

Original Research Article

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## Economic Viability of Red Cabbage Production under Varying Environment and Ferti-Irrigation Regimes

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### ABSTRACT

#### Keywords

Red cabbage, Polyhouse, Open field, Cost of cultivation, Net income, B:C ratio

#### Article Info

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The experiment was conducted at Precision Farming Development Centre of Mahatma Phule Agricultural University, Rahuri, Maharashtra. The objective of the study was to find out the economic viability of red cabbage under polyhouse and open field. The results revealed that the maximum net returns (₹ 1,79,319) were obtained from polyhouse under the treatment of 0.90 ETc and 125 % RDF. The maximum B: C ratio(2.21), was obtained under the treatment of E<sub>1</sub>I<sub>1</sub>F<sub>1</sub> (i.e. Polyhouse x 0.90 ETc x 125% RDF) and the minimum in treatment E<sub>2</sub>I<sub>3</sub>F<sub>3</sub> (i.e. Open field x 0.60 ETc x 75 % RDF). However, the maximum B: C ratio obtained from open field was 1.16, with same irrigation and fertigation levels.

### Introduction

In order to “Doubling the farmer’s income by 2022”, Indian Government has started taking several steps. In which maximization of irrigated area, providing fertilizer at lower cost to farmers, development of market of agriculture produce, development and promotion of Agriculture processing plant, maximization of export of agricultural produce, promotion and awareness to grow exotic vegetables in Indian climate etc. are included. This research was conducted under natural ventilated polyhouse and open field on

red cabbage to study economic viability in Indian climate.

Murthy *et al.*, (2009) reported that the economic viability of tomato and capsicum under naturally ventilated polyhouse with drip irrigation system was found highly feasible i.e. net present value as Rs.3,23,145 /500 m<sup>2</sup>, benefit cost ratio as 1.80 and internal rate of returns 53.7% with payback period of less than two years. Laate (2013) reported that under greenhouse miscellaneous receipts were included to value of cucumber sales, total gross revenue increased to \$1,219,411 or

\$107.21 per square metre. Braulio *et al.*, (2010) and Kumar *et al.*, (2017) reported similar results for lettuce, cucumber and capsicum.

## Materials and Methods

This research was conducted at Precision Farming Development Centre, of Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra during late *khari* season, 2017-18. Research site is situated at 19° 47' N latitude and 74° 37' E longitudes at 657 m above mean sea level. The experiment was carried out in polyhouse and open field in split-split plot design with 18 treatments comprising of two environmental conditions (i.e. Polyhouse and open field), three irrigation regimes (i.e. 0.90, 0.75 and 0.60 ETc) and three fertigation regimes (i.e. 125, 100 and 75 % RD) with three replications. The size of the polyhouse was 25 × 20 m and open field was 20 × 18 m. The size of each raised beds in polyhouse and open field were 2.7 × 0.75 m and 4.5 × 0.75 m, respectively, with 0.3 m height and 0.5 m buffer strip was provided between two beds to avoid lateral movement of water from one bed to another. The irrigation water was applied daily to the crop through drip irrigation system and soluble fertilizers were applied by using ventury tube assembly. The irrigation scheduling was done as per treatment on the basis of ETc. Water soluble fertilizers were scheduled alternate day through drip irrigation as per recommended dose of fertilizer 80:40:40 NPK kg ha<sup>-1</sup>.

The crop evapo-transpiration was calculated, based on FAO Penman-Monteith formula, with MPKV recommended Phule Jal Software. The volume of water to be applied for each treatment plot was computed by the equation  $V = d \times A$ , where V is volume of water, lit; d is depth of water, mm; and A is area of plot, m<sup>2</sup>. The time of operation (hr) of

drip irrigation system for each treatment was calculated by equation  $T_o = V / q \cdot n \cdot EU$ , where  $T_o$  is time of operation of drip irrigation unit for respective treatment (hr); V is volume of water to be applied per irrigation, lit; q is average discharge of emitter in respective treatments, (lph); EU is emission uniformity of drip irrigation unit (0.90) and n is number of emitter plot<sup>-1</sup> (Table 1).

## Results and Discussion

### Cost of cultivation

The data in respect of cost of cultivation are presented in Table 2. The cost of cultivation per 1008 m<sup>2</sup> was highest (₹ 1, 48,717/-) in treatments E<sub>1</sub> × I<sub>1</sub> × F<sub>1</sub> (i.e. Polyhouse × 0.90 ETc × 125% RDF), E<sub>1</sub> × I<sub>2</sub> × F<sub>1</sub> (i.e. Polyhouse × 0.75 ETc × 125% RDF) and E<sub>1</sub> × I<sub>3</sub> × F<sub>1</sub> (i.e. Polyhouse × 0.60 ETc × 125% RDF). The lowest cost of cultivation of per 1008 m<sup>2</sup> (₹ 66,419/-) was found in E<sub>2</sub> × I<sub>1</sub> × F<sub>3</sub> (i.e. Open field × 0.90 ETc × 75 % RDF), E<sub>2</sub> × I<sub>2</sub> × F<sub>3</sub> (i.e. Open field × 0.75 ETc × 75 % RDF) and E<sub>2</sub> × I<sub>3</sub> × F<sub>3</sub> (i.e. Open field × 0.60 ETc × 75 % RDF).

### Gross monetary returns

The differences in respect of gross monetary returns were observed due to the various treatments under study. The gross income obtained under different treatments varied from ₹ 31,474/- to ₹ 3, 28,036/-. The maximum gross monetary returns per 1008 m<sup>2</sup> of ₹ 3, 28,036/- were obtained under the treatment of E<sub>1</sub>I<sub>1</sub>F<sub>1</sub> (i.e. Polyhouse × 0.90 ETc × 125% RDF). The minimum gross monetary returns (₹ 31,474 /-) were obtained by E<sub>2</sub>I<sub>3</sub>F<sub>3</sub> (i.e. Open field × 0.60 ETc × 75 % RDF).

### Net income

The net income obtained due to various

treatments is reported in Table 2. The net income obtained under different treatments varied from ₹ -34,945/- to 1, 79,319/-. The maximum net income of (₹ 1, 79,319/-) was obtained under the treatment of E<sub>1</sub>I<sub>1</sub>F<sub>1</sub> (i.e. Polyhouse x 0.90 ETc x 125% RDF) and the minimum net income (₹ -34,945/-) was under E<sub>2</sub>I<sub>3</sub>F<sub>3</sub>(i.e. Open field x 0.60 ETc x 75 % RDF).

**Benefit: Cost ratio**

The calculated values of B: C ratios in various

treatments are shown in Table 2. The B: C ratio obtained under different treatments varied from 0.47 to 2.21. The maximum B: C ratio of 2.21 was obtained under the treatment of E<sub>1</sub>I<sub>1</sub>F<sub>1</sub> (i.e. Polyhouse x 0.90 ETc x 125% RDF), whereas the minimum B: C ratio (0.47) was recorded in treatment E<sub>2</sub>I<sub>3</sub>F<sub>3</sub> (i.e. Open field x 0.60 ETc x 75 % RDF). Table 2 Economics of red cabbage production as affected by environmental conditions, irrigation regimes and fertigation regimes.

**Table.1** Details of treatments and symbol used

S. No.	Symbol used	Treatments
1	T <sub>1</sub> : E <sub>1</sub> x I <sub>1</sub> x F <sub>1</sub>	Polyhouse x 90 % ETc x 125% RDF
2	T <sub>2</sub> : E <sub>1</sub> x I <sub>1</sub> x F <sub>2</sub>	Polyhouse x 90 % ETc x 100% RDF
3	T <sub>3</sub> : E <sub>1</sub> x I <sub>1</sub> x F <sub>3</sub>	Polyhouse x 90 % ETc x 75% RDF
4	T <sub>4</sub> : E <sub>1</sub> x I <sub>2</sub> x F <sub>1</sub>	Polyhouse x 75 % ETc x 125% RDF
5	T <sub>5</sub> : E <sub>1</sub> x I <sub>2</sub> x F <sub>2</sub>	Polyhouse x 75 % ETc x 100% RDF
6	T <sub>6</sub> : E <sub>1</sub> x I <sub>2</sub> x F <sub>3</sub>	Polyhouse x 75 % ETc x 75% RDF
7	T <sub>7</sub> : E <sub>1</sub> x I <sub>3</sub> x F <sub>1</sub>	Polyhouse x 60 % ETc x 125% RDF
8	T <sub>8</sub> : E <sub>1</sub> x I <sub>3</sub> x F <sub>2</sub>	Polyhouse x 60 % ETc x 100% RDF
9	T <sub>9</sub> : E <sub>1</sub> x I <sub>3</sub> x F <sub>3</sub>	Polyhouse x 60 % ETc x 75% RDF
10	T <sub>10</sub> : E <sub>2</sub> x I <sub>1</sub> x F <sub>1</sub>	Open field x 90 % ETc x 125% RDF
11	T <sub>11</sub> : E <sub>2</sub> x I <sub>1</sub> x F <sub>2</sub>	Open field x 90 % ETc x 100% RDF
12	T <sub>12</sub> : E <sub>2</sub> x I <sub>1</sub> x F <sub>3</sub>	Open field x 90 % ETc x 75% RDF
13	T <sub>13</sub> : E <sub>2</sub> x I <sub>2</sub> x F <sub>1</sub>	Open field x 75 % ETc x 125% RDF
14	T <sub>14</sub> : E <sub>2</sub> x I <sub>2</sub> x F <sub>2</sub>	Open field x 75 % ETc x 100% RDF
15	T <sub>15</sub> : E <sub>2</sub> x I <sub>2</sub> x F <sub>3</sub>	Open field x 75 % ETc x 75% RDF
16	T <sub>16</sub> : E <sub>2</sub> x I <sub>3</sub> x F <sub>1</sub>	Open field x 60 % ETc x 125% RDF
17	T <sub>17</sub> : E <sub>2</sub> x I <sub>3</sub> x F <sub>2</sub>	Open field x 60 % ETc x 100% RDF
18	T <sub>18</sub> : E <sub>2</sub> x I <sub>3</sub> x F <sub>3</sub>	Open field x 60 % ETc x 75% RDF

**Table.2**

Treatment No.	Treatment	Cost of cultivation, ₹ 1008 m <sup>-2</sup>	Gross income, ₹ 1008 m <sup>-2</sup>	Net Income, ₹ 1008 m <sup>-2</sup>	B:C ratio
T <sub>1</sub>	E <sub>1</sub> x I <sub>1</sub> x F <sub>1</sub>	148717	328036	179319	2.21
T <sub>2</sub>	E <sub>1</sub> x I <sub>1</sub> x F <sub>2</sub>	148300	284366	136066	1.92
T <sub>3</sub>	E <sub>1</sub> x I <sub>1</sub> x F <sub>3</sub>	147889	278877	130988	1.89
T <sub>4</sub>	E <sub>1</sub> x I <sub>2</sub> x F <sub>1</sub>	148717	275547	126830	1.85
T <sub>5</sub>	E <sub>1</sub> x I <sub>2</sub> x F <sub>2</sub>	148300	271687	123387	1.83
T <sub>6</sub>	E <sub>1</sub> x I <sub>2</sub> x F <sub>3</sub>	147889	243627	95738	1.65
T <sub>7</sub>	E <sub>1</sub> x I <sub>3</sub> x F <sub>1</sub>	148717	195645	46928	1.32
T <sub>8</sub>	E <sub>1</sub> x I <sub>3</sub> x F <sub>2</sub>	148300	184176	35876	1.24
T <sub>9</sub>	E <sub>1</sub> x I <sub>3</sub> x F <sub>3</sub>	147889	142032	-5856	0.96
T <sub>10</sub>	E <sub>2</sub> x I <sub>1</sub> x F <sub>1</sub>	67247	77858	10611	1.16
T <sub>11</sub>	E <sub>2</sub> x I <sub>1</sub> x F <sub>2</sub>	66830	72347	5517	1.08
T <sub>12</sub>	E <sub>2</sub> x I <sub>1</sub> x F <sub>3</sub>	66419	67101	683	1.01
T <sub>13</sub>	E <sub>2</sub> x I <sub>2</sub> x F <sub>1</sub>	67247	66525	-721	0.99
T <sub>14</sub>	E <sub>2</sub> x I <sub>2</sub> x F <sub>2</sub>	66830	61217	-5613	0.92
T <sub>15</sub>	E <sub>2</sub> x I <sub>2</sub> x F <sub>3</sub>	66419	54465	-11954	0.82
T <sub>16</sub>	E <sub>2</sub> x I <sub>3</sub> x F <sub>1</sub>	67247	43171	-24076	0.64
T <sub>17</sub>	E <sub>2</sub> x I <sub>3</sub> x F <sub>2</sub>	66830	37570	-29260	0.56
T <sub>18</sub>	E <sub>2</sub> x I <sub>3</sub> x F <sub>3</sub>	66419	31474	-34945	0.47

In conclusions, the maximum B: C ratio of 2.21 was obtained under polyhouse condition with drip irrigation @ 0.90 ETc and fertigation @ 125% RDF and the minimum in open field condition with drip irrigation @ 0.60 ETc and fertigation @ 75% RDF. Hence, the adoption of polyhouse with irrigation regimes of 0.90 ETc and fertigation regimes of 125% of RDF was found to be best amongst all other treatments, having maximum B: C ratio and maximum net income, for the production of red cabbage.

**References**

Braulio, I. A., A. B. Rezende, C. Filho, A. P. Barros, R. Q. Porto Diego and M. I. Martins. 2010. Economic analysis of cucumber and lettuce intercropping under greenhouse in the winter-spring.

Annals of Brazilian Academy of Sciences, 83(2): 705-717.  
 Kumar, R. and S. Kumar. 2017. Effect of irrigation levels and frequencies on growth, yield and economics of capsicum production under naturally ventilated polyhouse. Dr. Y. S. Parmar University of Horticulture and Forestry, Solan, HP. Vegetable Science; 44 (1).  
 Laate, E. A. 2013. The economics of production and marketing of greenhouse crops in alberta. Economics and Competitiveness Division, Agriculture and Rural Development, Alberta, Canada.  
 Murthy, D. S., B. S. Prabhakar, S. S. Hebbar, V. Srinivas and M. Prabhakar. 2009. Economic feasibility of vegetable production under polyhouse: A case study of capsicum and tomato. Section

of Economics and Statistics Indian  
Institute of Horticultural Research,  
Hesarghatta Lake Post, Bangalore,

India. Journal of Horticultural Sciences,  
Vol. 4 (2): 148-152.

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