2. Irrigation Effect on Upland Crops

To determine the optimum amount and interval of irrigation for upland crops grown on paddy field in dry season, the furrow irrigation experiments for maize, soybean, mungbean and peanut were carried out in 1974, 1976 and 1977.

1) Irrigation and Fertilizer Effects on Maize and Soybean (1974)

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Material and Method

Variety:	Maize: PB 5, Soybean: SJ 2
Treatment:	As shown in Table 2-1, three levels of irrigation water, two intervals of irrigation and two levels of nitrogen fertilizer were combined in the experimental design.
Layout:	The split-plot design was applied; 6 randomized plots with 2 sub-plots and 3 replications made 36 sub-plots in total, for each crop.
Plot and sub-plot size:	Maize: 117 m^2 ($13^m \times 9^m$) and 58.5 m^2 ($6.5^m \times 9^m$) Soybean: 66 m^2 ($11^m \times 6^m$) and 33 m^2 ($5.5^m \times 6^m$)
Spacing:	Maize: 75 cm × 25 cm, 1 plant per hill Soybean: 50 cm × 20 cm, 3 plants per hill
Sowing:	Maize: January 22, 1974 Soybean: January 24, 1974
Harvesting:	Maize: May 9, 1974 Soybean: May 10, 1974
Irrigation:	The furrow irrigation was made through the perforated pipes connected to the water tank which is constructed at the corner of the experimental field. The irrigation water for each plot was regulated by gauging the water level of the tank. Total irrigation amount and rainfall during the experiment are summarized as follows:
4 day interval	plot 1,2: $16^{mm} \times 15^{time} = 240^{mm}$ plot 3,4: $28^{mm} \times 15^{time} = 420^{mm}$ plot 5,6: $40^{mm} \times 15^{time} = 600^{mm}$
7 day interval	plot 7,8: $28^{mm} \times 10^{time} = 280^{mm}$ plot 9,10: $49^{mm} \times 10^{time} = 490^{mm}$ plot 11,12: $70^{mm} \times 10^{time} = 700^{mm}$
	In addition to the above, maize and soybean were irrigated at the rate of 63^{mm} and 77^{mm} respectively after sowing for uniform germination.

Rainfall during the Experiment: 349.9^{mm}

Climatic Conditions

Suphanburi area had a direct attack of a heavy hail-storm on March 31, at the beginning stage of silking of maize or at the early ripening stage of soybean. About 40%

of leaves of maize and 20% of those of soybean were damaged by the storm. Therefore, dry matter production at this stage was also checked to get rid of errors in grain yields due to the damages.

The rainfall in March and April was as much as about three times of that in normal year (see Appendix). In some cases surplus water was drained off from the field to avoid the wet injury.

Results

Maize (Fig.2-1):

Irrigation at the rate of 4^{mm}/day induced better results than that of 7^{mm}/day and 10^{mm}/day. Four day irrigation interval seemed better than 7 day one. Thus, it may be concluded that irrigation of short interval with little amount of water induces better yield than that of long interval with much amount. Dry matter production and grain yield was significantly increased by high rate of nitrogen application as compared with low one.

Soybean (Fig.2-2):

Dry matter production and grain yield of 4 day irrigation interval plot were higher than those of 7 day one. Amount of irrigation water did not have significant effects on grain yield. In case of high rate of fertilizer application, grain yield somewhat decreased with increased amount of water. The increase of nitrogen fertilizer application brought about adverse effects on the total plant weight and the grain yield.

Table 2-1. Treatment

Plot No.	Irrigation amount & interval	Rate of fertilizer application	Nitrogen application	
			Maize	Soybean
	mm		Kg/ha	Kg/ha
1	16/4 day	Low	50	20
2	16/4	High	100	40
3	28/4	Low	50	20
4	28/4	High	100	40
5	40/4	Low	50	20
6	40/4	High	100	40
7	28/7	Low	50	20
8	28/7	High	100	40
9	49/7	Low	50	20
10	49/7	High	100	40
11	70/7	Low	50	20
12	70/7	High	100	40

Remarks
1. a half of the nitrogen mentioned above was applied as top-dressing around 6 weeks after seeding.
2. The following amount of phosphorus and potassium was applied as the basal in every plot.
   Maize: P_2O_5 75 Kg/ha, K_2O 50 Kg/ha
   Soybean: P_2O_5 50 Kg/ha, K_2O 50 Kg/ha

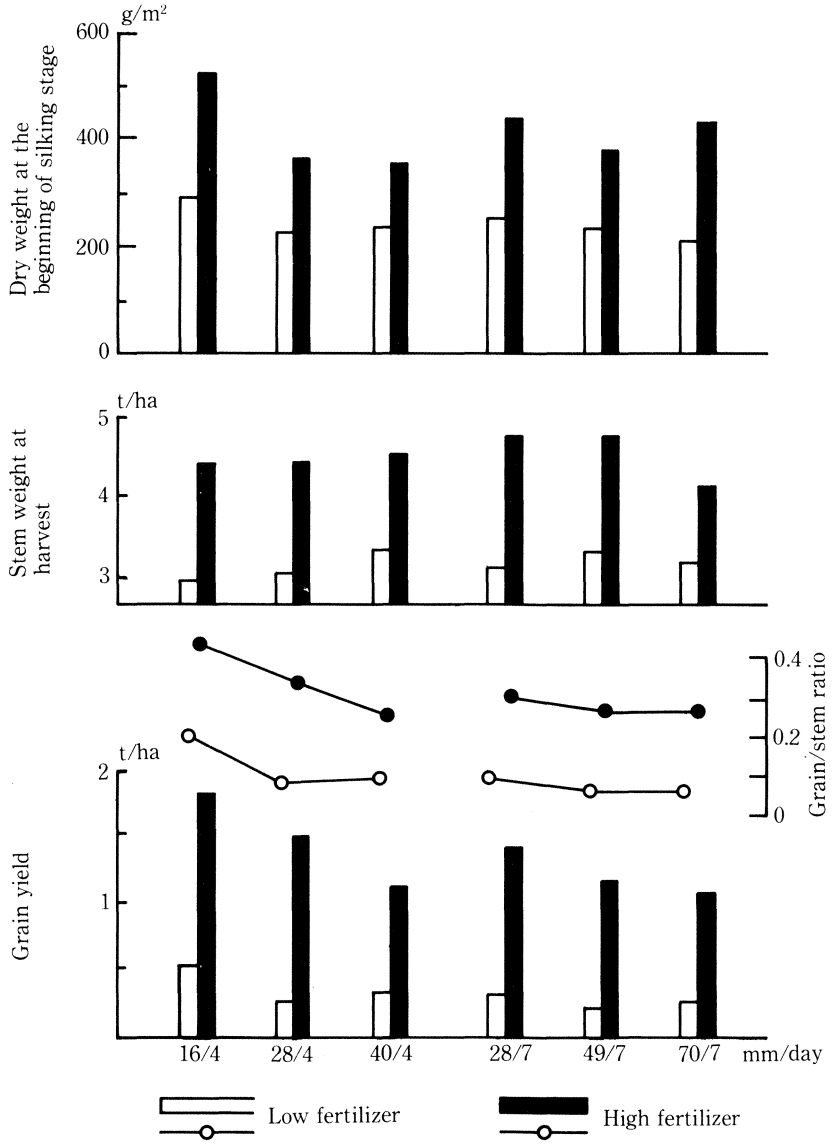

Fig. 2-1. Irrigation and fertilizer effects on dry matter production at the beginning of silking stage and grain yield of maize

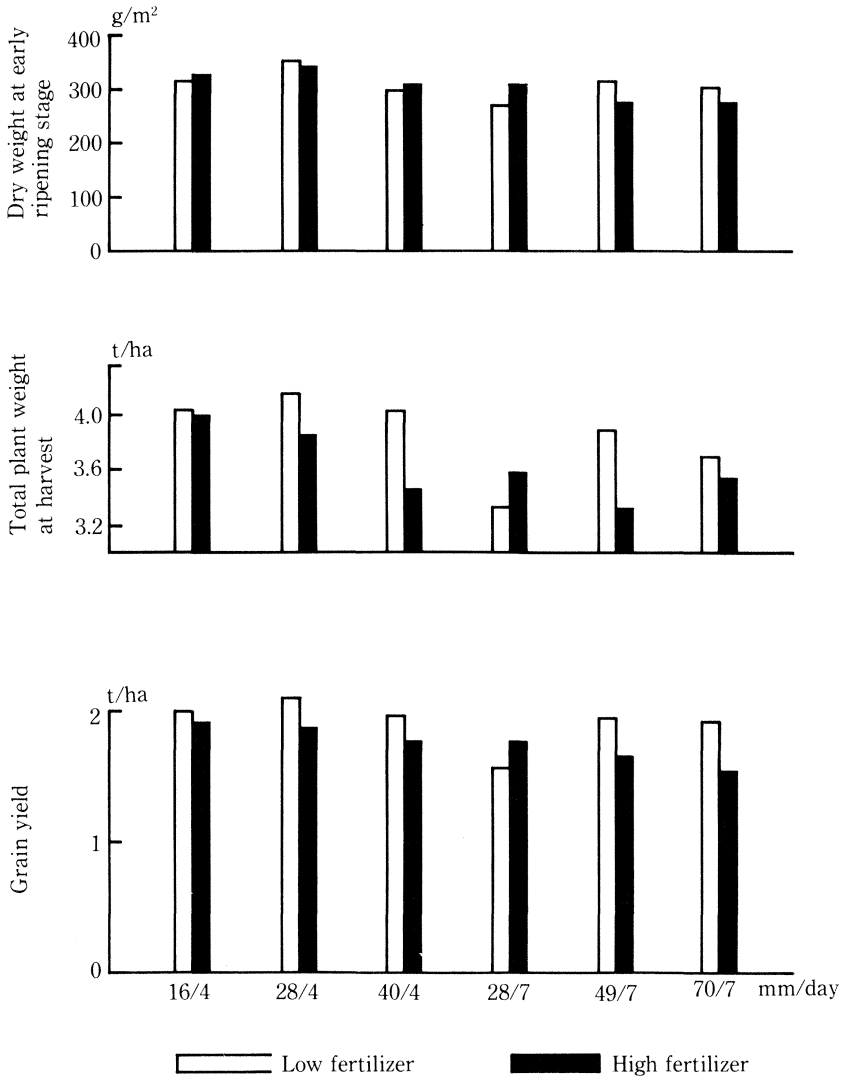

Fig. 2-2. Irrigation and fertilizer effects on dry matter production at early ripening stage and grain yield of soybean