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Recent Trends in Area, Production and Productivity of Rapeseed and Mustard and Chickpea in Haryana and India

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ABSTRACT: Rapeseed and mustard and chickpea are essential oilseed and pulse crops in India providing a reliable source of human nourishment and serving as a key component of climate-resilient agricultural systems. The spread of rapeseed-mustard and chickpea cultivation to fresh areas under alternative cropping systems, as well as an integrated approach to plant-water, nutrient, and pest management, will play a major role in further boosting and stabilizing the productivity and production of these crops. The present study was carried out with the objectives to analyze the trend in area, production and productivity of rapeseed & mustard and chickpea. The outcomes of study revealed an increasing trend in the area, production and productivity of rapeseed & mustard at the national level with CAGR values of 0.14, 2.17 and 1.92 per cent, respectively. Whereas, in Haryana, the trend in area indicated increasing trend 0.05 per cent, while production and productivity illustrated increasing trend with CAGR values of 2.37 and 3.67 per cent, respectively. In this study, an increasing trend was shown in the area, production and productivity of chickpea at the national level with CAGR values of 1.87, 3.30 and 1.41 per cent, respectively. Whereas, in Haryana, the trend in area and production indicated decreasing trend -8.14 per cent and -6.88 per cent while productivity illustrated increasing trend with CAGR values of 1.32 per cent, respectively. In case production, the maximum production of rapeseed and mustard was 9256 thousand tones during 2018-19 in India. While in case of chickpea, the production was maximum in 2017-18 *i.e.* 11379 thousand tones.

Keywords: Compound Annual Growth Rate (CAGR), Chickpea, Growth rate, Productivity, Rapeseed and mustard, Recent trends.

INTRODUCTION

Rapeseed & mustard is the key source of income mainly for the marginal and small farmers in rain-fed areas. Thus this crop is cultivated mainly in the rain-fed and resource vulnerable regions of the country, their effect to livelihood safety of the small and marginal farmers in these regions are also very important (Shekhawat *et al.,* 2012). Despite the high quality of pulses and oilseeds and their adaptability to a wide range of agro-climatic conditions, India's area, production, and yield have been fluctuating due to biotic and abiotic stresses, including the country's domestic price support programme (Kumar *et al.,* 2016; Kumar *et al.,* 2018). Indian mustard is mainly cultivated in the states of Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh, and Gujarat which contribute 81.50 per cent area and 87.50 per cent production (Meena and Hosmaani, 2012; Agarwal, 1988). Chickpea is an important pulse crop grown and consumed all over the world, mainly in the Afro Asian Countries. It is also one of the major pulse crops cultivated and consumed in India and also known as Bengal gram (Avinash and Patil, 2018). In India, chickpea accounts for about 45 per cent of total pulses production. Similar the case of other pulses, India is the major chickpea producing country and contributing for over 75 per cent of total world chickpea production. The study examined the dynamics of mustard acreage, output, and productivity in India, Uttar Pradesh from 1996 to 2019. According to the growth trend study, mustard area was dropping with compound growth rates of 0.2 and 2% per year in India and Uttar Pradesh, respectively (Kalia *et al.,* 2021). Total area under rapeseed & mustard cultivation was 6856.27 (000 ha) while total production was 9123.64 (000 tones) and productivity was 1331 kg/ha in India (Indiastat, 2020). Total chickpea area in India was 9698.75 thousand hectares while production was 11078.50 thousand tones and productivity was 1142 kg/ha in India (Indiastat, 2020). During the year 2019-20, total area of oilseed

was recorded 659 thousand hectares and production 1175.23 thousand tones in Haryana. Out of total oilseed area, rapeseed and mustard area was recorded 641.30 thousand hectares and production 1149.85 thousand tones in Haryana in the year 2019-20 (Indiastat, 2020). Total area of pulses was recorded 69.66 thousand hectares and production 64.38 thousand tones in Haryana in 2019-20. Out of total pulses area, area under the chickpea was recorded 43.97 thousand and production was 47.14 thousand tones in Haryana in the year 2019-20 (Indiastat, 2020).

MATERIALS AND METHODS

A. Analytical tools and techniques

The collected data were analyzed by using the following tools and techniques to achieve the specified objectives:

B. Estimation of growth rate

Secondary data regarding area, production and productivity of rapeseed & mustard and chickpea were collected from various published and unpublished sources like statistical abstracts of Haryana, Government of Haryana from 1995-96 to 2019-20 for rapeseed & mustard and chickpea crops.

The CAGR was calculated to show the trends in area, production and productivity. The growth rates were estimated using exponential growth functional form as under

$$Y = ab^t \quad (1)$$

Where, Y = Index number of area, production, productivity as the

Dependent variable

t = Time variable (year) as independent variable

a = Intercept

b =Regression coefficient

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

$$\log y = \log a + t \log b \quad (2)$$

$$\log y = A + B\,t \quad (3)$$

Where, A= log a B = log b

The compound growth rate "r" was computed as:

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

RESULTS AND DISCUSSIONS

A. Trends in area, production and productivity of rapeseed & mustard and chickpea

Rapeseed and mustard was the key source of income mainly even to the marginal and small farmers in rain fed areas. Thus this crop was cultivated mainly in the rain-fed and resource vulnerable regions of the country, their effect to livelihood safety of the small and marginal farmers in these regions are also very important. Chickpea was also an important pulse crop grown and consumed all over the world, mainly in the Afro-Asian countries. It was also one of the major pulse crops cultivated and consumed in India and also known as Bengal gram.

B. Trends in area, production and productivity of rapeseed and mustard in India

It was evident from the Table 1 that in the period (1995-2020), Compound annual growth rate in area, production and productivity of total rapeseed and mustard in India recorded was 0.14, 2.17 and 1.92 per cent respectively. Area of rapeseed and mustard was maximum in the year 2004-05 *i.e.* 7316 thousand ha while minimum in 2000-01 (4477 thousand ha). In case of production maximum was found in the year 2018-19 *i.e.* 9256 thousand tones and minimum (3880 thousand tones) in 2002-03. Productivity of rapeseed & mustard in India was maximum (1511 Kg/ ha) in the year 2018-19 while minimum (668 Kg/ha) in the year 1997-98.

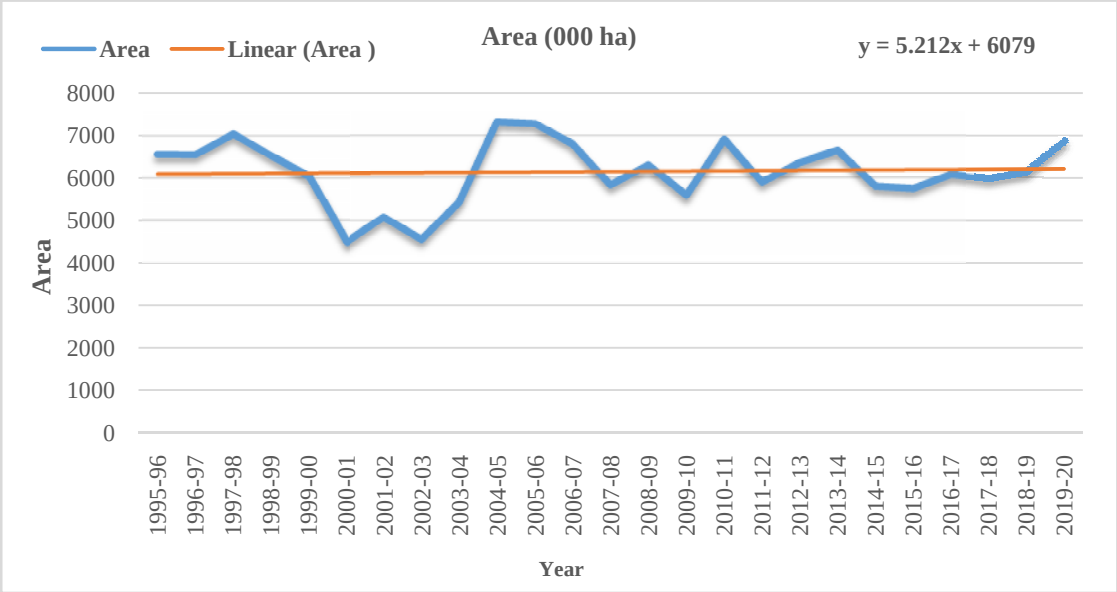

Fig. 1. Trend in area of rapeseed and mustard in India.

Table 1: Trends in area, production and productivity of rapeseed and mustard in India.

Year	Area ('000 ha)	Production (000'Tones)	Productivity (kg/ha)
1995-96	6547	6000	916
1996-97	6545	6658	1017
1997-98	7041	4703	668
1998-99	6513	5664	870
1999-00	6027	5790	961
2000-01	4477	4190	936
2001-02	5073	5083	1002
2002-03	4544	3880	854
2003-04	5428	6291	1159
2004-05	7316	7593	1038
2005-06	7276	8131	1117
2006-07	6790	7438	1095
2007-08	5826	5834	1001
2008-09	6298	7201	1143
2009-10	5588	6608	1183
2010-11	6901	8179	1185
2011-12	5894	6604	1121
2012-13	6363	8029	1262
2013-14	6646	7877	1185
2014-15	5799	6282	1083
2015-16	5746	6797	1183
2016-17	6074	7917	1134
2017-18	5977	8430	1410
2018-19	6124	9256	1511
2019-20	6856	9124	1331
CAGR	**0.14**	**2.17**	**1.92**

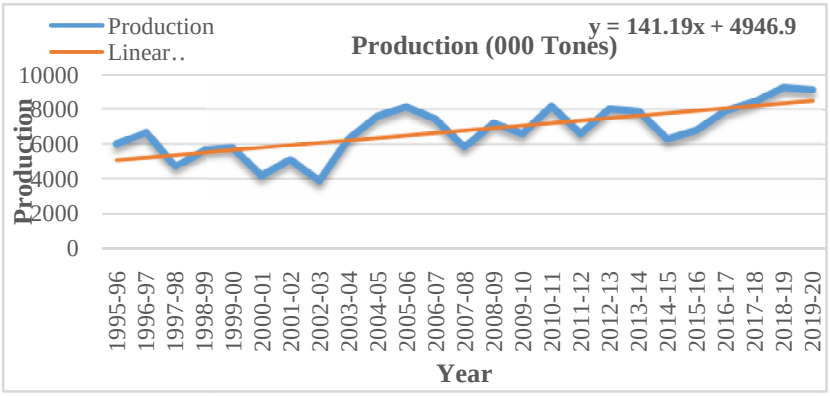

Fig. 2. Trend in production of rapeseed and mustard in India.

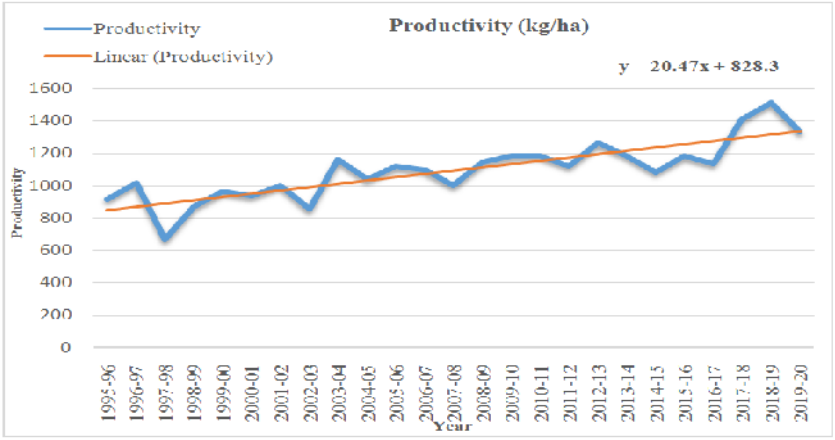

Fig. 3. Trend in productivity of rapeseed and mustard in India.

C. Trends in area, production and productivity of chickpea in India

It was observed from the Table 2 that compound annual growth rate in area, production and productivity of chickpea in India was recorded 1.87, 3.30 and 1.41 per cent respectively in the period (1995-2020). In case of area of chickpea was maximum in the year 2017-18 *i.e.* 10560 thousand ha while minimum in 2000-01(5185 thousand ha).

Table 2: Trends in area, production and productivity of chickpea in India.

Year	Area (000 ha)	Production (000 Tones)	Productivity (kg/ha)
1995-96	7116	4979	700
1996-97	6847	5570	814
1997-98	7563	6132	811
1998-99	8469	6801	803
1999-00	6146	5118	833
2000-01	5185	3855	744
2001-02	6416	5473	853
2002-03	5906	4237	717
2003-04	7048	5718	811
2004-05	6715	5469	815
2005-06	6926	5600	808
2006-07	7494	6334	845
2007-08	7544	5749	762
2008-09	7893	7060	895
2009-10	8169	7476	915
2010-11	9186	8221	895
2011-12	8299	7702	928
2012-13	8522	8833	1036
2013-14	9927	9526	960
2014-15	8251	7332	889
2015-16	8399	7058	840
2016-17	9626	9378	974
2017-18	10560	11379	1078
2018-19	9547	9938	1041
2019-20	9699	11078	1142
CAGR	**1.87**	**3.30**	**1.41**

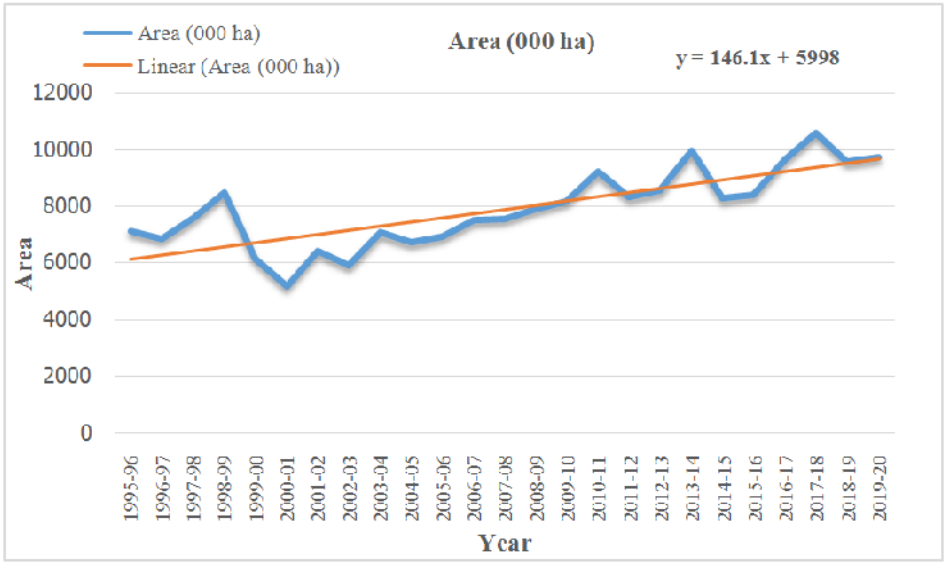

Fig. 4. Trend in area of chickpea in India.

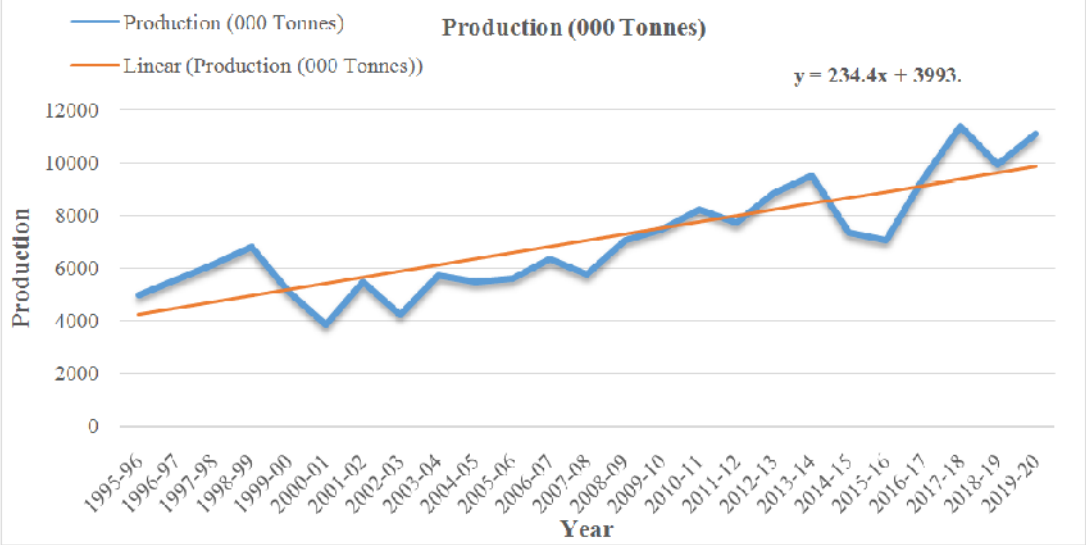

Fig. 5. Trend in production of chickpea in India.

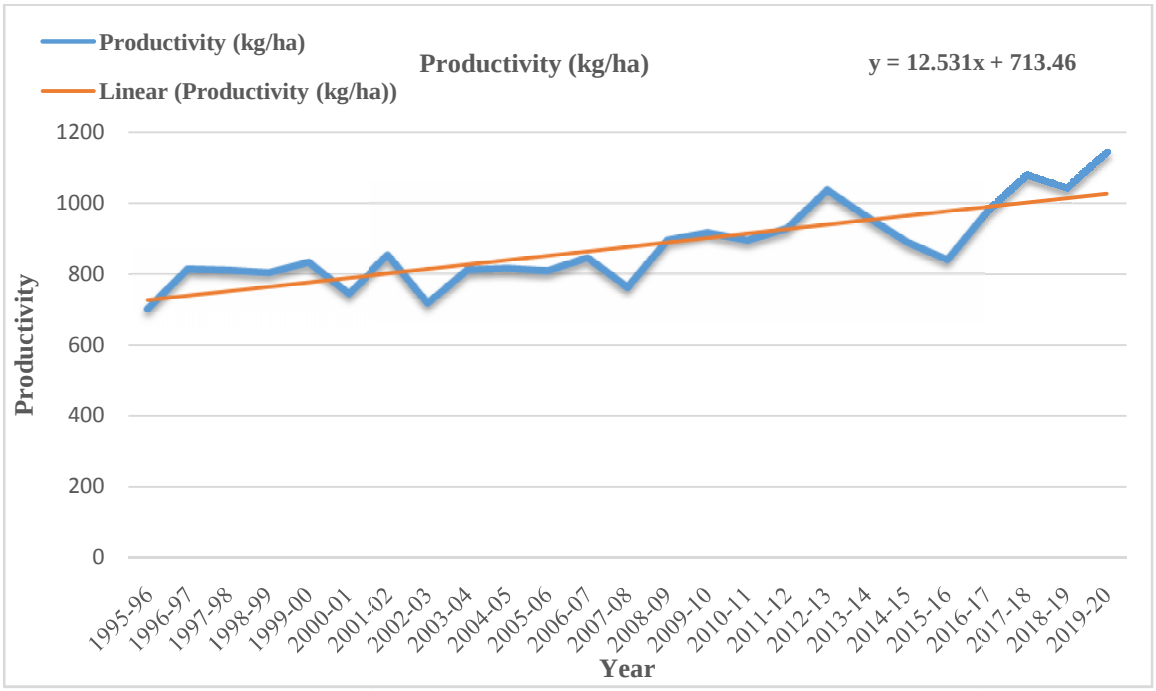

Fig. 6. Trend in productivity of chickpea in India.

Production of chickpea was maximum (11379 thousand tones) in the year 2017-18 while minimum (3855 thousand tones) in the year 2000-01. Productivity of chickpea in India was maximum (1142 Kg/ ha) in the year 2019-20 while minimum (700 Kg/ha) in the year 1995-96.

D. Trends in area, production and productivity of Rapeseed and Mustard in Haryana

It is found from the Table 3 that in the period (1995-2020), compound annual growth rate in area, production and productivity of total rapeseed and mustard in Haryana documented was 0.05, 2.37 and 3.67 per cent, respectively. Area of rapeseed and mustard was maximum in the year 2005-06 *i.e.* 707.80 thousand ha while minimum in 2000-01 (408.80 thousand ha). In case of production maximum was found in the year 2019-20 *i.e.* 1149.85 thousand tones and minimum (368.00 thousand tones) in 1997-98. Productivity of rapeseed and mustard in Haryana was maximum (2018 kg/ ha) in the year 2018-19 while minimum (605 kg/ha) in the year 1995-96.

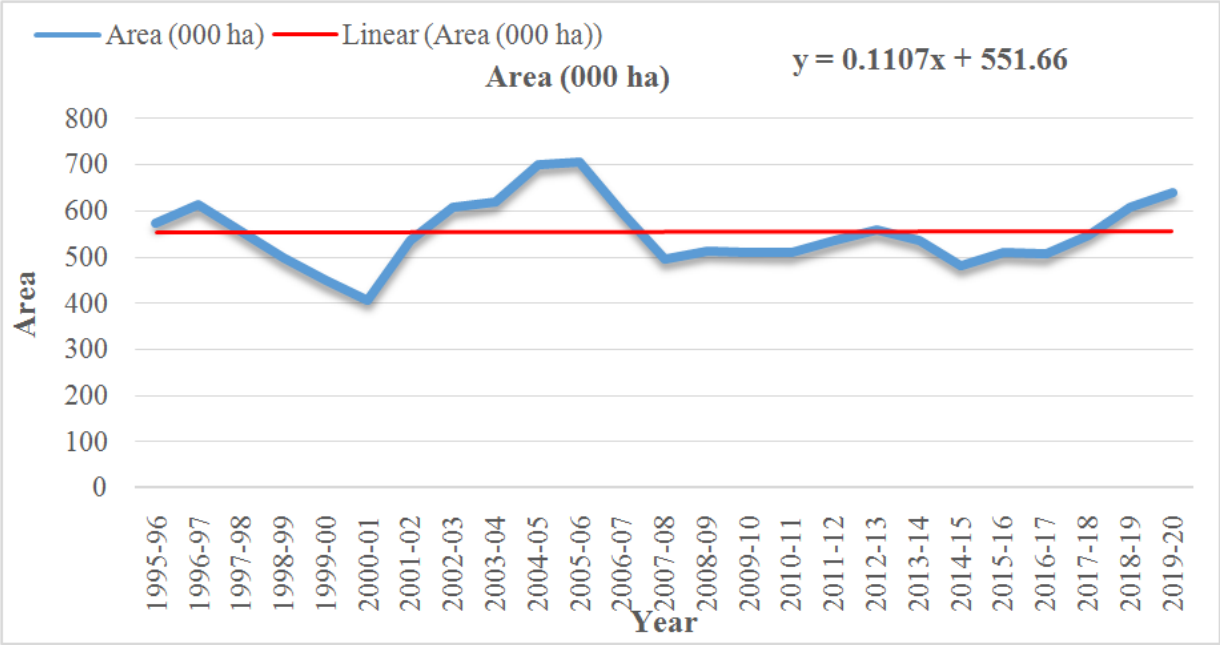

Fig. 7. Trend in area of rapeseed and mustard in Haryana.

Table 3: Trends in area, production and productivity of rapeseed and mustard in Haryana.

Year	Area (000 ha)	Production (000 Tons)	Productivity (kg/ha)
1995-96	574.60	729.00	605
1996-97	612.70	894.00	650
1997-98	556.00	368.00	662
1998-99	498.00	615.00	1235
1999-00	449.00	595.00	1322
2000-01	408.80	560.00	1369
2001-02	536.40	800.00	1490
2002-03	607.00	697.00	1148
2003-04	619.20	965.00	1559
2004-05	699.80	824.00	1177
2005-06	707.80	792.80	1117
2006-07	598.10	804.00	1344
2007-08	496.50	597.00	1202
2008-09	514.00	894.90	1722
2009-10	511.10	847.00	1657
2010-11	509.70	953.00	1852
2011-12	535.90	747.00	1394
2012-13	558.30	959.30	1722
2013-14	536.90	878.00	1611
2014-15	481.90	706.00	1432
2015-16	510.40	823.00	1669
2016-17	506.10	946.10	1830
2017-18	548.90	1107.50	2018
2018-19	609.08	1286.5	2018
2019-20	641.3	1149.85	1793
CAGR	**0.05**	**2.37**	**3.67**

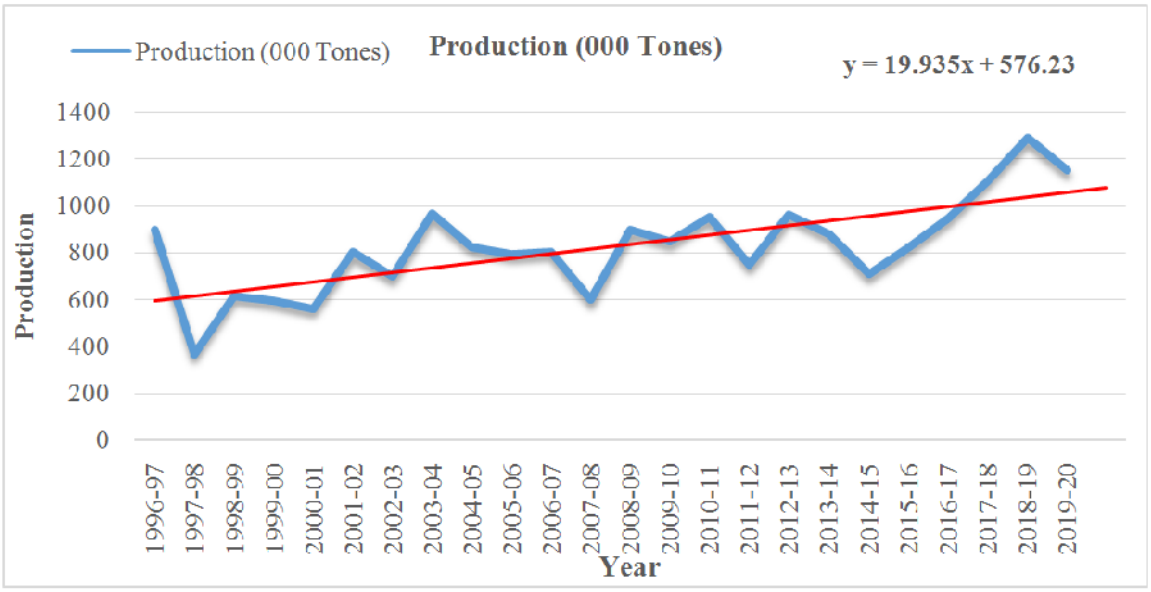

Fig. 8. Trend in production of rapeseed and mustard in Haryana.

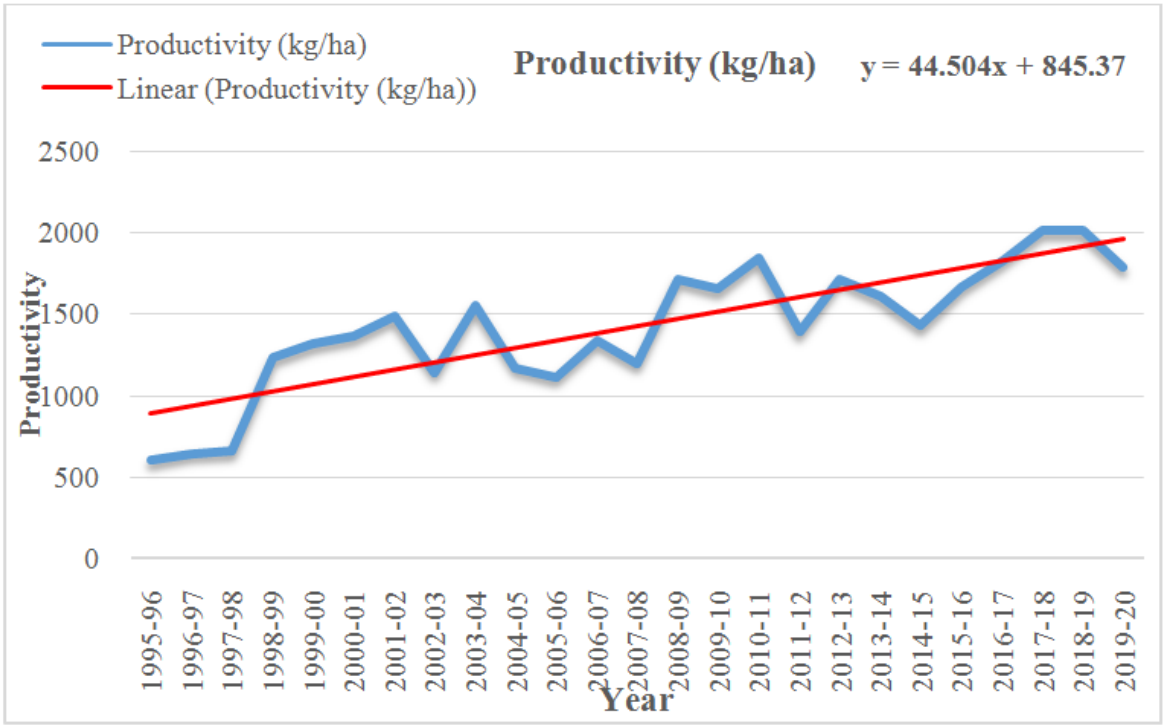

Fig. 9. Trend in productivity of rapeseed and mustard in Haryana.

E. Trend in area, production and productivity of chickpea in Haryana

It was evident from the Table 4 compound annual growth rate for the period (1995-2020). Compound annual growth rate in area, production and productivity of chickpea in Haryana was noted -8.14, -6.88 and 1.32 per cent, respectively. In case of area of chickpea was maximum in the year 1995-96 i.e. 376.70 thousand ha while minimum in 2017-18 (32 thousand ha). Production of chickpea was maximum (381 thousand tones) in the year 1995-96 while minimum (27.00 thousand tones) in the year 2015-16. Productivity of chickpea in Haryana was maximum (1385 kg/ ha) in the year 2018-19 while minimum (505 kg/ha) in the year 2007-08.

Table 4: Trends in area, production and productivity of chickpea in Haryana.

Year	Area(000 ha)	Production (000Tonnes)	Productivity (kg/ha)
1995-96	376.70	381.00	1,010
1996-97	345.10	276.00	799
1997-98	353.90	309.00	872
1998-99	357.00	294.00	824
1999-00	100.40	58.00	577
2000-01	124.50	80.00	640
2001-02	142.50	122.00	853
2002-03	54.70	41.00	745
2003-04	122.80	100.00	813
2004-05	107.90	91.00	843
2005-06	129.80	72.00	554
2006-07	107.70	90.00	843
2007-08	107.30	54.00	505
2008-09	123.60	129.00	1040
2009-10	84.10	62.00	735
2010-11	111.50	110.00	982
2011-12	78.90	73.00	924
2012-13	47.00	53.00	1128
2013-14	82.60	72.00	867
2014-15	65.10	42.00	646
2015-16	43.00	27.00	619
2016-17	37.10	46.40	1179
2017-18	32.00	36.40	1125
2018-19	44.9	62.2	1385
2019-20	43.97	47.14	1072
CAGR	**-8.14**	**-6.88**	**1.32**

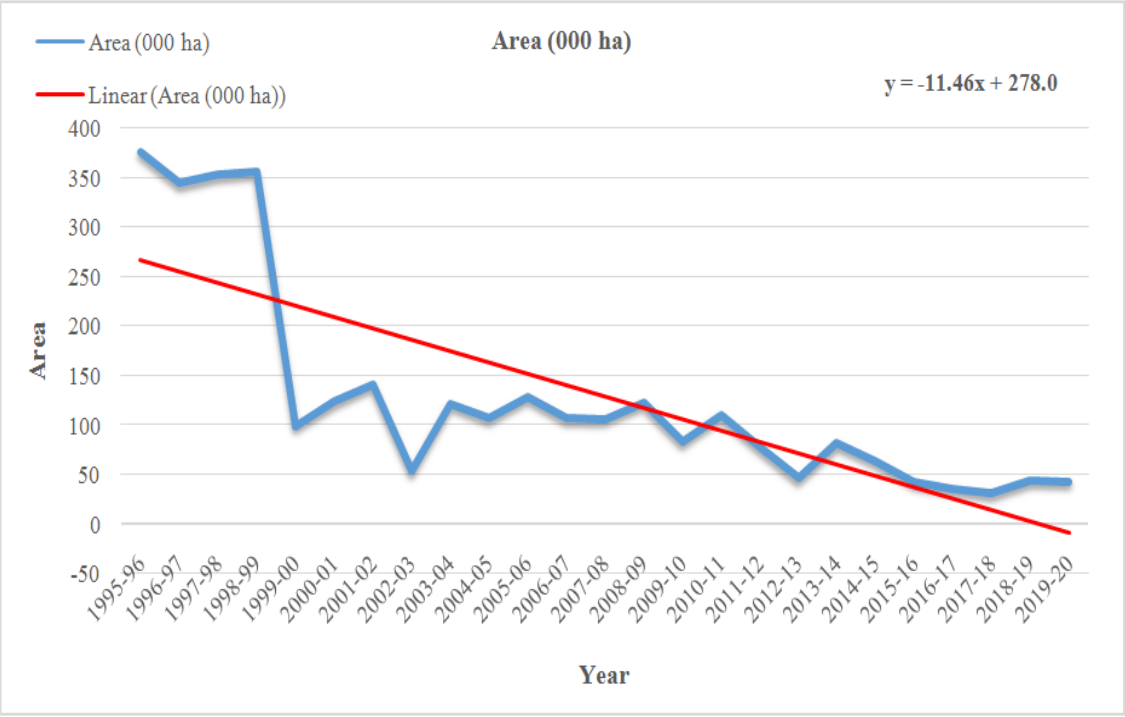

Fig. 10. Trend in area of chickpea in Haryana.

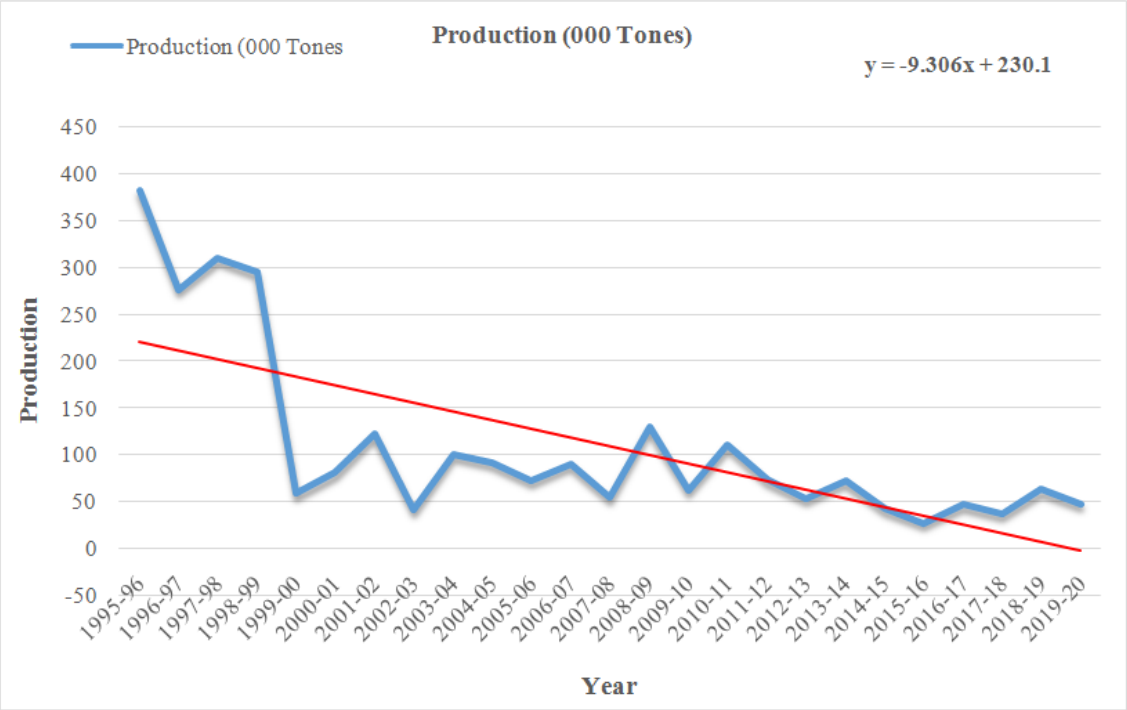

Fig. 11. Trend in production of chickpea in Haryana.

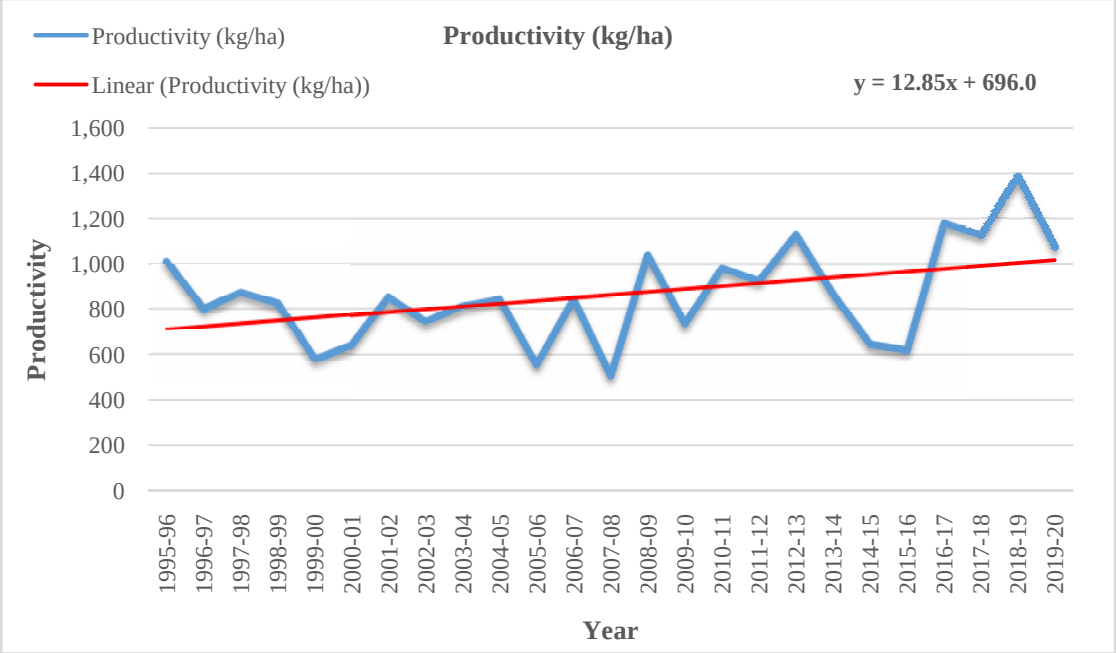

Fig. 12. Trend in productivity of chickpea in Haryana.

E. Growth in area, production and productivity of rapeseed and mustard in India

The growth of area and production of rapeseed and mustard in India for the period 1995-96 to 2019-20 *i.e.* 0.14 and 2.17 per cent per annum, respectively and productivity grew at 1.92 per cent, respectively (Table 1). The introduction of technology in mustard with the release of high yielding varieties was the major reason for increase in production and productivity of rapeseed and mustard during this period in India. Result was in conventionality with the earlier findings of Choudhary *et al*. (2011).

F. Growth in area, production and productivity of chickpea in India

Compound annual growth rate in area, production and productivity of chickpea in India was recorded 1.87,

3.30 and 1.41 per cent respectively, (Table 2) for the period 1995-96 to 2019-20. For the country as a whole the growth rate of area, production and productivity was found positive during study period (Kumar *et al.*, 2017). This increasing trend in production and productivity of chickpea in India mainly because was introduction of resistant varieties against different diseased and insects and pests, better management. The result is in the same pattern was reported by Maurya and Kumar (2018).

G. Growth in area, production and productivity of rapeseed and mustard in Haryana

It was found from the Table 3 that in the period (1995-96 to 2019-20), compound annual growth rate in area, production and productivity of total rapeseed and mustard in Haryana was recorded was 0.05, 2.37 and 3.67 per cent respectively. Major cause of increase of area of rapeseed and mustard are higher MSP of mustard, less input cost, as compared to wheat & the state government's efforts for crop diversification have also pushed more farmers to go for mustard cultivation. Domestic demand for mustard seed oil and high yield varieties used by farmer was also the reasons for rise in production and productivity. The similar study conducted by Kumrawat and Yadav (2018).

H. Growth in area, production and productivity of chickpea in Haryana

Compound annual growth rate in area, production and productivity of chickpea in Haryana was noted -8.14, -6.88 and 1.32 per cent respectively for time period 1995-96 to 2019-20 in Table 4. Production of chickpea was maximum (381 thousand tones) in the year 1995-96 while minimum (27.00 thousand tones) in the year 2015-16. Reason of decreasing area under chickpea was lack of improved varieties, low market price and no certain market (Pathak *et al.,* 2017). Table 4 shows as area decreases as well as production also decrease because it's directly proportional to area. The similar results were observed by Nimbrayan *et al.* (2019); Kumari *et al.*, 2020.

CONCLUSION

This study was designed to find out the growth and trends of area, production and productivity of rapeseed & mustard and chickpea in Haryana as well as India from the secondary data for a period from 1995-96 to 2019-20. This shows that the area, production and productivity growth trends of rapeseed and mustard in Haryana was positive. In case of chickpea, the area and production growth trends of chickpea in Haryana were negative while in productivity growth trend was positive. But in case of India, the area, production and productivity trends of rapeseed & mustard and chickpea are positive.

FUTURE SCOPE

Agricultural pricing policy has a significant impact on farm production and income. The findings of this research paper are not only a first step in this direction, but they also suggest future research topics and policy guidelines for the country's future production and marketing strategies.

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Conflict of interest. None.

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