



Research Article

GROWTH AND TRENDS OF ONION CULTIVATION IN DIFFERENT ZONES IN HARYANA

USHA¹, SHIVAM², NIMBRAYAN P.K.³ AND LUHACH V.P.¹

¹Department of Agricultural Economics, CCS Haryana Agricultural University, Hisar, 125004, Haryana, India

²Department of Business Management, CCS Haryana Agricultural University, Hisar, 125004, Haryana, India

³Department of Agricultural Economics and Extension, School of Agriculture, Lovely Professional University, Phagwara, 144411, Punjab, India

*Corresponding Author: Email - parv2509@gmail.com

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Abstract: The present study was conducted to know the growth and trends in the different agro-ecological zones of Haryana. Compound annual growth rates of area, production, and productivity for a period from 2000-01 to 2020-21 were calculated. It is revealed from the study that, the area under onion cultivation has grown by 10.18 percent in the case of zone-I whereas in zone-II and zone-III, it was found 10.74 and 2.23 percent CGR, respectively. Production of onion has been increased by 15.33 per cent in zone-I, 12.32 percent in zone-II and 7.01 percent in zone-III. In case of productivity, highest (4.68 percent) increase was observed in zone-III followed by 4.67 and 1.43 percent in zone-I and zone-II, respectively. Compound annual growth rate in area, production and productivity in overall Haryana was 4.07, 6.56 and 2.40 percent, respectively.

Keywords: Compound annual growth, Haryana, Onion

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Introduction

One of the most significant commercial vegetables cultivated and eaten practically everywhere in the globe since at least 4000 BC is the onion (*Allium cepa* L.). The area surrounding the Mediterranean Sea and North-West India, Afghanistan, Kazakhstan, Uzbekistan, Western Tianshan, and Western Asia are the secondary centres of growth. Although it is categorised as a vegetable, it has unique properties that enhance the flavor and taste of food, making it mostly utilized in Indian cuisine. India is the greatest producer in the world, contributing 25.57 percent of the total global output (Food and Agriculture Organization, 2020), with a production of 26.74 million tonnes (2020) and an average productivity of 18.65 tonnes per hectare. Between 1991–1992 and 2017–2018, the area under onion cultivation almost tripled, while output grew by roughly four times (Horticultural Statistics at a Glance, 2018). Maharashtra (8854.09 thousand MT), Madhya Pradesh (3701.01 thousand MT), Karnataka (2986.59 thousand MT), Bihar (1240.59 thousand MT), and Andhra Pradesh are the top five states in terms of onion output (915.73 thousand MT) [1,2]. About 90% of India's production of onions comes from the top 10 states [3,4]. The production per hectare varied throughout the states, with Gujarat leading with 24.25 tonnes/ha and Odisha coming in last with 10.77 tonnes/ha. Mewat, Yamunanagar, and Ambala are the main onion producing regions, but district Fatehabad, with productivity of 39.89 tonnes per ha, is at the top, followed by Karnal and Sonapat, with productivity of 36.34 and 32.63 tonnes per ha, respectively (hortiharyana.gov.com). Haryana is in ninth place with an average productivity of 20.45 tonnes/ha and production of 6.40 lakh tonnes [5,6].

Material and Methods

The present study was conducted in Haryana state. On the basis of Agro-climatic conditions, the state was divided into three zones. One district from each Agro-climatic Zones was purposively selected on the basis of highest production of onion in respective zones for the study of growth and trend during 2001-02 to 2020-21. Zone-I is wet zone: Yamunanagar Zone-II is semi-arid zone: Mewat and Zone-III is arid zone: Bhiwani.

To accomplish the objectives of the study, the data collected was statistically analyzed. Tabular method was used to analyze the data. Simple averages and percentages were worked out. Cost and returns of onion cultivation, marketing and storage system and losses incurred at different stages and their efficiency was also worked out in three zones of state. For this purpose, following techniques were adopted.

Growth rate analysis

The compound growth rate (CGR) is the mean annual growth rate of an investment over a specified period of time longer than one year. Compound growth rates (CGR) in area, production and productivity of onion for the Haryana were calculated for the period of 20 years *i.e.*, 2000-01 to 2020-21. The exponential function of the following formula was used to calculate the compound growth rates:

$$Y_t = a b^t u^t$$

$$\text{Log } Y_t = \text{Log } a + t \text{ Log } b + \text{Log } u_t$$

Where,

Y_t - Area/production/productivity of onion in year t

t - Time elements which take the value 1, 2, 3, 4... n

a - Intercept

b - Regression coefficient

u_t - Error term

Compound growth rates were worked out as follow:

$$\text{Compound growth rate (r)} = (b-1) \times 100$$

Result and Discussion

Compound annual growth rates of area, production, and productivity of onion in different zones for a period from 2000-01 to 2020-21 were calculated and the results are presented in the [Table-1-4]. It is revealed from the [Table-1] that, that the maximum area under onion cultivation in zone-I was in year 2021-22 and CGR in area was found 10.18 percent, it means positive growth during the period.

Growth and Trends of Onion Cultivation in Different Zones in Haryana

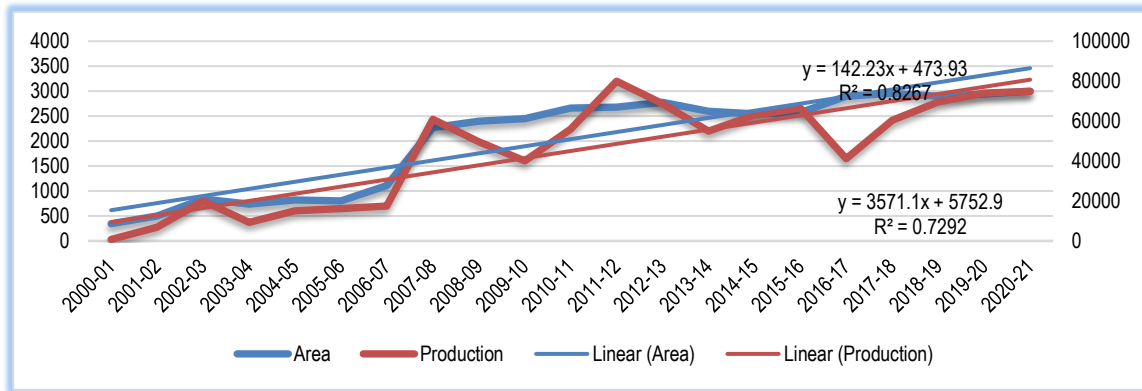


Fig-1 Trends in area, production and productivity of onion in zones-I

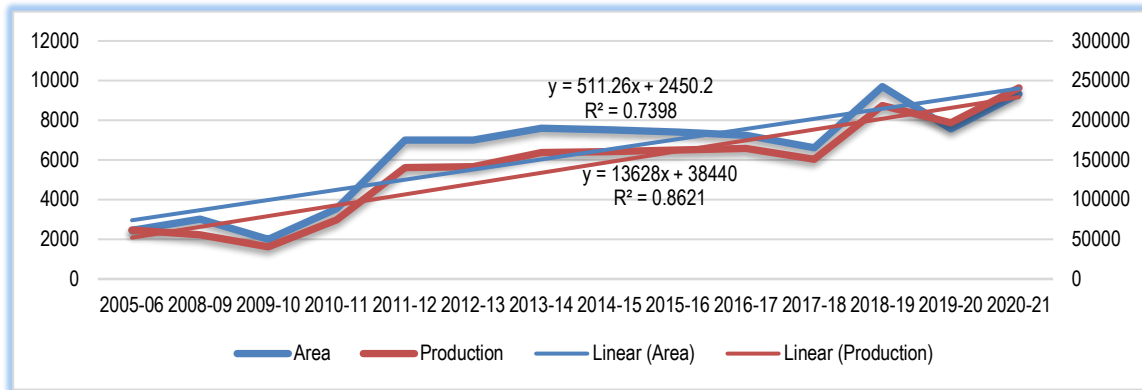


Fig-2 Trends in area, production and productivity of onion in zones-II

The average area during the period in zone-I was 2038.43 ha. The R^2 in area was recorded as 0.8267. In case of production in zone-I the maximum production (79970 tonnes) was observed in the year 2011-12. The CGR in production of zone-I was 15.33 percent [7]. The R^2 in production was observed as 0.7292. During the period the CGR in productivity was 4.67 percent.

Table-1 Growth in area, production and productivity of onion in zones-I

Year	Area (ha)	Production (Tonnes)	Productivity (T ha ⁻¹)
2000-01	345	741	2.15
2001-02	500	6850	13.70
2002-03	838	20126	24.02
2003-04	740	9333	12.61
2004-05	820	15079	18.39
2005-06	805	16201	20.13
2006-07	1110	17525	15.79
2007-08	2272	60921	26.81
2008-09	2400	49678	20.70
2009-10	2452	40053	16.33
2010-11	2660	55876	21.01
2011-12	2680	79970	29.84
2012-13	2776	68802	24.78
2013-14	2600	54912	21.12
2014-15	2546	62932	24.72
2015-16	2570	66560	25.90
2016-17	2900	41280	14.23
2017-18	2953	60457	20.47
2018-19	2895	69557	24.03
2019-20	2945	74050	25.14
2020-21	3000	74825	24.94
Average	2038.43	45034.67	20.32
CAGR	10.18	15.33	4.67

[Table-2] presented the timeseries data of zone-II i.e., Mewat. In case of zone-II the data from 2000-01 to 2004-05 and 2006-07 to 2007-08 was unavailable. In the zone-II maximum area (9325 ha) was observed in year 2020-21. During the period the CGR in zone-II was 10.74 percent with average area 6284.64 ha. The R^2 in area was 0.7398. In case of production in zone-II the average production during the period is 140649.36 tonnes and CGR was 12.32 percent 0.8621. The productivity in zone-II was higher in 2019-20 and CGR during the period was 1.43 percent.

It is observed from the [Table-3] that, that the maximum area (1360 ha) under onion cultivation in zone-III was in year 2013-14 and CGR in area was found 2.33 percent, it means positive growth during the period [8-10].

In comparison of all the zones, this zone-III has least CGR in area. The average area during the period in zone-III was 903.81 ha.

Table-2 Growth in area, production and productivity of onion in zones-II

Year	Area (ha)	Production (Tonnes)	Productivity (T ha ⁻¹)
2005-06	2450	61870	25.25
2008-09	3010	55803	18.54
2009-10	2000	40532	20.27
2010-11	3550	145552	21.00
2011-12	7000	140450	20.06
2012-13	7000	141558	20.22
2013-14	7600	159486	20.99
2014-15	7520	160383	21.33
2015-16	7400	162626	21.98
2016-17	7250	164647	22.71
2017-18	6610	150708	22.80
2018-19	9700	218766	22.55
2019-20	7570	196820	26.00
2020-21	9325	240890	25.83
Average	6284.64	140649.36	22.11
CAGR	10.74	12.32	1.43

Table-3 Growth in area, production and productivity of onion in zones-III

Year	Area (ha)	Production (Tonnes)	Productivity (T ha ⁻¹)
2000-01	785	8867	11.30
2001-02	700	6850	9.79
2002-03	1256	20836	16.59
2003-04	322	3839	11.92
2004-05	248	4688	18.90
2005-06	939	14432	15.37
2006-07	1010	16511	16.35
2007-08	750	16295	21.73
2008-09	735	11871	16.15
2009-10	610	10883	17.84
2010-11	1340	25544	19.06
2011-12	1340	22352	16.68
2012-13	1350	29423	21.79
2013-14	1360	31324	23.03
2014-15	682	16205	23.76
2015-16	1333	31379	23.54
2016-17	919	21807	23.73
2017-18	526	12087	22.98
2018-19	739	17253	23.35
2019-20	962	35920	37.34
2020-21	1074	33340	31.04
Average	903.81	18652.67	20.11
CAGR	2.23	7.01	4.68

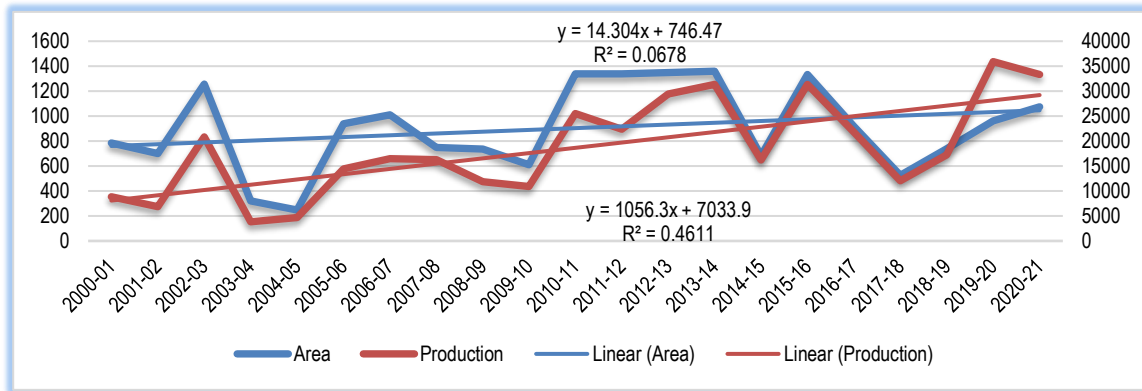


Fig-3 Trends in area, production and productivity of onion in zones-III

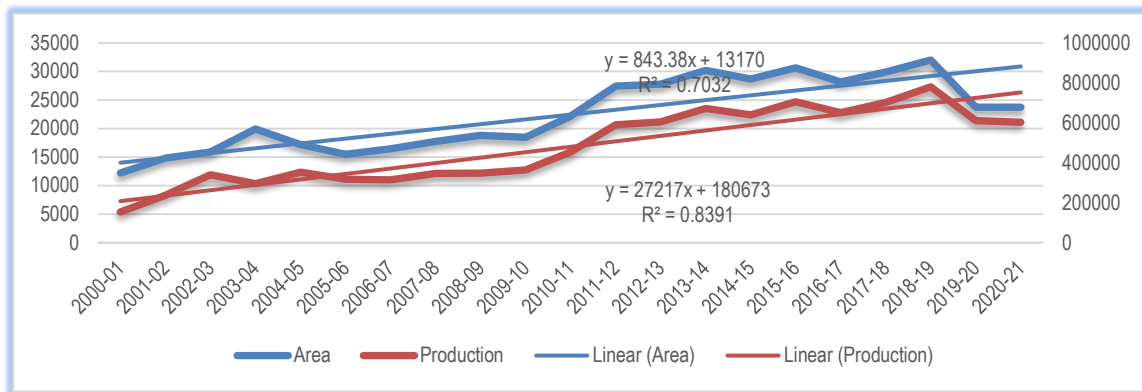


Fig-4 Trends in area, production and productivity of onion in Haryana

The R^2 in area was recorded as 0.0678. In case of production in zone-I the maximum production (35920 tonnes) was observed in the year 2019-20. The CGR in production of zone-I was 7.01 percent. The R^2 in production was observed as 0.4611. In zone-III maximum productivity (37.34 tonnes ha⁻¹) was observed during the period 2019-20 while lease (9.79 tonnes ha⁻¹) was observed in 2001-02. The average productivity in zone-III was observed 20.11 tonnes ha⁻¹. During the period the CGR in productivity was 4.68 percent.

Table-4 Growth in area, production and productivity of onion in Overall Haryana

Year	Area (ha)	Production (Tonnes)	Productivity (T ha ⁻¹)
2000-01	12212	153838	12.60
2001-02	14825	236835	15.98
2002-03	15900	340161	21.39
2003-04	19897	294650	14.81
2004-05	17179	352967	20.55
2005-06	15494	317699	20.50
2006-07	16430	314910	19.17
2007-08	17747	346614	19.53
2008-09	18796	347942	18.51
2009-10	18440	364402	19.76
2010-11	22160	453862	20.48
2011-12	27448	589830	21.49
2012-13	27800	604469	21.74
2013-14	30163	672165	22.28
2014-15	28688	640215	22.32
2015-16	30645	705795	23.03
2016-17	28164	650394	23.09
2017-18	29931	701504	23.44
2018-19	32010	780150	24.37
2019-20	23749	610443	25.70
2020-21	23713	602345	25.40
Average	22447.19	480056.67	20.77
CAGR	4.07	6.56	2.40

Compound annual growth rates of overall Haryana in area, production, and productivity for a period from 2000-01 to 2020-21 were calculated and the results are presented in the [Table-4]. It is revealed from the table that, that the maximum area (32010 ha) under onion cultivation in Haryana was observed during 2018-19. The average area under onion cultivation in Haryana was 22447.19 ha and CGR during the period was 4.07 percent [11-15]. The R^2 of Haryana area was observed as a 0.7032. In case of onion production in Haryana, maximum production (780150 tonnes) was recorded in 2018-19.

The CGR and R^2 of onion production during period was 6.56 percent and 0.8391, respectively. Average productivity of onion cultivation in overall Haryana during the period was 20.77 and CGR was 2.40 percent.

Conclusion

Onion one of the most significant vegetable crops cultivated all around the world. India is the largest producer in the world, with 26.74 million tonnes and an average productivity of 18.65 tonnes per hectare. The present study was conducted to find out the growth and trends in the different agro-ecological zones of Haryana. Compound annual growth rates of area, production, and productivity for a period from 2000-01 to 2020-21 were calculated. It is revealed from the study that, the area under onion cultivation has grown by 10.18 percent in the case of zone-I whereas in zone-II and zone-III, it was found 10.74 and 2.23 percent CGR, respectively. Production of onion has been increased by 15.33 per cent in zone-I, 12.32 percent in zone-II and 7.01 percent in zone-III. In case of productivity, highest (4.68 percent) increase was observed in zone-III followed by 4.67 and 1.43 percent in zone-I and zone-II, respectively.

Application of research: Research shows compound annual growth rate in area, production and productivity in overall Haryana was 4.07, 6.56 and 2.40 percent, respectively.

Research Category: Agricultural Economics

Abbreviations: CGR-combined annual growth rate

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Research project name or number: MSc Thesis

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Yamunanagar, Mewat, Bhiwani

Cultivar / Variety / Breed name: Onion (*Allium cepa* L.)

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Ethical Committee Approval Number: Nil

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