

SCIENTIFIC NOTE

Scheduling Irrigation for Sugarcane with Potato as intercrop in the Ganges River Plain Soils

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An experiment was conducted in the silty clay loam soil of Pabna and Chuadanga districts in 1996-97 crop year to have an irrigation schedule for sugarcane with Potato as intercrop using pan ratio (PR) method of irrigation scheduling. The experiment was set up in BSRI Farm of Pabna and in a farmer's field of Chuadanga districts. Potato variety 'cardinal' and sugarcane variety Isd 16 were used. Irrigation was required during pre-monsoon only. Four treatments viz two base irrigation, Irrigation at PR (Pan ratio) 1.00, 0.90, 0.60 during intercrop as well as pre-monsoon period were applied. In both the locations seven irrigation before monsoon including four during intercrop period given at PR = 1.00 gave the highest yield of both Potato (average 11.63 t/ha) and Cane (average 132.16 t/ha). The amount of irrigation water required was 220 mm for intercrop period and 480 mm for pre-monsoon total period using 65 mm effective rainfall.

Inter-cropping increase the crop yield per unit area by intensifying the use of land. Growers achieve additional benefit from sugarcane, as the yield of sugarcane may be increased 64.26 % by inter-cropping with potato (Imam *et al.*, 1987). In the monsoon climatic region, the best period of planting of both sugarcane and potato is from October to 3rd week of November (Nankar, 1993). If sugarcane and potato are planted in that period, both the crops remain shallow rooted i.e. 0.4 to 0.6 m rooting depth; (FAO, 1988) until potato is harvested. Moreover, frequent irrigation is needed during pre-monsoon period for optimum growth and yield of both the crops. But to irrigate efficiently, appropriate irrigation schedule is necessary.

Frequent irrigation promotes rapid canopy development of both potato and sugarcane. But yields are reduced when excess irrigation water is applied (Marutani & Guz, 1989). Khalek and Kumaraswamy (1992) reported that tuber yield along with growth attributes of potato increase with the increase of irrigation frequency and found best yield at PR 1.00 (IW/ CPE= 1). Sing (1980 and 1981) got similar results as quoted by Khalek and Kumaraswamy (1992). Yang (1979) stated that the relationship between Et and evaporation from class A pan is linear with a slope (PR) of 0.75. Islam *et al.* (1990) found maximum total water use for optimum growth of potato to be 267 mm by 5 irrigation with 40 mm of average irrigation water (depth) whereas Karim and Akhand (1982) found 284 mm by 6 irrigation in silt loam red soil of Joydebpur, Bangladesh. In 1990-91 an experiment was conducted in Jamalpur district to see the effect of irrigation frequency on sugarcane inter-cropped with potato. Before monsoon ten irrigation (including 6 irrigation up to potato harvest) with 420 mm irrigation water (effective rainfall was 96 mm) applied at the pan ratio (IW / CPE) 0.9 produced highest yield (103 t/ha). The yield was 37%

higher over that with 2 base irrigation- One as life irrigation and other for urea application (Siddique *et al.*, 1998).

The experiment was conducted during 1996-97 in BSRI farm and in a farmer's field of Chuadanga. The main objective of the experiment was to make economic use of irrigation water and estimate water requirement of sugarcane along with potato as its intercrop. The experiment was set following randomized complete block design with three replication. The soil was silty clay loam having average bulk density 1.32 gm/cc and average field capacity (FC) 30.5 (vol %)

Four treatments were as follows:

I_B = Only two base irrigation at 0 and 15-20 DAT (Days after transplantation)

I_1 = I_B + Irrigation at PR= 0.6 followed by PR= 0.4 three months before harvest of sugarcane.

I_2 = I_B + Irrigation at PR= 0.9 followed by PR= 0.6 three months before harvest of sugarcane.

I_3 = I_B + Irrigation at PR= 0.1 followed by PR= 0.6 three months before harvest of sugarcane.

Where, pan ratio (PR) is the ratio of irrigation water (IW) to the cumulative open pan evaporation (CPE) from USWB class A open pan. That is $PR = IW/CPE$.

Taking 40 cm effective root depth at the start of irrigation period and 100 cm during tillering stage and assuming 50 % depletion of available soil moisture allowable, irrigation water (IW) was calculated. Then irrigation interval was determined by the following equation:

$$CPE = \frac{IW+ER}{PR}$$

Where, ER is the effective rainfall between two irrigation. On each irrigation prefixed amount of irrigation water (in proportion to effective root depth) was applied. Irrigation was not needed after monsoon.

Sugarcane of variety Isd 16 and potato of variety cardinal were planted. Sugarcane was planted by STP method. Single row of potato (pre-germinated tuber cuttings) was planted in between two 90 cm spaced sugarcane rows. Potato was planted in the 2nd week of November and harvested in the 1st week of March. recommended dose of fertilizer was used and recommended method of application was followed for both potato & sugarcane. Also all intercultural operations were duly performed besides irrigation as treatment for both potato & sugarcane for their optimum growth and development.

From the Table 1 it is clear that irrigation had significant effect on tillers count, millable cane and yield of sugarcane in both the locations. It had no effect on recovery of sugar. Highest yields were found by the treatment I_3 and those were 130.74 t/ha and 133.57 t/ha in BSRI farm and Chuadanga respectively. Those were followed by the treatments I_2 . The yields were 121.83 t/ha and 124.41 t/ha in BSRI farm and Chuadanga respectively. The yields of cane under the treatments differed significantly from each other. Similarly the tillers count and also the millable cane under the four treatments differed significantly (each treatment from the other).

Table 1. Tillers count, millable canes, recovery and yield of sugarcane in BSRI farm and Chuadanga. 1996-1997.

Treatment	Tiller count (x 10 ³ /ha)		Millable cane (x 10 ³ /ha)		Recovery (%)		Yield of sugarcane (t/ha)	
	BSRI farm	Chuadanga	BSRI farm	Chuadanga	BSRI farm	Chuadanga	BSRI farm	Chuadanga
I _B	129.52d*	120.71d	93.92d	92.17d	8.84	9.17	95.49d	101.72d
I ₁	135.70c	132.52c	104.25c	103.46c	8.97	9.17	104.99c	108.13c
I ₂	151.92b	148.56b	119.14b	120.13b	8.76	9.19	121.83b	124.41b
I ₃	160.39a	158.13a	125.19a	130.19a	8.85	9.06	130.74a	133.57a

* Figures in a column accompanied by similar letter(s) do not differ significantly at 0.05 level of probability as per DNMR.

From the Table 2 it is seen that treatment I₃ which gave highest yield of sugarcane, received seven (7) irrigation water (including 220 mm during intercrop period). From the Table 2 it is also seen that irrigation had significant effect on the yield of potato. Highest yield was obtained by the treatment I₃ in both the locations. The yields were 11.19 t/ha and 12.06 t/ha in BSRI farm and chuadanga respectively. The yields of potato under treatment I₃ did not differ significantly from those under I₂ in both the locations but both of I₂ and I₃ differed significantly from the other two treatments.

Table 2. Irrigation water, number of irrigation and yield of potato. 1996-1997.

Treatment	Irrigation water (mm)		Effective rainfall(mm)	No. of irrigation		Yield of potato (t/ha)	
	Intercrop	Total		Intercrop	Total	BSRI farm	Chuadanga
I _B	100	100	65	2	2	6.12c	5.99c
I ₁	160	330	65	3	4	7.79b	7.93b
I ₂	220	390	65	4	6	10.62a	11.51a
I ₃	220	480	65	4	7	11.19a	12.06a

* Figures in a column accompanied by similar letter(s) do not differ significantly at 0.05 level of probability as per DNMR.

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