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Soybean in Cropping System in Central Thailand
II. Various Intercropping Combinations of Corn and Soybean

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ABSTRACT

The experiment was conducted at Kampangsaen Campus, Kasetsart University to investigate the possibility of growing sweet corn (variety Hawaiian sugar supersweet DMR) and soybean (variety S.J. 4) in the intercropping. Three intercrop combinations of 75% corn + 25% soybean, 50% corn + 50% soybean, and 25% corn + 75% soybean were used in the experiment in comparison with corn and soybean monocultures. Soybean was harvested for seed while corn was harvested for green cob.

The yield of soybean per hectare was high in 75% soybean + 25% corn and 100% soybean. The present of corn at 75% and 50% of land resulted in the competitive effect to soybean and lower the yield per plant and number of pod significantly. Neither number of seeds per pod nor seed size were affected by intercropping combination.

Corn yield in monoculture was higher than those in the intercropping. The larger the area in the intercrop which had been occupied by soybean, the lower the yield of corn. Land equivalent ratio (LER) values indicated that the best intercropping combination was 75% soybean + 25% corn, in which the yield of soybean in the intercrop was slightly lower than the soybean yield in the control treatment.

INTRODUCTION

In certain cultivated upland areas of Maeklong basin, farmers do not grow sugarcane due to the lack of sufficient input and linkage with sugar milling factory. In these particular areas, farmers cultivate sweet corn, glutionous corn or soybean in the rainy season and sell the products to the local markets. These crops generally gave poor yield under farmer conditions due to the lack of recommended varieties and appropriate cultivation methods. An intercropping was thought to be one of the alternative cropping systems in the rainy season in which farmers may increase the production and obtain additional income.

MATERIALS AND METHODS

An intercropping experiment was conducted at Kampangsaen Campus in which corn and soybean were planted together in alternate rows. The S.J. 4 soybean variety and Hawaiian Sugar Super Sweet DMR corn variety were used in the experiment. A total of 20 plots of 6 × 7.5 m^2 was used.

Treatments composed of different levels of corn and soybean intercropping based on the percentage of land in which each crop was occuppied. The detail treatment combinations and actual plant populations of corn and soybean after thinning was shown in Table 1.

The crops were planted on July 1, 1983 and harvested on October 20, 1983. Duration of crop growth was 110 days. The design of the experiment was Randomized Complete Block with four replications.

The spacings for soybean and corn were 75 × 12.5 cm. and 75 × 25 cm. respectively. Four or five seeds of soybean and corn were dropped in each hill, after emergence, soybean

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Table 1 Treatment combination of corn-soybean intercropping experiments and their respective plant populations.

Treatment	Plants Population (plants/hectare)	
	Soybean	Corn
1. Soybean 25% + Corn 75%	53,332	40,000
2. Soybean 50% + Corn 50%	106,666	26,666
3. Soybean 75% + Corn 25%	160,000	13,333
4. Soybean 100%	213,332	-
5. Corn 100%	-	53,333

plants were thinned to 2 plants, and corn to one plant per hill.

RESULTS AND DISCUSSION

1. The yield and yield components of soybean

The yield and yield components of soybean were presented in Table 2. The yields of soybean per hectare in 75% soybean + 25% corn, and 100% soybean were high. However, intercropping soybean with corn at 25% and 50% based on the percentage of land occuppied by soybean, resulted in low yield due to the effect of competition the corn had on soybean growth. The yields of soybean per plant and the number of pod in 25% soybean + 75% corn, and 50% soybean + 50% corn were significantly lower than 75% soybean + 25% corn, and the control ($P < 0.05$). These results also confirmed the competition effect of corn to soybean. Among three intercropping treatments, growing corn at 75% of land gave the strongest competitive effect to soybean. At 75% soybean + 25% corn, the presence of corn did not effect soybean growth and yield, since the yield per plant and per unit area and the number of pods per plant of 75% soybean + 25% corn did not significantly differ from control.

The number of seeds per pod and seed size in all treatments did not differ significantly from each other. As it had often been found in numerous experiments in the past, cultural practices or plant population rarely affected the number of seeds per pod and the seed size (Adam, 1967; Buttery, 1969).

2. The yield of corn

The yield of corn in all intercropping combinations was reduced significantly ($P < 0.05$) by the presence of soybean. The larger the area which had been occupied by soybean, the lower the yield of corn (Table 3). Yield of corn can be expressed either as the number and weight of total ears (ear shoot of over 10 cm in length) or the number and weight

Table 2 Yield and yield components of soybean under various combinations.

Treatment	Yield (kg/ha)	Yield (g/plant)	No. pod per plant	No. seed per pod	Seed size) (g/100 seed)
1. Soybean 25% + corn 75%	238.0	8.1	64.2	1.0	13.5
2. Soybean 50% + corn 50%	718.7	17.2	107.9	1.3	14.5
3. Soybean 75% + corn 25%	1,208.6	19.8	119.0	1.1	14.1
4. Soybean 100%	1,390.4	19.8	119.3	1.3	14.5
1/ $LSD_{.05}$	430.9	7.3	17.4	NS	NS

1/ NS = not significant at 5%

Table 3 Yield of corn in the intercropping treatments.

Treatment	Yield of total ear produced		Yield of marketable ear produced	
	No. of ears/ha	Weight (ton/ha)	No. of ears/ha	Weight (ton/ha)
1. Corn 25% + Soybean 75%	19,305	4.0	14,583	3.7
2. Corn 50% + Soybean 50%	35,416	6.6	23,333	5.6
3. Corn 75% + Soybean 25%	44,861	8.3	33,472	7.2
4. Corn 100%	58,194	10.5	39,166	8.4
$LSD_{.05}$	4,297	1.7	4,393	1.6

Table 4 Land equivalent ratio of corn and soybean intercropping and monoculture[1/]

Treatment	A[2/]	B	C	D
25% Soybean + 75% corn	0.95^{c}	1.03^{c}	0.97^{c}	1.04^{c}
50% Soybean + 50% corn	1.17^{ab}	1.15^{ab}	1.19^{ab}	1.23^{ab}
75% Soybean + 25% corn	1.37^{a}	1.41^{a}	1.42^{a}	1.47^{a}
100% Soybean	1.00^{c}	1.00^{c}	1.00^{c}	1.00^{c}
100% Corn	1.00^{c}	1.00^{c}	1.00^{c}	1.00^{c}

1/ Figures in a column followed by a common letter are not significantly different at .05 level of probability.

2/ A = LER computation based on total number of ear produced per hectare
B = LER computation based on number of marketable ear produced per hectare
C = LER computation based on total weight of ear produced per hectare
D = LER computation based on weight of marketable ear produced per hectare

of marketable ears (ear shoot of over 20 cm in length). Considering the yield categories, presented in Table 3, it appeared that the yield of corn was lowest in the 25% corn + 75% soybean combination. Corn yield in monoculture was highest compared with other treatments.

3. Land equivalent ratio

The land equivalent ratio (LER) values, presented in Table 4, indicated that the beneficial effect to corn growing with soybean in the intercropping manner would be derived from intercropping of 75% soybean + 25% corn combination. In this intercropping combination, the highest LER was obtained. The LER values in Table 4 had been computed under four categories i.e. based on (1) total number of ears, (2) weight of total ears, (3) total number of marketable ears, (4) weight of marketable ears. The LER values in monoculture soybean and corn are equivalent to 1.00. Not in all cases that the intercropping combinations were better than that of monoculture. The combination of 25% soybean + 75% corn gave LER not higher than monoculture corn and soybean. The best intercropping combination which gave highest value of LER was 75% soybean + 25% corn, in which soybean yield in the intercrop was slightly lower than the yield of soybean in the control treatment.

CONCLUSION

From the data obtained in this experiment, one can see advantage in intercropping corn and soybean over planting them separately. The results indicated the intercropping combination of 25% corn + 75% soybean gave the highest LER value compared with other intercropping combinations. Although the yield of corn and soybean in this intercropping combination was not higher than that of monoculture corn or soybean, the reduction in land area required to produce corn and soybean at the yield level equal to that of the monoculture proved intercropping advantageous.

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