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Economic analysis of basmati cultivation in Haryana

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Abstract

India is the second largest producer of rice in the world after China. Particularly, basmati rice is a unique aromatic variety grown in our country. India exports basmati rice more than fifty countries in the world. The study was based on primary and secondary data. Primary data was collected through a survey of 120 farmers growing basmati rice in the selected two districts of Haryana. The study was conducted in Karnal and Kaithal district of Haryana in 2018-19 to study the comparative economics of production of basmati rice in the state. It was revealed that farmers in Karnal and Kaithal were selected purposively on the basis of highest area under basmati rice. Even though, the cost of cultivation was found to be higher in PB-1121 (Rs. 121911/ha.) over CSR-30 (Rs. 119320/ha.) in overall basis. Gross return was found to be higher in PB-1121 (Rs. 150836/ha.) over CSR-30 (Rs. 136820/ha.) and net returns was observed in case of PB-1121 (Rs. 28925/ha.) over CSR-30 (Rs. 17500/ha.) in overall basis respectively. The area, production and productivity of basmati rice during the year 2009-10 to 2018-19 were calculated based on secondary data collected from Agricultural and Processed Food Products Export Development Authority (APEDA), Horizon Research and Directorate of Rice Development. The results indicated that area and production of basmati rice in Haryana during the year 2009-10 to 2018-19 declined with a CAGR of negative 1.09 per cent and negative 0.59 per cent and productivity increased with positive 0.50 per cent. Similarly, in India, the area, production and productivity of basmati rice during the year 2009-10 to 2018-19 declined with a CAGR of negative 0.09 per cent, negative 2.18 per cent and negative 2.09 per cent respectively.

Keywords: basmati rice, economics of cultivation, PB-1121, CSR-30

Introduction

Rice (*Oryza sativa*) is the staple food of more than half of the world population. The population of the world at present was 7.53 billion in the year 2017. Rice provides about 20 per cent of the global average calorie intake and its cultivation occupies 11 per cent of world agricultural land. Total production of rice in the year 2017 was about 984 million tonnes in the world (FAOSTAT 2019).

Asia dominates in the world in rice production as it accounts for about 90 per cent of world's rice area and 92 per cent of production. Total production of Asia in the year 2017 according to FAOSTAT was about 692 million tonnes. India is second largest producer of rice 111.01 million tonnes preceded by China 144.55 million tonnes during the year 2017-18. It was the largest exporter of rice in year 2015-16 followed by Thailand (Commodity Profile, 2015-16).

Rice constitutes approximately 44 per cent of the overall food-grains consumption inside the country and it occupy 23 per cent of gross planted area of India. The major rice producing states are West Bengal, Uttar Pradesh, Tamil Nadu, Chhattisgarh, Andhra Pradesh, Punjab and Haryana (Sekhara *et al.*)^[2]. In Northern India, foremost rice producing states are Punjab and Haryana and Uttar Pradesh. Punjab has the maximum yield of basmati rice *i.e.* 3590 kg per hectare, whereas Haryana rank second *i.e.* 3372 kg per hectare.

India dominates the trade among its basmati rice followed by Pakistan, China, Indonesia and Bangladesh etc. Rice is exported from India in terms of basmati and non- basmati rice. The basmati rice exports are in three categories: White, brown and parboiled. Basmati rice constitutes the foremost share of rice exports from India. Basmati rice fetches good export price in the international markets and its exports are at peak during March-April/November-December.

Basmati rice plays a significant role within the export income of the country. India exported 26870.16 Crores worth of basmati rice during 2017-18. The major export destinations of basmati rice in the world are Saudi Arabia, Iran, United Arab Emirates, Iraq, United Kingdom and United States of America.

The area under basmati rice within the major states of India are: Punjab, Haryana, Uttar Pradesh, Jammu & Kashmir and Uttarakhand.

In Haryana, the total rice area was 1274 thousand hectares, out of which total basmati rice area 634 thousands hectares (table 1). The major basmati rice varieties grown are Pusa Basmati-1121, CSR-30, Pusa-1509, Pusa Basmati-1 (APEDA, December 2018) [1]. Two districts namely Karnal and Kaithal are main producers of basmati rice in Haryana (71100 hectares in Karnal and 58800 hectares in Kaithal). Two basmati varieties Pusa Basmati -1121 and CSR-30 are predominantly cultivated here. Keeping in view the importance of basmati rice in terms of foreign exchange it earns for the country and the associated future prospects it holds this study was undertaken to study the comparative economics of two major varieties of basmati rice cultivated in Haryana.

Table 1: Area, production and productivity of basmati rice in India and Haryana (2009-18)

Year	India			Haryana		
	Area	Production	Yield	Area	Production	Yield
2009-10	1477	6160	4171	700	2656	3794
2010-11	1760	7213	4098	781	2752	3524
2011-12	1806	7792	4315	750	2676	3568
2012-13	1732	6129	3539	730	2261	3097
2013-14	1676	6663	3976	711	2899	4077
2014-15	2134	8771	4110	833	3702	4444
2015-16	2118	8055	3803	833	3243	3893
2016-17	1685	6156	3653	720	2797	3885
2017-18	1553	5641	3632	652	2535	3888
2018-19	1514	5024	3318	634	2138	3372
CAGR (%)	0.00	-0.02	-0.02	-0.01	-0.02	-0.01

Note: Area in 000³ha, Production in 000³t, Yield in Kg/ha.

Methodology

The study was conducted during the year 2018-19 in the state of Haryana

Selection of study area

In Haryana two districts Kaithal and Karnal were selected purposively for the survey. These districts were the highest and second highest producer of basmati rice in the state. Sixty farmers were selected from each district comprising 30 each practicing basmati rice varieties (Pusa-1121 and CSR-30) randomly. Thus a total of 120 sample farmers were interviewed for the study.

Data

Both primary and secondary data was used for the study. Primary data used to work out the comparative economics of basmati rice was collected by conducting personal interview of selected farmers and responses were recorded on through a pretested schedule prepared for the study.

Secondary data required form the study was collected from agriculture department and other published and unpublished sources obtained from Agricultural and Processed Food Products Export Development Authority (APEDA), Horizon Research, Directorate of Rice Development and Agri. Net.

Analytical techniques

Estimation of compound annual growth rate

$$Y = ab^t \tag{1}$$

Where,

Y = Index number of area, production, productivity as the dependent variable

t = Time variable (year) as independent variable

a = Intercept

b =Regression coefficient

Equation (1) can be expressed in logarithmic form as follows:

$$\log y = \log a + t \log b \tag{2}$$

$$\log y = A + B t \tag{3}$$

Where,

A= log a

B = log b

The compound growth rate "r" was computed as:

$$r = (\text{Antilog of } b - 1) \times 100 \tag{4}$$

Profitability concepts

Gross Income = Value of main product + Value of by product

Return over variable cost =Gross return – Variable cost

Net returns = Gross return – Total cost

Benefit-Cost Ratio (B: C ratio) = Gross returns/Total cost

Results and Discussion

Area, production and yield of basmati in India

The total area under basmati rice was 1477 thousand hectares in 2009-10 which increased to 1806 thousand hectares in 2011-12 (Table 1). However, in the next year it reduced to 1732 thousand hectares due to reduction in area of Pusa basmati-1121. This happened primarily due to very low prices in the previous season. The maximum area under total basmati rice was noticed in 2014-15 i.e. 2134 thousand hectares which was seen in response to the introduction of new variety of basmati rice (Pusa basmati-1509). In the very next year he area under Pusa basmati-1509 declined as the rice millers and exporters association decided against the purchase of Pusa basmati-1509. This decision came in response to high incidence of grain breakage. In the year 2018-19, the area under total basmati rice further decreased to 1514 thousand hectares due to lack of adequate minimum support price (MSP) and resultant fluctuations in price. Likewise, Haryana also saw similar ups and downs in the cultivation of basmati rice. The total area under basmati rice was 700 thousand hectares in 2009-10 and increased to 781 thousand hectares in 2010-11 which decreased to 750 thousand hectares in 2011-12 due to low prices of PB-1121. The maximum area under basmati rice recorded was 833 thousand hectares in 2014-15 and 2015-16. Owing to the introduction of new variety of basmati rice (Pusa basmati-1509). Furthermore, during the year 2016-17, the area under basmati declined as the rice millers and exporters decided against the purchase of Pusa basmati-1509.

The major basmati rice producing states are Haryana, Punjab, Uttar Pradesh and Jammu & Kashmir. Haryana is the leading producer of basmati rice in India. Within the last 10 years it has continuously had a share of more than 42 per cent in terms of area. The state of Punjab has also been a close followers of Haryana in terms of area cultivated. Both states altogether constitute more than three quarters of the total basmati cultivation (Table 2).

The production of basmati rice in India was 6160 thousand tonnes in 2009-10 which after a decade has come down to 5024 thousand tonnes in 2018-19. The share of Haryana in total basmati production has been fluctuating between 35 to

45 per cent. The share of Haryana and Punjab together has been in the range of 70 to 85 per cent during the last decade owing to stable share in terms of area.

Yield of basmati paddy was seen falling in throughout the country. In the year 2009-10, the productivity of India was about 4171 kg per hectare which has now come down to 3318 kg per hectare. The productivity of Haryana during the year 2009-10 *i.e.* 3794 kg per hectare. In comparison to India, the productivity of Haryana was continuously decreasing up to the year 2012-13. In the next two years it grew positively.

But, from 2015 onwards it has been declining continuously (Table 1). Punjab has been the most productive state in the country. The highest productivity of Punjab was observed during the year 2010-11 *i.e.* 5147 kg per hectare.

The negligible compound annual growth rate (CAGR) of basmati rice in terms of area, production and productivity during the year 2009-10 to 2018-19 in India and its states show that there is a stagnation in terms of coverage and production technology.

Table 2: Area, production and productivity of major basmati rice producing states in India (2009-18)

State/Year	Haryana			Punjab			Uttar Pradesh			Jammu & Kashmir			Others			India		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
2009-10	700	2656	3794	513	2489	4852	254	983	3870	0	0	0	10	32	3333	1477	6160	4171
	(47.4)	(43.1)		(34.7)	(40.4)		(17.2)	(16.0)		(0.0)	(0.0)		(0.7)	(0.5)		(100)	(100)	
2010-11	781	2752	3524	550	2831	5147	378	1443	3817	18	80	4444	33	107	3333	1760	7213	4098
	(52.9)	(38.2)		(31.3)	(39.2)		(21.5)	(20.0)		(1.0)	(1.1)		(1.9)	(1.5)		(100)	(100)	
2011-12	750	2676	3568	600	2832	4720	400	2066	5165	22	95	4318	34	123	3308	1806	7792	4315
	(50.8)	(34.3)		(33.2)	(36.3)		(22.1)	(26.5)		(1.2)	(1.2)		(1.9)	(1.6)		(100)	(100)	
2012-13	730	2261	3097	585	2282	3901	374	1428	3818	24	96	4000	19	62	3000	1732	6129	3539
	(49.4)	(36.9)		(33.8)	(37.2)		(21.6)	(23.3)		(1.4)	(1.6)		(1.1)	(1.0)		(100)	(100)	
2013-14	711	2899	4077	590	2293	3886	319	1270	3981	37	144	3892	19	57	3000	1676	6663	3976
	(48.1)	(43.5)		(35.2)	(34.4)		(19.0)	(19.1)		(2.2)	(2.2)		(1.1)	(0.9)		(100)	(100)	
2014-15	833	3702	4444	858	3499	4078	354	1261	3562	68	241	3544	21	68	2000	2134	8771	4110
	(56.4)	(42.2)		(40.2)	(39.9)		(16.6)	(14.4)		(3.2)	(2.7)		(1.0)	(0.8)		(100)	(100)	
2015-16	833	3243	3893	864	3541	4098	340	1066	3135	63	152	2413	18	53	3500	2118	8055	3803
	(56.4)	(40.3)		(40.8)	(44.0)		(16.1)	(13.2)		(3.0)	(1.9)		(0.8)	(0.7)		(100)	(100)	
2016-17	720	2797	3885	549	2337	4257	266	817	3071	62	134	2161	88	71	4143	1685	6156	3653
	(48.7)	(45.4)		(32.6)	(38.0)		(15.8)	(13.3)		(3.7)	(2.2)		(5.2)	(1.2)		(100)	(100)	
2017-18	652	2535	3888	562	2142	3811	256	763	2980	61	132	2164	22	69	4286	1553	5641	3632
	(44.1)	(44.9)		(36.2)	(38.0)		(16.5)	(13.5)		(3.9)	(2.3)		(1.4)	(1.2)		(100)	(100)	
2018-19	634	2138	3372	547	1964	3590	251	730	2908	62	135	2177	20	57	2857	1514	5024	3318
	(42.9)	(42.6)		(36.1)	(39.1)		(16.6)	(14.5)		(4.1)	(2.7)		(1.3)	(1.1)		(100)	(100)	
CAGR (%)	-0.01	-0.02	-0.01	0.01	-0.02	-0.03	0	-0.03	-0.03	0.13	0.05	-0.07	0.07	0.06	-0.02	0.01	-0.02	-0.02

Note: A- Area in 000'ha, P- Production in 000't, Y- Yield in Kg/ha., figures in parenthesis are percentage of total.

Cost and returns from basmati cultivation

Karnal: Table 3 shows the cost of cultivation of chosen basm

Cost of cultivation in Pusa basmati-1121 *i.e.* Rs.123565 per hectare was estimated to be higher as compared to CSR-30 *i.e.* Rs.120562 per hectare.

The share of variable cost as well as fixed cost in total cost of Pusa basmati-1121 were observed 42.08 per cent (Rs. 52002/ha.) and 57.92 per cent (Rs.71563/ha.) respectively. Similarly in CSR-30, the share of variable cost as well as fixed cost were found to be 41.82 per cent (Rs.50415/ha.) and 58.18 per cent (Rs.70147/ha.) in total cost of cultivation respectively.

In case of Pusa basmati-1121, the highest share of variable cost were estimated to be on irrigation *i.e.* 7.51 per cent (Rs. 9278/ha.), followed by harvesting and threshing *i.e.* 6.58 per cent (Rs. 8125/ha.) and preparatory tillage *i.e.* 5.64 per cent (Rs. 6975/ha.). In fixed cost, maximum cost incurred on rental value of land *i.e.* 48.36 per cent (Rs.59750/ha.) followed by management charges and risk factor which was 4.21

(Rs.5200/ha.) each.

Similarly in CSR-30, maximum cost incurred on irrigation *i.e.* 7.93 per cent (9565/ha.), followed by harvesting and threshing *i.e.* 5.71 per cent (6890/ha.) and preparatory tillage *i.e.* 5.54 per cent (6680/ha.) of variable cost. Whereas, in fixed cost, highest share were incurred on rental value of land *i.e.* 48.67 per cent (Rs.58675/ha.) followed by management charges and risk factor *i.e.* 4.18 per cent (Rs.5041/ha.) each in total cost of basmati rice cultivation in the study area.

Profitability from basmati rice cultivation in Karnal district of Haryana given in Table 4. Gross returns were estimated to be higher in Pusa basmati-1121 *i.e.* Rs. 153425 per hectare as compare to CSR-30 *i.e.* Rs. 138474 per hectare. Whereas, higher net returns were found to be in case of Pusa basmati-1121 *i.e.* Rs. 29860 per hectare in comparison to CSR-30 *i.e.* Rs. 17912 per hectare. As far as

Benefit-cost ratio is concern, Pusa basmati-1121 was observed profitable, 1.24 over CSR-30 *i.e.* 1.15 in the study area.

Table 3: Cost of cultivation in Pusa basmati-1121 and CSR-30 in Karnal (Rs. /ha.)

Sr. No.	Variables	Pusa basmati-1121			CSR-30		
		No./ Qty.	Value	% Share	No./Qty.	Value	% Share
1	Preparatory tillage	5.85	6975	5.64	5.65	6680	5.54
2	Pre-sowing irrigation		970	0.79		988	0.82
3	Seed (Kg)/ Nursery raising	13.25	1375	1.11	11.25	1462	1.21
4	Seed treatment		235	0.19		223	0.19
5	Sowing		6063	4.91		5875	4.87
6	Ridging		153	0.12		171	0.14
7	FYM (qtl.)	18.55	635	0.51	17.82	598	0.5
8	Fertilizer nutrients						
	(a) Urea (Kg)	265	1613	1.31	254	1553	1.29
	(b) DAP (Kg)	122	2975	2.41	115	2770	2.3
	(c) Potash (Kg)	53.75	915	0.74	47.5	823	0.68
	(d) Zinc sulphate (Kg)	22.88	803	0.65	22.3	780	0.65
	Total fertilizer cost		6306	5.11		5926	4.92
9	Fertilizer application cost		535	0.43		523	0.43
10	Irrigation	9.57	9278	7.51	10.2	9565	7.93
11	Hoeing/ Weeding (Chemical)		510	0.41		518	0.43
12	Weedicide application cost		253	0.2		268	0.22
13	Pesticide cost		6375	5.16		6575	5.45
14	Pesticide application cost		438	0.35		485	0.4
15	Harvesting & Threshing		8125	6.58		6890	5.71
16	Miscellaneous		374	0.3		370	0.31
17	Total (1to16)		48600	39.33		47117	39.08
18	Interest on working capital		3402	2.75		3298	2.74
19	Variable cost (A)		52002	42.08		50415	41.82
20	Management charges		5200	4.21		5041	4.18
21	Risk factor		5200	4.21		5041	4.18
22	Transportation charges		1413	1.14		1390	1.15
23	Rental value of land		59750	48.36		58675	48.67
24	Total fixed cost (B)		71563	57.92		70147	58.18
25	Total cost (A+B)		123565	100		120562	100

Note: Management charges @ 10 % of Variable cost, Risk factor @ 10 % of Variable cost, Interest on working capital @ 7 % of Total (1 to 16)

Table 4: Returns in production of basmati rice in Karnal (Rs. /ha.)

S. No.	Particular	Pusa basmati-1121		CSR-30	
		Qty.	Value	Qty.	Value
1.	Production (qtl.)				
	(a) Main	45.90	149175	34.80	135024
	(b) By Product		4250		3450
2.	Gross return		153425		138474
3.	Return over variable cost		101423		88059
4.	Net returns		29860		17912
5.	Cost of production (Rs. /qtl.)		2692		3464
6.	B:C ratio		1.24		1.15

Kaithal

Cost of basmati rice cultivation under Pusa basmati-1121 and CSR-30 in Kaithal district of Haryana given in Table 5. Cost of cultivation in Pusa basmati-1121 i.e. Rs.120260 per hectare was estimated to be higher as compared to CSR-30 i.e. Rs. 118080 per hectare. The share of variable cost as well as fixed cost in total cost of Pusa basmati-1121 were observed 42.37 per cent (Rs. 50950/ha.) and 57.63 per cent (Rs. 69310/ha.) respectively. Similarly in CSR-30, the share of variable cost as well as fixed cost were found to be 42.28 per cent (Rs. 49926/ha.) and 57.72 per cent (Rs. 68154/ha.) in total cost of cultivation respectively. In case of Pusa basmati-1121, the highest share of variable cost were estimated to be on irrigation 7.66 per cent (Rs. 9213/ha.), followed by harvesting and threshing 6.63 per cent (Rs. 7975/ha.) and preparatory tillage 5.61 per cent (Rs. 6750/ha.). While in fixed cost, maximum cost incurred on rental value of land i.e. 48.02 per cent (Rs. 57750/ha.) followed by management charges and

risk factor which was 4.24 (Rs. 5095/ha.) each.

Similarly in CSR-30, maximum cost incurred on irrigation 8.03 per cent (Rs. 9480/ha.), followed by harvesting and threshing 5.65 per cent (Rs. 6675/ha.) and preparatory tillage 5.56 per cent (Rs. 6560/ha.) of variable cost. Whereas, in fixed cost, highest share were incurred on rental value of land i.e. 48.19 per cent (Rs. 56900/ha.) followed by management charges and risk factor i.e. 4.23 per cent (Rs. 4993/ha.) each in total cost of basmati rice cultivation in the study area. Profitability from basmati rice cultivation in Kaithal district of Haryana also given in Table 6. Gross returns were estimated to be higher in Pusa basmati-1121 i.e. Rs. 148247 per hectare as compare to CSR-30 i.e. Rs. 135167 per hectare. Whereas, higher net returns were found to be in case of Pusa basmati-1121 i.e. Rs.27987 per hectare in comparison to CSR-30 i.e. Rs. 17087 per hectare. As far as benefit cost ratio is concern, Pusa basmati-1121 was observed profitable, 1.23 over CSR-30 i.e. 1.14 in the study area.

Table 5: Cost of cultivation in Pusa basmati-1121 and CSR-30 in Kaithal (Rs. /ha.)

Sr. No.	Variables	Pusa basmati-1121			CSR-30		
		No./Qty.	Value	% Share	No./Qty.	Value	% Share
1	Preparatory tillage	5.7	6750	5.61	5.6	6560	5.56
2	Pre-sowing irrigation		950	0.79		925	0.78
3	Seed (Kg)/ Nursery raising	13.38	1405	1.17	12.68	1585	1.34
4	Seed treatment		225	0.19		220	0.19
5	Sowing		5938	4.94		6075	5.14
6	Ridging		128	0.11		140	0.12
7	FYM (qtl.)	18.3	628	0.52	18.2	625	0.53
8	Fertilizer nutrients						
	(a) Urea (Kg)	257	1568	1.3	243	1485	1.26
	(b) DAP (Kg)	118	2865	2.38	110	2720	2.3
	(c) Potash (Kg)	50	850	0.71	52.93	900	0.76
	(d) Zinc sulphate (Kg)	22.2	780	0.65	22.07	775	0.66
	Total fertilizer cost		6063	5.04		5880	4.98
9	Fertilizer application cost		513	0.43		523	0.44
10	Irrigation	9.5	9213	7.66	9.77	9480	8.03
11	Hoeing/ Weeding (Chemical)		503	0.42		500	0.42
12	Weedicide application cost		270	0.22		279	0.24
13	Pesticide cost		6188	5.15		6325	5.36
14	Pesticide application cost		485	0.4		498	0.42
15	Harvesting & Threshing		7975	6.63		6675	5.65
16	Miscellaneous		383	0.32		370	0.31
17	Total (1to16)		47617	39.6		46660	39.52
18	Interest on working capital		3333	2.77		3266	2.77
19	Variable cost (A)		50950	42.37		49926	42.28
20	Management charges		5095	4.24		4993	4.23
21	Risk factor		5095	4.24		4993	4.23
22	Transportation charges		1370	1.14		1268	1.07
23	Rental value of land		57750	48.02		56900	48.19
24	Total fixed cost (B)		69310	57.63		68154	57.72
25	Total cost (A+B)		120260	100		118080	100

Note: Management charges @ 10 % of Variable cost, Risk factor @ 10 % of Variable cost, Interest on working capital @ 7 % of Total (1 to 16)

Table 6: Returns in production of basmati rice in Kaithal (Rs. /ha.)

S. No.	Particular	Pusa basmati-1121		CSR-30	
		Qty.	Value	Qty.	Value
1.	Production (qtl.)				
	(a) Main	44.55	144297	34.10	131797
	(b) By Product		3950		3370
2.	Gross return		148247		135167
3.	Return over variable cost		97297		85241
4.	Net returns		27987		17087
5.	Cost of production (Rs. /qtl.)		2699		3462
6.	B:C ratio		1.23		1.14

Haryana

Overall cost of basmati rice cultivation under Pusa basmati-1121 and CSR-30 in Haryana given in Table 7. Cost of cultivation in Pusa basmati-1121 i.e. Rs. 121911 per hectare was estimated to be higher as compared to CSR-30 i.e. Rs. 119320 per hectare. The share of variable cost as well as fixed cost in total cost of Pusa basmati-1121 were observed 42.22 per cent (Rs. 51475/ha.) and 57.78 per cent (Rs.70436/ha.) respectively. Similarly in CSR-30, the share of variable cost as well as fixed cost were found to be 42.05 per cent (Rs. 50170/ha.) and 57.95 per cent (Rs. 69150/ha.) in total cost of cultivation respectively.

In case of Pusa basmati-1121, the highest share of variable cost were estimated to be on irrigation 7.58 per cent (Rs. 9246/ha.), followed by harvesting and threshing 6.60 per cent (Rs. 8050/ha.) and preparatory tillage 5.63 per cent (Rs. 6862/ha.). While in fixed cost, maximum cost incurred on rental value of land i.e. 48.19 per cent (Rs. 58750/ha.) followed by management charges and risk factor which was

4.22 per cent (Rs. 5147/ha.) each.

Similarly in CSR-30, maximum cost incurred on irrigation 7.98 per cent (Rs. 9523/ha.), followed by harvesting and threshing 5.68 per cent (Rs. 6783/ha.) and preparatory tillage 5.54 per cent (Rs. 6620/ha.) of variable cost. Whereas, in fixed cost, highest share were incurred on rental value of land i.e. 48.43 per cent (Rs. 57787/ha.) followed by management charges and risk factor i.e. 4.20 per cent (Rs. 5017/ha.) each in total cost of basmati rice cultivation in the study area.

Overall profitability from basmati rice cultivation in Haryana given in Table 8. Gross returns were estimated to be higher in Pusa basmati-1121 i.e. Rs. 150836 per hectare as compare to CSR-30 i.e. Rs. 136820 per hectare. Whereas, higher net returns were found to be in case of Pusa basmati-1121 i.e. Rs. 28925 per hectare in comparison to CSR-30 i.e. Rs. 17500 per hectare. As far as benefit cost ratio analysis, Pusa basmati-1121 was recorded profitable, 1.24 over CSR-30 i.e. 1.15 in the study area.

Table 7: Overall cost of cultivation in Pusa basmati-1121 and CSR-30 in Haryana (Rs. /ha.)

Sr. No.	Variables	Pusa basmati-1121			CSR-30		
		No./Qty.	Value	% Share	No./Qty.	Value	% Share
1	Preparatory tillage	5.78	6862	5.63	5.63	6620	5.54
2	Pre-sowing irrigation		960	0.79		956	0.8
3	Seed (Kg)/ Nursery raising	13.32	1390	1.14	11.96	1523	1.28
4	Seed treatment		230	0.19		221	0.19
5	Sowing		6000	4.92		5975	5
6	Ridging		140	0.12		156	0.13
7	FYM (qtl.)	18.42	632	0.52	18.01	611	0.51
8	Fertilizer nutrients						
	(a) Urea (Kg)	261	1590	1.3	248	1519	1.27
	(b) DAP (Kg)	120	2920	2.39	112	2745	2.3
	(c) Potash (Kg)	51.87	882	0.72	50.21	861	0.72
	(d) Zinc sulphate (Kg)	22.54	792	0.65	22.18	778	0.65
	Total fertilizer cost		6184	5.07		5903	4.95
9	Fertilizer application cost		524	0.43		523	0.44
10	Irrigation	9.53	9246	7.58	9.98	9523	7.98
11	Hoeing/ Weeding (Chemical)		506	0.42		509	0.43
12	Weedicide application cost		261	0.21		273	0.23
13	Pesticide cost		6282	5.15		6450	5.4
14	Pesticide application cost		462	0.38		492	0.41
15	Harvesting & Threshing		8050	6.6		6783	5.68
16	Miscellaneous		379	0.31		370	0.31
17	Total (1to16)		48108	39.46		46888	39.3
18	Interest on working capital		3367	2.76		3282	2.75
19	Variable cost (A)		51475	42.22		50170	42.05
20	Management charges		5147	4.22		5017	4.2
21	Risk factor		5147	4.22		5017	4.2
22	Transportation charges		1392	1.14		1329	1.11
23	Rental value of land		58750	48.19		57787	48.43
24	Total fixed cost (B)		70436	57.78		69150	57.95
25	Total cost (A+B)		121911	100		119320	100

Note: Management charges @ 10 % of Variable cost, Risk factor @ 10 % of Variable cost, Interest on working capital @ 7 % of Total (1 to 16)

Table 8: Overall returns in production of basmati rice in Haryana (Rs. /ha.)

S. No.	Particular	Pusa basmati-1121		CSR-30	
		Qty.	Value	Qty.	Value
1.	Production (qtl.)				
	(a) Main	45.22	146736	34.45	133410
	(b) By Product		4100		3410
2.	Gross return		150836		136820
3.	Return over variable cost		99361		86650
4.	Net returns		28925		17500
5.	Cost of production (Rs. /qtl.)		2696		3464
6.	B:C ratio		1.24		1.15

Conclusions

In 2018-19, to study the comparative economics of basmati rice cultivation in Haryana's Karnal and Kaithal districts farmers in Karnal and Kaithal were purposively chosen based on the amount of basmati rice planted in their fields. Despite the fact that PB-1121 (Rs. 121911/ha.) had a greater cultivation cost than CSR-30 (Rs. 119320/ha.) in overall basis respectively. The area, production, and productivity of basmati rice were computed using secondary data from the Agricultural and Processed Food Products Export Development Authority (APEDA), Horizon Research, and the Directorate of Rice Development from 2009-10 to 2018-19. According to the findings, from 2009-10 to 2018-19, the area and output of basmati rice in Haryana decreased by negative 1.09 percent and negative 0.59 percent, respectively, while productivity grew by positive 0.50 percent. Similarly, from 2009-10 to 2018-19, the area, output, and productivity of basmati rice in India decreased by negative 0.09 percent, negative 2.18 percent, and negative 2.09 percent, respectively,

with a CAGR of negative 0.09 percent, negative 2.18 percent, and negative 2.09 percent.

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