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Transition in production and export potential of garlic in India

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Abstract

The present study analyzed the performance of production and export of Indian garlic based on secondary data collected from different governments departmental repositories and websites. Statistical techniques like mean, standard deviation, regression and CAGR was applied for analysis. Garlic held quantity share (29.68 %) of aggregate production of Indian spices. But in export front the share of quantity and value share of garlic estimated only 2.30 % and 1.21 % respectively of total spices export from the country. India ranked 2nd after China possessing 5.85% share of global production and growing with 9.93 % CAGR over last 15 years (2006-2020) which was 3.5 times higher than China. The major destinations for garlic export from India are Malaysia, Thailand, USA, Vietnam (South) and Nepal altogether constituted around 41 % value of average annual export. But out of these countries, negative trend in export was found in three countries makes India searching for new clients. The lower growth rate (CAGR) of productivity (1.91 %) of garlic compared to acreage (5.46 %) over three decades (1990-91 to 2020-21) harnesses for technological breakthrough. Two producing states of India *viz.*, Madhya Pradesh and Rajasthan account around 78.34 % of national production. But in terms of productivity, Punjab (11.39 t/ha), Haryana (10.67 t/ha) and Madhya Pradesh (10.31 t/ha) led the country. Enhancement of productivity through technological development and adequate market infrastructures along with improvement in post harvest management of the crop particularly processing might be given importance to increase production and export potential of garlic.

Key words: CAGR, export potential, garlic, instability, productivity, spices, trend

Introduction

Globally India is the second-largest producer of horticultural crops. About 33% of the agriculture Gross Value Added (GVA) is contributed by the Indian horticulture sector making a large amount of contribution to the Indian economy (Ministry of Statistics and Programme Implementation). On the other hand, spices alone constitute 41 % of GVA of horticulture and contribute 1.38 % of total national export earnings (Spices statistics at a glance 2021). India has the largest domestic market for spices in the world and is the world's largest producer, exporter and consumer of spices, known as the 'land of spices' (APEDA agri-Xchagne). India shares 46 % of volume of global production 23 % value of export of spices in the international market (Babu, 2017). The diversified climate of India is conducive to variety of spice cultivation. The country accounts world's highest number of varieties of spices (Kumar *et al.*, 2018). Out of the total spices (109), listed by the International Organization for Standardisation (ISO) nearly 75 spices are being produced by India accounting half of the global trading in spice (APEDA agri-Xchange).

Garlic (*Allium sativum*), belonging to family of Alliaceae, is one of the most important spices which is consumed by people all over the world. Garlic has originated from Central Asia (Russia, West China, India and Afghanistan) and it spread through colonization and trade to different parts of world (Mekonnen and Gadisa, 2021). Underground part of the plant that is the bulb is used as spice as well as herbal medicine, also other parts of the plant such as scrapes, bulbils, as well as leaves are also eaten and the presence of organosulfur compound Allicin in it has a strong aroma (Patidar and Mohiuddin, 2018). Most vital part of garlic is the compound bulb or bulblets (Patidar *et al.,* 2018) which are made up of 4-20 cloves and single clove is about of one gram. Garlic stands as one of the most important crops helps in maintaining good health of human beings. Cloves of garlic are used for flavouring foods, preparation of pickles, chutneys, tomato ketchup and curry powder. Not only garlic is used for culinary item, it also prevents or cures human health related disorders or diseases (Srivastava *et al.*, 2022). Garlic has a large number of medicinal properties such as it helps in digestive system disorders, cough, blood cholesterol, etc. It also has potential for the treatment of plant diseases (Malik *et al.,* 2017). Garlic is rich in vitamins A, B1, and C, as well as fiber and water, with 100 grams containing significant amounts of these nutrients (Worku and Mehari, 2018).

Among spices, India is the 2nd largest producer of garlic after China, producing 10.41 % of total global production during 2019-20 (www.tridge.com) with an average production of 2786.62 million tonnes, 28.20 % of total spice production (2015-16 to 2020-21), stood 1st position (Spice Board-State Agri/Horti Dept.). The other principal producers are Bangladesh, South Korea, Egypt, Turkey and Spain (www.tridge.com). Garlic is one of the most important spice crops in India and it has a national importance and significant attention is given to it by the National Agricultural Research System for the further improvement of garlic by our country. NAFED, ICAR and its various crop research institutes are involved for its improvement (Srivastava *et al.,* 2012). Though production and area of garlic in

India is huge but shockingly its productivity is about five times less than that of Uzbekistan, China and Egypt (Gupta, 2015 and FAOSTAT, 2014). The low productivity is primarily caused by the cultivation of short-day genotypes, combined with ineffective production and protection management practices, inadequate postharvest techniques, and the volatile pricing in the output market (Malik *et al.,* 2017). Yield of garlic is also less in various other countries due to constraints such as poor soil fertility, pests and diseases, moisture stress, absence of stable nutrient supply (Shiferaw, 2016). Major garlic producing states in India are Madhya Pradesh, Rajasthan, Uttar Pradesh, Gujarat and Assam. In India 21 wholesale markets are exclusively organized for trading of garlic. Out of them seven belongs to Madhya Pradesh having market share around 33 % of aggregate national trade followed by four in Uttar Pradesh having share around 19 % and rest in Tamil Nadu having share around 14 % (Sekhar *et al.*, 2014).

Although India is the 2nd largest garlic producer of globe but only 1.03 % of its total domestic production was exported in 2020-21. Major destinations of export of Indian garlic are Malaysia, Bangladesh, Thailand and Vietnam (DGCI&S Kolkata/Exporters' Returns/DLE from customs). Thus dormant potentiality of Indian garlic in enhancing countries export exchequer needs to be examined to get a trade solution.

The study aimed to investigate how Indian garlic performed in terms of production and export growth, both in comparison to domestic and global markets.

Materials and methods

The required secondary data related to area, production, productivity and export were collected from Agriculture Department; Horticulture department particularly spices board of India; Department of Economics and Statistics, Government of West Bengal and also from websites particularly of Horticulture Board, Spices Board, tridge.com and agristat.com to satisfy the specific objectives

Analytical techniques: Simple descriptive statistics particularly mean, standard deviation, coefficient of variation (CV) and percentage were used to analyze the data. To inspect the trend in Garlic production, productivity, Compound Annual Growth Rate (CAGR) and CV techniques were employed.

Compound Annual Growth Rate (CAGR): The Compound Annual Growth Rate (CAGR) in area, production and productivity of garlic was estimated by using the exponential growth function of the following form;

$$Y = ab^t e^u$$

Where,
Y is dependent variable (area/production/productivity

a = intercept term

b = (1+r) and 'r' is the compound growth rate

t = time trend

u = Random error term

The above model in the Logarithmic form is expressed as: $\ln Y = \ln a + t \ln b + u$

ln a and ln b values were obtained using the methods of ordinary least squares and per cent CAGR was computed using the following relationship;

% CAGR= (Antilog of (ln b)–1) ×100.

Student't' test was used to test the significance of growth rate.

Results and discussion

Status of garlic production and extent of export: The seven years (2015-16 to 2021-22) data of the production and export of major spices produced in India was used to assess the proportionate share of average volume of production and export of respective spice, presented through Fig.1. The major spices, produced in India are pepper, small and large cardamom, chilli, ginger, garlic, turmeric, coriander, cumin, etc. It was observed that key contribution to the average total production of spices of India over the specified period came from garlic (29.68 %) followed by ginger (19.13 %), chilli (18.81 %), turmeric (10.59 %), coriander (7.43 %) and cumin (6.81 %). Although, garlic ranked 1st in terms of production among the spices, but it could contribute only 2.30 % share of total volume of export occupying 8th rank against 39.95 %, 15.09 % and 10.93 % volume share of total spices export contributed by chilli, cumin and turmeric respectively. Whereas, instead of having 29.68 % production share (vide Fig.1) in Garlic to the total volume of spices production, India could export only 0.63 % of its own production during 2021-22 (Fig. 2) might be due to huge domestic consumption. Further, the growth rate (CAGR) of volume of export of garlic was found negative (-7.14) compared to all the major spices (Fig. 3) instead of having positive growth rate in production (8.95). This indicates that from supply point of view India has capacity to increase export of Garlic without sacrificing domestic demand.

Similarly from the analysis of export earning of major spices from 2015-16 to 2021-22, it was examined that the major contribution to the value of export of spices realized from chilli (36.58 %), followed by mint products (19.98 %), cumin (16.94 %), Turmeric (7.67 %) and Pepper (4.13 %) altogether contributed 85.30 % of the average total export earnings (Table 1). Whereas, on an average 1.21 % of total value of export from spices was contributed by garlic instead of having highest share (29.68 %) in spices production. Further in respect to instability index (Coefficient of Variation) around 32 % variation was noticed in garlic export over the specified period. Further, in

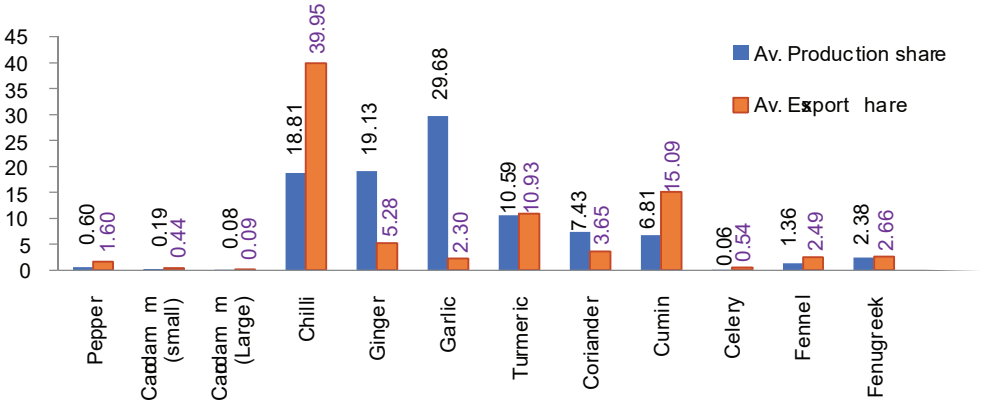

Fig. 1. Production and export share of major spices over total spices production and export in India (2015-16 to 2021-22)

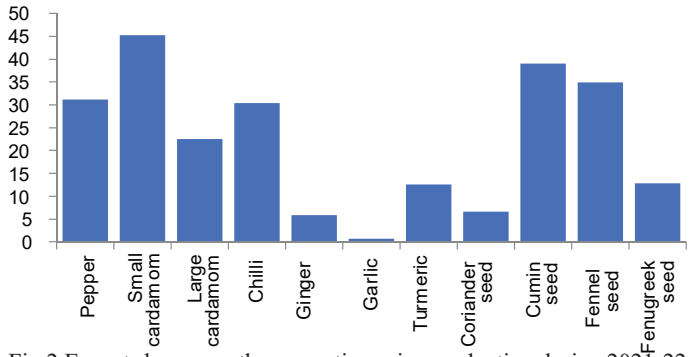

Fig.2.Export share over the respective spice production during 2021-22

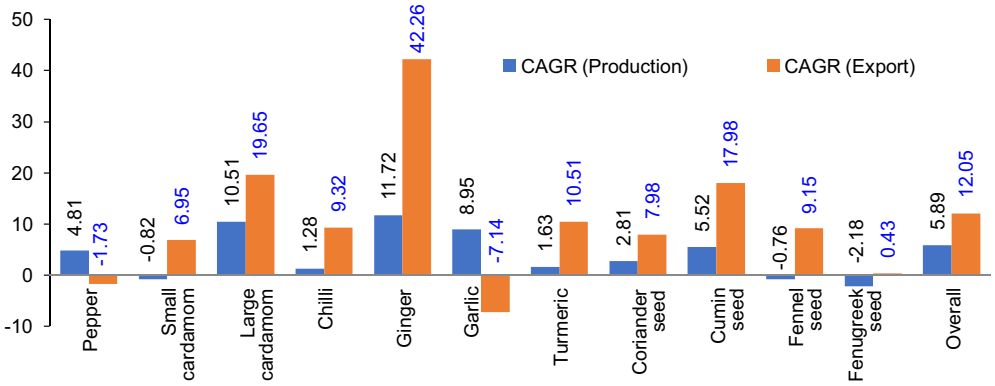

Fig.. Growth rate (CAGR) of quantity of production and export of major spices over six years (2015-16 to 2021-22)

terms of growth rate of value of export of major spices from India, Ginger occupied 1st position followed by Small Cardamom, Cumin seed and Chilli with compound annual growth rate (CAGR) of 26.91, 19.21, 16.22 and 15.35 respectively. But, the CAGR of export earnings from Garlic was found to be negative (-5.45). The above outcomes inferred that the average annual exportable surplus of garlic was very little than most of the other major spices. Hence, India needs to stress on improving Garlic export through production, productivity and value addition traits.

Global position of garlic production and trend: To determine the trend and performance in Garlic production in India compared to the principal Garlic producing countries, the CAGR technique of analysis was employed. The fifteen years (2006 to 2020) data of garlic production of major garlic producing countries have been used for analysis of growth rate and presented in Table 2. The Table shows that the major nine garlic producing countries are China, India, Bangladesh, South Korea, Egypt, Spain, Uzbekistan, Ukraine and Myanmar. India produced 5.85 % of total average global production (24047.33 thousand metric tons) over the same period and occupied 2nd position globally. China alone contributed 78.45 % of total global average production and ranked topper. In terms of growth rate (CAGR), India occupied a favourable position compared to China (2.73), Egypt (3.42), Spain (5.72), Ukraine (3.50) and Myanmar (1.12), but less favourable to Uzbekistan (16.23) and Bangladesh (11.46) during the specified period. Over the same period, India achieved 9.93 % growth rate in Garlic production which was observed to be higher than the Global growth rate (3.13). The trend line of garlic production in India as well as World showed an increasing trend (Fig. 4) with R^2 value of 0.890 and 0.774 respectively. The growth rate of garlic production of both India and Global was found significant at 1 % level of probability. But the variation of garlic production over the said 15 years in India revealed much higher (49.35 %) than compared to China (13.38 %) as well as Global (14.13 %) indicating, India has less stability of production even with favourable growth. The said instability of production might be happened due to erratic crop failure, poor storage techniques and high volatility of annual price in domestic market that leads also variation in crop acreage.

Country wise value of export of garlic from India over the last six years (2015-16 to 2021-22) has been presented in Table 3. According to observed data, five major export destinations of Indian garlic were Malaysia followed by Thailand, USA, Vietnam and Nepal sharing 10.83 %, 10.49 %, 7.30 %, 6.38 % and 5.99 % of average value of total export earnings respectively. Around 35 % of total value of export (seven years' average) brought from first four countries only. However, in case of country-wise accounting of export growth (CAGR) the three importing countries *viz.*, Vietnam, Malaysia and Thailand showed the negative trend. On the other hand, only three countries *viz.,* USA, Nepal and UAE showed hopeful positive growth of export trend from India during the same period. The analysis indicates that the export destinations of Indian Garlic are passing through a change and there remains opportunity to improve the export base by strengthening the present clients as well as invading newer market.

Table 1. Item-wise export of spices ((2015-16 to 2021-22) from India (value in lakhs)

Spices	Average value of export (₹)	% share	CV	CAGR (Per cent)
Pepper	73838.33	4.13	57.95	-14.06**
Small cardamom	71522.36	4.00	55.86	19.21*
Large cardamom	8698.70	0.49	38.37	10.40 NS
Chilli	654528.70	36.58	31.80	15.35***
Ginger	48075.57	2.69	60.29	26.91**
Turmeric	137295.24	7.67	20.24	08.95**
Coriander	38233.05	2.14	22.91	06.67 NS
Cumin	303154.50	16.94	30.54	16.22***
Celery	7569.78	0.42	24.26	10.90***
Fennel	29158.42	1.63	25.77	08.96*
Fenugreek	18915.19	1.06	31.08	04.83 NS
Garlic	21581.08	1.21	32.22	-5.45 NS
Nutmeg & mace	19157.53	1.07	20.23	-2.86NS
Mint products	357429.64	19.98	19.53	09.53***
Grand total	1789158.07	100.00	23.57	11.16***

***, ** and *shows significant at 1%, 5% and 10% level of probability respectively. Source: Spices Board of India

Area, production and productivity of garlic in India and their trend: Annual data of area, production and productivity of Indian Garlic for a period of three decades (1990-91 to 2020-21) was analysed to examine the status of Garlic crop and the results has been depicted in Table 4. The analysis reveals a positive trend of growth (CAGR) 5.46 %, 7.48 % and 1.91 % respectively for Area, Production and Productivity, which are all significant at 1 % level of probability. But the instability index of given annual

Table 2. Status of Global Garlic production (Qty in 000'MT)

Year	China	India	Bangladesh	South Korea	Egypt	Spain	Uzbekistan	Ukraine	Myanmar	Global
2006	11500.00	598.20	102.49	331.38	164.26	145.37	37.99	145.60	161.00	15270.00
2007	16000.00	776.30	176.71	347.55	234.57	151.67	39.20	131.50	197.30	20070.00
2008	18280.00	1070.00	144.82	375.46	339.62	133.61	46.40	136.80	178.10	22740.00
2009	17900.00	831.10	154.83	357.28	195.74	154.59	49.20	150.10	197.60	22050.00
2010	18490.00	833.97	164.39	271.56	244.63	136.56	45.70	157.40	206.00	22500.00
2011	18430.00	1060.00	209.15	295.00	295.85	140.76	127.63	171.90	209.30	23060.00
2012	18430.00	1230.00	233.61	339.11	309.16	154.36	139.88	171.40	208.80	23410.00
2013	19170.00	1260.00	223.69	412.25	234.16	173.60	203.59	185.57	212.00	24250.00
2014	19970.00	1250.00	312.00	353.76	263.17	177.42	154.13	191.14	208.90	24990.00
2015	21700.00	1430.00	345.73	266.27	290.89	178.42	165.76	176.47	209.13	26970.00
2016	20280.00	1620.00	381.85	275.55	272.77	209.80	200.87	187.96	212.91	25850.00
2017	20650.00	1690.00	425.40	303.58	289.77	274.71	214.26	185.83	203.68	26470.00
2018	20880.00	1610.00	461.97	331.74	348.70	273.48	254.86	187.02	203.43	26990.00
2019	20600.00	2910.00	466.39	387.67	363.46	271.35	216.27	215.07	208.91	28040.00
2020	20710.00	2920.00	485.45	363.43	333.54	269.09	223.72	211.68	211.14	28050.00
Mean	18866.00	1405.97	285.90	334.11	278.69	189.65	141.30	173.70	201.88	24047.33
SD	2524.99	693.79	132.62	43.99	57.10	55.04	78.71	25.21	14.30	3396.92
CV	13.38	49.35	46.39	13.17	20.49	29.02	55.71	14.51	7.08	14.13
R^2	0.60	0.89	0.95	0.00	0.46	0.82	0.84	0.87	0.43	0.77
CAGR (%)	2.73*** (0.0006)	9.93*** (0.0000)	11.46*** (0.0000)	-0.03^{NS} (0.97)	3.42*** (0.005)	5.72*** (0.0000)	16.23*** (0.0000)	3.15*** (0.0000)	1.12*** (0.008)	3.13*** (0.0000)

*** significant at 1% level of probability.

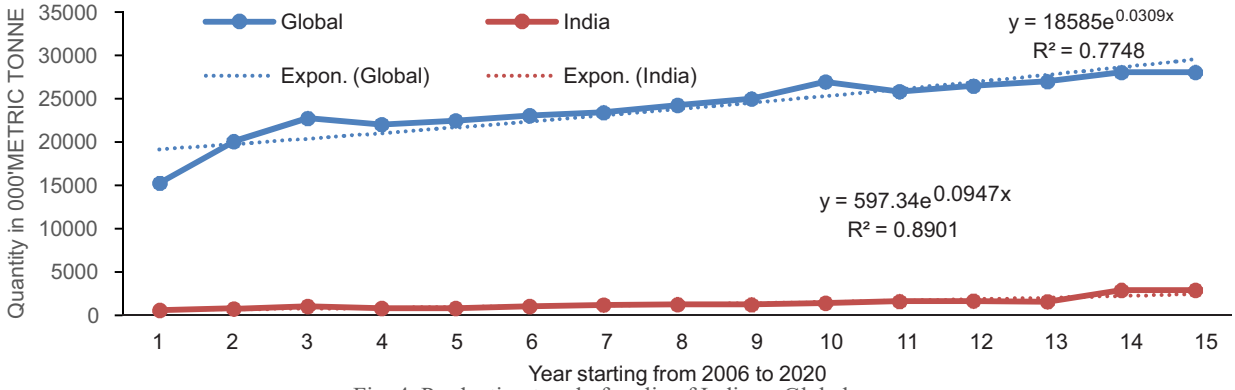

Fig. 4. Production trend of garlic of India vs Global

Table 3. Major country wise value of export of Garlic from India (value in lakhs)

Country	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Average	% share	CAGR (%)
Thailand	1964.19	3274.42	2666.25	1609.33	2506.74	1591.62	1848.78	2208.76	10.49	-5.84
U.S.A	391.66	1275.00	1768.05	2267.52	2354.27	1699.55	1001.64	1536.81	7.30	14.04
Malaysia	1917.74	5403.26	1832.50	3258.26	467.53	439.26	2633.99	2278.93	10.83	-17.64
Nepal	606.78	1601.26	1173.86	617.90	1038.30	2286.43	1506.07	1261.51	5.99	12.58
U.A.E	810.39	832.89	1042.48	738.83	1058.42	909.85	783.77	882.38	4.19	0.33
Bangladesh	160.78	2594.72	1966.37	1256.41	961.21	316.42	446.52	1100.35	5.23	-6.43
Vietnam (South)	1696.34	1901.27	2987.57	862.12	826.70	378.17	745.13	1342.47	6.38	-22.07
South Africa	528.90	1105.30	682.91	458.18	589.62	524.33	724.37	659.09	3.13	-2.45
Mexico	377.87	948.60	895.66	1082.44	475.56	300.98	400.60	640.24	3.04	-9.37
Canada	92.71	711.04	1429.60	1367.33	146.88	148.53	184.94	583.00	2.77	-11.23
Others	7411.64	11063.74	14491.13	5472.45	6757.28	6375.87	8299.21	8553.05	40.64	-5.30
Grand Total	15959.00	30711.50	30936.38	18990.77	17182.51	14971.01	18575.02	21046.60	100.00	-5.45

*** and **significant at 1% and5%level of probability respectively. Source: Spices Board of India

data of Garlic showed an immense variation in acreage under crop (50.65 %), production (75.77 %) and productivity (22.78 %).

The exponential trend line of area and production of garlic (Fig. 5) in the country, has also shown the positive trend in growth of area and production and the annual growth rate of production was higher than area expansion due to increase in productivity. A three decades *viz.*, 1990-91 to 1999-2000, 2000-01 to 2009-10 and 2010-11 to 2020-21) break up analysis was also performed for getting an inter-decadal comparison of growth trend. It was observed that the growth rate of area and production was more during second decade in comparison to other two decades. This indicates that the Rabi crop Garlic could achieve a steady growth of area expansion during the second phase and the said growth was receded due to other competitive crops cultivated during the same production season. Whereas, the trend in growth rate of productivity revealed highest in last decade compared to other preceding decades indicating technological improvement in cultivation of Garlic.

The major state-wise six years (2016-17 to 2021-22) average area, production and productivity of garlic was estimated and presented

Table 4. Area, production and productivity of Garlic in India

Year	Area (In ' 000 Hectare)	Production (In ' 000 MT)	Productivity (In MT/Hectare)
1990-1991	90.10	350.40	3.90
1991-1992	94.30	370.70	3.90
1992-1993	85.50	355.80	4.20
1993-1994	76.20	306.00	4.00
1994-1995	98.90	403.30	4.10
1995-1996	114.80	490.00	4.30
1996-1997	94.30	437.90	4.60
1997-1998	108.80	484.40	4.50
1998-1999	123.20	570.70	4.60
1999-2000	126.60	538.00	4.20
2000-2001	74.90	276.90	3.70
2001-2002	115.20	530.80	4.60
2002-2003	119.90	573.00	4.80
2003-2004	123.50	600.20	4.90
2004-2005	129.50	619.00	4.80
2005-2006	134.90	598.20	4.40
2006-2007	159.20	776.30	4.90
2007-2008	205.10	1068.40	5.20
2008-2009	190.50	1003.80	5.30
2009-2010	187.30	975.40	5.20
2010-2011	211.00	1256.60	6.00
2011-2012	242.50	1228.30	5.10
2012-2013	247.50	1259.30	5.10
2013-2014	230.60	1251.90	5.40
2014-2015	262.10	1425.50	5.40
2015-2016	281.00	1617.00	5.80
2016-2017	321.00	1693.00	5.30
2017-2018	317.00	1611.00	5.10
2018-2019	358.00	2910.00	8.10
2019-2020	352.00	2944.00	8.36
2020-2021	392.00	3190.00	8.14
Mean	182.82	1023.09	5.09
SD	92.61	775.18	1.16
CV	50.65	75.77	22.78
R^2	0.9189	0.9076	0.7138
CAGR (%) (1990-91 to 2020-21)	5.46*** (0.0000)	7.48*** (0.0000)	1.91*** (0.0000)
CAGR (%) (1990-91 to 1999-20)	4.29*** (0.0083)	6.05*** (0.0011)	1.69*** (0.0083)
CAGR (%) (2000-01 to 2009-10)	9.69*** (0.0001)	12.64*** (0.0003)	2.70*** (0.0086)
CAGR (%) (2010-11 to 2020-21)	6.12*** (0.0000)	10.86*** (0.0000)	4.47** (0.0142)

*** and **significant at 1% and 5%level of probability respectively.
Source: www.agristat.com

in Table 5. The data shows that Madhya Pradesh, Rajasthan and Uttar Pradesh occupied the 1st, 2nd and 3rd position respectively in annual average area put under garlic cultivation and garlic production respectively. It reveals that Madhya Pradesh alone has contributed 60.76 % of total garlic production of India followed by Rajasthan (17.58 %) and Uttar Pradesh (6.93 %) and given states altogether comprises around 85 % of national production share over the specified period. Whereas, individual contribution by other major garlic producing states *viz.,* Punjab, Assam, Orissa, Haryana, West Bengal and Maharashtra remained less than 4 %. But in terms of productivity, Punjab achieved the 1st position (11.39 MT/ha) having 1.99 % share of national average production followed by Haryana (10.67 MT/ha), Madhya Pradesh

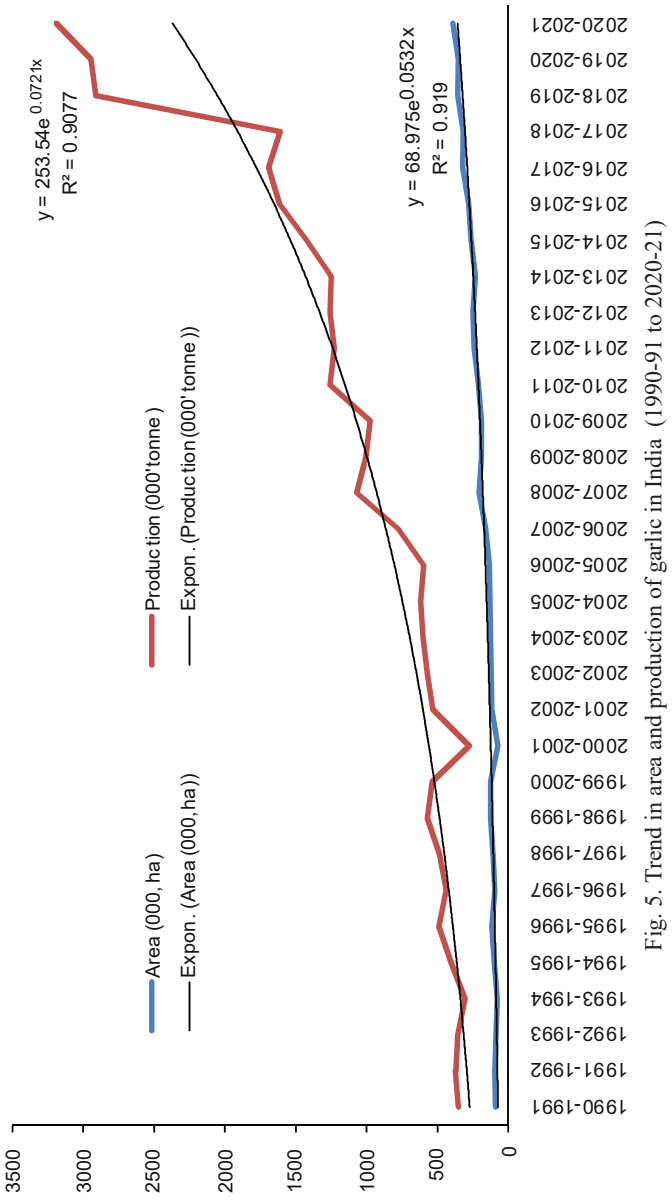

Fig. 5. Trend in area and production of garlic in India (1990-91 to 2020-21)

(10.31 MT/ha) and West Bengal (9.56 MT/ha. The productivity of all other major garlic producing states particularly Rajasthan, Uttar Pradesh and Gujarat stood less than national average garlic productivity (8.11 MT/ha).

Garlic contributed the highest production share (29.68%) to the total spices production in India over six years (2015-16 to 2021-22) but having only 2.30 % and 1.21 % to the volume and value of export of total spices respectively. But as a second best global producer after China, India could export only 0.63 % of her own garlic production. Even having good positive growth rate (CAGR) of production (9.93 %) over a period of 15 years, the growth in export of garlic showed a negative trend (around 7 %) over the years. Therefore it can be inferred that due to increasing trend of domestic consumption of garlic, the amount of exportable surplus is much lower even negative than other major spices. Out of total average export, around 28 % of the garlic has been exported to Malaysia, Thailand and Vietnam but with a decreasing trend (CAGR). However, three export destinations *viz.,* USA, Nepal and UAE with comparatively lower share showed positive growth. Hence, India has to explore other international markets of garlic to fetch more export earnings from it. Over the last 30 years, Indian garlic has depicted positive growth rate in area,

Table 5. Major state-wise area, production, productivity of garlic (2016-17 to 2021-22) (Area in 000'ha and Production (Prodⁿ.) in 000' MT)

State	2016-17		2017-18		2018-19		2019-20		2020-21		2021-22		Average		
	Area	Prodⁿ.	Area	Prodⁿ.	Area	Prodⁿ.	Area	Prodⁿ.	Area	Prodⁿ.	Area	Prodⁿ.	Area	Prodⁿ.	Prodty. (MT/ ha)
Madhya Pradesh	156.88	1716.85	186.18	1882.39	178.16	1807.95	183.71	1869.43	193.07	1982.60	204.68	2106.63	183.78 (47.80)	1894.31 (60.76)	10.31
Rajasthan	107.97	727.5	112.89	582.08	74.83	452.94	68.01	416.30	87.66	517.09	98.34	592.52	91.62 (23.83)	548.07 (17.58)	5.98
Uttar Pradesh	35.15	223.55	35.22	188.61	34.31	227.34	34.64	207.89	34.90	207.14	40.96	242.24	35.86 (9.33)	216.13 (6.93)	6.03
Gujarat	10.13	81.47	19.08	151.01	10.75	83.00	12.18	94.56	15.06	118.22	26.01	202.83	15.54 (4.04)	121.85 (3.91)	7.84
Punjab	6.46	73.74	6.46	73.74	7.49	89.09	7.75	92.64	8.87	96.77	8.88	97.04	7.65 (1.99)	87.17 (2.80)	11.39
Assam	10.31	61.25	10.45	62.33	10.45	62.33	10.66	67.42	10.77	68.92	10.81	69.42	10.57 (2.75)	65.28 (2.09)	6.17
Hariyana	5.00	32.00	4.42	51.36	3.29	42.64	3.10	41.62	3.20	31.70	3.42	39.91	3.74 (0.97)	39.87 (1.28)	10.67
Orissa	10.9	35.5	12.44	45.48	12.44	45.48	12.44	45.48	12.44	45.48	11.03	39.51	11.95 (3.11)	42.82 (1.37)	3.58
West Bengal	3.7	36.1	3.8	36.3	3.88	37.07	3.93	37.47	3.98	37.98	4.04	38.15	3.89 (1.01)	37.18 (1.19)	9.56
Maharashtra	2.56	14.26	2.54	14.99	2.66	13.72	2.65	13.84	3.78	22.44	4.05	24.35	3.04 (0.79)	17.27 (0.55)	5.68
Other States	18.49	32.59	16.24	25.45	15.236	57.386	13.6	39.455	18.506	61.921	19.018	70.845	16.85 (4.38)	47.94 (1.54)	2.85
Total (India)	367.55	3034.81	409.72	3113.74	353.50	2918.95	352.66	2926.10	392.23	3190.26	431.22	3523.44	384.48 (100)	3117.88 (100)	8.11

Source: Spice Board of India, Prodty.= Productivity

production and productivity. There exist high degree of inter year variability due to climatic and price factors. Inter decadal comparison shows that area expansion was more during 2000-01 to 2009-10 but receded in succeeding decades. The highest growth rate of productivity during last decade (2010-11 to 2020-21) indicates the technological progress in garlic cultivation. Only two states, Madhya Pradesh and Rajasthan contribute 78.34 % of total garlic production of the country covering 71.63 % of national acreage of garlic cultivation. But the productivity of states like Rajasthan, Uttar Pradesh and Gujarat found lower than national average. In terms of productivity, Punjab leads the country followed by Haryana, Madhya Pradesh and West Bengal. To achieve a gainful export opportunity, production of Indian Garlic needs to be enhanced by increasing productivity in almost all garlic producing states of India. Besides restoration of existing trade with international clients new export destination also to be searched for getting stability in export market. For this, adequate market infrastructure along with improvement in post harvest management of the crop particularly processing may be the targeted focus.

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