

## "Reconversion of the Yaqui Valley"

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The comments that follow are not a systematic summary of the April 28<sup>th</sup> conference, but are rather a series of specific points that were stimulated by discussions in Cd. Obregon. These remarks draw from our own research, and also from that of Pamela Matson, Ivan Ortiz-Monasterio, Arturo Puente-Gonzales, Jessa Lewis, and Lee Addams.

1. Globalization, economic reforms, biological shocks, and severe drought now confront Yaqui Valley producers and policy makers with challenging new circumstances that require major changes in thinking at every level.
  - Supply/production orientations must give way to demand/marketing modes of thought and behavior.
  - The wheat/soybean cropping system must move toward higher valued alternatives, especially for the summer season to replace the soybean crop now precluded by white flies.
  - Producers must move from a mind-set of plentiful irrigation water to the new reality of less water—perhaps substantially less water.
  - Single marketing channels with high prices and little price uncertainty must give way to multiple marketing channels, international competition, (generally) lower commodity prices, and substantial price uncertainty.
  - The strong individualistic producers that have made the Valley famous throughout the world must now shift to a more group-oriented perspective to ensure the sustainability of the Valley's resource base and to promote new "systems" of higher valued products.
2. Global competition requires that Valley farmers pay substantially more attention to cost-cutting if they are to survive and prosper in the 21<sup>st</sup> century.
  - Numerous opportunities exist for reducing costs, including minimum tillage systems and improved water efficiency. Often these changes also have positive effects on the environment.
  - Improved management of nitrogen fertilizer is one important place to begin cost cutting. Farmers now apply very heavy doses of nitrogen

fertilizer in the Valley, typically above 250 kg per ha on durum. Nitrogen losses from this fertilizer—in the forms of ammonia, NO<sub>x</sub>, dinitrogen, nitrous oxide, and nitrates—are among the highest in the world. Moreover, nitrogen losses from fertilizer (and also from animal wastes) are beginning to cause severe environmental problems in the Valley and in the estuaries of the Sea of Cortez.

- Farmers typically apply three fourths of their N fertilizer before planting; 40 percent of this portion is lost by various pathways, even before seeds go into the ground. Applying only 180 kg per ha, but applying one-third of this amount at planting and two-thirds at the end of tillering, would produce durum yields comparable to present yields.
  - Changing farm management practices on fertilizer in the foregoing manner would cut farmers' costs by some US\$25 per ha and would reduce nitrogen pollution in the groundwater, estuaries, and atmosphere. Later seasonal applications of a given amount of fertilizer would also raise the protein percentage (quality) of durum, making it more competitive internationally.
  - New assessments of nitrogen fertilizer recommendations are clearly called for. Farmers also need more accurate soil testing and better measures of residual nitrogen in the soil at the start of the growing season. Credit is also needed to purchase new, or modify existing, machinery better suited to planting and applying fertilizer simultaneously.
3. *Ejidots* and *ejidatarios* are facing substantial new difficulties in the Valley that arise as a result of reduced subsidies on crops and credit. Survey evidence indicates that *ejido* villages are becoming older (as the younger generation leaves) and are also becoming less cohesive. These conditions and the change in Article 27 mean that much more of the *ejido* land, which occupies about 55 percent of the Valley, is being rented to private farmers during the last half of the 1990s.
- If *ejidos* are to stay in agricultural production, they must move into the production of higher valued crops. This switch is unlikely to occur unless *ejidos* are made an integral part of broader regional efforts to engage in processing and marketing.
  - A Valley master-plan for the *ejidos* requires a shift in focus from increasing agricultural production to increasing human capital of *ejido* families so as to facilitate their employment mobility.
  - New rental arrangements by *ejidos* represent opportunities for private farmers to expand the size of their operating units, to spread costs, and to survive on lower margins per hectare.
4. Aquaculture represents a new opportunity for the Valley—either a positive opportunity to provide a model of regional development that is both

profitable and sustainable, or a negative opportunity to destroy an important portion of the Valley's resource base in the same unsustainable manner that has bedeviled a dozen other countries.

- Somewhat ironically, much of the best land for aquaculture along the coast is owned by *ejidos*—land that was previously thought to be almost worthless. Land prices (long-term rental rates) are rising rapidly along the coastline, which in turn are causing uncertainty among *ejidos* about whether to sell, rent, or develop the land for aquaculture themselves. The problem of uncertainty is intensified because aquaculture development, if done at all rationally, will not permit all *ejidos* to convert their land because of water quality and other environmental constraints. Given the high capital costs of shrimp-pond development, the questions of “who develops the land and when” will be answered primarily by credit availability to various groups. Longer-run property rights are also critical for this land, since there are already great pressures to produce shrimp too intensively. Such systems typically collapse within five years, leaving behind fouled landscapes and polluted estuaries. They tend also to disrupt the economies of fishing villages that depend on ocean shrimp and fish for their livelihood.
  - Sustainable aquaculture will require enormous restraint on the part of producers and policy makers. Producers in a dozen countries have pushed systems too intensively and have fallen victims of crashes caused by the viral diseases of shrimp and by fecal- and antibiotic-laden effluents. Policy makers and regulators have typically permitted too many farms within too small an area, have not separated inflow and outflow canals adequately, and have not ensured proper management of water quality. In short, they have themselves contributed substantially to the problems of aquaculture. Fortunately, several research institutions in Sonora are now using geographic information systems and other analytic techniques to develop a listing of optimal sites.
  - Returns from shrimp aquaculture in other countries are often US\$25,000 per ha from semi-intensive systems. Even higher returns are possible for a few years, but they are not sustainable for very long. The politics and economics of allocating a limited number of shrimp aquaculture sites of moderate farming intensity create dilemmas that almost no region has handled wisely. Whether the Valley becomes a model system for doing aquaculture correctly, or simply another all-too-familiar example of aquaculture done in a resource-destroying manner, is still an open choice for decision-makers in the Valley.
5. Five years of successive drought have left the Valley in a precarious position with respect to irrigation water. Reservoir levels (1,500 Mm<sup>3</sup>) in

March 2000 were less than 20 percent of reservoir capacity (7,200 Mm<sup>3</sup>), and were down from about 50 percent of capacity (3,500 Mm<sup>3</sup>) in March 1996. By May 2000, levels (1,250 Mm<sup>3</sup>) had slipped close to the minimum pool level of the reservoirs, at which point remaining water supplies are accessible only by pumping. During 1999-2000, durum irrigations were cut from five to four per crop, and essentially no water will be released for summer crops of 2000. Six additional months of drought would have large negative impacts on Valley producers—in terms both of the acreage of durum that could be sown in autumn 2000 and also on the water per hectare that could be provided to areas that are planted.

- Multi-year periods of dry and wet weather are not unknown in the Yaqui Valley; however, the current drought appears to be the worst on record. Global climate change may already have begun to produce more extreme weather events of longer duration in the Valley. Rains will no doubt return, but the past five years should serve as a wake-up call on the need for greater water conservation, for greater water use efficiency, and for greater thought to a longer-run water plan for the Valley.
- Relative to most irrigated systems, the Yaqui Valley is not “short” of water. Alternative forms of irrigation, such as pivot and drip, could cut substantially the “required” water per hectare. But these improved irrigation systems cannot be “paid for” only by growing durum in the autumn season. The need for greater water-use efficiency is thus another important reason why the Valley should shift toward higher valued crops.
- Continued drought will require durum varieties with greater tolerance to water stress as compared to existing varieties. Fortunately, CIANO and CIMMYT are testing such varieties currently. Continued dry conditions could cause the number of irrigation applications to be reduced from four to three. Preliminary evidence indicates that the profits from growing 133 ha of drought-resistant durum with three irrigations will exceed the profits from growing 100 ha of current varieties with four applications. Therefore, having drought-tolerant varieties ready—if needed—for autumn 2000 should be part of the short-run contingency plan for the Valley.
- Pressures to increase pumping of groundwater in the Valley will intensify if generally dry conditions continue into the future. Fortunately the Valley has good irrigation infrastructure, a market for water that functions well within modules, and a tradition of District (public) control of groundwater pumping for agricultural uses. Nevertheless, the pressure from farmers to pump more than (about) 15 percent of total irrigation supplies is likely to build. Current limitations on groundwater use include salinity constraints and a perceived maximum yield. However, a fresh look at optimal use of surface and

groundwater is needed, as is an analysis of salt balances and salinity control under altered pumping regimes. Water resource planning, nitrogen use, and aquaculture are topics on which Stanford and its collaborators have ongoing research interests.

6. The Yaqui Valley has always been known for its technological leadership in the production of bulk commodities, especially wheat. However, new economic, irrigation, and biological shocks have created circumstances that require new modes of thought. Whitefly infestations have eliminated soybeans as a summer crop. Low grain prices, relatively low summer-maize yields, and high evapo-transpiration rates for irrigation water make maize and most other summer crops no longer competitive. Increased livestock production offers some hope for generating new sources of income, but nitrogen loadings from these units are already contributing to nitrate problems in the groundwater and to eutrophication of certain estuaries. Melon production in the Valley has gone through several boom and bust cycles, with high melon prices calling forth large melon supplies, only to be followed by prices so low that it did not pay even to harvest the melons. Current talk is of diversification to higher valued fruit and vegetable crops, but the question is how? Outside consultants could help with this question, but capitalizing on existing experiences in the Yaqui and Hermosillo regions would be even a better first step.
  - Successful fruit and vegetable production must be demand- and processor-led. Quality control will be at a premium, as will compliance with food-safety regulations. Fortunately, the Yaqui Valley enjoys a generally good reputation for enforcing sanitary codes.
  - Some Valley producers have produced high valued crops on speculation, i.e., they have produced products without having established a clear final-demand linkage. They typically have been at the mercy of brokers at Nogales or other border towns.
  - Finding niche markets for supplying high quality produce for particular time slots though the use of forward contracts is a preferred solution to diversification in the Yaqui Valley. Often such solutions require a set of producers, not just a single farmer. The questions at issue are whether those niches can be found, and if so, how?
  - The region around Hermosillo has made major changes toward high-valued cropping systems during the past 25 years, largely as an induced effect from water shortages. (Sustainability at Hermosillo is still an open question, however, since pumping now exceeds recharge.) Hermosillo marketing channels should be analyzed carefully for their relevance to the Yaqui Valley, as should other ongoing experiments with eggplant, chili peppers, and orchards within the Yaqui Valley. Conversion of the Valley will not happen overnight, but it needs to

build systematically on experiences, both positive and negative, of Yaqui Valley producers.

7. The Cd. Obregon conference, more than anything else, demonstrated the capacity of large numbers of talented farmers and farm groups to face up to difficult problems. A forward-looking Master Plan for the Valley that looks critically at new land, water, and environmental constraints; that recognizes cost-cutting as one of the necessary first steps; that understands the changing role of the *ejidos*; that accepts the challenge of planning for sustainable aquaculture; and that deals more systematically with securing forward contracts for niche markets could be of major benefit to individual producers and to the Valley as a whole.