Chapter 1

Context and Background on Wild and Cultivated Maize in Mexico

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Abstract

Man began the process of domesticating maize from teosinte in the Balsas River basin some nine thousand years ago. Initial steps toward domestication involved getting rid of the hard fruit case and the fruit-shedding character of teosinte. Domestication included planting and selecting for many generations. Three ancient ears were excavated in the Guila Naquitz cave of Oaxaca and predate the present by 6250 years: the morphology of those ears is prototypic of modern maize. Ancient maize was dispersed into North and South America within one thousand years after its domestication. Hybridization with a different subspecies of teosinte in Central America produced a new type of maize that hybridized with ancient maize as it was brought back to Mesoamerica.

From the years when yields became higher than 200 to 250 kg per hectare—considered necessary for village life—until contact with Europeans, the Mesoamericans accumulated substantial technological advancements: the modern races of maize, production-storage know-how, the nixtamalization process ("limestone cooking") for direct human consumption, which we now know prevents pellagra.

Columbus took maize—though he did not take nixtamalization processing along—back to the Old World. Wherever it was grown, maize outproduced yields of all other cereals and made an inexpensive food. It became the staple food of the poor in Europe during the 17th and 18th centuries. Along with its use as a staple crop came pellagra, a deadly dietary disease associated with the strict consumption of maize. Pellagra is unknown in Mesoamerica even among strict consumers of maize, thanks to nixtamalization. The association of maize with pellagra among humans in the Old World, plus the observation that domestic animals thrived on maize, marked the future use of the crop as unfit for human consumption but an excellent animal feed.

Several scientists have added to the pioneer work of Wellhausen and collaborators in describing 41 landraces of maize. Altogether, these 41 races make maize the ubiquitous crop of Mexico. Teosinte (the ancestor), and *Tripsacum*, a related genus, are also widely distributed in Mexico. Teosinte outcrosses freely with maize—though with exceptions—and makes viable hybrids. Some ethnic groups revere teosinte as the heart of maize. *Tripsacum* does not outcross with maize in nature, though tripsacorn, a hybrid between *Tripsacum* and perennial teosinte, has been successfully, albeit experimentally, crossed with maize.

The 81 ethnic groups of Mexico are the true stewards of most of the 41 maize landraces. They have their own breeding-conservation strategy. It is widely accepted within the Mexican scientific community that *in situ* conservation of maize will stay viable as long as ethnic cultures remain stable. We estimate that almost a million farming units—most of them smaller than two hectares and largely limited to human energy inputs—pursue traditional peasant agricultural practices. The indigenous population of Mexico stands as the poorest of the poor. The environment of nil-subsidy and competition generated by the North American Free Trade Agreement (NAFTA) is seriously affecting this type of agriculture.

Mexico produces about 18 million metric tons of maize per year. This amount of product is about 50 percent greater than a traditional maize-based diet would require for feeding 10 million inhabitants in a year. Yet the mixture of transgenic and non-transgenic maize imported from the United States has been disseminated—albeit in low proportion as of now—deep in the heartland of traditional agriculture, which is also the historical, *in situ* conservation ground of Mexico’s landraces. The government aid program to food-depressed areas is the most likely culprit for disseminating transgenic maize. The *de facto* moratorium on commercial growing of transgenic maize was insufficient to prevent dissemination of transgenic maize in Mexico. The lack of a policy concerning the nature of imported maize acted as a missing link to the moratorium.

Recently, recombinant DNA technology is producing transgenic non-food maize for pharmaceutical or industrial use and that should also be considered in future scenarios in Mexico.

The future presence of transgenic maize in Mexico depends on a combination of decisions by the Mexican government: (1) maintaining the 1998 moratorium; (2) cleansing the environment of transgenic maize already imported; (3) enacting a policy to keep imported mixtures of non-transgenic and transgenic maize away from rural areas; and (4) enforcing a policy to bar imports of transgenic maize.

Government “yes” or “no” answers to the set of alternatives listed above will inevitably impact a number of historical, political, social, economic, and ecological issues. At stake in this scenario are: (1) the primary location of *in situ* genetic diversity for maize and teosinte in the world; (2) the *in situ* conservation of maize and teosinte; (3) farmers who grow their own seed; (4) would be maize breeding programs that started from landraces collected *in situ*; (5) larger-scale, commercial farmers; (6) consumers of maize; (7) the future of gene banks over the longer term.