AN EVALUATION OF THE AGRONOMIC RESEARCH PROGRAM

This section seeks to evaluate the results of agronomic research in terms of impact on maize yields, on net incomes of farmers, and on the risks farmers take with input investments for maize production. A major difficulty in making such an evaluation stems from the fact that increases in production and net income are generated by many interacting factors (production credit, distribution of inputs, markets, input cost: product price ratios, etc.), and not by improved technology alone. Nevertheless, it seems reasonable to examine the influence of project recommendations by comparing increases in maize yields and net income – and changes in risk as well – that can be expected if farmers adopt each of several production technologies presently available.

According to the 1967 survey, 69.3 percent of the farmers applied fertilizers to their maize plantings that year. The production technology of those farmers (on the average) consisted of approximately 50 kg/ha N, 25 kg/ha P_2O_5, 10 kg/ha K_2O (potassium), 25,000 plants/ha, a local variety and a planting date ranging from 0 to 75 days before the beginning of the rainy season. Each of these production factors showed variation across the Project area, probably in response to the diversity of local producing conditions. Unfortunately, the 1967 survey was not designed to collect such information on the local production technology. Thus, the average production technology of farmers is used here to represent the traditional technology, allowing flexibility only for the local variety and the planting date. The inflexibility of the fertilizer treatment and the population density assumptions is very probably biased against the traditional technology in these comparisons. However, the assumption that all farmers fertilized their maize should be a bias favoring the traditional technology, since only 69.3 percent of farmers applied fertilizer to their maize plantings in 1967.

A maize technology, recommended by the National Agricultural Research Institute (INIA), was available to the Puebla farmers in 1967. It consisted of 80 kg/ha N, 40 kg/ha P_2O_5, 40,000 plants/ha, the hybrid H-28, and planting as soon as the rains began. This recommendation applied to the entire Project area.

The INIA technology was modified in two ways to facilitate the comparison of technologies: (a) the recommendation to plant at the beginning of the rainy season was changed to "plant early (late March, April, early May) in producing systems with adequate residual moisture." (It is known, *a posteriori,* that early plantings of maize produce higher yields. It was assumed that, once active promotion of the INIA technology was underway, the Project staff would recognize this fact and quickly change the recommended date of planting). (b) the recommendation to plant H-28 was discarded. This change was made because native varieties (not H-28) were planted in most of the experiments whose results were used to compare the different technologies. It was thought that this change would introduce little bias against the INIA technology, since local varieties compare favorably with H-28 in their yielding ability (see Chapter 4).

As indicated previously, the results obtained in the experiments conducted in 1967 were used to develop a new recommendation for maize, referred to here as the second approximation to the maize production technology. Experimental results obtained in subsequent years were used to develop a third, fourth, fifth, and sixth approximation. The sixth approximation, available at the beginning of 1972, included recommendations for 16 maize-producing systems. As shown in Table 3.9, these systems differed in soil morphology, previous crop, elevation above sea level, or planting date. Alternative recommendations for two levels of capital investment were available for each of the 16 systems. The recommendation for the lower level of capital, referred to here as the limited capital recommendation, was selected rather intuitively; however, it corresponds closely to the factor combination that maximizes the rate of return on capital.

The 16 pairs of recommendations, together with their variable costs expressed in tons of maize grain per hectare,

TABLE 3.9. The 16 producing systems recognized in the Project area since 1972.

1.1.1	Deep soils of Popocatépetl; elevations between 2,100 and 2,350 meters above sea level; plantings before May 15.
1.1.2	Deep soils of Popocatépetl; elevations between 2,100 and 2,350 meters above sea level; plantings between May 16 and June 15.
1.2	Deep soils of Popocatépetl; elevations between 2,351 and 2,800 meters above sea level; plantings before April 30.
2.1.1	Pumiceous soils of Popocatépetl; elevations between 2,100 and 2,350 meters above sea level; plantings before May 15.
2.1.2	Pumiceous soils of Popocatépetl; elevations between 2,100 and 2,350 meters above sea level; plantings between May 16 and June 15.
2.2	Pumiceous soils of Popocatépetl; elevations between 2,351 and 2,800 meters above sea level; plantings before April 30.
3	Soils of La Malinche; plantings before April 5.
4	Heavy soils of Zone V; plantings at the start of the rainy season.
5.1.1	Soils with a compacted horizon; plantings made in March and April.
5.1.2	Soils with a compacted horizon; plantings made in May.
5.1.3	Soils with a compacted horizon; plantings made in June.
6.1.1	Sodic-like soils; plantings made in March and April.
6.1.2	Sodic-like soils; plantings made in May.
6.1.3	Sodic-like soils; plantings made in June.
7.1	Soils with a high water table; plantings immediately after the turning of alfalfa stubble; plantings before April 15.
7.2	Soils with a high water table or any irrigated soil; one or more years after the turning of alfalfa stubble; plantings before April 15.