The investigations reported in this dissertation deal with the effect of some agronomic factors on the development and yield of the maize crop. The studies were carried out at the Government Agricultural Station, Jullundur, during the years 1950 and 1951, on a light loam soil under irrigated conditions. The various agronomic factors under study were two row to row spacings, viz., 1 foot and 2 feet, three plant to plant spacings, viz., 9, 12 and 15 inches and four levels of nitrogen in the form of ammonium sulphate, viz., 0, 50, 100 & 150 lbs. nitrogen per acre. The residual effect of these treatments was studied on the succeeding wheat crop during both the years. In addition to the above, other complementary factors of crop yield, like the optimum sowing time and the efficacy of organic and inorganic manures, were studied on this crop in separate experiments during the same years. The salient features of the experimental results are:

- The season was found to be a very potent factor in influencing growth behaviour and yielding capacity of the maize crop. This crop was found to be very sensitive to excessive water content of the soil.

- Of the three factors investigated, the application of nitrogen in graded doses proved to be most effective and in most cases the effect was of a linear order. Nitrogen caused all round development of the plant both in extension and expansion. Height was visibly increased mainly on account of an increase in internodal length, whereas the number of leaves on the main stem appeared to be the function of time under the conditions of this experiment. Although the number
of leaves was scarcely influenced by nitrogen, it brought about considerable improvement in size. The thickness of stem was similarly affected in a favourable way.

Nitrogen advanced tasseling only slightly, but the period of silking was significantly reduced by the addition of nitrogen.

Ear development showed marked improvement in size as revealed by ear circumference and the length and the weight of ear. The most conspicuous feature was the increase in the number of grains per row and in the weight of kernal. The number of ears borne per plant and the number of rows of grain per ear were, however, not appreciably affected.

Nitrogen was also instrumental in encouraging the development of prop roots as well as the general root system up to the depth of 6 inches, but it was not reflected in a distinct corresponding decrease in the extent of lodging.

Barrenness decreased with each increment of nitrogen up to the highest dose and thus the maize crop became more productive with the application of nitrogen. Shelling percentage was significantly higher in the manured plots than in the control only in the first year, but during the second year, the quantitative differences amongst the various manurial treatments were insignificant.

The over-all effect of nitrogen was highly beneficial both for plant growth and for grain yield. The increase in the yield of grain and stalks was almost proportional to the dose of nitrogen. The highest yields of 21.49 and 44.65 maunds per acre of grain and stalks respectively were obtained with the highest dose of 150 lbs. of nitrogen.
per acre.

Between the two spacing types, the one between rows showed more significant differences in plant growth and ear development than the plant spacings within the rows. The effect of wider rows was principally identical with that of extra supply of nitrogen in so far as the development of individual plants and ears was concerned, but in the yield of grain and stalks per acre, the number of plants per unit area seemed to be more important than anything else. The wider rows stood no comparison with closer rows in the yield of grain and stalks per acre, because here the plant population exercised a dominating effect. The plant to plant spacings showed little difference in the development of plants and ears. The closer plant spacings of 9 inches and 12 inches gave slightly higher yields of grain and stalks per acre than the widest plant spacing of 15 inches.

Apart from the main effects of manuring and spacing, their interactions were also observed on some of the important plant characters. For instance, widely spaced plants grew taller than the closely spaced plants under conditions of nitrogen deficiency only. The differences in height resulting from spacing were neutralized at higher levels of nitrogen. Under low or medium levels of nitrogen, a moderate increase in plant spacing from 9 inches to 12 inches favoured leaf expansion, but a further increase to 15 inches recorded no extra advantage. When, however, the level of nitrogen was raised to 150 lbs. per acre, leaf expansion continued uninterrupted even under the wider spacing. Internodal length was found to increase with increase in plant spacing in the
absence of nitrogen application, but at high levels of nitrogen, wider plantings produced a reverse effect. As for size of grain, wide spacing encouraged better grain development, but the difference in its favour was small in unmanured plots. When additional nitrogen was supplied, the beneficial effect of wider spacing on this character became more pronounced.

The effect of the application of fertilizer on the yield of grain and of stalks was identical. Both these characters showed great improvement with the application of nitrogen, more particularly when the crop was planted close.

The protein content of grain increased with each increment of nitrogen and also under wider row and plant spacings.

The residual effect of spacing treatments on the succeeding wheat crop was found to be small. As for nitrogen, the amount of residual effect on the yield of grain was largely proportional to the original level of the fertilizer, the largest effect being left by the highest dose. A similar, but less marked, effect was observed on the yield of straw.

Out of the various levels of nitrogen, 50 lbs. nitrogen per acre was found to be more economical than 100 lbs. and 150 lbs. nitrogen per acre. Taking into account the residual effect of the fertilizer doses on the succeeding wheat crop, the highest net income was recorded under 150 lbs. nitrogen per acre. The optimum dose of ammonium sulphate applied directly to the maize crop grown under these conditions worked out to be 77.25 lbs. nitrogen per acre.

Important developmental characters of the plant
were found to be positively correlated with yield. Stalk characters like height, girth of the stem and yield of stalks possessed a strong and positive correlation with yield with values of r ranging from 0.398 to 0.628. The area of leaves, the number of grains per row, the weight and circumference of the ear and the weight of the kernel also showed a significant and positive relationship with the yield of grain. The number of leaves and the number of rows of grain per ear showed a positive but non-significant association with yield.

Sowings done at 10-day intervals revealed mid July to be the optimum sowing time for maize. Earlier and later sowings were attended by reduction in the yields of grain and stalks. On the whole, the borer attack was the highest in the early sowing (5th July) and least in the last sowing (4th August). The relationship between barrenness and sowing date was just the reverse - the number of barren stalks being the least in the first sowing and progressively more in the later sowings.

A comparative study of the various organic and inorganic fertilizers on equivalent nitrogen basis showed that ammonium sulphate and ammonium phosphate were most effective in furthering crop growth and enhancing the yields of grain and stalks, these two fertilizers were equally effective. Groundnut cake occupied an intermediate position in response, while farm yard manure and superphosphate were no better than control.

To sum up, the grain yields of the maize crop grown at the optimum time can be effectively increased from 14.95 maunds per acre to 19.90 maunds per acre, i.e., by 34 percent, by the adoption of closer row spacing of one foot;
from 16.34 maunds to 17.96 maunds per acre, i.e., by 9 percent, by closer plant spacing of 9 inches or 12 inches and from 10.90 maunds to 17.57 maunds, i.e., by 61 percent increase, by the addition of 50 lbs. of nitrogen per acre in the form of ammonium sulphate.