# STUDIES ON MAIZE (*Zea mays*, L) - SOYBEAN (*Glycine max* L, Merril) INTERCROPPING SYSTEMS WITH SPECIAL REFERENCE TO PLANT DENSITY

By

JOSHUA NALLATHAMBY DANIEL, B.Sc. (Agriculture)

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# ABSTRACT



Studies on maize (*Zea mays, L*) - soybean (*Glycine max, L.Merrill*) intercropping systems with special reference to plant density.

In the small-holdings of developing tropical countries like Sri Lanka, intercropping is popular and widely practised. It is said that efficient utilization of available resources is maximised by intercropping in labour intensive, sparingly mechanised agricultural lands. Several methods have been proposed to assess the yield advantages of intercropping systems. One of them is to ensure an unaffected full yield from the main crop and an additional yield from the second crop in the cropping system. The full yield of the main crop is the yield obtained with the optimum plant density of that crop. Where the main crop is below its optimum plant density, even a reasonable yield obtained from the second crop, without adversely affecting the main crop yields, may not be an actual advantage as the main crop itself could have given a higher yield with its optimum plant density. The optimum plant density inturn is dependent upon water and nutrient status of the soil besides other environmental and plant factors. Thus, the full yield could be realised only if these factors are non-limiting to support the optimum plant density.

In order to study the effect of soybean on main-crop maize, a field experiment with a systematic spacing design was conducted which also included a maize density range of 5 to 20 plants per $m^2$.

The soybean density was 60 plants per $m^2$. Soybean was planted 7 days after planting maize so as to reduce any competition maize may encounter from soybean. Results indicated a significant reduction in maize yield due to competition from soybean under all maize densities. Maize yield increased curvilinearly upto 14 plants per $m^2$, with or without the soybean crop and then declined. On the other hand, soybean yield declined with increasing maize density and here again the relationship was of a quadratic nature. Thus, soybean at 60 plants per $m^2$ competes with maize in the intercropping system to reduce maize yields significantly and that the optimum plant density for maize in this instance was around 15 plants per $m^2$.

A second experiment was conducted where competition from soybean was further reduced by planting soybean in 3 week-old maize stands. Maize plant density range was retained at 5 to 20 plants per $m^2$. A 30 plants per $m^2$ soybean plant density treatment was included in addition to the 60 plants per $m^2$ treatment studied in the first experiment. These 2 soybean densities were grown in monoculture as well. The treatments were arranged in a randomised block design. Where the maize density treatment was concerned, the results were similar to that of the first experiment. However, maize did not suffer by the inclusion of soybean in the cropping system. Soybean seed yields were severely reduced in association with maize. Reduction in soybean density resulted in lower seed yields with no favourable effects on maize.

The yield data of the second experiment were compared with that of a third experiment carried out simultaneously. The third experiment differed from the second in that it had the maize densities arranged systematically. The plant density - yield parameter relationships of both designs were generally similar, though they were not of the same magnitude. These differences between the experimental designs may be due to a 'crowding effect' in the systematic arrangement where all the high density treatments were adjacent to each other. As a result, the differences were found to be more pronounced at higher maize densities. However, it was possible to obtain data on 11 maize densities in the systematic design, whereas in randomized design, within the same density range of 5 to 20 plants per $m^2$, information on only 4 densities were obtained.