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RESEARCH PAPER

Effect of different irrigation methods on productivity of beetroot crop under saline vertisols

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Abstract : A field study was conducted at the Agricultural Research Station, Gangavati in northern Karnataka during *Rabi/* summer, 2007-'08 and 2008-'09 to investigate the effects of drip and surface irrigation levels on the economic viability of growing beetroot crop under the salt-affected soils. The experiments were conducted in strip plot design with three soil salinity levels (EC - 1.3, 2.7 and 4.3 dS m^{-1}) in main plots and five drip irrigation levels (0.6, 0.8, 1.0, 1.2 and 1.4 ET) and three surface irrigation levels (0.8, 1.0 and 1.2 ET) in sub plots with three replications. The total water used (500.1 and 557.8 mm ET during 2007-'08 and 2008-'09, respectively) was the highest in case of drip irrigation under 1.4 ET and the lowest (282.3 and 296.4 mm) was in case of 0.6 ET. Among the surface irrigation schedules, the highest (424.5 and 487.3 mm) water was used under the irrigation level of 1.2. The gross income was more in drip irrigation than surface irrigation. Among all the different irrigation levels, the maximum gross seasonal income, net returns and BC ratio were obtained in 1.2 ET with drip irrigation and the minimum in case of surface irrigation at 0.8 ET during both the years of study. The irrigation scheduled at 1.2 ET level was more profitable as compared to the other treatments in both the methods of irrigation. The magnitude of 4.5, 5.0 and 20.5 per cent increase in the BC ratio were noticed in case of drip irrigation level at 1.2 ET over that of surface irrigation respectively in salinity levels I, II and III during 2007'-08. Similar trend was observed during 2008-'09.

Key Words : Drip irrigation, Micro irrigation, Saline soils, Vegetables, Irrigation scheduling

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INTRODUCTION

Introduction of irrigation in many arid and semi-arid parts of the world and India has benefited in improving productivity and farm income significantly. However, during recent years in most major irrigation projects development of twin problems of waterlogging and salinisation have become serious curse as considerable area either has gone out of cultivation or experiencing reduced crop yields. The total area of salt-affected soils distributed in more than hundred countries especially in arid and semi-arid regions is about 95.5 M ha. It is estimated that the world as a whole is loosing at least 3 ha of fertile land every minute due to salinisation/ sodification (Siyal *et al.*, 2002). Though our country has made phenomenal irrigation development during the post-independence period, the performance of most of the major and medium irrigation projects is highly disappointing due to various factors. Particularly the twin menacing problems of waterlogging and salinity pose questions on capital investment. Further, they cause environmental problems and have become a major concern. The waterlogged saline soils are found to occur from Jammu and Kashmir in the north to Kanyakumari in the south and Andaman Nicobar islands in the east to Gujarat in the west. The salt-affected soils form sizable area in India and according to one estimate an area of 6.73 M ha has been salt-affected in the country (Sharma *et al.,* 2006). As per the future projection made on an all India basis, an area of about 13 M ha is likely to be affected by the problem of waterlogging and soil salinity in the irrigation commands of India. This does not take into account the area under non-commands (lift irrigation schemes), coastal salinity and salinity in groundwater irrigated land with deep water table. Waterlogging, soil salinity and saline groundwater conditions at shallow depth in Haryana are resulting in a potential annual loss of about US$ 37 M at 1998-299 prices (Ambast *et al.*, 2007). About 42 per cent increase in area under waterlogging and soil salinity in southwest Punjab has occurred over a 4-year period (1997-2001).

The state of Karnataka is no exception and considerable extent of command areas of various irrigation projects has been afflicted by the problems of waterlogging and salinity. According to guesstimates, 3.5 lakh ha area has been affected in the state; of which about 80,000 ha is in the Tungabhadra Irrigation Project (TBP) area accounting for nearly 22 per cent of the command area. The problems being dynamic in nature are developing at rapid pace. Unless, these problems are addressed and solutions are evolved for prevention of the same and reclamation/management of the already affected areas, the performance of the project and agricultural productivity and production would continue to pose serious concern.

An increasing trend in land degradation has become a serious concern for the planners as significant parts of once productive lands have turned unproductive. Strategies to stimulate agriculture growth and increase production through improved soil and water management practices to enhance irrigation water use efficiencies and developing suitable irrigation technologies for the soils affected with salinity and waterlogging is needed. The recent advances in irrigation techniques involving efficient use of water through micro irrigation systems hold a key to arrest further increase in waterlogging and salinisation and also can improve the economy of the farmers especially in the tail-ends through increased farm produce. Hence, effort was made to make use of advanced irrigation systems in enhancing yield of vegetable crop (beetroot) through standardisation of irrigation levels including pressurised irrigation and their effect on economic feasibility under saline vertisols.

MATERIAL AND METHODS

Experimental site:

The experiment to find out the effect of different levels and methods of irrigation on performance of beetroot was conducted at the salinity block of the Agricultural Research Station (ARS), Gangavathi, which is situated in the north-eastern dry zone *i.e.* zone-3 of region–II of Karnataka State, India and the location corresponds to 15°15’40" North latitude and 76° 31’ 45" East longitude at an altitude of 419 m above the mean sea level. The site selected for the conduct of experiment was found to have wide range of soil salinity. Separate soil samples from 0-60 cm depth were taken to classify the experimental site into three salinity (EC, dS m^{-1}, 1:2.5 soil water extract) level blocks and divided accordingly. The soil of the experimental site is clay belonging to Noyyal series.

Weather and climate:

Daily climatological data during the study period were obtained from the meteorological station at the Agricultural Research Station, Gangavati. During the period of study (2007-’08), the maximum temperature of 34.9°C was recorded in the month of April, while the minimum temperature of 15.2°C occurred in the month of March, against the maximum temperature of 40.3°C in May and the minimum temperature of 16.8°C in February during 2008-’09.

Treatment details:

The treatment consisted of three salinity levels in main plots and eight irrigation regimes in sub-plots as follows. The experiment was laid out in strip plot design with three replications.

Main plot: Salinity levels (Three) - S :

S_1 : Salinity level – I (EC = 1.3 dS m^{-1})
S_2 : Salinity level – II (EC = 2.7 dS m^{-1})
S_3 : Salinity level – III (EC = 4.3 dS m^{-1}).
z

Sub-plots: Irrigation levels (Eight) - I :

I_1 : Drip irrigation at 0.6 ET
I_2 : Drip irrigation at 0.8 ET
I_3 : Drip irrigation at 1.0 ET
I_4 : Drip irrigation at 1.2 ET
I_5 : Drip irrigation at 1.4 ET
I_6 : Surface irrigation at 0.8 ET
I_7 : Surface irrigation at 1.0 ET
I_8 : Surface irrigation at 1.2 ET.

Lay-out of drip irrigation system:

Irrigation water was pumped through 3 hp motor and conveyed to the main line of 75 mm OD PVC pipes after passing through sand and screen filters. From the main pipes, sub-mains of 63 mm OD PVC pipes were drawn. From the sub main, laterals of 12 mm LLDPE pipes were installed at an interval of 1.20 m. Each lateral was provided with individual tap control for imposing irrigation. Along the laterals, pressure compensating drippers of 4 Lph, were fixed at a spacing of 60 cm. One lateral was used for four rows of beetroot. Sub-mains and laterals were closed at the end with end cap. After installation, trial run was conducted to assess mean dripper discharge and uniformity coefficient. During the irrigation period an average uniformity coefficient of 95 per cent was observed. This was taken into account for fixing the irrigation water application time.

Irrigation schedule :

Good quality water was used for irrigation (EC = 0.34 dS m^{-1} and pH = 7.64). Irrigation was scheduled based on climatological approach and the daily evapotranspiration (ET) rate of beetroot was estimated using the following eq.

$$ET = Ep \times Kp \times Kc$$

where,

ET = Evapotranspiration, mm
Ep = Pan evaporation, mm
Kp = Pan co-efficient
Kc = Crop co-efficient.

Quantity of water required to be applied per day per plant for 100 per cent ET in case of drip irrigation was computed using the following eq.

$$Q = ET \times A \times B$$

where,

Q = Quantity of water required per day per plant, L
A = Gross area per plant,
m^2 = Plant to plant distance, m x row to row distance, m
B = Amount of area covered with foliage fraction (100%, Tiwari *et al.,* 2003).

From the above equation, irrigation water required to meet 100 per cent crop evapotranspiration (ET) was determined, followed by 0.6, 0.8, 1.2 and 1.4 ET values. Accordingly, the irrigation was given every 48 hours based on the estimated ET requirement of the crop.

Cost of cultivation:

The expenditure incurred from field preparation to harvest was worked out and expressed as Rs. ha^{-1}.

Gross return:

The crop yield was computed per hectare and the total income was worked out based on the minimum market rate which was prevalent during the time of this study.

Net return:

The net returns were obtained by subtracting the cost of cultivation from the gross returns for each treatment.

Benefit cost ratio:

The benefit cost ratio (BCR) was worked out by using the formula given bellow (Palaniappan 1985).

$$\text{BC ratio} = \frac{\text{Gross return (Rs. ha}^{-1})}{\text{Total cost of cultivation (Rs. ha}^{-1})}$$

Economics of the drip irrigation system :

The cost of drip system for one hectare was worked out based on current market rates. The useful life of the drip system was assumed to be 5 years (10 seasons) (Tiwari *et al.,* 2003). Prevailing market price of drip components from a standard firm was used for various components of the drip system. Interest on capital investment was taken as 8.0 per cent per annum.

RESULTS AND DISCUSSION

The total amount of water applied through drip irrigation was maximum in case of 1.4 ET (500.1 mm) followed by 1.2 ET (445.7 mm), 1.0 ET (391.2 mm), 0.8 ET (336.8 mm) and minimum in case of 0.6 ET (282.3 mm) during 2007-'08,which also included the effective rainfall of 29.5 mm. Similarly, during 2008-'09 the total amount of water applied through drip irrigation was highest in case of 1.4 ET (557.8 mm) followed by 1.2 ET (492.5 mm), 1.0 ET (427.1 mm), 0.8 ET (361.8 mm) and the lowest in case of 0.6 ET (296.4 mm) including the effective rainfall of 40.3 mm (Tables 1 to 3). The total amount of water applied through surface irrigation was maximum in case of 1.2 ET (419.5 mm) followed by 1.0 ET (325.5 mm) and minimum in case of 0.8 ET (305.3 mm) during 2007-'08. Similarly, the amount of water applied through surface irrigation was highest in 1.2 ET (487.3 mm) followed by 1.0 ET (427.3 mm) and the least in case of 0.8 ET (374.6) during 2008-'09. All these included the effective rainfall of 95.3, 55.5, and 29.5 mm in 0.8, 1.0 and 1.2 ET in 2007-'08 and 44.6, 37.3 and 37.3 mm under 0.8 ET, 1.0 ET and 1.2 ET during 2008-'09, respectively (Table 4).

The different levels of salinity had marked influence on tuber yield during both the years. The highest tuber yield of 226.83 q ha^{-1} in drip irrigation at 1.2 ET and the lowest tuber yield of 61.03 q ha^{-1} at 0.8 ET were registered, respectively in salinity levels-I and III during 2007-'08. During 2008-'09, significantly the maximum tuber yield of 222.48 q ha^{-1} in salinity level-I at 1.2 ET and the lowest of 57.25 q ha^{-1} in salinity level-III were recorded. These results corroborate the results obtained by Tripathi *et al.* (2010) and Mallikarjun *et al.* (2011). The highest tuber yield in case of drip irrigation at 1.2 ET under salinity level-I might be attributed to conducive growth conditions under lowest salinity, better availability of soil moisture environment and availability of plant nutrients throughout the crop growth period under the drip irrigation system. This is in accordance with the findings of Manjunath *et al.* (2004) who reported that higher *brinjal* yield was recorded for drip irrigation at 1.2 ET followed by drip irrigation at 1.4 ET under varied salinity levels. The tuber yield reduced as the salinity increased. The reduction was to the extent of 12 per cent in salinity level-II and 39.7 per cent in salinity level-III as compared to the tuber yield obtained in salinity level-I during 2007-'08 and similarly, it was 12.8 and 41.3 per cent during 2008-'09.

In the salinity level-I, among the drip irrigation levels, the highest BC ratio of 7.0 was obtained in case of 1.2 ET followed by 1.4 ET (6.8), 1.0 ET (6.6), 0.8 ET (6.3) and the least BC ratio of 5.9 was recorded at 0.6 ET during 2007-'08 (Table 1). Similar trend was obtained during 2008-'09 with 6.9, 6.6, 6.5, 6.1 and 5.8, respectively for 1.2, 1.4, 1.0, 0.8 and 0.6 ET levels under drip irrigation (Table 1). Among the surface irrigation levels, the maximum BC ratio of 6.7 was obtained in 1.2 ET followed by 1.0 ET (6.3) and 0.8 ET (5.8) during 2007-'08 (Table 4). Similar trend was obtained during 2008-'09 with 6.6, 6.0 and 5.6, respectively for 1.2, 1.0 and 0.8 ET levels.

In case of the salinity level-II, among the drip irrigation levels, the maximum BC ratio of 6.3 was obtained in case of drip irrigation at 1.2 ET, followed by 1.4 ET (5.9), 1.0 ET (5.8), 0.8 ET (5.4) and the lowest BC ratio of 5.1 was recorded in the at 0.6 ET. Similar trend was obtained during 2008-'09 with 6.2, 5.8, 5.7, 5.3 and 5.0, respectively for 1.2, 1.4, 1.0, 0.8 and 0.6 ET levels under drip irrigation (Table 2). Among the surface irrigation levels the highest BC ratio of 6.0 was obtained in case of irrigation regime 1.2 ET followed by 1.0 ET

Table 1 : Economic viability of drip irrigation levels for beetroot under salinity level-I

Sr. No.	Economics	2007-'08					2008-'09				
		0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET	0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET
1.	Fixed cost	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873
	Depreciation cost	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787
	Interest @ 8 %	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230
	Repair and maintenance	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Total (b+c+d)	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017
2.	Cost of cultivation (Rs. ha^{-1})	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269
3.	Seasonal total cost (1d + 2) (Rs. ha^{-1})	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286
4.	Water used (mm)	282.3	336.8	391.2	445.7	500.1	296.4	361.8	427.1	492.5	557.8
5.	Yield of produce (q ha^{-1})	190.20	202.57	214.70	226.83	217.97	184.72	197.69	210.16	222.48	212.75
6.	Selling price (Rs. q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
7.	Gross income (5 x 6) (Rs.)	190,200	202,570	214,700	226,830	217,970	184,720	197,690	210,160	222,480	212,750
8.	Net seasonal income (7-3) (Rs.)	157,914	170,284	182,414	194,544	185,684	152,434	165,404	177,874	190,194	180,464
9.	Benefit cost ratio (7/3)	5.9	6.3	6.6	7.0	6.8	5.7	6.1	6.5	6.9	6.6

(5.5) and 0.8 ET (5.0) during 2007-'08 (Table 4). Similar trend was obtained during 2008-'09 with 5.8, 5.3 and 4.8, respectively for 1.2, 1.0 and 0.8 ET levels.

In the salinity level-III, among the drip irrigation levels the maximum BC ratio of 4.7 was obtained at 1.2 ET followed by 1.4 ET (4.3), 1.0 ET (4.2), 0.8 ET (3.8) and the lowest BC ratio 3.5 was recorded in 0.6 ET. Similar trend was obtained during 2008-'09 with 4.5, 4.1, 4.0, 3.6 and 3.3, respectively for 1.2, 1.4, 1.0, 0.8 and 0.6 ET levels under drip irrigation (Table 3). Among the surface irrigation levels the highest BC ratio of 3.9 was obtained in case of 1.2 ET followed by 1.0 ET (3.3) and the least in 0.8 ET (2.8) during 2007-'08 (Table 4). Similar trend was obtained during 2008-'09 with 3.7, 3.1 and 2.6, respectively for 1.2, 1.0 and 0.8 ET levels.

The gross income was more in drip irrigation than that of surface irrigation. Among the different drip irrigation levels, the maximum gross BC ratio was obtained in 1.2 ET and the minimum in case of 0.6 ET, which might be attributed to higher yield in the former treatment due to better and conducive moisture regime over that of the latter. Similar trend was observed in the surface irrigation treatment. There were 4, 4.5 and 20 per cent increase in the BC ratio in case of drip irrigation

Table 2 : Economic viability of drip irrigation levels for beetroot under salinity level-II

Sr. No.	Economics	2007-'08					2008-'09				
		0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET	0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET
1.	Fixed cost	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873
	Depreciation cost	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787
	Interest @ 8 %	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230
	Repair and maintenance	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Total (b+c+d)	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017
2.	Cost of cultivation (Rs. ha^{-1})	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269
3.	Seasonal total cost (1d + 2) (Rs. ha^{-1})	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286
4.	Water used (mm)	282.3	336.8	391.2	445.7	500.1	296.4	361.8	427.1	492.5	557.8
5.	Yield of produce (q ha^{-1})	165.27	175.80	187.93	204.17	191.23	157.66	170.30	183.10	199.14	186.34
6.	Selling price (Rs. q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
7.	Gross income (5x 6) (Rs.)	165,270	175,800	187,930	204,170	191,230	157,660	170,300	183,100	199,140	186,340
8.	Net seasonal income (7-3) Rs.)	132,984	143,514	155,644	171,884	158,944	125,374	138,014	150,814	166,854	154,054
9.	Benefit cost ratio (7/3)	5.1	5.4	5.8	6.3	5.9	4.9	5.3	5.7	6.2	5.8

Table 3 : Economic viability of drip irrigation levels for beetroot under salinity level-III

Sr. No.	Economics	2007-'08					2008-'09				
		0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET	0.6 ET	0.8 ET	1.0 ET	1.2 ET	1.4 ET
1.	Fixed cost	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873	77,873
	Depreciation cost	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787	7,787
	Interest @ 8 %	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230	6,230
	Repair and maintenance	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
	Total (b+c+d)	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017	15,017
2.	Cost of cultivation (Rs. ha^{-1})	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269	17,269
3.	Seasonal total cost (1d + 2) (Rs. ha^{-1})	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286	32,286
4.	Water used (mm)	282.3	336.8	391.2	445.7	500.1	296.4	361.8	427.1	492.5	557.8
5.	Yield of produce (q ha^{-1})	112.03	123.07	136.67	151.90	139.20	104.23	116.96	131.22	145.65	133.94
6.	Selling price (Rs. q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
7.	Gross income (5 x 6) (Rs.)	112,030	123,070	136,670	151,900	139,200	104,230	116,960	131,220	145,650	133,940
8.	Net seasonal income (7-3) (Rs.)	79,744	90,784	104,384	119,614	106,914	71,944	84,674	98,934	113,364	101,654
9.	Benefit cost ratio (7/3)	3.5	3.8	4.2	4.7	4.3	3.2	3.6	4.1	4.5	4.1

level of 1.2 ET over that of surface irrigation at 1.2 ET, respectively in salinity level-I, II and III during 2007-'08. Similar trend was observed during 2008-'09. There was marked per cent increase in BC ratio in drip irrigation over surface irrigation at higher soil salinity levels. Thus, 1.2 ET level was found to be more profitable as compared to other treatments in both the methods of irrigation. Similarly, in all the salinity levels the gross income, net income and BC ratio were more in drip irrigation treatments than the surface irrigation treatments. Among the salinity levels, the salinity level-I recorded the highest gross returns, net returns and BC ratio than the salinity levels-II and III, because of better conducive environment due to lower salinity, higher available moisture content and higher tuber yield. The economic feasibility of adopting drip irrigation was reported in sugarbeet (Sharmasarkar *et al.,* 2001). The economic analysis of experiment conducted at different salinity blocks with different levels and methods of irrigation revealed that, the highest net seasonal income was obtained with drip irrigation level of 1.2 ET and the lowest with 0.8 ET (Manjunath *et al.,* 2004).

Thus, from the foregone discussion it could be concluded that better growth, higher yield and income and larger quantity of irrigation water saving indicate the practical feasibility of drip irrigation for higher productivity, profitable and sustainable beetroot production in the saline soils. The drip irrigation would also facilitate bringing additional area under beetroot cultivation to meet the domestic and export demands. Adoption of drip irrigation for hybrid beetroot is a viable proposition for cultivation in salt-affected soils for greater income benefits with less amount of water. The drip irrigation at 1.2 ET with recommended dose of fertiliser would be an ideal practice to achieve greater yield, income and water saving benefits as compared to surface irrigation under saline vertisols.

Table 4 : Economic viability of surface irrigation levels for beetroot as influenced by different salinity levels

Sr. No.	Economics	2007-'08			2008-'09		
		0.8 ET	1.0 ET	1.2 ET	0.8 ET	1.0 ET	1.2 ET
Salinty level-I							
1.	Cost of cultivation (Rs. ha^{-1})	22,069	22,069	22,069	22,069	22,069	22,069
2.	Water used (mm)	305.3	325.5	419.5	374.6	427.3	487.3
3.	Yield of produce (q ha^{-1})	127.89	138.31	147.57	124.19	133.45	145.37
4.	Selling price (Rs q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000
5.	Income from produce (3 x 4) (Rs.)	127,890	138,310	147,570	124,190	133,450	145,370
6.	Net seasonal income (5-1) (Rs.)	105,821	116,241	125,501	102,121	111,381	123,301
7.	Benefit cost ratio (5/1)	5.8	6.3	6.7	5.6	6.0	6.6
Salinty level-II							
1.	Cost of cultivation (Rs. ha^{-1})	22,069	22,069	22,069	22,069	22,069	22,069
2.	Water used (mm)	305.3	325.5	419.5	374.6	427.3	487.3
3.	Yield of produce (q ha^{-1})	110.53	120.95	131.94	106.60	117.01	127.66
4.	Selling price (Rs q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000
5.	Income from produce (3 x 4) (Rs.)	110,530	120,950	131,940	106,600	117,010	127,660
6.	Net seasonal income (5-1) (Rs.)	88,461	98,881	109,871	84,531	94,941	105,591
7.	Benefit cost ratio (5/1)	5.0	5.5	6.0	4.8	5.3	5.8
Salinity level-III							
1.	Cost of cultivation (Rs. ha^{-1})	22,069	22,069	22,069	22,069	22,069	22,069
2.	Water used (mm)	305.3	325.5	419.5	374.6	427.3	487.3
3.	Yield of produce (q ha^{-1})	61.03	71.84	86.42	57.25	68.16	82.21
4.	Selling price (Rs q^{-1})	1,000	1,000	1,000	1,000	1,000	1,000
5.	Income from produce (3 x 4) (Rs.)	61,030	71,840	86,420	57,250	68,160	82,210
6.	Net seasonal income (5-1) (Rs.)	38,961	49,771	64,351	35,181	46,091	60,141
7.	Benefit cost ratio (5/1)	2.8	3.3	3.9	2.6	3.1	3.7

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