

3) *Irrigation Effect on Peanut and Mungbean (1977)*

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Materials and method

1. Variety: peanut: Tainan No.6, mungbean: SPR No.1
2. Irrigation treatment:
 - Interval: 7 day (I_1), 14 day (I_2)
 - Rate of irrigation amount:
 - Vegetative growth stage: 2 (V_1), 4 (V_2) and 6 mm/day (V_3)
 - Reproductive growth stage: Irrigated with same rates as in vegetative growth stage (R_1)
Irrigated with rates of ($R_1 + 2$ mm/day) (R_2)
 - Combination of factor: V and R is combined as follows:

Vegetative growth stage	Reproductive growth stage
V_1R_1	2 mm/day
V_1R_2	4 mm/day
V_2R_1	4 mm/day
V_2R_2	6 mm/day
V_3R_1	6 mm/day
V_3R_2	8 mm/day

Irrigation amount was adjusted according to rainfall during the period concerned. The amount of irrigation and rainfall during the experiment is summarized in Table 2-7.

3. Fertilizer application
 - N: 20 kg/ha
 - P_2O_5 : 50 kg/ha
 - K_2O : 50 kg/ha
4. Seeding time:
 - Peanut: January 28, 1977
 - Mungbean: February 10, 1977
5. Spacing:
 - Peanut: 75 cm × 20 cm, 2 plants/hill
 - Mungbean: 60 cm × 30 cm, 2 plants/hill
6. Harvest:
 - Peanut: May 17.
 - Mungbean: April 20, April 26, May 2.
7. Lay out:

The experiment was carried out separately for peanut and mungbean, applying split plot design with two blocks disposing irrigation interval as main plot, rate of irrigation in vegetative growth stage as sub-plot, rate of irrigation in reproductive growth as sub-sub-plot. The size of sub-sub-plot was 9 m × 9 m for peanut and 7.5 m × 6 m for mungbean.

8. Soil moisture check:

Soil moisture tension at 10 cm in depth from the top of the row near plant hills was measured by using tension meters.

9. Irrigation practice:

Water was introduced from the tank through 3 inch main pipe and distributed to each furrow through perforated 1.5 inch PVC pipe connected to the main pipe. When the amount of irrigation water was insufficient to flow up to the end of furrows as eventually occurred in the plot of 2 mm per day, water from the pipe was taken in buckets and was evenly scattered in the furrow by hands.

Results

1. Soil moisture:

Transition of soil moisture tension in the reproductive growth stage of peanut is shown in Table 2-8. It was observed that 14 day interval (I_2) resulted in alternation of excess moisture and severe drought except the plot irrigated at the rate of 2 mm/day.

2. Yield:

1) Peanut

(a) As shown in Table 2-9, highest yield was obtained in the plot irrigated at 4 — 4 mm/day (V_2R_1) with 7 day interval (I_1). Irrigation at 4 — 6 mm/day (V_2R_2) and 6 — 6 mm/day (V_3R_1) with 7 day interval, and 2 — 4 mm/day (V_1R_2) and 4 — 4 mm/day (V_2R_1) with 14 day interval (I_2) resulted in fairly good yield. The effect of increasing irrigation rate by 2 mm/day in reproductive growth stage was little. Thus, irrigation at the rate of 4 mm/day throughout the growth period could be recommended to obtain high yield of peanut.

(b) Applying the irrigation interval of 14 days yielded better than that of 7 days when peanut was irrigated at 2 mm/day in vegetative growth stage (V_1), but had negative effect on yields when irrigated at 4 and 6 mm/day in the same stage (V_2 and V_3), as shown in Table 2-9.

(c) Yield of peanut positively correlated with number of pods and 100 grain weight.

2) Mungbean:

(a) As shown in Table 2-10, yields were generally higher in the plots irrigated with 7 day interval (I_1), than in those with 14 day interval (I_2). Those irrigated at 2 mm/day in vegetative growth stage (V_1) yielded best in I_1 , while those irrigated at 4 mm/day in the same stage (V_2) did best in I_2 .

Effect of increasing irrigation rate by 2 mm/day in reproductive growth stage was not clear, but irrigation at 2 mm/day in vegetative growth stage and 4 mm/day in reproductive growth stage with 7 day interval could be recommended to obtain high yield of mungbean.

(b) Yield of mungbean highly correlated with number of pods.

3) Irrigation practice:

Both the crops are sensitive to excess moisture of soil but rather tolerant to drought especially in case of peanut. Long interval of irrigation such as 14 days often causes severe drought and excess moisture as described above. However, from the practical point of view, long interval of irrigation may contribute to protecting from evaporation loss of soil moisture and to saving labors required

for irrigation. Thus, when long interval of irrigation is applied, furrow irrigation to every two rows or two rows out of three and so forth, can be recommended.

Table 2-7. Amount of irrigation water and rainfall

Treatment	Sign	Rate & interval ¹⁾	Peanut			Mungbean		
			V ²⁾	Stage R ³⁾	total	V ²⁾	Stage R ³⁾	total
			mm	mm	mm	mm	mm	mm
I ₁ V ₁ R ₁		2—2/7	155	155.9	310.9	114.4	92.4	206.8
1 1 2		2—4/7	155	263.9	419.8	114.4	158.4	272.8
1 2 1		4—4/7	239	263.9	502.9	184.4	158.4	342.8
1 2 2		4—6/7	239	375.9	614.9	184.4	228.4	412.8
1 3 1		6—6/7	323	375.9	698.9	254.4	228.4	482.8
1 3 2		6—8/7	323	487.9	810.9	254.4	298.4	552.8
2 1 1		2—2/14	155	151.9	306.9	114.4	102.4	246.8
2 1 2		2—4/14	155	263.9	418.9	114.4	186.4	300.8
2 2 1		4—4/14	239	263.9	502.9	184.4	186.4	370.8
2 2 2		4—6/14	239	375.9	614.9	184.4	270.4	454.8
2 3 1		6—6/14	323	275.9	698.9	254.4	270.4	524.8
2 3 2		6—8/14	323	487.9	810.9	254.4	354.4	608.8

- Remarks: 1) 2—4/7 means irrigated at the rate of 2 mm/day in vegetative growth stage and 4 mm/day in reproductive growth stage, both with 7 day interval.
 2) V: Irrigation amount in vegetative growth stage, including 71 mm for peanut and 41 mm for mungbean, both of which were irrigated after seeding.
 3) R: Irrigation amount in reproductive growth stage.
 4) Both of V and R contains rainfall in the respective stage.

Table 2-8. Transition of soil moisture tension in the peanut field

Interval	Irrigation rate per day	Date								
		Mar. 21 — Apr. 5			Apr. 6 — 20			Apr. 21 — May 3		
		2*	4*	Max	2*	4*	Max	2*	4*	Max
7 day	2 mm	154	401	596	334	487	692	556	650	720
	4 mm	78	111	324	55	338	647	56	210	632
	6 mm	71	246	403	104	389	659	100	192	410
14 day	2 mm	298	400	608	484	448	610	234	310	610
	4 mm	79	176	606	-10	20	682	-30	—	—
	8 mm	-18	68	652	-12	72	758	-10	320	736

- Remarks: 1) Figures mean soil moisture tension in g/cm² at 10cm in depth.
 2) Soil moisture tension was measured only in reproductive growth stage. Then irrigation rate means the rate of reproductive growth stage.
 3) Max means maximum value at every interval, but the values exceeding 600 g/cm² do not always correspond to soil moisture tension since such values are mostly beyond the capacity of a tension meter.
 * Number of days after irrigation.

Table 2-9. Yield and dry matter production of peanut

Treatment	Dry weight, g/m ²				No. of pods /m ²	100 grain ¹⁾ weight g	Yield ¹⁾ g/m ²
	Top part	Pod	Bean	whole plant			
I ₁ V ₁ R ₁	350.8	68.3	156.0	575	243	44.5	179
1 1 2	386.8	68.6	156.7	612	254	47.8	180
1 2 1	348.3	74.1	214.1	636	284	49.2	246
1 2 2	290.6	64.3	196.8	552	263	46.9	226
1 3 1	271.1	40.9	196.3	509	246	45.6	226
1 3 2	267.8	61.1	165.6	495	215	47.3	190
2 1 1	445.7	81.6	179.1	707	317	45.0	206
2 1 2	374.6	75.3	193.7	645	276	49.2	222
2 2 1	322.3	71.6	186.4	581	239	48.5	214
2 2 2	272.2	62.1	157.2	492	224	44.9	181
2 3 1	228.5	65.4	158.9	453	219	44.8	183
2 3 2	257.6	70.7	173.0	501	260	41.4	199
I ₁	319.3	62.8	180.9	563	251	46.9	208
I ₂	316.8	71.1	174.7	563	256	45.6	201
V ₁	389.5	73.4	171.4	634	273	46.6	197
V ₂	308.4	68.0	188.6	565	253	47.4	217
V ₃	256.3	59.5	173.4	489	235	44.8	199
R ₁	327.8	67.0	181.8	577	258	46.3	209
R ₂	308.3	67.0	173.8	549	249	46.2	200
B	2.91	0.69	243.66*	1.56	98.37 ⁺	0.13	243.66*
I	0.01	3.02	96.91 ⁺	0.00	69.87 ⁺	0.30	96.91 ⁺
V	26.79**	3.52	1.79	22.10**	4.77 ⁺	7.06*	1.79
IV	1.07	0.87	2.71	2.79	3.46 ⁺	2.29	2.71
R	1.26	0.00	0.69	1.01	0.36	0.00	0.69
IR	0.42	0.78	0.65	0.07	0.08	0.65	0.65
VR	1.23	2.69	0.86	1.27	0.20	3.08	0.86
IVR	1.53	0.29	0.73	0.74	1.26	0.64	0.73

Remarks: 1) Moisture content was 13%.
 2) + : Significant at 10% level, * : 5%, ** : 1%.

Table 2-10. Yield and 100 grain weight of mungbean

Treatment	Yield, g/m ²				100 grain weight, g			
	1 ²⁾	2	3	total	1	2	3	total
I ₁ V ₁ R ₁	29.6	37.0	8.6	75.3	8.5	8.0	8.3	8.3
1 1 2	31.6	43.3	11.2	86.0	8.1	8.2	8.4	8.2
1 2 1	15.8	38.7	14.0	68.6	9.0	7.9	8.1	8.3
1 2 2	5.2	37.0	14.1	56.3	8.8	8.4	8.0	8.3
1 3 1	10.8	36.4	14.6	61.8	9.6	8.3	7.9	8.6
1 3 2	7.7	32.7	11.9	52.3	8.3	9.0	7.7	8.3
2 1 1	7.0	33.0	17.2	57.2	9.6	9.0	9.1	9.2
2 1 2	7.9	35.4	13.4	56.8	8.9	8.4	8.1	8.5
2 2 1	14.2	37.0	9.4	60.6	9.4	8.2	8.6	8.7
2 2 2	10.3	41.5	14.2	66.0	9.9	8.3	8.6	8.9
2 3 1	10.4	25.3	6.1	41.8	9.1	8.3	8.5	8.6
2 3 2	7.0	16.7	7.7	33.3	8.6	8.1	8.5	8.4
I ₁	16.8	37.5	12.4	66.7	8.7	8.1	8.0	8.3
I ₂	9.5	31.5	11.3	52.6	9.2	8.4	8.6	8.7
V ₁	19.0	37.2	12.6	68.8	8.8	8.4	8.5	8.6
V ₂	11.4	38.6	12.9	62.9	9.3	8.2	8.3	8.6
V ₃	9.0	27.8	10.1	47.3	8.9	8.2	8.2	8.4
R ₁	14.7	34.6	11.7	60.9	9.2	8.3	8.4	8.6
R ₂	11.6	34.4	12.1	58.4	8.7	8.2	8.2	8.7
B	0.07	0.46	99.87 ⁺	5.68	0.04	8.11	45.58 ⁺	
I	40.79 ⁺	1.46	6.38	18.69	3.57	23.65	232.66 [*]	
V	5.99	42.74 ^{**}	0.84	26.32 ^{**}	2.94	1.60	3.01	
IV	5.08 ⁺	8.61 [*]	1.56	4.61 ⁺	2.00	1.21	0.75	
R	0.43	0.00	0.06	0.47	7.29 [*]	0.10	0.87	
IR	0.04	0.01	0.07	0.12	1.15	1.21	0.32	
VR	0.29	0.49	0.33	1.34	3.22	1.42	0.23	
IVR	0.07	0.15	1.04	1.38	1.08	0.87	0.83	

Remarks: 1) Moisture content was 13%
2) 1 : April 20, 2 : April 16, 3 : May 2.
3) + : Significant at 10% level, * : 5%, ** : 1%