PLANT POPULATION IN SOYBEAN PRODUCTION ON RED BROWN EARTHS

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Soybean (Glycine max (L.) Merrill) yields have increased remarkably as a result of cultivar improvement and better management technology. While there is still more room for cultivar improvement, much of yield potential available in existing cultivars remains to be exploited through the application of appropriate management practices. When vegetative development is curtailed, soybean yield can be pushed up by increasing the number of plants per unit area of land. This seems to be realistic until enough plants are established to provide complete ground cover during pod filling. Soybean cultivars grown in Sri Lanka are determinate growth habit. They more or less complete their vegetative growth by the time blooming starts. An important aspect of soybean management is plant spacing to obtain optimum number of plants per unit area of land. This management variable can be readily manupulated by row spacing and/or plant population. Currently, a plant population of 50 plants per square meter derived from 20 plants per meter in 40 cm rows is recommended in this country.

However, recently an investigation was carried out to study the effect of plant spacing and population on seed yield and other agronomical characteristics in two soybean cultivars at the Agricultural Research Station, Maha Illuppallama. A factorial (2 cultivars x 3 row spacing . x 2 within row spacings) experiment in a randomised complete block design was laid on R.B. soils at the appropriate time of planting in Maha 1983/84 and managed as recommended, including the following plant spacings and population.

New spacing (cm).	within row spacing (cm)	Plant Population (plants/m^2)
30	2.5	132
45	2.5	90
60	2.5	66
30	5.0	66
45	5.0	45
60	5.0	33

Results of this experiment illustrates that :

1. 45 cm row spacing gives the highest seed yield which is however, not significantly different from 60 cm row spacing (Table 1).

2. Although within row spacing of 5.0 cm shows higher seed yield than 2.5 cm within row spacing, both are statistically alike (Table 2).

3. Seed yield increases with increase of plant population upto 66 plants/m^2 and tends to decline afterwards in both cultivars included in this experiment (Figure 1). The highest seed yield of 2182.20 Kg/ha is achieved by the plant population of 66 plants/m^2 provided by a plant spacing of 60 cm x 2.5 cm. while the lowerst yield of 1358.33 Kg/ha is given by 132 plants/m^2 (30 cm x 2.5 cm), which is the highest plant population arrived in this experiment (Table 3). There are no significant yield differences between plant population provided by plant spacings of 60 cm x 2.5 cm, 45 cm x 5.0 cm. However, plants in 30 cm rows with a plant population of 20 plants per meter show a tendency to grow into vine with long internodes, causing severe lodging.

4. In both cultivars, the highest plant height, lowest number of pods per plant, and smallest seed expressed in terms of 100 seed weight are observed in the highest plant population (132 plants/m^2) and the opposite appears true for these characters in the lowest plant population (33 plants/m^2) (Table 4).

In conclusion, appropriate management is a prerequisite to achievement of the potential soybeans yield in any environment. Manupulation of plant spacing is an important aspect of management. Early maturing cultivars with determinate growth habit, as in this case, produce high yields when managed appropriately. This investigation may permit estimation of an optimum plant population that appears to range from 45 to 66 plants per square meter. The results of this experiment also reveals that 45 or 60 cm row spacing may be suitable depending on plant population as determined by spacing between plants in rows.

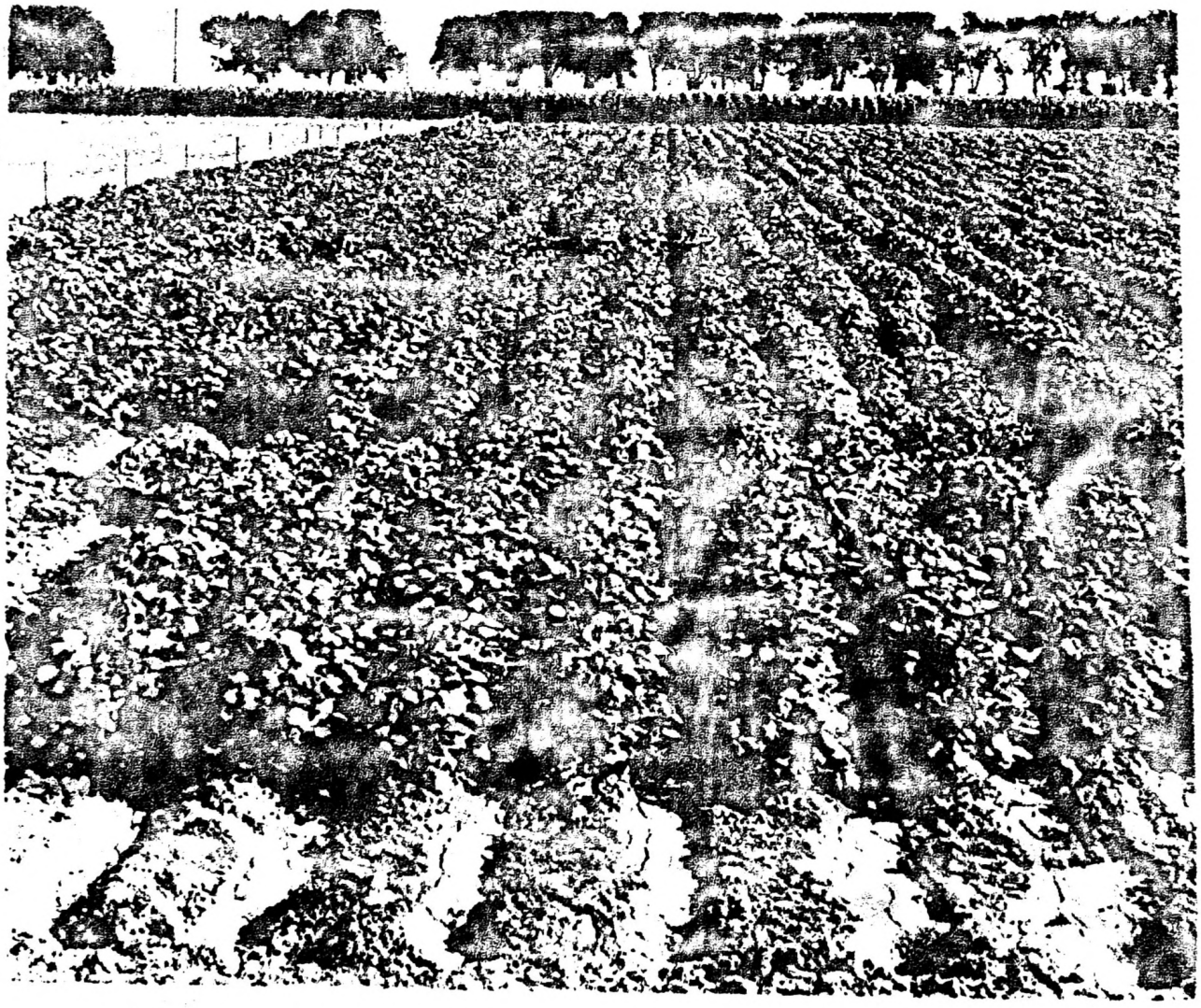

Table 1: Mean seed yield at different row spacings.

Row spacing (cm)	Seed yield (Kg/ha)
30	1723.75
45	2040.63
60	1930.68
L.S.D. (P=0.05)	242.75

Table 2. Mean seed yield at two within row spacings.

Within row spacing (cm)	Seed yield (Kg/ha)
2.5	1697.44
5.0	1920.11
	N.S*

*Not significant.

Table 3: Relationship between plant population and seed yield.

Row spacing (cm)	Within row spacing (cm)	Plant pupulation ($plants/m^2$)	Seed yield (Kg/ha)
60	5.0	33	1679.15
45	5.0	45	1992.35
60	2.5	66	2182.20
30	5.0	66	2088.90
45	2.5	90	1570.17
30	2.5	132	1358.33
L.S.D. (P=0.05)			343.08

Table 4: Mean seed yield and other agronomical characteristics of two soybean cultivars at different plant spacings.

Row Spacing (cm)	Within row spacing (cm)	Plant Population (plants/m^2)	Seed Yield (Kg/ha)	Plant height at maturity (cm)	Number of pods per Plant.	100 seed weight. (g)
			Cultivar - PM-78-5-6-13			
60	5.0	33	1826.0	56.6	31.6	13.37
45	5.0	45	2068.7	60.5	28.4	12.38
60	2.5	66	2426.0	58.2	29.5	12.41
30	5.0	66	2175.0	66.7	27.4	13.14
45	2.5	90	1411.0	66.5	27.4	12.01
30	2.5	132	1271.3	67.1	25.5	12.01
			Cultivar - PM-78-2-5-25			
60	5.0	33	1532.3	72.9	36.5	8.91
45	5.0	45	1916.0	75.6	26.7	8.40
60	2.5	66	1938.3	83.6	22.4	8.51
30	5.0	66	2002.7	96.8	29.8	8.73
45	2.5	90	1729.3	98.8	25.4	8.30
30	2.5	132	1445.3	105.6	14.1	7.68