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DYNAMICS OF ONION PRODUCTION AND TRADE IN INDIA: REGIONAL TRENDS, EXPORT PATTERNS, AND POLICY INSIGHTS

Akshata Nayak* and Channamma G**

Abstract

India is the world's leading producer and exporter of onions, yet its onion sector faces significant regional disparities, market volatility, and policy inconsistencies. This study examines long-term trends in onion cultivation across Indian states, with a focus on the area, production, and productivity over a 39-year period (1984–2023). It employs compound growth analysis and the Markov Chain model to assess trade dynamics and export market stability. The results reveal substantial regional variations, with Western and Central India driving growth, while Southern and Northeastern states experience declines. Despite an overall rise in production and export value, productivity remains stagnant nationally. Export patterns show shifting trade directions and retention inconsistencies, particularly among major buyers such as Bangladesh and the UAE. The study highlights the need for region-specific policies, investment in post-harvest infrastructure, and consistent export strategies to enhance resilience and global competitiveness in India's onion sector.

Keywords: Onion, Production, Trade, Export, Market Trends, Markov chain analysis.

Introduction

Onion (*Allium cepa*) is one of the most significant commercial vegetable crops cultivated in India and globally. It ranks as the third most valuable vegetable worldwide, following potatoes and tomatoes, and is cultivated across 140 countries, covering an area of approximately 5.48 million hectares, with a total production of 1045.54 lakh tonnes reported for the year 2022–2023. The leading onion-producing nations include India, China, Egypt, the United States, Turkey, Pakistan, Bangladesh, Sudan, Indonesia, and Nigeria (Beniwal, 2022).

India holds the position of the world's largest onion producer, contributing approximately 25% of global production, followed by China (22.67%) and Egypt (3.11%) (FAO, 2023). Over the past two decades, both the area under onion cultivation and global production have shown a consistent upward trend. In 2023, global onion exports reached 2.5 million metric tonnes, with the Netherlands, China, India, Mexico, and the United States emerging as the top five exporting countries. Europe led in export value, accounting for $1.43 billion (33.5% of the global total), followed by Asia (32.9%) and North America (19.7%) (FAO, 2023).

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According to Volza's Global Export Data (2023), there were 1,516,925 global onion export shipments in 2023, with 1.5 million shipments originating from 38,528 exporters and reaching 59,828 buyers worldwide. India topped the list with 819,774 shipments, followed by China (55,136) and the Netherlands (52,781). Within India, major onion-producing states include Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Bihar, Andhra Pradesh, Rajasthan, Haryana, and Telangana.

India primarily exports fresh onions to countries such as Bangladesh, Malaysia, the United Arab Emirates, Sri Lanka, Nepal, Indonesia, Saudi Arabia, Qatar, Kuwait, and Oman. In 2023, the country exported 2,525,258.35 metric tonnes of fresh onions, valued at ₹4,522.79 crores (USD 561.38 million) (APEDA, 2023). On the import side, India primarily sources onions from Afghanistan, Egypt, and Turkey (Gulati et al., 2022). During 2023–24, India exported 30.26% of its onions to Bangladesh, followed by Malaysia (18.48%), the UAE (13.24%), and Sri Lanka (12.55%) (APEDA, 2023).

Despite India's prominent position in global onion production and trade, existing literature offers limited integration of long-term regional production trends with trade pattern dynamics. Most studies tend to analyse these components in isolation, overlooking the complex interlinkages that influence market behaviour, policy responses, and research priorities. This study aims to fill this gap by adopting a holistic approach that combines statistical trend analysis and trade modelling using the Markov Chain technique.

By addressing this critical gap, our work contributes to a more nuanced understanding of the Indian onion sector, particularly in the context of regional disparities, evolving export directions, and global research linkages. The findings of this study have significant implications for policymakers, researchers, and stakeholders seeking to enhance productivity, stabilise markets, and strengthen India's global competitiveness.

Accordingly, this study is guided by the following research questions:

1. What are the long-term trends in area, production, and productivity of onions in India and Karnataka?
2. How have regional dynamics contributed to disparities in onion cultivation and output?
3. What are the patterns and transitions in India's onion trade, and how stable are its major export markets?

Materials and Methods

This study is based on secondary data collected from various sources. To analyse the growth trends in onion cultivation—covering area, production, and productivity—data was sourced from the Directorate of Economics and Statistics and Indiastat for a 39-year period (1984-85 to 2023-24). Triennium averages and the compound annual growth rate were calculated.

To examine India's onion trade patterns, export and import data were collected from the Agricultural and Processed Food Products Export Development Authority (APEDA) for a 33-year period (1993-94 to 2023-24) and for 2010-11 to 2023-24 respectively. The Markov Chain technique, implemented using LP Solve software, was applied for the period from 2000-01 to 2023-24.

Analytical Tools and Techniques

To full-fill the specific objectives of the study, based on the nature and extent of availability of data, the following analytical tools and techniques have been adopted to draw meaningful interpretation and inferences.

Compound growth rate analysis (CAGR):

For computing compound growth rate of area, production and productivity of onion in India and Karnataka, the exponential function of the following form was used.

$$Y_t = a\, b^t\, e^u \quad \text{.....(1)}$$

Where,

Y_t = Area/production/productivity of onion for the year 't'.

t = Time variable (1,2……., n) for each period

a= intercept

b = Growth coefficient

Log transformation of above function is:

$$\ln Y_t = \ln a + t \ln b + u \quad \text{.....(2)}$$

a and b are obtained by application of ordinary least squares (OLS) procedure to equation (2) and the growth rate 'r' is computed as below

$$r = [\text{antilog of } b - 1] * 100 \quad \text{.....(3)}$$

Markov chain analysis:

The trade directions of Indian onion exports were analysed using the first order Markov chain approach (Krishnadas, 2010, Nalegaonkar, 2020). Markov chain analysis is the estimation of the transitional probability matrix P. The elements P_{ij} of the matrix P indicates the probability that export will switch from country i to country j with the passage of time. In the context of the current application, from 2000-01 to 2023-24, 14 major importing countries of onion were considered. The average exports to a particular country were considered to be a random variable which depends only on the past exports to that country, which can be denoted algebraically as

$$E_{jt} = \Sigma E_{it-1} * P_{ij} + e_{jt}$$

E_{jt} = Exports from India to j^{th} country during the year t

E_{it-1} = Exports from India to i^{th} country during the period t-1

P_{ij} = Probability that the exports will shift from i^{th} country to j^{th} country.

e_{jt} = The error term which is statistically independent to E_{it-1} (the error term used for forecasting or prediction, the error term in the equation for expected value, is introduced to account for uncertainties and imperfections in the model. The assumptions are, First, it is typically assumed to have a zero mean, indicating that the model does not systematically overestimate or underestimate the expected values.

Second, the error term is expected to have finite variance, which allows for the quantification of uncertainty and the construction of confidence intervals. Third, independence or weak dependence across time steps is often assumed, meaning that errors in one period do not strongly influence errors in another. Finally, the underlying Markov process is usually considered stationary or ergodic, ensuring that the statistical properties of the system remain stable over time, which supports the reliability of long-term predictions.)

t = Number of years considered for the analysis

r = Number of importing countries

The transitional probabilities P_{ij} which can be arranged in a (c * r) matrix, have the following properties.

$$O < P_{ij} < 1$$

$$\Sigma P_{ij} = 1, \text{ for all } i$$

Thus, the expected export shares of each country during period 't' were obtained by multiplying the export to these countries in the previous period (t-1) with the transitional probability matrix.

Results and Discussion

Trends in area, production, and productivity of onion in India

Table 1 presents the long-term trends in onion cultivation in India, capturing variations in area, production, and productivity from the triennium ending (TE) 1985–86 to TE 2023–24. Over this nearly four-decade period, the area under onion cultivation expanded markedly, from 273.66 thousand hectares in TE 1985–86 to 1,739.50 thousand hectares in TE 2023–24. This reflects more than a sixfold increase, indicative of growing domestic and international demand, and evolving market opportunities.

Parallel to the expansion in cultivated area, onion production in the country increased tenfold, from 2.83 million metric tonnes in TE 1985–86 to 28.70 million metric tonnes in TE 2023–24. This substantial rise underscores India's strengthening position as a global leader in onion production. However, productivity improvements have been relatively modest over the same period, with average yields rising from 10.33 tonnes/ha to 16.47 tonnes/ha, suggesting that growth in output has been driven more by area expansion than by yield enhancement.

A decadal disaggregation of growth trends (see Table 2) reveals that the highest growth in both area (8.89%) and production (11.00%) occurred during the 2004–2013 period, supported likely by policy reforms, improved market linkages, and rising export potential. Conversely, the decade from 2014 to 2023 witnessed a slowdown, with production growth (5.32%) becoming statistically insignificant and productivity even recording a marginal decline (−0.34%, NS). These findings suggest that while onion cultivation has expanded substantially, yield improvements remain constrained, likely due to factors such as climatic variability, soil degradation, and inadequate adoption of modern agronomic practices.

Overall, the trends reflect a resilient and growing onion sector in India. Yet, the stagnation in productivity raises concerns about the long-term sustainability of yield-driven growth. Targeted investments in irrigation, high-yielding varieties, and post-harvest infrastructure, along with region-

specific policy support, are imperative to enhance productivity and maintain India's competitive advantage in onion production and trade.

Table 1: Trends in Area, Production, and Productivity of Onion in India

Year	Area (000′ ha)	Production (000′ MT)	Productivity (Kg/ha)
TE 1985-86	273.66	2834.00	10333.33
TE 1988-89	291.80	2988.80	10233.33
TE 1991-92	337.66	4545.50	13300.00
TE 1994-95	380.53	4040.83	10633.33
TE 1997-98	410.20	4262.23	10266.67
TE 2000-01	479.33	4957.56	10333.33
TE 2003-04	524.13	5925.56	11133.33
TE 2006-07	681.16	9984.83	14166.67
TE 2009-10	884.73	13613.67	15533.33
TE 2012-13	1114.10	17908.60	16066.67
TE 2015-16	1266.43	20761.80	16400.00
TE 2018-19	1312.00	24057.33	18333.33
TE 2021-22	1768.46	29512.03	16700.00
TE 2023-24	1739.50	28702.47	16466.67

Note: TE: Triennium ending

Growth Dynamics of Onion Cultivation in India: A Compound Growth Rate Perspective

The compound annual growth rate (CAGR) analysis presented in Table 2 offers critical insights into the temporal evolution of onion cultivation in India over the 39-year period from 1984–85 to 2023–24. Nationally, the area under onion cultivation expanded at a significant rate of 5.55% per annum, while production registered a 7.35% annual growth. Productivity growth, however, was comparatively modest at 1.74% per annum, underscoring the limited yield gains despite increased cultivation.

Disaggregated by decade, the highest CAGR for both area (8.89%) and production (11.00%) occurred during 2004–2013, reflecting a period of substantial sectoral expansion. This growth spurt coincided with enhanced export opportunities, improved supply chain infrastructure, and greater institutional support. Notably, productivity also recorded a statistically significant growth rate of 2.31% during this period, suggesting that technological adoption and input intensification contributed positively to yield improvements.

Conversely, the 1994–2003 period exhibited stagnation in productivity, with a non-significant CAGR of 0.25%, despite moderate growth in area (3.60%) and production (3.89%). This phase likely reflects structural inefficiencies, including limited diffusion of high-yielding varieties and inconsistent market support mechanisms.

The most recent decade (2014–2023) presents a more complex scenario. While the area continued to expand at a robust 5.68% annually (significant at the 1% level), production growth (5.32%) was statistically non-significant, and productivity declined marginally by 0.34% (non-

significant). These findings point to emerging constraints in yield optimisation, potentially due to climate variability, suboptimal resource management, and post-harvest losses.

Taken together, the results highlight a clear temporal shift in the growth drivers of India's onion sector. While early growth was driven by area expansion, the 2000s showed productivity-enhancing effects, followed by a tapering off in recent years. These patterns underscore the pressing need to shift from extensive to intensive growth strategies, emphasising yield improvement through sustainable agronomic practices, research investments, and climate-resilient technologies. Addressing these structural challenges is essential to ensure long-term productivity gains and sectoral stability.

Table 2: Compound Annual Growth Rate of Area, Production, and Productivity of Onion in India,1984-85 to 2023-24

Year	CAGR%		
	Area	Production	Productivity
1984-1993	4.20 *	9.02***	4.55***
1994-2003	3.60*	3.89***	0.25 NS
2004-2013	8.89 NS	11.00***	2.31**
2014-2023	5.68***	5.32NS	-0.34NS
1984-2023	5.55 *	7.35 NS	1.74***

Note: ***significant at 1% level , **significant at 5% level, *significant at 10% and NS : not significant

Trends in onion Area, Production, and productivity for Indian regions

The trends in area under onion cultivation across Indian regions from TE 2015–16 to TE 2023–24 reveal notable regional disparities, shaped by agro-climatic conditions, infrastructure, policy interventions, and local constraints (Table 3).

In Southern India, the cultivated area declined marginally by -2.04%, decreasing from 292.87 to 286.87 thousand hectares. Among the southern states, all except Tamil Nadu—where area increased by 44.73%—exhibited a downward trend. This differential behaviour can be attributed to several region-specific challenges. States like Karnataka and Telangana, despite being traditionally strong in onion cultivation, faced constraints such as declining soil fertility, erratic rainfall, water scarcity, and market volatility, which have discouraged further expansion (Bhat et al., 2022). In contrast, Tamil Nadu's growth suggests targeted state-level support and adaptation to local conditions may have helped improve adoption and investment in onion cultivation.

Table 3: Trends in Onion Area for Indian Regions

Regions	Area ('000 ha)				National share (TE 2023-24,%)	TE 2014 – TE 2023 (% change)
	TE 2015-16	TE 2018-19	TE 2021-22	2023-24		
Sothern India	**292.87**	**264.15**	**317.38**	**286.87**	**16.49**	**-2.04**
Andra Pradesh	41.68	43.81	42.06	40.22	2.31	-3.50
Karnataka	198.34	173.76	216.99	191.73	11.02	-3.33
Kerala	0.10	0.01	0.01	0.01	0.00	-90.00
Puducherry	0	0.02	0.01	0.00	0	0.00
Tamil Nadu	32.68	33.45	50.69	47.30	2.71	44.73
Telangana	20.10	13.71	7.61	7.59	0.43	-62.23
Northern India	**143.75**	**145.31**	**170.34**	**174.27**	**10.01**	**21.23**
Delhi	0.28	0.88	0.88	0.87	0.05	210.71
Haryana	30.11	28.64	23.14	24.84	1.42	-17.50
Himachal Pradesh	2.46	2.86	3.39	3.38	0.19	37.39
Jammu & Kashmir	2.86	3.91	5.34	5.85	0.33	104.54
Punjab	8.57	9.77	10.46	10.57	0.60	23.33
Rajasthan	70.05	67.62	88.77	92.97	5.34	32.71
Uttar Pradesh	25.17	27.25	29.59	31.44	1.80	24.91
Uttarkhand	4.19	4.37	4.33	4.33	0.24	3.34
North-East India	**12.57**	**11.65**	**10.69**	**10.60**	0.60	**-15.67**
Assam	8.34	8.23	8.31	8.21	0.47	-1.55
Manipur	0.41	0.55	0.54	0.54	0.03	31.70
Meghalaya	0.52	0.56	0.57	0.58	0.03	11.53
Mizoram	1.90	0.87	0.27	0.27	0.01	-85.78
Nagaland	0.70	0.64	0.60	0.60	0.03	-14.28
Sikkim	0.33	0.62	0.27	0.27	0.01	-18.18
Tripura	0.50	0.15	0.18	0.19	0.01	-62.00
Eastern India	**156.19**	**167.33**	**169.59**	**176.16**	**10.12**	**12.78**
Bihar	54.13	56.09	57.82	57.64	3.31	6.48
Chhattisgarh	23.03	25.65	23.53	23.60	1.35	2.47
Jharkhand	16.24	18.30	17.23	17.53	1.00	7.94
Odisha	33.36	31.34	31.18	31.79	1.82	-4.70
West Bengal	29.43	35.93	43.69	45.58	2.62	54.87
Western & Central India	**660.44**	**723.51**	**1101.00**	**1093.36**	**62.85**	**65.55**
Gujarat	49.70	41.60	82.52	86.30	4.96	73.64
Madhya Pradesh	128.97	156.59	199.11	202.00	11.61	56.62
Maharashtra	481.76	525.32	819.36	805.05	46.28	67.10
India Total	**1266.43**	**1312.00**	**1768.46**	**1739.50**	**100**	**37.35**

Northern India saw a 21.23% increase in area, rising from 143.75 to 174.27 thousand hectares. This growth aligns with Bhagat *et al* (2022), who identify the region as an emerging contributor to onion production. The area expansion can be linked to improving infrastructure, such as better road connectivity and access to input markets, as well as policy interventions that support vegetable

cultivation, including subsidies and procurement support. However, yield improvements remain modest, indicating scope for agronomic advancements.

In the Northeastern region, area trends were highly uneven. While Manipur recorded a 31.70% increase, Mizoram and Tripura showed sharp declines of -85.78% and -62.00%, respectively. These contrasts underscore deep-rooted structural challenges in the region. Factors such as inadequate irrigation, limited transportation infrastructure, poor access to quality inputs, and small landholdings restrict commercial viability and scale-up potential (Bhagat et al., 2022).

Eastern India experienced a moderate 12.78% increase in onion area, with West Bengal showing the most significant growth (54.87%). This expansion reflects improved input access, extension services, and market connectivity in parts of the region. However, other states such as Odisha and Chhattisgarh continue to face climatic and logistical barriers that limit further development.

The most prominent gains occurred in Western and Central India, where area increased by 65.55%, reaffirming the region's dominant role in India's onion sector. Maharashtra alone saw a 67.10% increase, reaching 805.05 thousand hectares. As Bhat et al. (2022) noted, this region benefits from a combination of favourable agro-climatic conditions, efficient irrigation systems, high-yielding varieties, and well-developed post-harvest and market infrastructure, including storage and exports. These factors provide resilience against climate shocks and price volatility, contributing to sustained expansion.

While the national area under onion cultivation shows overall growth, these regional disparities highlight the critical need for tailored policy interventions. Strategies should include strengthening irrigation, post-harvest infrastructure, and price stabilisation mechanisms, particularly in underperforming regions. Enhancing extension services, input delivery, and market access will be essential to unlock the potential in emerging regions and ensure equitable, sustainable growth in the onion sector (Devi et al., 2019; Bhat et al., 2022).

Trends in Onion Production for Indian Regions

Between TE 2015–16 and TE 2023–24, onion production in India increased by 38.24%, from 20.76 to 28.70 million metric tonnes (Table 4). While this reflects strong national growth, production trends reveal sharp regional disparities, driven by variations in agro-climatic suitability, irrigation availability, policy support, and infrastructure.

In Southern India, total production declined by -17.14%, dropping from 4.66 to 3.86 million metric tonnes. This contraction is primarily attributed to reduced cultivated area in key states like Karnataka (-20.70%) and Telangana (-64.30%), where erratic rainfall, water shortages, and shifting cropping patterns have undermined onion productivity and farmer confidence (Kovalli, 2021). Additionally, price fluctuations and inadequate cold storage facilities further limit the region's resilience. Tamil Nadu, however, showed a 22.90% increase in production, likely driven by targeted state policies, access to irrigation, and local adaptation of high-yielding varieties.

Northern India recorded a 17.50% rise in production, reaching 3.09 million metric tonnes in TE 2023–24. States like Jammu & Kashmir (145.73%) and Himachal Pradesh (111.86%) posted the strongest gains, likely benefiting from favourable agro-climatic conditions, smaller but intensively

managed farms, and improved access to inputs and government support (Jhade et al., 2023). In contrast, Haryana saw a decline (-15.80%) due to lower productivity and a shift in cropping preferences toward high-value crops.

The North-East region presents a mixed picture. Assam showed a notable 41.36% increase in production, supported by efforts to expand area and improve input access. However, other states like Mizoram (-79.88%) and Tripura (-50.83%) experienced severe declines, driven by constraints such as lack of irrigation, low market integration, and limited extension services. These structural limitations restrict sustained growth despite isolated gains (Bhagat et al., 2022).

In Eastern India, overall production rose by 19.93%, with West Bengal leading with a 92.80% increase. This surge reflects focused state-level investments in horticulture, improved extension efforts, and better supply chain linkages. Nevertheless, Odisha recorded a small decline (-4.01%), suggesting that climatic risks and post-harvest losses continue to pose challenges in parts of the region.

Western and Central India remains the powerhouse of Indian onion production, accounting for 65.32% of the national total in TE 2023–24. The region posted a 76.82% increase in output, led by Maharashtra (85.80%), Gujarat (75.88%), and Madhya Pradesh (59.41%). These gains are supported by the region's strong infrastructure, including cold storage, well-linked wholesale markets, export-oriented production systems, and widespread adoption of high-yielding varieties (Jhade et al., 2023). Advanced irrigation networks and price responsiveness have further fueled expansion and ensured relative stability in production.

These regional trends underscore the importance of context-specific interventions. While Western and Central India thrive on infrastructure and policy synergy, other regions require targeted efforts to address production bottlenecks. Expanding irrigation coverage, investing in farmer training, strengthening market access, and improving post-harvest handling will be essential to foster balanced and sustainable production growth across all regions.

Table 4: Trends in Onion Production for Indian Regions

Regions	Production ('000 MT)				National share (TE 2023-24,%)	TE 2014 – TE 2023 (% change)
	TE 2015-16	TE 2018-19	TE 2021-22	2023-24		
Sothern India	**4663.50**	**4178.01**	**4128.17**	**3863.84**	**13.46**	**-17.14**
Andra Pradesh	792.47	959.13	771.81	773.42	2.69	-2.40
Karnataka	2990.83	2606.53	2701.83	2371.67	8.26	-20.70
Kerala	0.23	0.15	0.10	0.11	0.00	-52.17
Puducherry	0	0.13	0.04	0.03	0.00	0
Tamil Nadu	463.75	345.71	507.70	569.98	1.98	22.90
Telangana	416.29	266.36	146.61	148.61	0.51	-64.30
Northern India	2633.95	2634.57	3117.22	3094.95	**10.78**	**17.50**
Delhi	5.95	16.51	16.90	17.16	0.05	188.40
Haryana	676.32	697.21	551.37	569.45	1.98	-15.80
Himachal Pradesh	30.60	57.96	69.83	64.83	0.22	111.86
Jammu & Kashmir	66.56	71.21	134.98	163.56	0.56	145.73
Punjab	194.81	223.61	247.03	248.00	0.86	27.30
Rajasthan	1181.72	1078.66	1483.25	1455.45	5.07	23.16
Uttar Pradesh	421.11	444.67	496.85	532.07	1.85	26.34
Uttarkhand	41.54	44.72	44.41	44.41	0.15	6.90
North-East India	**95.27**	**149.90**	**112.60**	**111.82**	**0.38**	**17.37**
Assam	64.67	84.70	92.34	91.42	0.31	41.36
Manipur	5.46	6.03	5.19	5.20	0.01	-4.76
Meghalaya	4.61	5.03	5.16	5.24	0.01	13.66
Mizoram	8.95	11.58	1.80	1.80	0.00	-79.88
Nagaland	7.37	6.30	5.64	5.68	0.01	-22.93
Sikkim	1.79	35.23	1.67	1.68	0.00	-6.14
Tripura	2.40	1.02	1.17	1.18	0.00	-50.83
Eastern India	**2754.34**	**2992.82**	**3157.88**	**3303.40**	**11.50**	**19.93**
Bihar	1247.87	1288.34	1349.23	1369.05	4.76	9.71
Chhattisgarh	368.71	418.53	387.33	389.73	1.35	5.70
Jharkhand	289.98	290.65	285.96	282.27	0.98	-2.65
Odisha	384.39	348.03	362.68	368.94	1.28	-4.01
West Bengal	463.38	647.26	845.25	893.40	3.11	92.80
Western & Central India	**10603.08**	**14102.38**	**18996.20**	**18748.57**	**65.32**	**76.82**
Gujarat	1257.50	1026.43	2086.39	2211.74	7.70	75.88
Madhya Pradesh	3137.20	3881.23	4850.40	5001.26	17.42	59.41
Maharashtra	6208.36	9194.69	12059.40	11535.57	40.19	85.80
India Total	**20761.80**	**24057.33**	**29512.03**	**28702.47**	**100**	**38.24**

Trends in Productivity of Onion for Major Regions of India

While India's total area and production of onions have shown growth, the national-level productivity has remained nearly stagnant, with only a marginal increase of 0.55% between TE 2014–16 (16,386.96 kg/ha) and TE 2023–24 (16,478.03 kg/ha) (Table 5). However, this apparent stability at the national level masks significant regional variations, which can be attributed to differences in agro-climatic conditions, technological adoption, infrastructure quality, and policy implementation (Chengappa *et al*, 2012).

Table 5: Trends in Onion Productivity for Indian Regions

Regions	Productivity (000' MT/ha)				TE 2014 – TE 2023 (% change)
	2014-16	2017-19	2020-22	2023-24	
Southern India	**15.92**	**15.80**	**13.12**	**13.50**	**-15.20**
Andhra Pradesh	18.89	22.20	18.42	19.27	2.01
Karnataka	15.14	14.97	12.55	12.30	-18.75
Kerala	2.45	9.72	8.09	6.83	178.77
Puducherry	0	8.00	7.38	7.49	0
Tamil Nadu	13.85	10.30	10.08	12.21	-11.84
Telangana	21.22	19.32	19.30	19.64	-7.44
Northern India	**18.32**	**18.12**	**18.30**	**17.77**	**-3.00**
Delhi	7.08	18.78	19.20	19.72	178.53
Haryana	22.46	24.41	24.01	22.85	1.73
Himachal Pradesh	18.57	20.20	20.54	19.14	3.06
Jammu & Kashmir	23.23	18.26	24.64	27.95	20.31
Punjab	22.71	22.88	23.61	23.45	3.25
Rajasthan	16.89	15.91	16.71	15.67	-7.22
Uttar Pradesh	16.73	16.31	16.78	16.92	1.13
Uttarkhand	9.93	10.22	10.26	10.26	3.32
North-East India	**7.51**	**12.98**	**40.31**	**56.24**	**648.86**
Assam	7.74	10.29	11.10	11.13	43.79
Manipur	13.16	10.95	9.67	9.70	-26.29
Meghalaya	8.79	9.00	9.00	9.00	2.38
Mizoram	5.16	34.37	6.67	6.67	29.26
Nagaland	10.56	9.75	9.36	9.44	-10.60
Sikkim	5.40	56.45	6.15	6.15	13.88
Tripura	6.62	6.43	6.41	6.19	-6.49
Eastern India	**17.63**	**17.88**	**18.67**	**18.75**	**6.35**
Bihar	23.05	22.97	23.33	23.75	3.03
Chhattisgarh	15.96	16.31	16.45	16.51	3.44
Jharkhand	17.85	15.92	16.66	16.19	-9.29
Odisha	11.52	11.07	11.63	11.60	0.69
West Bengal	15.70	18.01	19.32	19.61	24.90
Western & Central India	**16.03**	**19.52**	**17.27**	**17.15**	**6.98**
Gujarat	25.30	24.62	25.21	25.62	1.26
Madhya Pradesh	24.29	24.80	24.35	24.76	1.93
Maharashtra	12.87	17.53	14.74	14.27	10.87
India Total	**16386.96**	**18346.51**	**16695.58**	**16478.03**	**0.55**

Note: TE; Tri-annum ending

In Southern India, productivity declined sharply by -15.20%, dropping from 15.92 to 13.50 MT/ha. Karnataka experienced the steepest fall (-18.75%), reflecting the impact of soil degradation, pest pressure, and climate variability, including inconsistent rainfall (Kovalli, 2021). Though Tamil Nadu and Telangana maintained relatively higher yields, both also saw negative growth, indicating challenges in sustaining productivity without continuous investment in inputs, irrigation, and crop protection. The exception was Kerala, which showed a surprising 178.77% increase, though this likely reflects a very low base and small-scale intensive cultivation.

Northern India showed a mild decline in productivity by -3.00%, with Rajasthan recording a noticeable drop (-7.22%). These outcomes suggest that area expansion in the region has not been accompanied by proportional improvements in input use or agronomic efficiency. In contrast, Jammu & Kashmir recorded a 20.31% increase in productivity, likely benefiting from favourable weather, targeted extension services, and better access to inputs (Jhade *et al*, 2023).

The North-East region posted the most dramatic gains, with productivity surging by 648.86%—from 7.51 to 56.24 MT/ha. This jump is primarily due to improvements in Assam (43.79%) and Mizoram (29.26%), where focused interventions such as better-quality seeds, localised training, and support for vegetable crops have begun to yield results (Bhagat *et al*, 2022). However, states like Manipur (-26.29%) and Nagaland (-10.60%) continue to struggle due to limited technical capacity, small and fragmented landholdings, and lack of post-harvest facilities.

Eastern India achieved a moderate increase in productivity by 6.35%, driven largely by West Bengal (24.90%), which has invested in seed quality, extension, and input supply systems. In contrast, Jharkhand (-9.29%) and Odisha (0.69%) showed stagnant or declining trends, likely due to persisting gaps in infrastructure, irrigation, and crop management support.

Western and Central India, the core onion-producing belt, showed a 6.98% rise in productivity, reflecting the region's effective integration of improved technology, irrigation systems, and market-responsive practices. Maharashtra led the trend with a 10.87% increase, benefitting from high adoption of high-yielding varieties and robust storage infrastructure. Gujarat and Madhya Pradesh showed stable but modest gains (1.26% and 1.93%, respectively), suggesting that productivity growth may be plateauing without further innovation or resource optimisation.

In summary, regional differences in productivity are closely tied to input availability, water management, agronomic practices, and the effectiveness of extension services. While some regions are making substantial progress, others are either stagnating or declining. To ensure balanced productivity growth, policy measures should prioritise:

- Promoting climate-resilient and high-yielding varieties,
- Expanding micro-irrigation coverage,
- Strengthening pest and disease management,
- Investing in farmer training and digital advisory services.

A focus on these region-specific productivity drivers is essential for India to enhance its onion yield potential and ensure food system resilience.

Trends in Area, Production, and Productivity of Onion in Karnataka

Table 6 presents the long-term trends in onion cultivation in Karnataka, highlighting changes in area, production, and productivity over the period from the triennium ending (TE) 1985–86 to TE 2023–24. The data reveal a marked increase in the area under onion cultivation, which expanded from 43,388.66 hectares in TE 1985–86 to 203,119.33 hectares in TE 2023–24. This nearly fivefold rise reflects the growing economic significance of onion farming in the state, driven by increased irrigation coverage, higher market demand, and improved access to regional and export markets (Devi & Kumar, 2019).

In tandem with area expansion, total onion production surged from 235,694 tonnes to 1,845,619 tonnes during the same period. However, production has exhibited considerable fluctuations over the decades, peaking at 1,718,358.33 metric tonnes in TE 2018–19 before declining modestly in subsequent years. These variations are indicative of vulnerabilities to climatic disturbances, such as erratic rainfall and droughts, as well as pest and disease outbreaks, which have increasingly impacted the stability of output (Kovalli, 2021; Jhade *et al*, 2023).

Table 6: Trends in Area, Production, and Productivity of Onion in Karnataka

Year	Area (Hectare)	Production (Tonnes)	Productivity (Kg/ha)
TE 1985-86	43388.66	235694.00	5406.66
TE 1988-89	50891.66	278709.33	5515.33
TE 1991-92	52980.00	427198.00	8051.33
TE 1994-95	71524.00	428630.00	6032.33
TE 1997-98	91696.00	511533.66	5580.00
TE 2000-01	123552.33	719585.00	6014.00
TE 2003-04	121024.66	640945.00	5430.66
TE 2006-07	151212.00	880826.33	6176.00
TE 2009-10	163059.66	829936.66	5456.33
TE 2012-13	125271.66	757645.33	5665.66
TE 2015-16	193850.66	1148945.66	6210.33
TE 2018-19	187248.00	1718358.33	9922.33
TE 2021-22	233071.66	1920711.66	8538.33
TE 2023-24	203119.33	1845618.66	9501.00

Note: TE: Triennium ending

Productivity trends also show an overall upward trajectory, increasing from 5,406.66 kg/ha in TE 1985–86 to a high of 9,922.33 kg/ha in TE 2018–19, before slightly declining to 9,501.00 kg/ha in TE 2023–24. The peak productivity observed in TE 2018–19 corresponds with the diffusion of improved seed varieties, precision agriculture techniques, and enhanced water-use efficiency (Chengappa *et al*, 2012). Nevertheless, the recent decline in productivity signals emerging challenges related to soil fertility depletion, inconsistent input use, and the growing impact of climate variability. Farmers' adoption of high-input systems without corresponding soil management practices may have contributed to declining marginal returns (Parimalarangan, 2020).

Additionally, the role of market uncertainty in discouraging investment in productivity-enhancing technologies cannot be overlooked. Fluctuations in onion prices—often amplified by policy interventions such as export bans—affect farmer incentives and risk-bearing capacity (Jhade *et al*, 2023; Kovalli, 2021).

In summary, Karnataka's onion sector has witnessed commendable growth in area and production, supported by market integration and infrastructure development. However, sustaining productivity growth remains a critical concern. Policy efforts must focus on promoting climate-smart agriculture, improving input delivery systems, and strengthening storage and price stabilisation mechanisms. As noted by Chengappa *et al* (2012), integrating these strategies with robust extension services will be essential for maintaining yield stability and enhancing the resilience of Karnataka's onion farmers.

Growth Analysis of Onion Production in Karnataka

The Compound Annual Growth Rate (CAGR) analysis (Table 7) provides further insights into the decadal trends in Karnataka's onion sector. The highest area expansion (6.65%) was recorded between 1994-2003, driven by increased farmer participation and government support programs (Devi *et al*, 2019). However, the period from 2004-2013 saw negative growth in area (-1.47%) and production (-1.71%), likely due to climate uncertainties and declining market prices (Jhade *et al*, 2023).

Between 2014-2023, area under cultivation rebounded with a CAGR of 2.94%, while production grew at 6.69%, suggesting renewed interest in onion farming. This recovery was facilitated by higher market demand, better storage facilities, and improved export potential (Jhade *et al*, 2023). Despite these gains, productivity growth remained modest at 3.07%, indicating the need for technological advancements and efficient resource management (Chengappa *et al*, 2012; Parimalarangan, 2020).

Overall, while Karnataka remains a key onion-producing state, its growth trajectory is influenced by climate variability, fluctuating input costs, and price instability. To ensure sustainable growth, policymakers must focus on enhancing irrigation infrastructure, providing access to quality seeds, stabilising market prices, and promoting post-harvest storage solutions (Kovalli, 2021; Jhade *et al*, 2023). Future growth in Karnataka's onion sector will depend on adopting climate-smart agriculture and improving supply chain efficiencies to support farmers against market uncertainties.

Table 7: Compound Annual Growth Rate of Area, Production, and Productivity of Onion in Karnataka, 1984-85 to 2023-24

Year	CAGR (%)		
	Area	**Production**	**Productivity**
1985-1993	4.71***	12.29***	7.34***
1994-2003	6.65***	5.78***	-0.13 ^{NS}
2004-2013	-1.47 ^{NS}	-1.71 ^{NS}	-2.42 ^{NS}
2014-2023	2.94**	6.69***	3.07**
1984-2023	4.62 *	5.36 *	0.84***

Note: ***significant at 1% level, **significant at 5% level, *significant at 10% level and NS: not significant

Trends in Export of Indian Onion

India currently holds the position of the world's largest exporter of onions, a status underpinned by favourable agro-climatic conditions and extensive cultivation across multiple states, notably Maharashtra, Karnataka, and Rajasthan. The availability of diverse agro-ecological zones enables staggered harvesting cycles, facilitating year-round production and consistent export supply.

Indian onions are characterised by a distinctive combination of sweetness, firmness, and extended post-harvest shelf life—attributes that enhance their marketability and logistical viability in international trade. These quality parameters, coupled with price competitiveness, have strengthened India's comparative advantage in the global onion market.

The country's export portfolio is also notable for its varietal diversity, encompassing a range of types from high-pungency red onions to milder white cultivars. This enables Indian exporters to serve heterogeneous markets with varying consumer preferences, culinary traditions, and import standards.

Over the past decade, India's onion exports have witnessed sustained growth, particularly to markets in Africa, the Middle East, and South and Southeast Asia. These regions account for a substantial share of global onion imports and continue to exhibit increasing demand due to rising population, urbanisation, and changing dietary patterns.

India's strategic position in the global onion value chain highlights the critical interplay between agricultural policy, infrastructure development, and export-oriented production. However, volatility in domestic prices, periodic export restrictions, and post-harvest losses remain key challenges that warrant policy attention to ensure the long-term sustainability and competitiveness of the sector.

The international demand for onions and the broader behaviour of the world market significantly influence India's onion export performance. Exporters must continuously adapt to external conditions such as global supply shifts, policy changes, and demand trends. A resilient and responsive trade strategy—supported by investment in storage infrastructure, export logistics, and quality enhancement—is essential for maintaining India's leadership in the global onion market.

Table 8: Trends in Export of Onion during (1993-94 to 2023-24)

Year	Qty (Qtl)	Value (₹.Lacs)	Unit value (Rs./q)
TE 1994-95	3698010.00	20600.67	557.07
TE 1997-98	3253514.00	21457.33	659.51
TE 2000-01	3485262.00	27044.86	775.97
TE 2003-04	7728684.00	57386.85	742.51
TE 2006-07	11158290.00	96908.11	868.48
TE 2009-10	13815098.00	174050.40	1259.85
TE 2012-13	14864320.00	228641.20	1538.18
TE 2015-16	16789337.00	283460.50	1688.33
TE 2018-19	16408830.00	295946.40	1803.58
TE 2021-22	18802573.00	359383.00	1911.35
TE 2023-24	19267315.00	395924.60	2054.90

Note: TE: Triennium-ending

India's onion exports have shown consistent growth from 3,698,010 quintals in TE 1994-95 to 19,267,315 quintals in TE 2023-24, with export value rising from ₹20,600.67 lakhs to ₹395,924.60 lakhs (Table 8). The unit export value surged from ₹557.07 to ₹2054.90 per quintal, reflecting improved quality, storage, and strong global demand. Major importers include Bangladesh, Malaysia, and the UAE, benefiting from favourable trade policies and infrastructure improvements.

While exports grew steadily from 1994-2003, a sharp increase occurred post-2003, reaching 11,158,290 quintals by TE 2006-07. The fastest growth was recorded between TE 2009-10 and TE 2012-13, driven by higher production, improved logistics, and rising global prices (Sharma *et al*, 2017). From TE 2018-19 onward, exports remained high, reinforcing India's dominance in the global market. However, export bans to control domestic prices have disrupted supply chains and impacted India's reliability as a supplier (Rana *et al*, 2021).

Challenges include domestic price volatility, climate-induced production losses, and inconsistent trade policies (Sharma *et al*, 2017). To sustain growth, stabilising export regulations, expanding storage and supply chain infrastructure, and exploring new markets will be crucial (Sharma *et al*, 2017). Strengthening onion processing capabilities can further enhance India's competitiveness (Rana *et al*, 2021).

Trends in Import of Onion in India (2010-11 to 2023-24)

Table 9 depict fluctuations in India's onion imports, which peaked at 88,449.31 metric tonnes in TE 2019-21 due to supply shortages and rising demand, before declining to 19,363.54 metric tonnes in TE 2022-24 as production stabilised (APEDA, 2023).

Imports remained low at 3,108.1 MT during 2010-12 but surged to 23,506.09 MT in 2013-15, driven by market disruptions and supply constraints (Rana *et al*, 2021). The sharpest increase in 2019-21 resulted from climate-induced production losses and government measures to control prices.

To ensure market stability, India must enhance domestic production, expand storage infrastructure, and adopt consistent trade policies to reduce import reliance (Sharma *et al*, 2017).

Table 9: India's Onion Imports Trends Over the Years

Year	TE (2010-24)
2010-12	3108.1
2013-15	23506.09
2016-18	2050.49
2019-21	88449.31
2022-24	19363.54

Note: TE; Tri-annum ending

Trade Direction of Indian Onion Export (2000-01 to 2023-24)

Table 10 depicts the transitional probability matrix (TPM) for India's fresh onion exports, illustrating shifts in trade among major importing countries. Given the dynamic nature of trade, understanding these shifts is essential for informed decision-making (Kusuma and Shreeshail, 2016). The TPM was constructed using actual export proportions to different countries over the study period (Sharma *et al*, 2017). Comparative trade loss is represented by TPM row elements, while column elements indicate the probability of gaining trade volume from competing countries. Diagonal elements reflect the likelihood of retaining export volume from the previous year.

Kuwait, Bangladesh, Mauritius, and Nepal were the primary importers of Indian onions (Jhade *et al*, 2023). Kuwait remained the most stable market, with an 81.98% retention probability, though it lost shares to Nepal (5.26%) and Saudi Arabia (12.75%). Nepal followed with a 64.00% retention rate, losing a small share to the UAE. Bangladesh and Mauritius had retention rates of 52.20% and 52.50%, respectively, with Bangladesh losing its highest share (21.50%) to the UAE (Nalegaonkar *et al*, 2020). Conversely, the UAE, Saudi Arabia, Maldives, Oman, and other markets exhibited instability, failing to retain export shares from the previous year (Bhagat *et al*, 2022).

Table 10: Trade Direction of Indian Onion Export (2000-01 to 2023-24)

	U Arab Emts	Bangladesh Pr	Sri Lanka Dsr	Saudi Arab	Kuwait	Baharain Is	Mauritius	Maldives	Nepal	Oman	Indonesia	Qatar	Pakistan Ir	Saudi Arab	Others
U Arab Emts	0	0.582	0.386	0.031	0	0	0	0	0	0	0	0	0	0	0
Bangladesh Pr	0.215	0.522	0.176	0.007	0.011	0.006	0.004	0.002	0.012	0.009	0.000	0.007	0.023	0	0
Sri Lanka Dsr	0.445	0.354	0.081	0.029	0	0.033	0.015	0.003	0.033	0	0	0	0	0	0.002
Saudi Arab	0	0.705	0	0	0	0	0	0.036	0.256	0	0	0	0	0	0.001
Kuwait	0	0	0	0	0.8198116	0	0	0	0.0526884	0	0	0	0	0.1275	0
Baharain Is	0	0.620	0	0	0	0.368	0	0	0	0	0	0	0	0	0.011
Mauritius	0	0	0.199	0	0	0.275	0.525	0	0	0	0	0	0	0	0
Maldives	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Nepal	0.067	0.062	0	0	0	0	0	0.016	0.640	0.013	0	0.199	0	0	0
Oman	0	0.438	0	0	0	0	0	0	0	0	0.554	0	0	0.007	0
Indonesia	0.000	0.081	0	0	0.068	0	0	0.060	0.155	0	0.395	0.199	0	0.032	0.004
Qatar	0	0	0	0	0	0	0	0	0	0.636	0	0.167	0	0.196	0
Pakistan Ir	0.014	0.336	0	0	0.009	0	0	0	0	0.062	0.081	0	0.494	0	0
Saudi Arab	0	0	0	0.525	0	0	0	0.024	0	0	0	0	0	0.449	0
Others	0	0	0.243	0	0	0	0	0	0.697	0	0	0	0	0	0.058

Conclusion and Policy Implications

This study provides a comprehensive analysis of the long-term dynamics of onion cultivation and trade in India, with a focused examination of national and regional trends spanning nearly four decades (1984–2023). The findings underscore robust growth in both the area and production of onions at the national level, driven predominantly by the Western and Central regions, particularly Maharashtra, Madhya Pradesh, and Gujarat. However, productivity gains have been relatively modest and inconsistent, reflecting underlying agronomic and structural inefficiencies. Karnataka, despite being a major producing state, has experienced fluctuations in yield and output, pointing to vulnerability to climatic, market, and infrastructural constraints.

Regional disparities are stark: while some states demonstrate remarkable expansion supported by infrastructure and market integration, others—especially in the Southern and Northeastern regions—show declining trends in both area and production. Export trends reveal India's strong performance and market dominance in global onion trade, particularly with countries such as Bangladesh, Malaysia, and the UAE. However, trade direction analysis highlights instability and weak market retention in several importing countries, attributed in part to India's ad hoc export restrictions and price volatility.

Considering these findings, the following policy recommendations are proposed to ensure balanced, sustainable, and competitive growth in India's onion sector:

1. Promote Region-Specific Productivity Enhancement: Focused investments in research and development of regionally adaptable, high-yielding, and climate-resilient onion varieties are essential. This should be complemented by improved seed systems, extension services, and farmer training tailored to agro-climatic conditions.
2. Strengthen Post-Harvest and Storage Infrastructure: Expansion of cold storage, scientific warehousing, and decentralised pack houses will reduce post-harvest losses, stabilise supply, and improve price realisation. Particular attention is needed in underperforming regions such as Karnataka and Northeastern states.
3. Enhance Market Access and Price Stabilisation Mechanisms: Implementing minimum support price (MSP)-like interventions during peak harvest, coupled with efficient procurement and distribution systems, can reduce price crashes and disincentives for growers. Development of onion futures markets and digital platforms can further enhance transparency and predictability.
4. Establish Stable and Predictable Export Policies: Reducing ad hoc export bans and replacing them with calibrated export management frameworks—including buffer stocking and export quotas—can build India's credibility and consistency in global markets.
5. Expand Micro-Irrigation and Water-Efficient Practices: Given the sensitivity of onion yields to water stress, wider adoption of drip and sprinkler irrigation should be incentivised, particularly in water-scarce regions.
6. Leverage Digital Technologies and Advisory Systems: Mobile-based advisory tools, early warning systems for pests and weather, and real-time price intelligence can support farmer decision-making and reduce risks.

7. Encourage Regional Diversification and Inclusion: Special schemes targeting emerging and lagging regions, especially in Eastern and Northeastern India, should promote area expansion through infrastructure development, training, and access to credit and inputs.

By implementing these strategies, India can not only enhance its domestic onion productivity and regional equity but also consolidate its leadership in the global onion market. A coordinated and evidence-based approach to policy, anchored in regional realities and farmer-centric innovation, is essential for ensuring long-term resilience and competitiveness in the onion value chain.

References

APEDA (2023). Agricultural and Processed Food Products Export Development Authority. Government of India. Retrieved from https://apeda.gov.in

Beniwal, A., Poolsingh, D. and Shastry, S.S. (2022). Trends and Price Behaviour Analysis of Onion in India. *Indian Journal of Agricultural Economics*, 77 (4): 632-42.

Bhagat, A.A., Bhoge, R.S. and Shete, B.J. (2022). Stability Analysis of Indian Onion Export: A Markov Chain Approach. *The Pharma Innovation Journal*, 11(10S): 2291-93.

Braidotti, G., De Nobili, M. and Piani, L. (2020). Integrated Use of Local and Technical Soil Quality Indicators and Participatory Techniques to Select Them. A Review of Bibliography and Analysis of Research Strategies and Outcomes. *Sustainability*, 13 (1): 87.

Brichi, L., Fernandes, J.V., Silva, B.M., Vizú, J.D.F., Junior, J.N. and Cherubin, M.R. (2023). Organic Residues and their Impact on Soil Health, Crop Production and Sustainable Agriculture: A Review Including Bibliographic Analysis. *Soil Use and Management*, 39 (2): 686-706.

Chengappa P. G., Manjunatha A. V., Vikas D., and Khalil S. (2012). *Competitive Assessment of Onion Markets in India.* Report Prepared for Competition Commission of India, Government of India, ADRTC, ISEC, Bengaluru, Karnataka.

Devi, R. A., and Kumar, A. (2019). Study of Prospects and Scope of Onion Cultivation in India. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 6 (1): 829-83.

FAO (2023). Food and Agriculture Organization Food Production. Year Book.

Gulati, A., Ganguly, K., and Wardhan, H. (2022). *Tomato, Onion, and Potato (TOP) Value Chains.* In *Agricultural Value Chains in India* (p. 33). Springer Nature. DOI: https://doi.org/10.1007/978-981-33-4268-2.

Heilig, L. and Vob, S. (2017). Inter-terminal Transportation: An Annotated Bibliography and Research Agenda. *Flexible Services and Manufacturing Journal*, 29: 35-63.

Jhade Sunil, Abhishek Singh, Kuldeep Rajpoot, and Manjubala M. (2023). Export Performance and Comparative Analysis of Onion-with Reference to India. *Int J Stat Appl Math*, 8 (3): 133-140. DOI: 10.22271/maths.2023.v8.i3b.999

Koovalamkadu Velayudhan, P., Singh, A. and Korekallu Srinivasa, A. (2021). Exploring the Global Research Trends in Biofertilizers: A Bibliometric Approach. *3 Biotech*, 11 (6): 304.

Kovalli, C.B. (2021). *Price Behaviour and Market Integration of Onion in India* (Doctoral dissertation, Punjab Agricultural University, Ludhiana).

Krishnadas, M. (2010). Production and Export Performance of Major Indian Spices - An Economic Analysis. Ph.D. Thesis University of Agricultural Sciences, Dharwad, Karnataka State, India.

Kusuma, D.K. and Rudrapur, Shreeshail (2016). Production and Export Performance of Indian Onion-Markov Chain Analysis. *Agric. Update*, 11 (1): 70-74.

Laxkar, H., Sarawgi, A.K., Mishra, S. and Patel, S. (2022). Growth Rate and Trend of Area, Production and Productivity of Tomato, Potato and Onion (TOP) Commodities for Madhya Pradesh in Comparison to Other Major States of India: An Economic Analysis. *Asian Journal of Agricultural Extension, Economics & Sociology,* 40 (10): 924-31.

Nalegaonkar, A. R., S. S. More, R. D. Shelke and Gade, P. A. (2020). Direction of Trade and Changing Export Pattern of Onion. *Int.J.Curr.Microbiol.App.Sci.* 9 (11): 2755-2760. doi: https://doi.org/10.20546/ijcmas.2020.911.334

Parimalarangan, R. (2020). Trends in Area, Production and Productivity in Onion in Tamil Nadu. *International Journal of Environment and Climate Change*, 10 (11): 95-99.

Rana, M.J., Islam, S. and Kamruzzaman, M. (2021). Growth and Instability in Area, Production, and Productivity of Major Spices in Bangladesh. *Journal of Agriculture and Food Research*, 6: 100216.

Sharma, A., Ojha, A., Praveen, K.V., Aditya, K.S. and Pokharna, P. (2017). International Trade Potential of Indian Onion: An Analysis of Competitive Advantage and Direction of Trade. *Indian Journal of Economics and Development*, 13 (2): 315-320.

Sharma, H., Parihar, T.B. and Kapadia, K. (2017). Growth Rates and Decomposition Analysis of Onion Production in Rajasthan State of India. *Economic Affairs,* 62 (1): 157-161.

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