LCLUC Abstract

Land-Use and Land-Cover Change in Sonora, Mexico: Trajectories of Agricultural Intensification and Consequences for Non-Agricultural Ecosystems

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Since the beginning of the Green Revolution, development and utilization of improved cultivars and increased use of fertilizers, pesticides, and irrigation have lead to dramatic increases in grain production worldwide. This "intensification" of agriculture has accounted for more of the global food production increase than has expansion of agricultural land and is likely to continue to do so. Intensification of land-use, however, carries implications not only for agricultural production but also for off-site land-use and land-cover change.

The objective of this proposed research is to evaluate the causes and consequences of agricultural development in the Yaqui Valley of northwestern Mexico. The Yaqui Valley is the home of the Green Revolution for wheat, and one of the most productive breadbaskets of Mexico. Until the first half of this century, it was primarily a desert scrub ecosystem; development of irrigation and fertilization systems has lead to dramatic changes in the Valley, and potentially in surrounding regions as well. We propose to analyze the critical links among agricultural policy and agricultural extent and productivity within the Valley, as they have changed over the last fifty years and continue to change. Moreover, we will utilize remote sensing data to evaluate the off-site consequences of these agricultural land-use decisions for land-use and land-cover in the surrounding region, focusing on

1. the extensive changes in land use in the areas surrounding the agricultural valley (e.g., expansion of grazing systems in the scrub desert ecosystems at the edge of the Yaqui Valley)
2. alteration of native ecosystems as a result of down-wind deposition of anthropogenic nitrogen from the Valley.

We will collate or develop and use three data bases:

1. historical data from the Yaqui Valley Irrigation District
2. farm-level socio-economic and agronomic surveys conducted by CIMMYT and by Naylor during the past 15 years
3. MSS, TM, and AVHRR data registered in an ARC/INFO based GIS, along with climate, soils, and topographic data bases, for the Valley and surrounding regions.

The proposed work will build on our long-term experience and previous studies of biogeochemistry, agronomy, and economics in the Yaqui Valley.