In general, average yields of farmers on credit lists were only about two-thirds as large as they might have been, according to the results obtained in the field experiments. This finding suggested studies to determine why the farmers on credit lists did not have higher yields.

In each of the Zones II and V, sixty parcels representing 60 farmers on credit lists were chosen at random. A representative area was selected within each parcel consisting of 12 rows, 10 meters long. One of the two alternative maize recommendations was used on six rows of each parcel in Zone II, with the other alternative used on the other six rows. In Zone V, the more costly alternative was used on six rows of each parcel, with the same recommendation, plus 50 kg/ha P_2O_5, used on the other six rows. The latter treatment was included to test phosphorus needs of maize fields in Zone V.

These two plots in each of the selected parcels were managed by Project research agronomists. In addition, the agronomists made regular observations of the production practices used by the owners of the parcels, supplementing this information with data collected directly from the farmers.

Additionally in 1972, two field experiments were made to: (a) determine if weed problems were greater in fields using Project recommendations than in fields using the traditional technology, and (b) evaluate the profitability of the intensive weed control methods in the Project recommendations. It had been found that many farmers had the impression that weed control was more difficult in fields where the Project recommendations were used, and there was concern that this feeling might discourage farmers from adopting the new technology.

The weed control experiments consisted of 12 treatments. Project recommendations were used in half the treatments and the traditional technology in the other half. Several weed control measures were used with each of the technologies. The more intensive weed control practices consisted of hand weeding at different growth stages, and the use of herbicides. The experimental plot consisted of six rows, each 5 meters long. A randomized complete block design with six replications was used.

Results: 1972

Conditions in 1972 were excellent for maize and beans, perhaps comparable to 1968. In 24 experimental plantings of maize, or of maize associated with beans, the average numbers of days with wilting of the maize plants were 0.5, 1.0, 0, and 0.9 for the four parts of the growing cycle. The corresponding averages for 1968 were similar: 1.2, 1.7, 2.0, and 0. Hail and frost damage in 1972 were also slight.

Table 3.6 shows average yields, protein percentages of the grain, and net incomes for treatments used in three maize-bean association experiments conducted in the deep soils of Popocatépetl. The inclusion of 60,000 plants/ha of beans in a planting of maize with 40,000 plants/ha, fertilized with 120 kg/ha N and 40 kg/ha P_2O_5 resulted in: (a) a decrease in the maize yield of 1,328 kg/ha (Treatment 14 minus Treatment 2); (b) production of 1,246 kg/ha beans; and (c) an increase in net income per hectare of $166.64 with beans priced at $240/ton, or $66.96 with beans priced at $160/ton.

Bean production increased remarkably when 10 ton/ha of chicken manure was added to the treatment consisting of 150 kg/ha N, 40 kg/ha P_2O_5, 40,000 plants/ha of maize, and 60,000 plants/ha of beans. Comparison of bean yields obtained with Treatments 6 and 13 shows that the increase due to manure was 1,085 kg/ha. Part of this increase in bean yield was probably due to the nitrogen and phosphorus contained in the manure. Most of the increase, however, was apparently due to some different, undetermined cause. The net income from the maize-bean association receiving both chicken manure and chemical fertilizers (Treatment 13) was 2.28 times that derived from maize planted alone, with beans priced at $240/ton. The protein percentage of the beans fertilized with chicken manure was 1.5 percent points higher than that of the beans receiving the highest rate of chemical fertilizers (24.5 versus 23.0 percent).

Table 3.7 compares the amounts of protein and lysine produced by common maize planted alone, and by the maize-bean association, with the amounts produced by opaque maize. Opaque maize produced nearly twice as much lysine per hectare as did common maize. The common maize-bean association, fertilized with nitrogen and phosphorus, produced 59 percent more lysine than did opaque maize alone. The common maize-bean association, fertilized with nitrogen, phosphorus, and chicken manure, produced 2.39 times as much lysine as opaque maize alone.

TABLE 3.7. The amounts of protein and lysine produced by common and opaque maize planted alone, and by the common maize-bean association.

	Protein		Lysine *	
	kg/ha	% of Opaque	kg/ha	% of Opaque
Common maize, planted alone	394	93	9.9	52
Opaque maize, planted alone**	423	100	19.9	100
Maize-bean association with 150 kg/ha of N, 80 kg/ha of P_2O_5 and 40,000 plants/ha of maize	623	147	30.3	159
Maize-bean association with 150 kg/ha of N, 40 kg/ha of P_2O_5, 10 ton/ha of chicken manure and 40,000 plants/ha of maize	981	232	45.5	239

* In calculating the production of lysine per hectare, the protein of beans and common maize was assumed to have 7.2% and 2.5% lysine, respectively. For bean protein from the treatment with the chicken manure, it was assumed that the percentage of lysine dropped to 6%. Source: Mercedes Hernández, *et al.*, 1971. Valor nutritivo de los alimentos; Tablas de uso práctico. Publicaciones de la División de Nutrición–L–12, 5a. Instituto Nacional de la Nutrición, México. p. 20.

** Based on data from an experiment carried out on the deep soils of Popocatépetl. The best opaque variety yielded 4,700 kg/ha with 50,000 plants/ha and fertilized with 130 kg/ha of nitrogen plus 50 kg/ha of P_2O_5. It was assumed that the grain contained 9% protein and that the protein had 4.5% lysine.