



# Discussion Paper BRIEFS

Food Consumption and Nutrition Division of the International Food Policy Research Institute

*Discussion Paper 162*

## **The Impact of Improved Maize Germplasm on Poverty Alleviation: The Case of Tuxpeño-Derived Material in Mexico**

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Improved maize varieties have been available in Mexico for more than 40 years, but their diffusion has been limited. Despite government campaigns to encourage use of improved seed, only about one-fourth of the total maize area in the country is planted to improved varieties. The low rate of diffusion, however, may underestimate the true impacts of improved germplasm on the welfare of rural households. A growing body of evidence suggests that many small-scale, subsistence-oriented farmers have taken up improved varieties and planted them alongside local varieties. By exposing improved varieties to local conditions and management, continually selecting seed of these varieties for replanting, and promoting their hybridization with landraces, farmers produce what they recognize as “creolized” varieties. Conventional germplasm impact studies usually focus on areas planted to improved varieties. However, few attempts have been made to document the use of creolized varieties, and how these varieties respond to the livelihood conditions and needs of poor farmers.

### ***Purpose of This Study***

This study attempts to document how poor farmers in lowland tropical Mexico use improved maize germplasm directly (by adopting improved varieties) and indirectly (by creating creolized varieties). In addition, the study attempts to determine how the use of improved germplasm contributes to the well-being of poor small-scale farmers. The hypothesis is that poor farmers benefit from improved germplasm through creolization. The reason is that while improved varieties provide desirable traits not found in landraces, they also may lack traits found in landraces. Choosing between landraces and improved varieties presents trade-offs.

Creolization lessens these trade-offs by adapting improved varieties to the local conditions most relevant to these farmers. Creolized varieties provide traits not supplied by landraces and entail fewer trade-offs than improved varieties. Creolization provides farmers with new options, as they deliberately modify an improved technology generated by the formal research system to suit their own circumstances and needs.

The study involves three separate but related activities: (1) measuring and explaining diffusion, local adaptation, and use of improved maize germplasm; (2) understanding how adaptation choices are linked to livelihood strategies and vulnerability in the context of rural households; and (3) assessing the impacts of adoption on the welfare of rural households.

### ***Methodology***

The overall design of the research shared a common con-

ceptual framework with four other studies of the impact of agricultural research on poverty. Twelve communities in Oaxaca and Chiapas were selected in areas of medium, high, and very-high marginality, defined according to an index used by the Mexican government. They also included communities with indigenous populations. Site selection further considered agroecological conditions and government programs to diffuse seed of improved varieties, to select areas of “low diffusion” and “high diffusion.”

The qualitative research began with two sets of focus group discussions, the first on local perceptions of poverty, livelihood strategies, and vulnerability, and the second on perceptions of maize traits and how they respond to these conditions. These were followed by household case studies conducted in four of the communities, where fieldworkers lived in the villages, conducting extensive household interviews and observing activities in the household, community, field, and market. Ten case studies were conducted per village, with households selected to roughly represent “extreme poor,” “average poor,” and “less poor” farmers. The quantitative research involved a representative sample survey of 325 farming households covering all 12 communities. Finally, the project included a collection of all maize types grown in the communities and an agronomic evaluation of maize samples.

### ***Results***

***How Widespread Are Creolized Varieties?*** The results show that modern varieties, and particularly creolized varieties, are widely planted in the study areas and that the improved germplasm and creolized varieties have contributed to the well-being of poor farmers. Creolized varieties are perceived to provide traits that landraces do not have and have fewer trade-offs than improved varieties. Creolized seed is also cheaper. Adoption patterns show that the poor plant them.

In Chiapas, hybrids and other improved varieties seem to be neutral, i.e., the poor plant as much hybridized seed as the rest. The impact of creolized varieties is less straightforward than in Oaxaca, but they are still widely planted. Although their advantages compared to hybrids are less marked, they also provide advantages over landraces, and farmers in both study areas are willing to pay a premium for creolized seed compared to landrace seed.

Linguistic, cultural, and agroecological factors play a much lesser role in decisions to adopt different types of maize in both study areas. In general, the evidence supports

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the hypothesis about creolization and its role in farmers' maize agriculture.

*How Does Creolization Occur?* Creolization occurs when different varieties are planted near each other and they cross. This occurs with different levels of intention. Some farmers deliberately plant varieties close together in the hope of getting better characteristics in the new variety.

Although farmers discuss varieties and their traits, their ability to distinguish among creolized seed and landraces is unclear: all seed that is not from a sealed package is widely referred to as creolized. Furthermore, improved varieties are said to be "creolized" through seed recycling, where seed is seen as "acclimating" to the land. Even where seed actually degenerates through recycling, it is still a popular practice because of the high cost of new seed. Whether from crossing varieties or recycling, farmers have a high level of confidence in these "known" varieties, because they have proven themselves over time and are seen as better adapted to local conditions.

*How Is Seed Diffused?* In addition to selecting from one's own harvest, seeds are mainly obtained through informal social networks and, to a lesser extent, government programs. Commercial seed outlets play a very limited role. Social networks are key because they offer many options, are trusted, and, most importantly, they provide the opportunity for farmers to observe plants in the field before adopting. This need-to-see performance and reduce risk is true for all farmers, particularly the poorest.

*What Is the Role of Government?* Government programs play a more important role in Chiapas than in Oaxaca, but they suffer from a lack of credibility in both study areas. Farmers' experiences with these programs have been problematic, including seeds arriving late, restricted access to credit, absence of technical support, politicization of seed distribution, and quantity and quality requirements for marketing that the poorest farmers cannot meet. Experience with poor quality seed has left farmers suspicious of government seed and improved seed more generally. They also often do not trust advice about maize management practices or cannot afford to follow them.

## **Discussion**

Several implications can be drawn from these results.

- It is important to avoid the dichotomy of traditional versus modern varieties that is common in adoption and impact studies. There are many different types of germplasm, each with advantages and disadvantages. Moving away from this simple dichotomy, however, entails challenges that require the use of multiple methodologies, such as participatory and ethnographic as well as survey methods.
- We must question the conventional adoption model for improved germplasm that assumes that the breeding process finishes once farmers have adopted a variety, and that a variety once adopted should stay unchanged. Improved varieties change in farmers' hands, and these changes can be positive.
- Yield is not a sufficient yardstick of impact. We must look at the set of traits that farmers value, how those traits are being supplied by the germplasm available, and the trade-offs they entail. Farmers even have different concepts of yield that may not be correlated, e.g., yield by weight, yield by volume, yield of dough to make tortillas.
- Extension strategies should be attentive to local innovation and adaptation of improved varieties. Extension agents should not assume that an improved variety is automatically superior, especially for characteristics that matter to farmers.
- Researchers and extension agents should be aware of farmers' actual practices with regard to management and recycling of improved and creolized seeds, which is explained by their resource base, local beliefs, and access to and trust in different sources of information. This provides a window of understanding into the usefulness of different varieties under different conditions and likely outcomes of introduction, adoption, and creolization.

**Keywords:** poverty, agricultural research, sustainable livelihoods, vulnerability, agricultural extension, maize germplasm, creolization, Mexico

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