The local production technology for these crops is the product of centuries of interaction among the farmers, their environment, and external influences. There is solid evidence that primitive wild maize was domesticated as long as 7,000 years ago in the highland region of which the Project area is a part. When the Spanish conquerors arrived at Cholula (near the center of the Project area) they found the inhabitants cultivating maize. The historian Bernal Díaz del Castillo reports that the farmers in the valley of Mexico at the time of the conquest were using human excrement and fish bones to fertilize maize. It is probable that knowledge of these practices extended to the nearby Puebla valley.

Genetic Resources

Great phenotypical diversity is evident in the local varieties of maize, bush beans, pole beans, and pumpkin. Most of the local maize varieties belong to the Chalqueño race. For early plantings in March and April, farmers use late-maturing varieties that flower in 100-120 days and require about 180 days to reach physiological maturity. These early plantings usually experience some moisture stress during the first 2 or 3 months, but have adequate moisture during the rest of the growing season. The late varieties are generally high-yielding; yields of 10 ton/ha of grain have been reported in field trials.

Farmers use early-maturing varieties with a biological cycle of about 130 days for late plantings in June. These varieties flower in 75-90 days after planting. Typical environmental conditions during the early growth stages of late plantings are cool temperatures, low light intensities, and abundant moisture. The yielding potential of early varieties is only about half that of late varieties.

In addition to this relationship between earliness and yielding potential, the length of the growing cycle of maize varieties tends to be correlated with the height of the plants, shape, texture, and color of the grain, and (probably) tolerance to early drought. Late-maturing varieties are about 3 meters tall and have grain that is usually dented, hard, and light-colored. Early-maturing varieties are about 2 meters tall and produce large kernels that are usually floury and dark-colored (red or blue).

Maize varieties with an intermediate growing season also are available in the area for May plantings. Most native varieties are susceptible to lodging when produced under favorable growing conditions.

Data collected in the 1967 survey indicated that 54.6 percent of the farmers knew about hybrid varieties of maize. About 15 percent of the farmers had planted hybrid maize on at least one occasion, but only 0.8 percent of them planted a hybrid in 1967. Of the farmers who knew of hybrid maize but had never planted it, 64.2 percent gave as their reason that hybrids did not outyield their local varieties, or did so only under irrigation.

The length of the growing season of beans tends to be correlated with the growth habit and the size, form, color, and flavor of the grain. Beans with a long growing season have an indeterminate growth habit (pole beans), large grains, light colors, and a flavor preferred by most consumers. Beans with a shorter growing cycle have a determinate growth habit (bush beans), smaller grain, and a less popular flavor. (The yielding potential of the maize-pole bean association is suggested by the results from a later field trial in which the association receiving both chemical fertilizers and chicken manure produced 4.5 tons of maize and 3.0 tons of beans per hectare).

Little is known at present about local production technology for *ayocote* and pumpkin. The experimental study of the maize-pumpkin association was not undertaken until 1973.

Production Practices

Most farmers manage their soils so that moisture present in the profile at harvest time is conserved through the winter months; thus maize can be planted in March and April, some 2 months before the rainy season begins. Farmers cut and shock their maize as soon as it reaches physiological maturity; they then plow immediately and smooth the surface with a wooden plank. This operation is usually done in October and repeated in February or March. Maize planted in these soils with residual moisture usually suffers from drought before the summer rains begin. This moisture stress slows down or stops vegetative growth, but other physiological processes continue. As soon as the rains begin, the maize continues its vegetative development. If drought is not too prolonged, the maize has sufficient time to produce large plants and a good yield. By preparing their land in this manner, farmers (under rainfed conditions) are able to use late varieties that require 180 days to reach maturity in an area where the period with rainfall and without critical frosts lasts only 140 days.

Farmers who plant with residual moisture understand that agronomic risk in their plantings is due primarily to drought during the period between planting and the beginning of the rainy season and to the midsummer or intraestival drought (usually between July 15 and August 15). Those who plant early are betting that drought during the period before the rains begin will not be severe; they stand to gain a high yield if early drought is slight. Farmers who plant late are betting that early drought will be severe; they stand to gain yields less than those produced by early plantings if early drought is slight—but will produce comparatively higher yields if early drought is severe. Thus, planting date is a variable that can be manipulated. The usual practice is for farmers to use a mixed strategy in choosing the date of planting; that is, they distribute early plantings over a period of a month or so.

Present technology does not provide for the conservation of sufficient moisture during the winter months to permit early plantings of maize in sodic-like soils, heavy