

Research Notes

Crop geometry to reduce drip irrigation system cost for banana var. Karpuravalli

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India is the large producer of banana. Banana cultivation involves huge investment in labour, planting, irrigation, fertilizer application, weeding etc. At present when the water table is depleting very rapidly, judicious use of water has become very much essential. Patel *et al.* (1993) reported that drip irrigation economises water use and increases water use efficiency in banana. The concept of increasing the density by planting more number of suckers per pit has proved successful in increasing the yield without detriment to quality of banana (Belalcazar *et al.* 1994; Manivannan, 1994). Many farmers who are aware of the advantages of adopting drip irrigation are giving a second thought due to the higher capital investment involved in acquiring the accessories for laying out the drip irrigation system. The cost of laterals alone when designing the irrigation systems works out to nearly 40% though the water and labour saving over the crop period is 40-70%. Hence, to increase the water use efficiency and to reduce the cost involved in laying out the drip irrigation, studies were taken up at the Plasticulture Development Centre, College of Agricultural Engineering, TNAU, Coimbatore.

Field experiments were conducted between 1997-2000 at farmer's field near Thondamuthur, Coimbatore with sixteen treatments as follows.

- T1 2A - Lateral spacing of 2m with plant to plant spacing of 2m & 1 sucker/pit
 T2 2B - Lateral spacing of 2m with plant to plant spacing of 4m & 2 suckers/pit
 T3 2C - Lateral spacing of 2m with plant to plant spacing of 6m & 3 suckers/pit

- T4 2D - Lateral spacing of 2m with plant to plant spacing of 8m & 4 suckers/pit
 T5 3A - Lateral spacing of 3m with plant to plant spacing of 1.33m & 1 suckers/pit
 T6 3B - Lateral spacing of 3m with plant to plant spacing of 2.66 & 2 suckers/pit
 T7 3C - Lateral spacing of 3m with plant to plant spacing of 4.00m & 3 suckers/pit
 T8 3D - Lateral spacing of 3m with plant to plant spacing of 5.33m & 4 suckers/pit
 T9 4A - Lateral spacing of 4m with plant to plant spacing of 1m & 1 suckers/pit
 T10 4B - Lateral spacing of 4m with plant to plant spacing of 2m & 2 suckers/pit
 T11 4C - Lateral spacing of 4m with plant to plant spacing of 3m & 3 suckers/pit
 T12 4D - Lateral spacing of 4m with plant to plant spacing of 4m & 4 suckers/pit
 T13 5A - Lateral spacing of 5m with plant to plant spacing of 0.8m & 1 suckers/pit
 T14 5B - Lateral spacing of 5m with plant to plant spacing of 1.6m & 2 suckers/pit
 T15 5C - Lateral spacing of 5m with plant to plant spacing of 2.4m & 3 suckers/pit
 T16 5D - Lateral spacing of 5m with plant to plant spacing of 3.2m & 4 suckers/pit

Table 1. Yield parameters of banana under various crop geometry (Pooled data of three days)

Treatments	Bunch weight (kg)	No. of hands/ bunch	No. of fruits/ bunch	Fruit length (cm)	Fruit girth (cm)
2A	18.87	9.73	140.82	16.63	14.40
2B	25.30	10.80	132.60	16.80	13.85
2C	19.22	9.40	126.93	11.25	8.30
2D	17.02	9.00	134.35	13.23	10.85
3A	23.55	10.60	122.20	16.98	14.15
3B	15.82	9.75	126.95	14.40	12.55
3C	17.00	9.70	141.90	14.25	12.75
3D	21.50	10.23	154.35	17.75	15.55
4A	17.20	9.53	122.20	14.85	13.45
4B	16.80	9.40	116.75	14.30	12.50
4C	15.27	8.38	108.70	13.03	11.60
4D	14.65	7.93	99.75	13.03	11.60
5A	14.73	8.35	113.70	9.90	8.90
5B	14.33	9.10	132.90	9.25	8.85
5C	13.55	7.95	124.45	11.55	11.80
5D	13.08	8.65	120.05	11.45	9.90
SEd	0.215	0.20		0.347	
LSD (5%)	0.456	0.428	NS	0.735	NS
LSD (1%)	0.628	0.590		1.012	

The fertilizer were given as recommended in the ratio of 275:87.5:825g urea, super phosphate and muriate of potash. Irrigation was given through drip @ 10 lit per day per plant. Routine operations like weeding, desuckering etc. were taken up in the appropriate time. Three plants were selected in each treatment for recording the observations. Plant height, plant girth, canopy area, bunch weight, number of hands per bunch, number of fruits per bunch, average fruit length and girth were recorded. Statistically analysed pooled data for yield parameters (table 1) and the benefit cost ratio (table 2) are presented.

The physiological parameters recorded over the period of study revealed an increase in the plant height and canopy area with increasing number of plants per pit while, the reverse was observed in the girth of the plant though the data was not statistically significant. The reports of Chakrabarty *et al.* (1992) and Premalatha *et al.* (1996) are in concurrence with the result obtained in the current study. Kulasekharan (1985) reported that the spacing treatments had no influence on the number of leaves in banana var. robusta.

Among the sixteen treatments, the treatment T₂ (2B) in which the laterals were spaced a 2m spacing and two suckers were planted per pit at a spacing of 1.33m recorded higher bunch weight (25.3 kg) with more number of hands per bunch (10.80) and fruits per bunch (132.60). The laterals, when placed a 4m spacing and one sucker was planted with a spacing of 1m between plants (HA) recorded higher fruit length (17.75cm) and fruit girth (15.55 cm) but the overall bunch weight was less.

Daniells *et al.* (1985) observed significant reduction in bunch weight in closer planting. Apshara (1997) and Nalina (1999) reported a reduction in the number of fingers per bunch with increasing plant density. The net seasonal income in the best treatment (2B) was Rs.1,15,965 ha with a benefit cost ratio of 2.27 and net profit of Rs.224.64/mm of water used during the crop period. This was closely followed by the treatment 3A, in which the benefit cost ratio worked out to 2.08.

Table 2. Cost benefit analysis of banana under various crop geometry

Sl. No.	Details of cost economics	Treatments										
		2A	2B	2C	2D	3A	3B	3C	3D	4A	4B	4C
1.	Cost of drip system	58175	58175	58175	58175	49200	49200	49200	49200	43200	43200	43200
2.	Annual expenditure on drip (Rs)	12635	12635	12635	12635	12635	12635	12635	12635	9640	9640	9640
3.	Cost of cultivation (Rs/ha)	38400	38400	38400	38400	38400	38400	38400	38400	38400	38400	38400
4.	Seasonal total cost (Rs/ha)	51035	51035	51035	51035	49240	49240	49240	49240	48040	48040	48040
5.	Water used in mm	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147	1147
6.	Yield of produce t/ha	49.00	66.80	50.50	47.50	60.75	43.00	46.25	57.24	48.24	46.74	40.75
7.	Income from produce (Rs/ha)	122500	167000	126250	118750	151875	107500	115625	143125	120625	116875	101875
8.	Net seasonal income (Rs/ha)	71465	115965	75215	67715	102635	58260	66385	93885	72585	68835	53835
9.	Gross benefit cost ratio	1.40	2.27	1.47	1.33	2.08	1.18	1.35	1.91	1.51	1.43	1.12
10.	Net profit/mm of water used	159.25	224.64	160.99	126.56	215.3	151.07	139.02	193.51	131.35	106.5	121.76
11.	Yield/mm of water used	39.2	52.3	39.67	32.69	50.13	31.21	34.87	45.77	33.12	314.64	32.21

*Treatments with BC ratio less than are or furnished cost benefit ratio of the treatments T_{12} (4D), T_{13} (5A) - T_{16} (5D) will less than one, not furnished in this table.

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