The Transformation of Tarahumara Agriculture in Chihuahua, Mexico

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Introduction

The Tarahumara are one of the most isolated and intact indigenous groups in Mexico. Their agriculture has traditionally been practiced within the steep canyons and uplands of the Sierra Madre Occidental in southwestern Chihuahua. Adapting to these rugged conditions the Tarahumara developed a variety of agricultural techniques that allowed them to be self-sufficient in food production and independent of external inputs. As varied and ingenious as their techniques are, they share one main objective - to overcome the poor fertility in the stony mountain soils. Since the arrival of the Spanish, the addition of soil nutrients has involved large amounts of animal manure to increase soil fertility. The focus of this study was to investigate new agricultural techniques that the Tarahumara are adopting due to the pressures of globalization and climate change. These new technologies may still include many traditional agricultural methods, but they are increasingly using commercially available fertilizers and other modern agricultural additions, thereby losing self-sufficiency.

Research Questions

• As the Tarahumara are affected by globalization and the pulls of modernity, what changes have occurred in their agricultural techniques?
• How sustainable are these agricultural techniques? Do the Tarahumara have sufficient capital to maintain them?
• What effects will this have for the future of the Tarahumara? Will they be able to maintain their independence?

Methods

• 28 Interviews were conducted throughout the Sierra Tarahumara with local farmers and government officials to better ascertain the current agriculture technologies and perceptions of the Tarahumara
• Soil samples were taken from all 28 interview sites. Physical analyses included soil color, gravel content, soil organic matter (SOM) percentage, and texture analysis were conducted at the Soils Laboratory at the Department of Geography and the Environment at the University of Texas at Austin
• For a chemical analysis, soils were sent to the Agrilife Extension at Texas A & M University
• Results were compared based on field slope, erosion control structures and fertilizer use

Results: Qualitative Interviews

• Agriculture in the Tarahumara is currently undergoing a major transformation
• Several traditional agricultural techniques are being pushed aside in favor of more modern agricultural technologies
• Many farms lack necessary erosion control structures, such as terraces, semi-terraces, check dams and scattered rocks
• During a recent ten year drought, a large number of Tarahumara livestock died, resulting in the loss of their main source of fertilizer
• The drought, along with other pressures, has forced the Tarahumara into wage-labor jobs to pay for chemical fertilizer to maintain soil fertility
• A demographic change is occurring and many of the younger Tarahumara are not continuing traditional agriculture

Study Area

Research was carried out in the Sierra Tarahumara of southwestern Chihuahua, Mexico. Tarahumara farmers cultivate along the steep mountain slopes of the Sierra Tarahumara uplands and canyon country.

Results: Soil Analysis

• There are no set values for SOM, nitrate or soil texture that predicate high soil fertility. Desirable soil pH is between 5.8 and 7, and the critical levels for phosphorus are 50 ppm
• Field slope does not appear to play an important factor in soil fertility. Flat and inclined slopes had similar pH and sand percentage values, while the nitrate, phosphorus and SOM values varied
• Natural fertilizer is clearly more efficient than chemical fertilizer. The SOM %, soil pH, nitrate, and phosphorus values all favor natural fertilizer. The control sample, taken from a pine forest, demonstrates the naturally low pH and lack of essential macronutrients
• Erosion control structures also appear to aid in the soil fertility of Tarahumara agriculture. SOM, soil pH and phosphorus values are all higher in fields which work to stop erosion
• Soil analyses show high amounts of essential macronutrients and overall high soil fertility

Conclusions

• Tarahumara agricultural practices are quite effective and have helped create fertile and productive soil
• The influence of population influxes in to the Sierra Tarahumara, along with globalization threatens their traditional way of life
• The use of chemical fertilizer is not only expensive, but also creates acidic soil, and has lower amounts of nitrate, phosphorus, and soil organic matter
• For the Tarahumara to maintain their independence they must be able to continue traditional agricultural practices

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