Maize Adoption, Biodiversity Conservation and Poverty in Mexico

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Maize production plays a key role in the livelihoods of many small-scale farm households in Mexico, although its productivity remains relatively low. It is known that improved germplasms have the essential attributes for enhancing maize productivity. However, after more than four decades of improved maize varieties' availability in Mexico, only one fourth of the total maize area was covered with improved varieties in 1996. Therefore, a considerable portion of the rural households cultivating maize still live in poverty. In addition, there is a general concern about the loss of maize genetic diversity among scientists, researchers and political institutions as Mexico is the center of origin and diversity for maize.

This study examines three related topics: households' improved germplasm adoption, conservation of maize genetic diversity and the impact of maize technology adoption on poverty alleviation in two of the poorest states of Mexico, i.e., Chiapas and Oaxaca, using cross-sectional survey data of 325 maize producers collected between October and December 2001. A binary probit model as well as a count data poisson model and propensity score matching is employed to estimate maize technology adoption, maize diversity conservation and the impact of maize adoption on poverty alleviation, respectively. Specifically, propensity score matching is employed to investigate existence of cause and effect relationship, i.e., whether adoption of improved maize varieties like hybrid or OPV reduces small-scale farmers' poverty.

The results reveal significant and positive impacts of improved germplasm adoption on per-capita expenditures (as a measure of poverty status). Particularly, maize hybrid in Chiapas, and creolized maize in Oaxaca were found to have a strong impact on poverty levels. The findings are quite informative as traditional economic analyses on the impact of maize adoption often focus on high yielding varieties, like maize hybrid, with little emphasis on intermediate maize varieties or varieties that are modified by farmers such as creolized maize. Furthermore, few studies assessed the impact of maize technology adoption as such. Therefore, this study sheds light on the discussion of whether maize adoption helps the poorest farmers or not. The analysis highlights the potential role of maize technology adoption in directly reducing poverty through enhancement of small-scale farmers' per capita expenditure. Therefore, this result strongly suggests that improved germplasm is an important mechanism to help rural households to get out of poverty. This reveals the need for the evaluation of a broader set of maize types for maize breeding programs.

Additional results indicate that technology development for agriculture under less favorable conditions has to be attended by breeding programs at international and national level, as well as in the domestic government policy agenda. Factors that influence a household's likelihood of conserving maize genetic diversity in the traditional crop system are analyzed using a count data poisson model. The results indicate that the households' socioeconomic constraints are characteristics that significantly motivate small-scale farmers to manage a portfolio of local maize varieties, beans and squash in the traditional Milpa system. Old age and indigenousness of the household head, number of purposes maize is used for, higher number of farm plots, farm plots with poor soil quality, and high dependence on human labor characterize households using the subsistence oriented farming system which owns and produces the wealth of local varieties in the study areas. Conversely, the empirical results from binary probit model provide several insights to understand farmers' maize adoption behavior. The results revealed that age of the head of the household, proportion of male family members aged between 15 -50 years, number of horse owned as a capital asset, farm size and land quality increases the likelihood of maize technology adoption. These findings have important implications for maize breeding programs as well as government policy programs targeting to eradicate poverty, food insecurity, and crop genetic erosion in centers of diversity like Mexico.