange rates. The PAM approach is deceptively simple. To apply it well, an analyst has to focus on single commodity production systems (partial equilibrium analysis) but think about relationships within the entire economy (general equilibrium analysis). Eric's unusual conceptual abilities carried us a long way down that muddy road.

Eric and I had our longest and most productive collaboration in Portugal. The Arizona-Stanford-Lisbon team and we wrote three books on Portuguese agriculture, all of them based on the PAM approach. The first, *Portuguese Agriculture in Transition*, analyzed the competitiveness and efficiency of all of Portugal's major agricultural systems on the eve of that country's accession to the European Community, the second, *Structural Change and Small-farm Agriculture in Northwest Portugal*, examined prospects for structural change in the Minho, a small region of northwest Portugal, and the third, *Small-Farm Agriculture in Southern Europe*, compared

Portugal's structural change with that of southern Italy, which occurred about two decades earlier.

We also worked together to carry out long-term empirical field research leading to PAM studies of agriculture in Indonesia (1986–1991) and Kenya (1988–1996). As in Portugal, Eric demonstrated his exceptional skill in ferreting out information from farmers, traders, and processors in the field. Our book, *Rice Policy in Indonesia*, written with a team of Stanford Food Research Institute doctoral students and colleagues, set an example for empirical work on agricultural systems in Southeast Asia. I will never forget watching Eric literally peering over the shoulders of two doctoral students, making suggestions of follow-on questions as one student interviewed farmers in Indonesian while the other wrote notes for Eric to read in English. Despite the onset of his illness, Eric remained very productive in Kenya even after his time in the field had to be limited. Our book, *Agricultural Policy in Kenya: Applications of the Policy Analysis Matrix*, written with Kenyan collaborators and graduate students from Arizona and Stanford, contains the most extensive extant coverage of Kenyan farming systems. Eric's ability to teach and inspire by example led to the creation of a skilled group of Kenyan researchers from Egerton University who continue to maintain the best data base and set of analytical results available on Kenyan agriculture.

With Eric's premature death, the agricultural economics profession lost a fertile mind and a wonderful friend. No one I have known in the profession could match Eric's uncanny ability to bridge the gaps between theory and application, concept and field work, and analytical framework and practical policy recommendations. Eric was an extraordinarily skillful teacher to Arizona undergraduates and graduate students and a devoted mentor to students from numerous rich and poor countries. Eric will be missed tremendously by all of his students, colleagues, and friends but even more so by thousands of unmet researchers and students in developing countries who are seeking guidance in the practical application of project and policy analysis.


Eric Monke as a Colleague and Friend

by Mark Langworthy, University of Arizona

I have had the privilege to know Eric for over 20 years, as a colleague and close friend. I first met Eric in graduate school at Stanford. He and I shared an interest in economic development issues. I really got to appreciate Eric's intellectual insights and to forge a close friendship with him when we worked together on a research project in Portugal in the early 1980s. By this time, he had joined the faculty of the

Agricultural Economics Department at the University of Arizona, while I was still a lowly research assistant. I greatly value the guidance and insights into economics research that he gave me during that time. He had a keen understanding of economic principles and how to apply them to find appropriate policies to address real world problems. He was never interested in theory only as an intellectual exercise, but viewed it as a tool to find solutions for economic problems that people confront. His interest in economic development stemmed from his deeply held conviction that appropriate economic policies could effectively reduce poverty and suffering around the world, and that our responsibility as economists is to identify the appropriate policies to address these problems. Eric's convictions have strongly shaped the direction of my own professional activities.

When I joined the Department in 1985, Eric became my mentor with respect to all aspects of academic life. One of the most important lessons I learned from him was how to interact with and support students. I was always struck by the high level of regard that Eric held for all students that he interacted with. He took a deep personal interest in their studies and academic development. He put in a lot of time and effort to nurse students through their study programs. In some cases this was a highly exasperating experience for Eric, but he never expressed this to his students. Rather, he demonstrated to all his students a great deal of respect for their efforts, and in so doing he was able to motivate them to do their best. Eric felt that turning out highly motivated and well-trained students is one of the most important and lasting contributions that we in the academic community can provide. All of us in the department have been greatly influenced by Eric's example, and I try very consciously to follow his lead in my own interactions with students.

Eric's contributions to the Department will have lasting impacts. Our Department continues to provide the kind of guidance and support to students and junior faculty that Eric personally practiced and strongly advocated as Department policy. We continue to value academic excellence, and place high value on research that helps to find practical solutions to economic problems. For this we are all deeply indebted to Eric. We will greatly miss him. 

Memorial donations can be made to a scholarship fund set up in Eric's name at this address:

Eric Monke Memorial
Scholarship Development Office
1111 N. Cherry Ave., Suite 312
Tucson, Arizona 85721

and agricultural contracts are areas where I have had ongoing activities and interests. My work on contract structure and business organization has multiple applications to the relatively sophisticated agriculture structure in Arizona, particularly for Yuma contracting patterns. These topics bring agricultural and resource issues together in a way that is unique from other parts of the U.S., and I find these opportunities very attractive.

I was also attracted to this position because of the potential for collaboration and interaction with faculty outside of AREC. Opportunities and synergies exist for collaborations with other faculty in the Water Resources Research Center; the Department of Soil, Water and Environmental Science; the School of Renewable Natural Resources; the Office of Arid Lands Studies; and other units in CALS. The Economics Department in the Eller College of Business and Public Administration and the James E. Rogers College of Law also have faculty with interests that complement mine. In fact, I have joint appointments in both the Economics Department and the College of Law. The Cardon Endowment also provides me with resources to advance my own research and attract top-level graduate students. Last, joining a productive, energetic, and collegial department at a major research university like the University of Arizona attracted me to the Cardon Chair position.

Arizona Review. *By way of background, how does the Cardon Chair receive its funding?*

Lueck. Bartley P. "Bart" Cardon is a well-known name in Arizona agriculture. He made substantial contributions to Arizona's agriculture for more than 75 years through public service, innovations he developed while in the private agri-

business sector, and leadership he provided while he was professor and dean of the College of Agriculture. In 1997, friends and colleagues of Bart's raised money and worked with the University to create a research professorship in his name in AREC, CALS. Longtime AREC head and professor emeritus Jimmye Hillman was instrumental in making this happen. The Cardon Endowment is currently about \$1.3 million and still growing. Annual returns from the investment of this endowment, managed by the University of Arizona Foundation, are available to support the objectives of the Cardon Professor. Endowment funds are also matched by University of Arizona state funds. Bart still resides in Tucson and demonstrates his rich knowledge of Arizona's agriculture through his conversations.

Arizona Review. *Can you describe some of your recent and current research and how it relates to Arizona?*

Lueck. In the last decade I have worked on determinants of structure and contracts and business organization in agriculture. This work culminated in 2003 with the publication of a book at MIT Press, titled *The Nature of the Farm*. The book uses what has come to be known as the transaction cost framework, based on the pioneering work of Nobel Prize-winning economist Ronald Coase. The book develops specific models and tests the implications of those models against data sets from across North American agriculture, as well as against historical case studies such as eighteenth-century European land contracts and the late nineteenth-century bonanza farms in the United States. The book essentially explains the organization of agriculture by focusing on how incentives shape the behavior of farmers, landowners, and others who provide agricultural

inputs. One of the exciting things about being in Arizona is that the models developed in the book should have significant potential for understanding the relatively complex relationships between the many parties involved in Arizona's agriculture, including landowners, water rights holders, agricultural laborers, processors, and input suppliers. My earlier work had a focus on more traditional agriculture on the Great Plains and in the Corn Belt, where family operations still dominate and farm organization is rather simple. Arizona's agriculture is quite different from this structure and in many ways more interesting and forward looking.

I am currently working on a project that investigates the economics of conservation easements. Conservation easements are legal devices that separate the right to develop or use land in certain ways that would diminish the environmental amenities associated with the property. They are becoming widespread in Arizona and the West. Typically, conservation easements are held by nonprofit land trusts or public agencies such as wildlife departments. In principle they allow for separating ownership of land into specialized segments and can increase the total value of the land. In my research, three questions are being pursued. First, why was the law originally hostile to these private arrangements and why did the law ultimately change? Second, how have these changes in the law of property affected the methods by which land is allocated to conservation uses? Third, and perhaps most importantly, what are the effects of federal tax law that allow conservation easements to be donated and treated as nontaxable charitable gifts? Do these tax incentives lead to the use of easements where they are valued the most? Data on easement laws

and easements from all 50 states are being collected in order to answer these questions.

Arizona Review. *What do you see as key issues and activities that Cardon Chair resources should be focused on in the immediate future or within the next one to two years?*

Lueck. First, it is important to continue to support ongoing and committed projects, such as the *Arizona Review*, the Agribusiness Forum, and work by scholars and graduate students for whom funds have been committed. At a general level, my goal is to support top-flight scholarship on the most important agricultural and resource economic issues facing Arizona's agriculture. Another overriding goal is to support and enhance the intellectual development of the faculty and graduate students within AREC. This will improve the reputation of AREC within CALS, the University of Arizona, and within the agricultural economics and economics professions. An important part of meeting this goal will be to introduce specialized areas of study in environmental and resource economics within the Ph.D. program. This will further link AREC to the Economics Department in the Eller College and take advantage of complementarities within these faculties to create a stronger program for students in both AREC and Economics.

I intend to support research topics that are of importance to both Arizona and national professional audiences. For example, farmland conversion, contracts in agribusiness, endangered species regulations, and forest fire policies are research topics that are of

interest to both these audiences. Whenever possible, I will link visible research projects to education and outreach germane to Arizona and the Southwest. Another early and important task will be for me to continue to familiarize myself with agricultural and resource issues that are of greatest importance for Arizona and the greater Southwest.

Arizona Review. *What are some of the longer-term issues and activities that we should look for coming out of the Cardon Chair?*

Lueck. The Cardon Endowment will be used to support a wide range of activities. Without fully knowing all the possibilities lurking on the horizon, activities that support the basic mission I have for enhancing scholarship will include such things as graduate student assistantships; special scholarships for work on topics focused on Arizona's agriculture; distinguished public lectures; support for young faculty; short-term visiting professorships; a scholarly working paper series; undergraduate scholarships; and short workshops or symposia on timely policy topics. The resources of the Cardon Endowment will not only allow me to further my own research interests, but will also allow for some new activities.

It will be important to build long-term relationships with major agricultural and natural resource groups both on and off campus. Campus entities within CALS, the Udall Center for Studies in Public Policy, the Law School, and the Eller College of Business and Public Administration are important while good working relationships with major producer and agribusiness associations off campus are needed

to help identify important research issues and disseminate findings from ongoing and completed projects. It will also be important to make accessible those activities supported by the Cardon Endowment, either as part of the *Arizona Review* or in a separate publication. For example, a website could be developed so that interested parties can easily find out what is happening and what items the Cardon Endowment has supported. Expanding the Cardon Endowment is, of course, a long-term goal that I will work toward.

Arizona Review. *On a more personal note, can you tell us about your family and some of your favorite hobbies and family activities?*

Lueck. My wife, Betsey Stahler is a marriage/family therapist and currently a busy housewife. We have two daughters—Anna, sixth grade, and Katie, third grade. Coming from Montana, we particularly enjoy a wide variety of outdoor recreation activities—including camping, hiking, skiing, mountain biking, trail running, and rafting—and are looking forward to meeting new friends and exploring the deserts and mountains of Arizona. One of my own passions is hunting, especially upland birds. Moving from Montana to Arizona will require a shift from pheasants to quail, but I think Mitch, my seven-year-old Brittany, will be up for the challenge.

Arizona Review. *Thank you, Dean for sharing your plans and thoughts regarding the Cardon Chair with us. We look forward to the unfolding of how the Cardon Endowment will influence Arizona's agriculture—continuing the saga initiated by Bartley P. "Bart" Cardon.*



Arizona's Agricultural Situation

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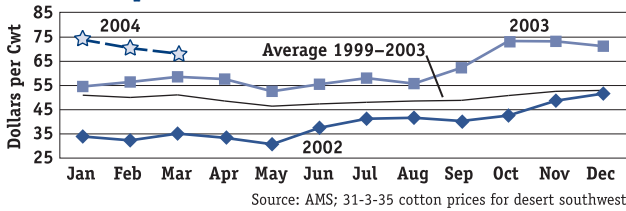
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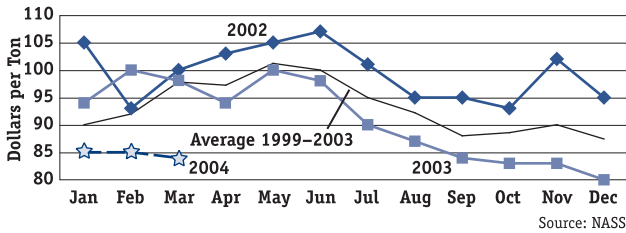
Agricultural and Resource Economics

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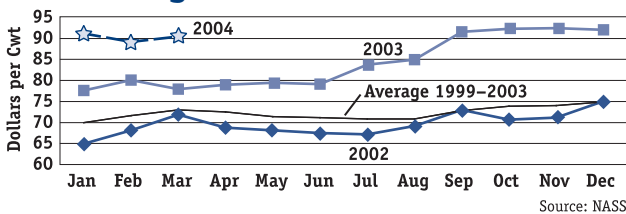
Arizona Upland Cotton Prices



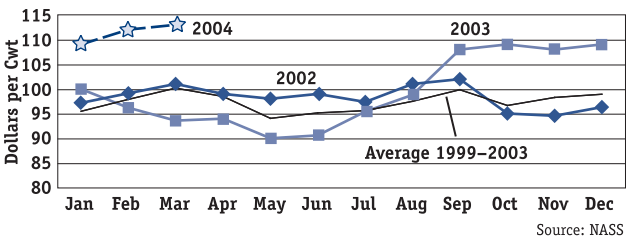
Arizona Alfalfa Prices



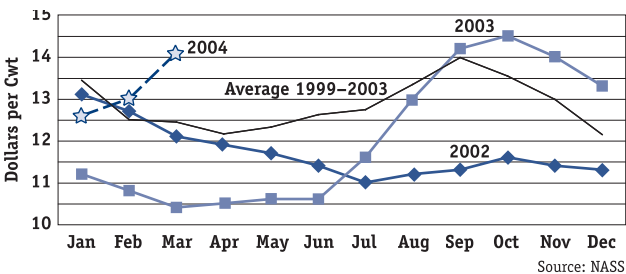
Arizona Slaughter Steer and Heifer Prices



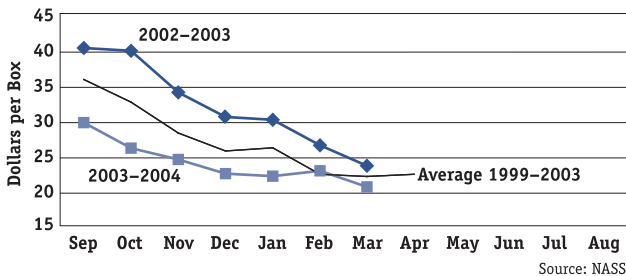
Arizona Calf Prices



Arizona Milk Prices



Arizona Lemon Prices



Although Arizona-fed steer and heifer prices are noticeably higher for 2004 than prior years, profit levels on feedlot closeouts for steers in recent months have been negative. The Livestock Marketing Information Center estimates feedlot losses near \$70 per head for March, down from losses that averaged more than \$140 in January and February. U.S. beef exports were virtually zero in January due to a ban on U.S. beef products implemented by U.S. trading partners in response to the discovery of a single case of BSE in December in the state of Washington. About 9 percent of U.S. beef production was exported in 2003. Japan, Mexico, and Canada are the largest importers of U.S.-fed beef products. On 3 March 2004, Mexico eased their two-month-old ban on U.S. beef imports by allowing the entry of deboned beef products from animals under 30 months of age. Japan announced in April that it would not end its ban on imports of U.S. beef unless the U.S. implements the same measures as Japan to prevent mad cow disease. Early on, Japan said it would not resume imports of U.S. beef unless 100 percent of the cattle were tested for BSE. U.S. officials say 100 percent testing is unnecessary because BSE is found only in older animals. They also say U.S. beef is safe because animal scraps are banned in cattle feed and meat packers are required

to keep brains, spinal cords and other central nervous system tissue from cattle over 30 months of age out of the food supply.

Arizona's Agricultural Statistical Service reports that the 2003 cotton crop totaled 566,000 bales, down from 630,300 bales in 2002. With harvested acreage of upland cotton remaining constant, Arizona's decrease in production is due mainly to upland yields declining from an average of 1,381 to 1,262 pounds per acre. Nationally, all cotton production is estimated at 18.2 million bales, about 5.9 percent higher than production for the 2002 crop year. Despite higher production nationally, prices rose noticeably during the third quarter of 2003, primarily due to a drop in global production and strong export demand. Lint exports to Mexico have been quite strong in recent years, while textile imports from Mexico have also increased.

The number of dairy cows in Arizona and the top 20 U.S. states appears to have leveled off after expansions and contractions of 2002 and 2003, respectively. After remaining well below 1998-2002 average levels for about a year, Arizona milk prices have been increasing since July 2003. Arizona farmers are expected to have harvested 1.96 million tons of alfalfa on 245,000 acres in 2003, a 7 percent increase in area and a 5

percent increase in production over 2002. After above average price levels in 2002, Arizona alfalfa prices have continued to decrease throughout 2003 and into the first three months of 2004. Alfalfa prices for the first quarter of 2004 were about 13 percent lower than 2003 first quarter prices and 15 percent lower than 2002 first quarter prices. USDA forecasts 2003–2004 U.S. lemon production to decrease by 0.8 million boxes or 3.1 percent over the previous year. USDA expects Arizona lemon production to be 3.2 million boxes, a 6.7 percent increase over last year and placing some downward pressure on lemon prices. **AR**

Satheesh Aradhyula's research shows how agricultural policies affect producers and consumers.

Russell Tronstad's research and extension activities focus on marketing, management, and policy issues germane to Arizona's production agriculture.

Border Water Quality continued from page 11.

U.S. Department of Agriculture. Rural Utilities Service:

<http://www.usda.gov/rus/water/index.htm>

U.S. Environmental Protection Agency. Border 2012:

<http://www.epa.gov/usmexicoborder/>

U.S. Department of Housing and Urban Development

Colonias Quick Facts: <http://www.hud.gov/offices/cpd/communitydevelopment/programs/colonias/>

U.S. General Accounting Office. US-Mexico Border:

Despite Progress, Environmental Infrastructure Challenges Remain: http://www.sice.oas.org/geo-graph/north/Gao_3.pdf

Water Infrastructure Finance Authority of Arizona

(WIFA): <http://www.wifa.state.az.us/>

George Frisvold conducts research and outreach on environmental policies and natural resource management issues of importance to Arizona. His program includes ongoing work on agricultural biotechnology, pesticide use and regulation, border environmental management, and the relationship between federal farm programs and resource use.

New at AREC and the Cardon Endowment Program

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