Mapping Rural Poverty in Mexico

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Introduction

The multiple activities of international agricultural development seek to increase food security, reduce poverty and conserve the natural resource base for agriculture and other human activities. Implicit in these efforts are notions of how food security and human welfare vary geographically and what forces drive this variation. Poverty mapping is an important tool for identifying economic and social disparities and the least developed areas within a country, in doing so it can aid decision-making and the targeting of development activities.

Researchers at the International Maize & Wheat Improvement Center (CIMMYT) developed rural poverty maps for Mexico - a country with one of the largest inequalities in the distribution of wealth and human welfare in the world. The results are now helping prioritize and target pro-poor activities.

Methods

A multi-variate regression model was developed based on methods developed by Bigman et al (2000). This model used household-level data from the Mexican National Income and Expenditure Survey 2000 (ENIGH, 2000), and GIS-derived environmental data to predict per capita household expenditure (total and food) for the average rural household, plus the fraction of rural households in extreme poverty by municipality. The model was then applied to the 2000 National Census and predicted expenditures compared to officially defined Mexican poverty lines (Comite para la Medicion Oficial de la Pobreza, 2002). All model results were incorporated into an ESRI ArcGIS environment for display and further analysis.

Bigman, D., S. Dercon, D. Guillaume and M. Lambotte. 2000. Community targeting for poverty reduction in Burkina Faso. The World Bank Economic Review 14: 167-194.

Comité Técnico para la Medición de la Pobreza. 2002. Medición de la Pobreza: Variantes Metodológicas y Estimación Preliminar. México, D.F.: Secretaría de Desarrollo Social.

Instituto Nacional de Estadística, Geografía e Informática (INEGI). nd. Encuesta Nacional de Ingresos y Gastos de los Hogares 2000. Aguascalientes: INEGI.

Results

At the municipality level, the estimated fraction of rural households in “extreme poverty” (those below the defined food poverty line of 485.71 Mexican Pesos per capita monthly expenditure) revealed an extremely non-uniform distribution (Fig. 1). Extreme rural poverty was concentrated in southern Mexico and the Sierra Madre Occidental. Application of the expenditure model to rural communities (defined as those with <2500 inhabitants) resulted in spatial distributions that mirrored those at the municipality level, with distinct concentrations of communities below the food poverty line (Fig. 2).

The Poverty Environment – Social & Biophysical

Given the non-uniform distribution of rural poverty, are there any key underlying social or environmental factors? Two important examples are presented.

In social terms, presence of indigenous communities (based on language) was an extremely important factor related to rural poverty (Fig. 3).

In environmental terms, there was a very strong tendency for the extreme poor communities to be located in sloping lands (Figs. 4a & 4b). In combination with other observed environmental factors in extreme poor areas e.g., high rainfall and erosion-prone soils, there was an implication that soil erosion could be an important issue in many of the poverty-prone areas.

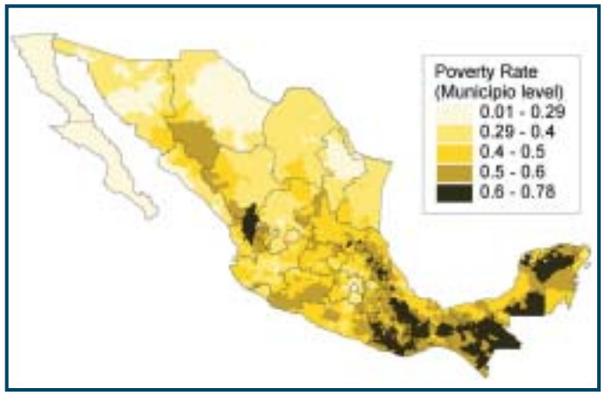

Fig. 1. Fraction of rural households per municipality in extreme poverty

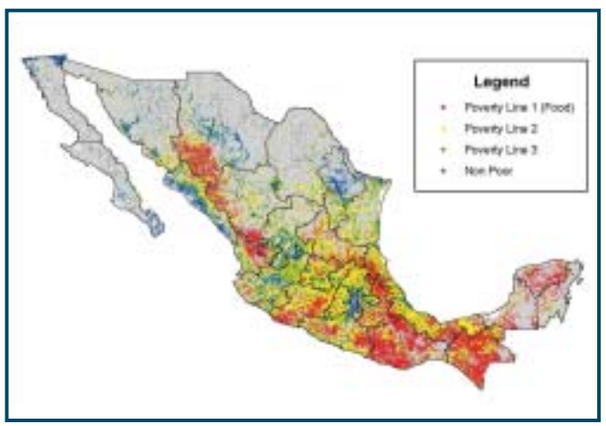

Fig. 2. Rural communities (<2500 inhabitants) classified by poverty line

Fig. 5. Kernal density probability surface of extreme rural poverty

Applications – Priority Setting & Technology Targeting

The observed clustered nature of extreme rural poverty permitted an investigation into the potential effectiveness of targeting appropriate technologies. Kernal density interpolation highlighted areas in which there were extremely high concentrations of predicted extreme poor rural communities (Fig. 5). This permitted the highest density areas (the “peaks”) to be selected as potential focal areas for technology or development targeting. As an illustrative example, 11 focal points were chosen and 50km buffer zones generated (Fig. 6). This approach resulted in the selection of over 26% of all the predicted extreme poverty rural communities in Mexico. Those key areas were then compared to predicted maize grain storage damage surfaces derived from CIMMYT research (Fig. 7). Maize grain storage losses were likely to be significant in the focal areas, and targeting of materials and technologies to reduce storage losses could be one intervention that has positive benefits.

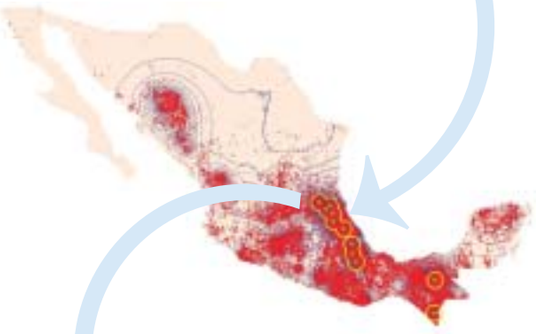

Fig. 6. Poverty focal points and 50km buffer zones in relation to the distribution of extreme poor rural communities. Kernal density probability contours also shown.

Fig. 3. Rural communities with more than 50% of the adult population speaking an indigenous language

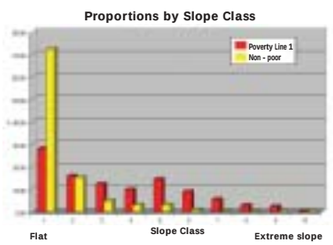

Fig. 4a. Proportions of extreme poor and non-poor rural communities by slope class

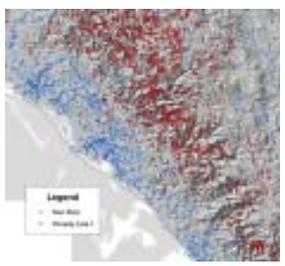

Fig. 4b. Distribution of extreme poor and non-poor rural communities and landscape relief, Sinaloa

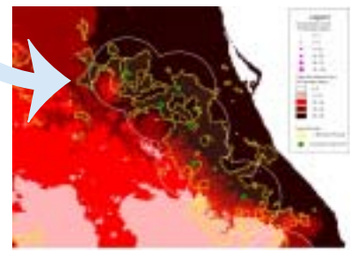

Fig. 7. Predicted maize grain damage losses during storage in relation to focal areas for extreme rural poverty.

Summary

- A very non-uniform and clustered distribution of extreme rural poverty in Mexico.
- Presence of indigenous communities was one important driver (but not the only one).
- Extremely poor communities tended to be concentrated in sloping areas, and this was often in combination with high rainfall and erosion-prone soils.
- Extremely high densities of extreme poor rural communities in certain areas offered opportunities for specific targeting of development activities.

Contact Information

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