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Trend analysis of area, production and productivity of basmati rice in India and Haryana

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Abstract

The study mainly focused on analyzing trend in terms of area, production and productivity of basmati rice in India and Haryana. To fulfill the objective of the study, Karnal and Kaithal district were selected purposively on the basis of highest and second highest area under paddy cultivation in the state. Study revealed that the area, production and productivity of basmati rice in India during the period 2009-10 to 2018-19, declined with CAGR at negative 0.09 per cent, negative 2.18 per cent and negative 2.09 per cent. The area and production of basmati rice in Haryana during the period 2009-10 to 2018-19, declined with CAGR at negative 1.09 per cent and negative 0.59 per cent. Similarly, the productivity of basmati rice in Haryana during the period 2009-10 to 2018-19 increasing with CAGR at positive 0.50 per cent. Haryana and Punjab constitute more than 75 per cent of total basmati production in India. The area of basmati rice in India was 1514 thousand hectares in the year 2018-19. In total basmati rice area, the share of Haryana (41.88%) followed by Punjab (36.13%), Uttar Pradesh (16.58%), Jammu & Kashmir (4.10%), Uttarakhand (0.99%) and Himachal Pradesh (0.46%). The production of basmati in India was 5024 thousand tonnes in the year 2018-19. In total basmati production, the share of Haryana (42.56%) followed by Punjab (39.09%), Uttar Pradesh (14.53%), Jammu & Kashmir (2.69%), Uttarakhand (0.74%) and Himachal Pradesh (0.40%). Study recommended to provide MSP as an incentive to heal this declining trend and provision of quality seeds, infrastructure for processing grading and standardisation, quality seeds to make our export more competitive in world market.

Keywords: Cumulative annual growth rate, trend, MSP, Competitive

Introduction

Rice is the most significant food crop in India, that plays a essential role in food security. It is the vital staple food for quite half of the globe population and provides 60-70 per cent body calorie intake to the customers. Rice may be a supreme trade goods to humanity, as a result of rice is actually life, culture, tradition and a way of income to millions. The International Organization General Assembly (IOGA), during a resolution declared the year 2004 because the International Year of Rice (Nguyen, 2006).

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. (Food and Agriculture Organization, 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. Asian countries take immense pride in having a vibrant rice farming system. Major rice producer counties in Asia are follows: China, India, Indonesia, Bangladesh, Vietnam, Thailand, Myanmar, Japan, Philippines etc.

India is second largest producer of rice 111.01 million tonnes proceeded 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, Vietnam and Pakistan (Commodity Profile, 2015-16). The productivity and sustainability of rice-based systems was threatened because of inefficient use of inputs, increasing scarcity of resources, especially water and labour, changing climate, emerging energy crisis and rising fuel prices, the rising cost of cultivation and emerging socio-economic changes such as urbanization, migration of labour, preference for non-agricultural activities etc. (Ladha *et al.*, 2009).

Within the international market rice is trade under two main categories like fragrant and non-fragrant. In case of fragrant rice, India dominates the trade among its basmati rice followed by Pakistan, China, Indonesia and Bangladesh etc. Basmati rice is that the primary aromatic quality of rice in the globe trade and it fetches good quality of export price in the international markets. Basmati exports from India peak throughout March-April and also the November- December period. 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. Uttaranchal, being the birth place of basmati rice vast potential because of its favourable climatic situation and recognition along with the farming community (Singh *et al*, 2006) [14] the state is divided into two different produce like plains and hills. Basmati may be a form of long grain rice, illustrious for its fragrance and fine taste. Basmati is long grain aromatic rice grown up for several centuries in the specific geographic region at the Himalayan foot hills of Indian sub- continent.

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. Karnal district has the maximum transplanted area under rice 159.20 thousand hectares, followed by Kaithal district 157.20 thousand hectares. Total basmati rice area in Karnal was 71.10 thousand hectares out of which the maximum area under basmati rice varieties was PB-1121 *i.e.* 34.90 thousand hectares and CSR-30 *i.e.* 24.70 thousand hectares followed by Kaithal total basmati rice area was 58.80 thousand hectares out of which the maximum area under basmati rice varieties was PB-1121 *i.e.* 32.60 thousand hectares and CSR-30 *i.e.* 22.40 thousand hectares. In Haryana, major basmati rice varieties was grown Pusa Basmati-1121, CSR-30, Pusa-1509, Pusa Basmati-1. (APEDA, December 2018). Thus, keeping in mind important of their export oriented crop major focus of the study was to analyse the trend in area, production and productivity of basmati rice.

Materials and methods

Description of the study area

The study was carried out in Karnal and Kaithal districts of Haryana state. Karnal and Kaithal districts were selected on the basis of highest and second highest producer of rice. These two districts has a fertile land and a very proper condition for growing of paddy.

Sampling design

Purposive and multistage random sampling technique was used for the selection of districts and villages.

Selection of the district

To fulfill the objective of the study, Karnal and Kaithal district were selected purposively on the basis of highest and second highest area under paddy cultivation in the state.

Selection of the respondent

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.

Collection of data

Primary data: To work out the comparative economics of basmati rice, required data for crop year 2018-19 on area under basmati rice was collected by conducting personal interview of selected farmers on pretested schedule prepared for the study.

Secondary data: Secondary data required form the study was collected from agriculture department and other published and unpublished sources. The data pertaining to area, production, productivity and exports, prices were collected from the following secondary sources.

- Agricultural and Processed Food Products Export Development Authority (APEDA).
- Directorate General of Commercial Intelligence and Statistics (DGCIS).

Analytical techniques

Estimation of growth rate

$$Y = ab^t \text{----- (1)}$$

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:

$$\log y = \log a + t \log b \text{----- (2)}$$

$$\log y = A + B t \text{----- (3)}$$

Where, A= log a B = log b

The compound growth rate "r" was computed as:

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

Results and discussion

Trends in area, production and productivity of basmati rice in India and Haryana

In this section, an attempt has been made to highlight the scenario of basmati rice in India and Haryana. The area, production and productivity of basmati rice during the period 2009-10 to 2018-19 were calculated based on secondary data collected from Agricultural and Processed Food Products Export Development Authority (APEDA), Horizon Research, Directorate of Rice Development and Agri. Net.

Area, production and productivity of basmati rice in India

The total area under basmati rice was 1477 thousand hectares in 2009-10 and increased year by year to 1806 thousand hectares in 2011-12 given in Table 1. The area under total basmati rice was decreased to 1732 thousand hectares in 2012-13 and this decline was due to reduction in area of Pusa basmati-1121 variety due to its vary low price. The maximum area under total basmati rice was noticed, 2134 thousand hectares in 2014-15 and the area increased due to introduction of new variety of basmati rice (Pusa basmati-1509). This trend was only up to the year 2014-15. The area under Pusa basmati-1509 was decline *i.e.* 1685 thousand hectares in 2016-17. This decline was due to the reason that the rice millers and exporters association decided against the purchase of Pusa basmati-1509, the decision has been taken because of high incidence of breakage and continuously the basmati rice

area decreased. In the year 2018-19, the area under total basmati rice again decreased due to lack of adequate minimum support price (MSP) in basmati results in variation in price. In this year the area under total basmati rice was 1514 thousand hectares.

The production and productivity of basmati rice was 6160 thousand tonnes and 4171 kilogram per hectare in 2009-10 and decreased to 5024 thousand tonnes and 3318 kilogram per hectare during the year 2018-19. The maximum production of basmati rice was noticed, 8771 thousand tonnes in 2014-15 and maximum productivity of basmati rice was noticed, 4315 kilogram per hectare in 2011-12 (Table 1).

The details on the compound annual growth rate (CAGR) of basmati rice in area, production and productivity during the year 2009-10 to 2018-19 in India given in Table 4.1. The results indicated that area, production and productivity of total basmati rice during the year 2009-10 to 2018-19 declined with CAGR of negative 0.09 per cent, negative 2.18 per cent and negative 2.09 per cent respectively.

Area, production and productivity of basmati rice in Haryana

The total area under basmati rice was 700 thousand hectares in 2009-10 and increased to 781 thousand hectares in 2010-11 given in Table 1. The area under total basmati rice was decreased to 750 thousand hectares in 2011-12 and this decline was due to reduction in area of Pusa basmati-1121 variety due to its vary low price and continuously the basmati rice area decreasing. The maximum area under basmati rice was noticed, 833 thousand hectares in 2014-15 and 2015-16. The area increased due to the introduction of new variety of basmati rice (Pusa basmati-1509) and during the year 2016-17, the area under Pusa basmati was decline *i.e.* 720 thousand hectares. This decline due to the reason that the rice millers and exporters association decided against the purchase of Pusa basmati-1509, the decision has been taken because of high incidence of breakage and continuously the basmati rice area decreased.

Table 1: Area, production and productivity of basmati rice in India and Haryana Area (000' ha.), Production (000' tonnes) and Productivity (Kg/ha.)

Year	India			Haryana		
	Area	Production	Productivity	Area	Production	Productivity
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 (%)	-0.09	-2.18	-2.09	-1.09	-0.59	0.50

Source: APEDA, Horizon Research, Directorate of Rice Development and Agri. Net.

In the year 2018-19, the area under basmati rice again decreased due to lack of adequate minimum support price in basmati results in variation in price. In this year the area under basmati rice was 634 thousand hectares.

In Haryana, the production and productivity of basmati rice was 2656 thousand tonnes and 3794 kilogram per hectare in

2009-10 and decreased to 2138 thousand tonnes and 3372 kilogram per hectare in 2018-19. The maximum production and productivity of basmati rice was noticed, 3702 thousand tonnes and 4444 kilogram per hectare in 2014-15 given in Table 1.

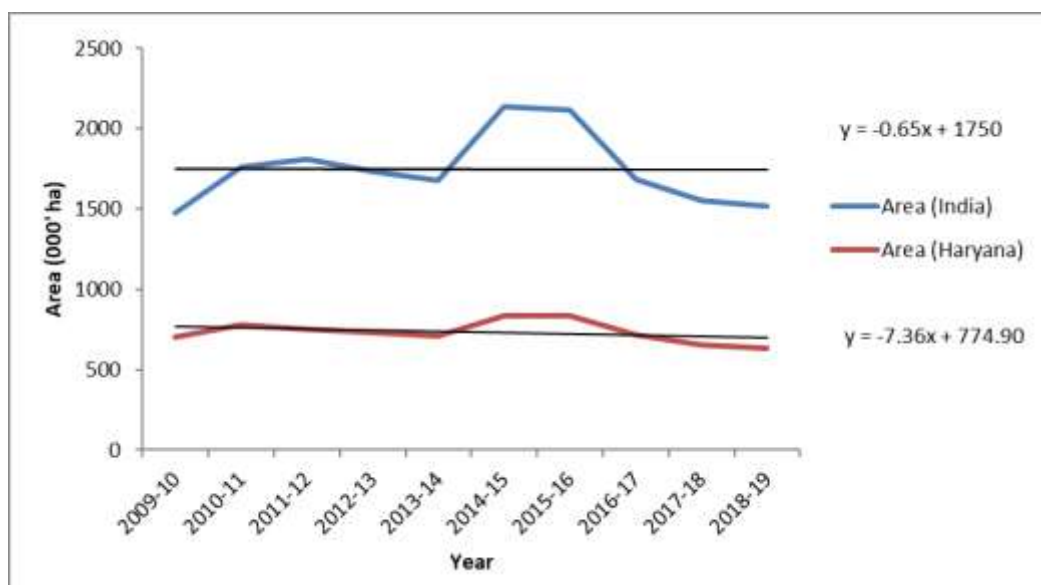


Fig 1: Trends in area of basmati rice in India and Haryana

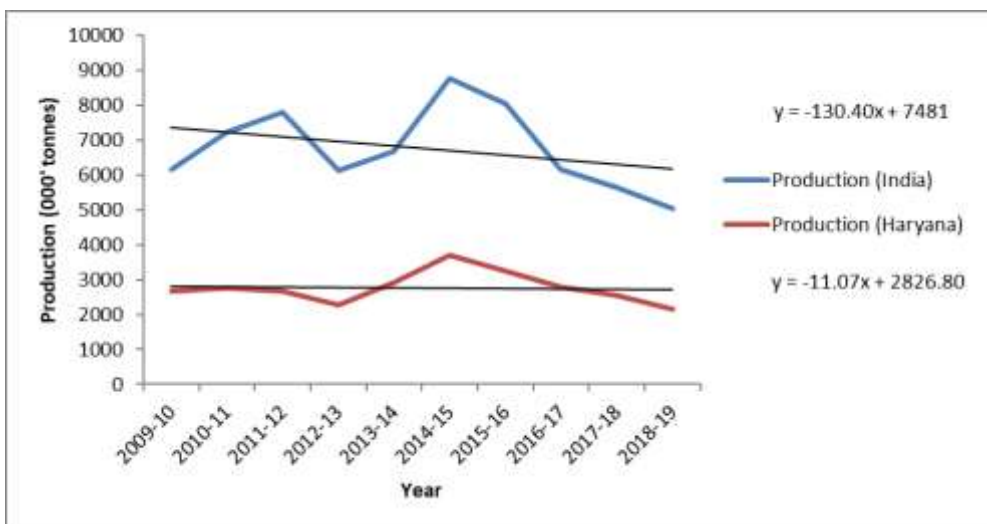


Fig 2: Trends in production of basmati rice in India and Haryana

The details on the CAGR of basmati rice in area, production and productivity during the year 2009-10 to 2018-19 in Haryana also given in Table 1. The results indicated that area and production of basmati rice during the period 2009-10 to

2018-19 declined with CAGR of negative 1.09 per cent and negative 0.59 per cent and productivity increased with significant CAGR of positive 0.50 per cent.

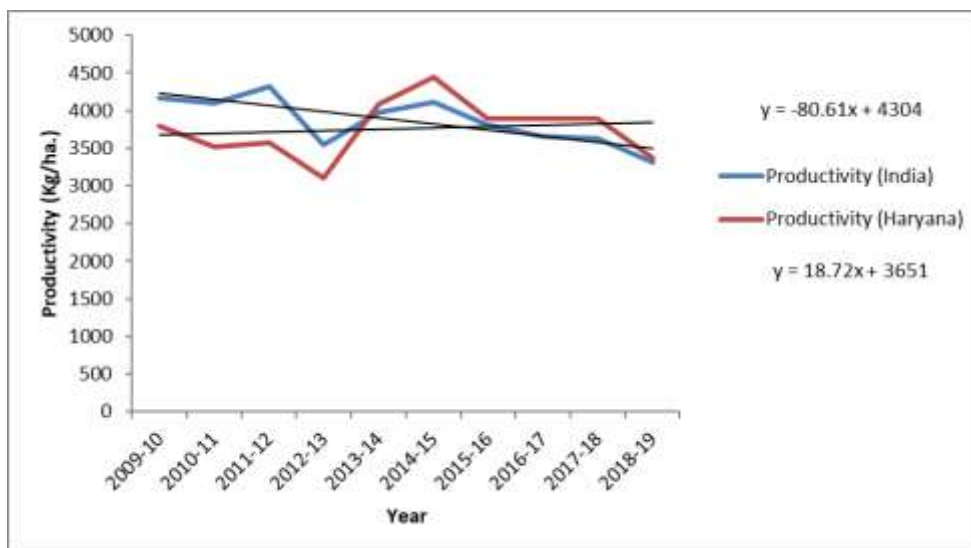


Fig 3: Trends in productivity of basmati rice in India and Haryana

Basmati rice area in India

The major basmati rice producing states are Haryana, Punjab, Uttar Pradesh, Jammu & Kashmir, Uttarakhand and Himachal Pradesh. The area of basmati rice in India was 1477 thousand hectares in 2009-10. The share of Haryana in total basmati rice in all over India in 2009-10 *i.e.* 47.39 per cent and the share was decreasing during the year 2015-16, the share was 39.33 per cent and increasing during the year 2016-17, the share was 42.73 per cent. Haryana is the leading producer of basmati rice in India. The area of basmati rice in India was 1514 thousand hectares in 2018-19. The share of Haryana in total basmati rice area was about 41.88 per cent followed by Punjab with 36.13 per cent, Uttar Pradesh with 16.58 per cent, Jammu & Kashmir with 4.10 per cent Uttarakhand with 0.99 per cent and Himachal Pradesh with 0.46 percent given in Table 2.

The share of Punjab in total basmati rice in all over India in 2011-12 *i.e.* 33.22 per cent and the share was increasing up to 2015-16 *i.e.* 40.79 per cent and then decreasing the share in

2016-17 *i.e.* 32.58 per cent. In the year 2018-19, the share of Punjab in total basmati rice was about 36.13 per cent.

The share of Uttar Pradesh in total basmati rice in all over India during the year 2009-10 *i.e.* 17.20 per cent and the share was increasing up to 2011-12 *i.e.* 22.15 per cent and the share was continuously decreasing up to 2016-17 *i.e.* 15.79 per cent. In the year 2018-19, the share of Uttar Pradesh was about 16.58 per cent given in Table 2.

The share of Jammu and Kashmir in total basmati rice in all over India during the year 2010-11 *i.e.* 1.02 per cent and the share was continuously increasing up to 2014-15 *i.e.* 3.19 per cent. In the year 2018-19, the share of Jammu & Kashmir was about 4.10 per cent.

The share of Uttarakhand in total basmati rice in all over India during the year 2009-10 *i.e.* 0.68 per cent and increased during the year 2010-11, the share was 1.70 per cent. In the year 2018-19, the share of Uttarakhand was about 0.99 per cent.

Table 2: Area of basmati rice in major growing states of India Area (000'ha.)

Year/ State	Haryana	Punjab	Uttar Pradesh	Jammu & Kashmir	Uttarakhand	Himachal Pradesh	India
2009-10	700 (47.39)	513 (34.73)	254 (17.20)	—	10 (0.68)	—	1477 (100)
2010-11	781 (44.37)	550 (31.25)	378 (21.48)	18 (1.02)	30 (1.70)	3 (0.17)	1760 (100)
2011-12	750 (41.53)	600 (33.22)	400 (22.15)	22 (1.22)	21 (1.16)	13 (0.72)	1806 (100)
2012-13	730 (42.15)	585 (33.78)	374 (21.59)	24 (1.39)	17 (0.98)	2 (0.12)	1732 (100)
2013-14	711 (42.42)	590 (35.20)	319 (19.03)	37 (2.21)	18 (1.07)	1 (0.06)	1676 (100)
2014-15	833 (39.03)	858 (40.21)	354 (16.59)	68 (3.19)	20 (0.94)	1 (0.05)	2134 (100)
2015-16	833 (39.33)	864 (40.79)	340 (16.05)	63 (2.97)	16 (0.76)	2 (0.09)	2118 (100)
2016-17	720 (42.73)	549 (32.58)	266 (15.79)	62 (3.68)	15 (0.89)	7 (0.42)	1685 (100)
2017-18	652 (41.98)	562 (36.19)	256 (16.48)	61 (3.93)	15 (0.97)	7 (0.45)	1553 (100)
2018-19	634 (41.88)	547 (36.13)	251 (16.58)	62 (4.10)	15 (0.99)	7 (0.46)	1514 (100)

Figure in the parenthesis represents per cent Source: APEDA, Horizon Research, Directorate of Rice Development and Agri. Net.

The share of Himachal Pradesh in total basmati rice in all over India during the year 2014-15 *i.e.* 0.05 per cent and the share was continuously increasing up to 2018-19 *i.e.* 0.46 per cent.

The share of Haryana and Punjab together constituted, in total basmati rice in all over India during the year 2011-12 *i.e.* 74.75 per cent and the share was continuously increasing up to 2015-16 *i.e.* 80.12 per cent. In the year 2018-19, the share of Haryana and Punjab together constituted *i.e.* 78.01 per cent. The highest share was observed during the year 2009-10, share was 82.12 per cent given in Table 2.

Basmati production in India

The production of basmati rice in India was 6160 thousand tonnes in 2009-10. The share of Haryana in total basmati production in all over India in 2009-10 *i.e.* 43.12 per cent and share was decreasing up to the year 2011-12 *i.e.* 34.34 per cent. The production of basmati rice in India was 5024 thousand tonnes in 2018-19. The share of Haryana in total basmati production was about 42.56 per cent followed by Punjab with 39.09 per cent, Uttar Pradesh with 14.53 per cent, Jammu & Kashmir with 2.69 per cent, Uttarakhand with 0.74 per cent and Himachal Pradesh with 0.40 per cent given in Table 3.

The share of Punjab in total basmati production in all over India during the year 2013-14, the share was 34.41 per cent and the share was continuously increasing up to 2015-16 *i.e.* 43.94 per cent. In the year 2018-19, the share of Punjab was

about 39.09 per cent.

The share of Uttar Pradesh in total basmati production in all over India during the year 2011-12 *i.e.* 26.51 per cent and the share was continuously decreasing up to 2015-16 *i.e.* 13.23 per cent. During the year 2018-19, the share of Uttar Pradesh was about 14.53 per cent.

The share of Jammu and Kashmir in total basmati production in all over India during the year 2010-11 *i.e.* 1.11 per cent and the share was continuously increasing up to 2014-15 *i.e.* 2.75 per cent. During the year 2018-19, the share of Jammu & Kashmir was about 2.69 per cent.

The share of Uttarakhand in total basmati production in all over India during the year 2010-11 *i.e.* 1.34 per cent and the share was continuously decreasing up to 2015-16 *i.e.* 0.57 per cent. During the year 2018-19, the share of Uttarakhand was about 0.74 per cent.

The share of Himachal Pradesh in total basmati production in all over India during the year 2014-15 *i.e.* 0.02 per cent and the share was continuously increasing up to 2016-17 *i.e.* 0.47 per cent. In the year 2018-19, the share of Himachal Pradesh was about 0.40 per cent.

The share of Haryana and Punjab together constituted, in total basmati production in all over India during the year 2011-12 *i.e.* 70.68 per cent and the share was continuously increasing up to 2015-16 *i.e.* 84.19 per cent. In the year 2018-19, the share of Haryana and Punjab together constituted *i.e.* 81.65 per cent. The highest share was observed during the year 2015-16, the share was 84.19 per cent given in Table 3.

Table 3: Production of basmati rice in major growing states of India

Year/ State	Haryana	Punjab	Uttar Pradesh	Jammu & Kashmir	Uttarakhand	Himachal Pradesh	India
2009-10	2656 (43.12)	2489 (40.41)	983 (15.95)	—	32 (0.52)	—	6160 (100)
2010-11	2752 (38.15)	2831 (39.25)	1443 (20.00)	80 (1.11)	97 (1.34)	10 (0.14)	7213 (100)
2011-12	2676 (34.34)	2832 (36.34)	2066 (26.51)	95 (1.22)	80 (1.03)	43 (0.55)	7792 (100)
2012-13	2261 (36.89)	2282 (37.23)	1428 (23.30)	96 (1.57)	54 (0.88)	6 (0.10)	6129 (100)
2013-14	2899 (43.51)	2293 (34.41)	1270 (19.06)	144 (2.16)	54 (0.81)	3 (0.04)	6663 (100)
2014-15	3702 (42.21)	3499 (39.89)	1261 (14.38)	241 (2.75)	66 (0.75)	2 (0.02)	8771 (100)
2015-16	3243 (40.25)	3541 (43.94)	1066 (13.23)	152 (1.73)	46 (0.57)	7 (0.09)	8055 (100)
2016-17	2797 (45.44)	2337 (37.96)	817 (13.27)	134 (2.18)	42 (0.68)	29 (0.47)	6156 (100)
2017-18	2535 (44.94)	2142 (37.97)	763 (13.53)	132 (2.34)	39 (0.69)	30 (0.53)	5641 (100)
2018-19	2138 (42.56)	1964 (39.09)	730 (14.53)	135 (2.69)	37 (0.74)	20 (0.40)	5024 (100)

Production (000' tonnes)

Figure in the parenthesis represents per cent Source: APEDA, Horizon Research, Directorate of Rice Development and Agri. Net.

Basmati productivity in India

In the year 2009-10, the productivity of India was about 4171 kilogram per hectare. The productivity of Haryana during the year 2009-10 *i.e.* 3794 kilogram per hectare. In comparison to India, the productivity of Haryana was continuously decreasing up to the year 2012-13. In the year 2013-14 to 2018-19, the productivity of Haryana was continuously increasing. The highest productivity of Haryana was observed during the year 2014-15 *i.e.* 4444 kilogram per hectare also

given in Table 4.4.

The productivity of Punjab during the year 2009-10 *i.e.* 4852 kilogram per hectare. In comparison to India, the productivity of Punjab was continuously increasing up to the year 2012-13. The highest productivity of Punjab was observed during the year 2010-11 *i.e.* 5147 kilogram per hectare.

In comparison to India, the productivity of Uttar Pradesh was continuously increasing from year 2011-12 to 2013-14 and continuously decreasing from year 2014-15 to 2018-19. The

highest productivity of Uttar Pradesh was observed during the year 2011-12 *i.e.* 5165 kilogram per hectare.

In comparison to India, the productivity of Jammu & Kashmir was continuously increasing from year 2010-11 to 2012-13 and continuously decreasing from year 2013-14 to 2018-19. The highest productivity of Jammu & Kashmir was observed during the year 2010-11 *i.e.* 4444 kilogram per hectare. In comparison to India, the productivity of Uttarakhand was

continuously decreasing from year 2009-10 to 2018-19. The highest productivity of Uttarakhand was observed during the year 2011-12 *i.e.* 3810 kilogram per hectare.

In comparison to India, the productivity of Himachal Pradesh was continuously decreasing from year 2010-11 to 2015-16. The highest productivity of Himachal Pradesh was observed during the year 2017-18 *i.e.* 4286 kilogram per hectare.

Table 4: Productivity of basmati rice in major growing states of India Productivity (Kg/ha.)

Year / State	Haryana	Punjab	Uttar pradesh	Jammu & Kashmir	Uttarakhand	Himachal Pradesh	India
2009-10	3794	852	38740	—	3200	—	4171
2010-11	3524	5147	3817	4444	3233	3333	4098
2011-12	3568	4720	5165	4318	3810	3308	4315
2012-13	3097	3901	3818	4000	3176	3000	3539
2013-14	4077	3886	3981	3892	3000	3000	3976
2014-15	4444	4078	3562	3544	3300	2000	4110
2015-16	3893	4098	3135	2413	2875	3500	3803
2016-17	3885	4257	3071	2161	2800	4143	3653
2017-18	3888	3811	2980	2164	2600	4286	3632
2018-19	3372	3590	2908	2177	2467	2857	3318

Source: APEDA, Horizon Research, Directorate of Rice Development and Agri. Net.

Conclusions

Rice being the staple food grain crop of India, fulfill food and nutritional security of entire nation. So, study analyzed the trend in area, production and productivity of basmati rice in India and Haryana. The area, production and productivity of basmati rice in India during the period 2009-10 to 2018-19, declined with CAGR at negative 0.09 per cent, negative 2.18 per cent and negative 2.09 per cent. The area and production of basmati rice in Haryana during the period 2009-10 to 2018-19, declined with CAGR at negative 1.09 per cent and negative 0.59 per cent. Similarly, the productivity of basmati rice in Haryana during the period 2009-10 to 2018-19 increasing with CAGR at positive 0.50 per cent. Haryana and Punjab constitute more than 75 per cent of total basmati production in India. The area of basmati rice in India was 1514 thousand hectares in the year 2018-19. In total basmati rice area, the share of Haryana (41.88%) followed by Punjab (36.13%), Uttar Pradesh (16.58%), Jammu & Kashmir (4.10%), Uttarakhand (0.99%) and Himachal Pradesh (0.46%). The production of basmati in India was 5024 thousand tonnes in the year 2018-19. In total basmati production, the share of Haryana (42.56%) followed by Punjab (39.09%), Uttar Pradesh (14.53%), Jammu & Kashmir (2.69%), Uttarakhand (0.74%) and Himachal Pradesh (0.40%). Thus, as a policy implication study suggestd to fix Minimum Support Price (MSP) of basmati rice. In this way, the problem of price variability may reduce among the farmers.

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