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An Assessment of Wheat Crop in Haryana

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ABSTRACT:
Haryana is one of the major wheat producing states of India. Since its inception from 1966, the state has increased its share in the production of the crop. Agricultural growth and stability is the main concern of the country. The study aims to analyze trend, growth and instability in area, production and productivity of wheat in Haryana. The study reveals that area, production and productivity have increased since 1966 with minor fluctuations. Compound annual growth rate for production and productivity is positive but negative for area in period 2015-20. Productivity of the state has been increasing surpassing the productivity of country throughout. Instability in the state has been low under wheat crop.

KEYWORDS: wheat, growth, productivity, coefficient of variation, instability

INTRODUCTION:

Wheat (*Triticum aestivum*) is one of the main cultivated crops around the world. India being second largest producer of wheat in the world producing 107.86 million ton contributing around 14.17 per cent of world's total. Haryana is an agrarian state in which around 70 per cent of the population depend on agriculture directly or indirectly. It contributes widely to the nation's food basket with wheat as one of the main components. In Haryana wheat is cultivated on 2533 thousand hectare with 11876 thousand ton production contributing to 4678 kg/ha yield. Haryana contributes around 11 per cent in the total production of wheat in the country. Ramadas et al. (2019) found that area under wheat crop has increased by2.21 per cent from 2008 to 2018 with decrease in yield by 3.01 per cent. Aggarwal and Moudgil (2015) analyzed unstable growth of Agriculture in Haryana from 2007 to 2015. The study also highlighted that area under wheat rose by 233 per cent and production by 976 per cent. Nisha et al. (2019) highlighted high variation in area, production and productivity in Haryana than India. The present study aims at analyzing the trend, growth and instability in area, production and productivity in Haryana. An attempt has been made to categorize the districts according to instability in area, production and productivity for the period 2005 to 2020.

NEED OF THE STUDY:

Many studies have been conducted for growth and instability in wheat production. A further attempt has been made to analyze the trend, growth and instability in various districts of the state. Also, analysis of the districts according to the productivity level has also been done in the study. The findings of the study will be useful for the agricultural policy makers, stakeholders and farmers. The study will also provide a base for further research in the area for the researchers.

OBJECTIVES:

1. To analyze the trend in area, production and productivity in wheat crop in Haryana (1966-2020).

2. To analyze the CAGR in area, production and productivity in Haryana for 2005-10, 2010-15 and 2015-20.
3. To see the productivity and instability in area, production and productivity for the study period.

MATERIALS AND METHODS:

The study is based on time series secondary data which are obtained from various government issues and publications of "Statistical Abstract of Haryana", "Handbook of Statistics on Indian Economy". Trend in area, production and productivity in the state was analyzed for the period 1990-91 to 2019-20. Productivity of the state and India is also highlighted. For the trend, growth and instability of the state fifteen year period has been taken and divided in to three periods, 2005-20: Period I (2005-10), Period II (2010-15) and Period III (2015-20). Graphical and tabular analysis was used to see the trends, growth, productivity and instability in area, production and productivity in the state.

The data for the study was analyzed using appropriate statistical tools and techniques as follows:

- Trend in area, production and productivity was analysed using graphical method with the help of exponential trend line for the period 1990-2020. Trend in productivity of Haryana and India was also seen in the study for period 1990-2020.
- Percentage change in area, production and productivity:
  % change = $(X_2\text{-}X_1 \div X_1)*100$
  Where:
  X_1= Initial value
  X_2= Final value
- CAGR (Compound Annual Growth Rate) was computed for the study period 2005- 10, 2010-15 and 2015-20.
  CAGR = $(\frac{v\ final}{v\ initial})$^1/t-1
  Where:
  V final- final value
  V initial- initial value
  t -time in years
- Productivity analyses:
  Based on the productivity of the rice crop districts have been categorized in different productivity groups:
  High productivity: (more than 2500 kg/ha)
  Medium productivity: (2000-2500 kg/ha)
  Low medium productivity: (1500-2000 kg/ha)
  Low productivity: (1000-1500 kg/ha)
  Very low productivity: (less than 1000 kg/ha)
- Coefficient of Variation:
  Karl Pearson coefficient of variation was used to see the instability in area, production and productivity.
  Coefficient of variation CV (%) = $(\frac{s.d.}{mean})$ * 100
  s.d. - standard deviation
  mean – average

formula used for s.d. = $\sqrt{\frac{1}{n}\sum(x_i - \bar{x})^2}$

where:

x- variable (area, production, productivity)

n- number of years

- Ranges of instability: according to C.V. districts have been categorized in different instability groups.

  Low instability: (0-15)

  Medium instability: (15-30)

  High instability: (more than 30)

RESULT AND DISCUSSION:

Area, production and yield in wheat in Haryana from 1966-67 to 2019-20:

Total area under wheat crop in the state has increased from 743 thousand hectare to 2533.9 thousand hectare showing huge increase of 241 per cent with increasing area under the crop since its inception. Production of wheat has increased from mere 1059 thousand ton to 11876 thousand ton with 1021 per cent increase helping the state to meet its food requirement. With this productivity has also increased from 1425 to 4687 kg/ha (228 per cent increase) (Fig. 1). Increase in productivity can be attributed to increase in area and production with improved seeds and practices in the crop. It is also seen that during all periods productivity of Haryana has surpassed productivity of India (fig. 2) indicating Haryana as one of the leading states with improved practices.

Fig. 1: Area, production and yield in wheat in Haryana from 1966-67 to 2019-20.

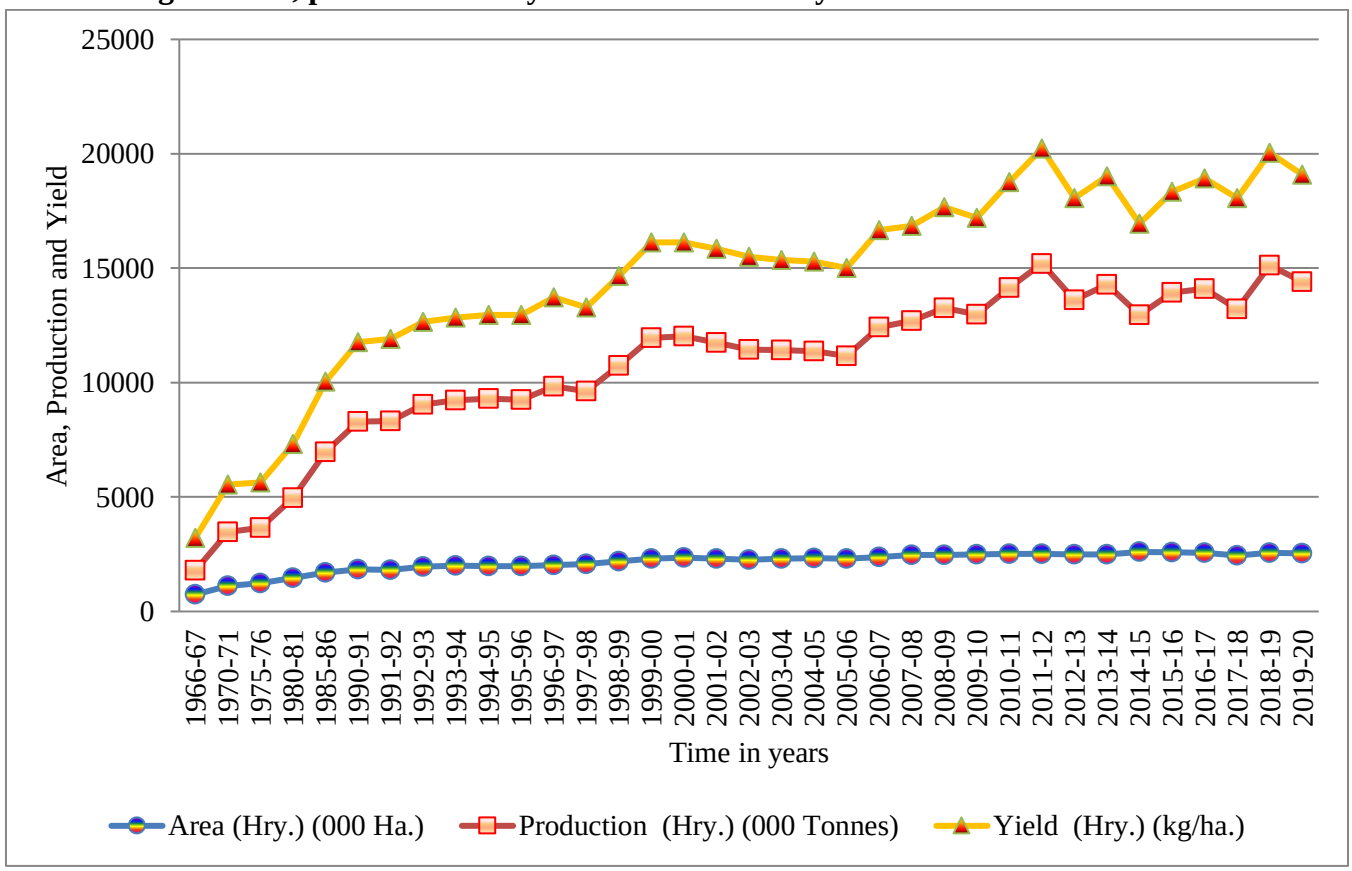

Fig. 2: Trend in productivity in Haryana and India

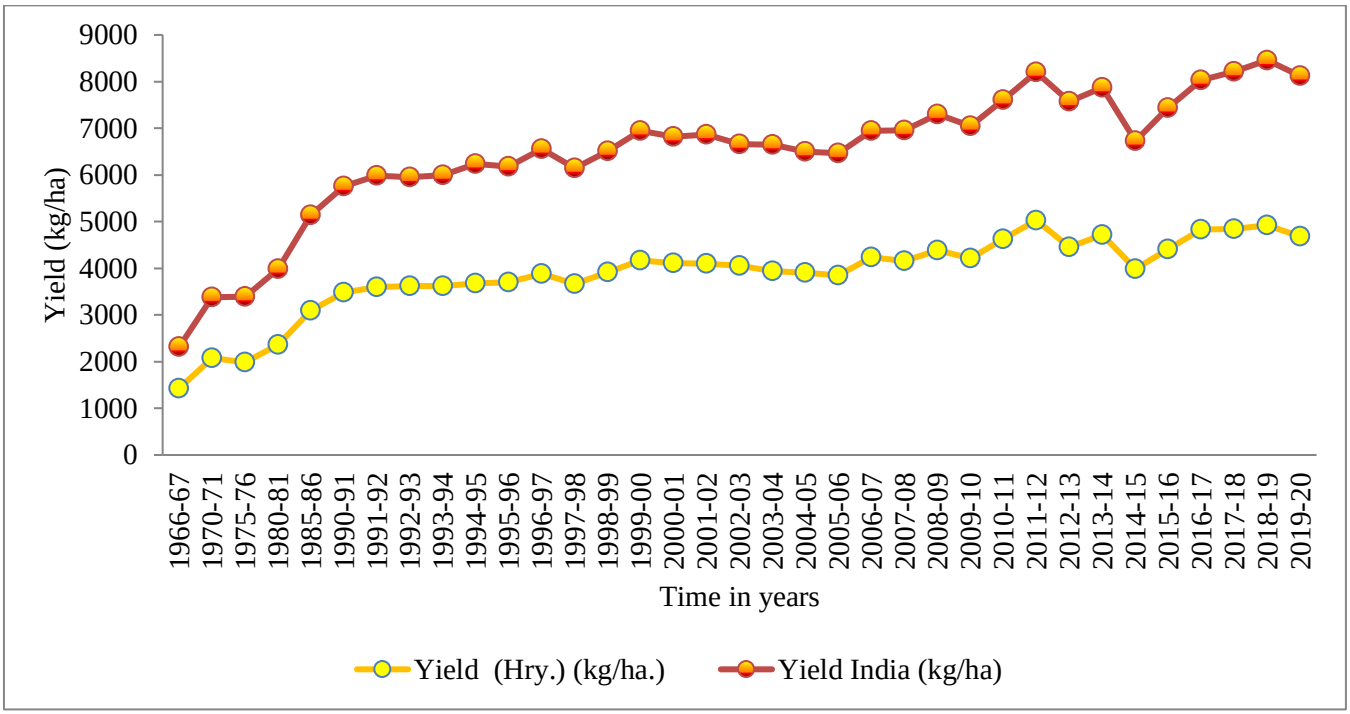

Table 1: Average area, production and productivity: 2005-10, 2010-15, 2015-20.

Period	Area (000 ha)	Production (000 ton)	Productivity (kg/ha)
2005-10	2419.8	10091.2	4167.4
2010-15	2526.8 (4.42)	11517.3 (14.13)	4561.8 (9.46)
2015-20	2532.14 (0.21)	11622.7 (0.91)	4738.8 (3.88)
% change in 2015-20 from 2005-10	**4.66**	**15.17**	**13.71**

*Figures in parentheses show percentage change from previous period.

From table 1 it can be seen that area under wheat crop has increased by 4.66 per cent from year 2005-10 from 2419 thousand hectare to 2532 hectare showing farmers interest in the crop. Production has increased by 15.17 per cent showing result of improved practices from 10091 to 11622 thousand ton. Productivity of the crop has also shown increase of 13 per cent indicating efficient use of the resources in state.

Table 2: CAGR- area, production and productivity

Period	Area	Production	Productivity
2005-10	0.015	0.034	0.018
2010-15	0.0067	-0.023	-0.029
2015-20	-0.0033	0.009	0.012

Table 2 highlights the compound annual growth rate in area, production and productivity of wheat crop in the state for period 2005-10, 2010-15 and 2015-20. It is seen that wheat growth shows fluctuations in the period under study. Area under crop has increased but growth rate has been declining since 2005

from positive to negative growth rate of 0.015 to -0.0033. Compound annual growth rate of production shows fluctuations from 0.034 to -0.023 in 2010-15 but in later period shows improvement with CAGR 0.009. Production has shown improvement despite decline in growth of area. Productivity of the state also declined in 2010-15 with revival in 2015-20 going in line with the production. Productivity has also improved despite decline in area showing better utilization of resources in the state.

Fig. 3: productivity of the districts for period 2005-10, 2010-15 and 2015-20

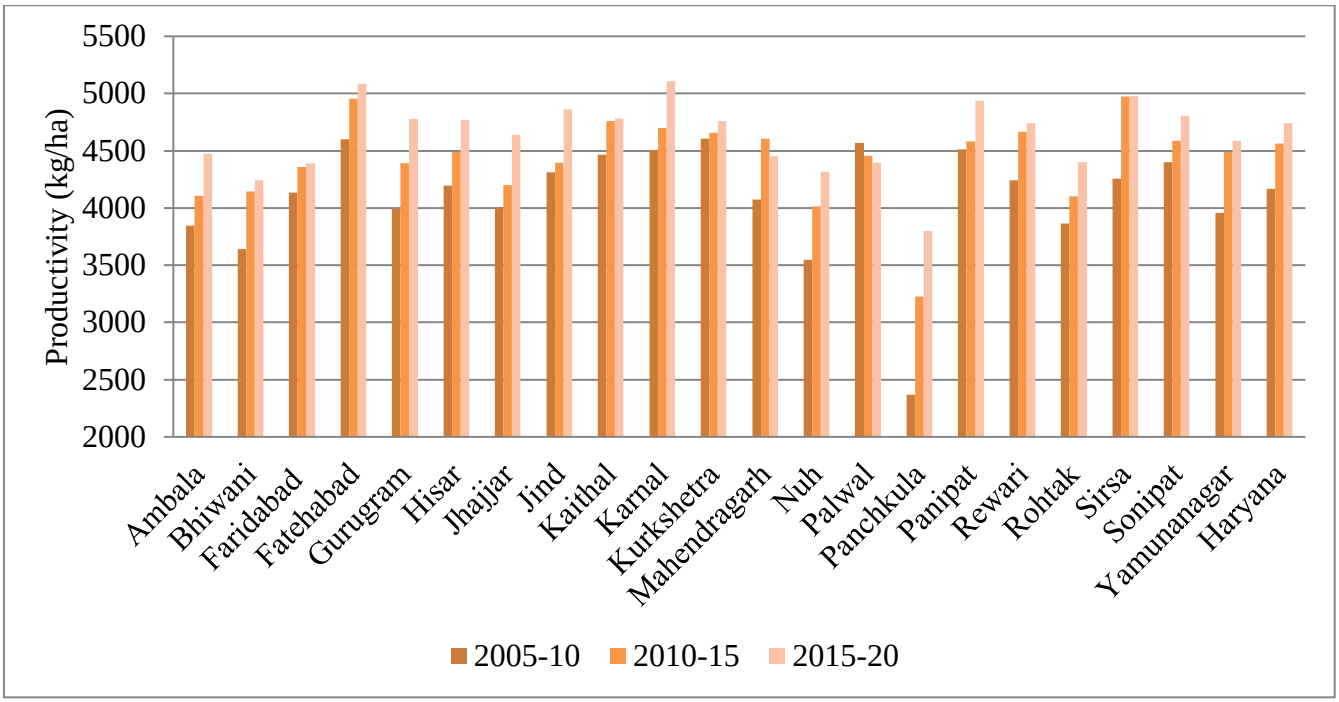

Figure 3 highlights the productivity of the districts has shown increment. All the districts lie in the high productivity group except Panchkula in 2005-10. In later periods 2010-15 and 2015-20 all districts lie in high productivity group. Lowest productivity is in Panchkula district with 3800 kg/ha and highest in Karnal with 5110 kg/ha. Mahendragarh and Palwal districts declined in their productivity from second period. Overall Haryana also shows increase in productivity from 4167 to 4738 kg/ha.

Instability:

Stability is the main concern of any activity. With stability only one gets to know the real picture of the subject under study. An attempt has been made to study the stability in area, production and productivity for the period 2005-10, 2010-15 and 2015-20. Wheat crop shows stability in area for the overall group but some instability within the group has been observed in the study. In Gurugram instability has increased from 3 per cent to 8 per cent, Kaithal from 0.1 per cent to 9 per cent, Karnal from 1 per cent to 5 per cent and Rewari depicting variations in the area under wheat. In Bhiwani instability in area has slightly increased from previous period (2005-10) as area has shown variations under the crop. Some districts show decline in instability also like Ambala, Fatehabad, Hisar, Nuh, Rohtak, Sirsa and Sonipat. The overall scenario under wheat shows stability with decrease in instability from 3.2 to 2.1 per cent indicating area under wheat is not fluctuating and farmers are practicing wheat with less variation.

Table 3: Instability in area under wheat crop in the districts of Haryana

Instability (Area)	2005-10	2010-15	2015-20
Low (0-15)	Ambala, Bhiwani, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar	Ambala, Faridabad, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar	Ambala, Faridabad, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Palwal, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar
Medium (15-30)	-	Bhiwani	Bhiwani
High (more than 30)	Faridabad Palwal	-	Charkhi Dadri

Table 4: Instability in production in the districts of Haryana

Instability (Production)	2005-10	2010-15	2015-20
Low (0-15)	Ambala, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Rewari, Rohtak, Sonipat, Yamuna nagar	Ambala, Bhiwani, Fatehabad, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Palwal, Panchkula, Rewari, Rohtak, Sirsa, Yamuna nagar	Ambala, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Palwal, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar
Medium (15-30)	Bhiwani, Sirsa,	Faridabad, Gurugram, Panipat, Sonipat	Bhiwani, Faridabad
High (more than 30)	Faridabad Palwal	-	Charkhi Dadri

From table 4 it is inferred that during 2010-15 Bhiwani was in low instability group but in 2015-20 it moved to medium instability group showing increase in instability. Sirsa being instable at 16 per cent in 2005-10 shows tremendous stability in later periods with only 2 per cent instability in 2015-20. Gurugram, Panipat and Sonipat lacked stability in 2010-15 maybe due to crop diversification or crop loss due to weather change but later revived and show less instability in 2015-20. Within low instability region, districts also show variations. The state has improved stability form 7 per cent to 5 per cent.

Table 5: Instability in productivity in the districts of Haryana

Instability (Productivity)	2005-10	2010-15	2015-20
Low (0-15)	Ambala, Bhiwani, Faridabad, Fatehabad, Gurugram, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar	Ambala, Bhiwani, Faridabad, Fatehabad, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Palwal, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar	Ambala, Bhiwani, Faridabad, Fatehabad, Hisar, Jhajjar, Jind, Kaithal, Karnal, Kurukshetra, Mahendragarh, Nuh, Panchkula, Panipat, Palwal, Rewari, Rohtak, Sirsa, Sonipat, Yamuna nagar
Medium (15-30)	-	Gurugram	-
High (more than 30)	Palwal	-	-

Table 5 shows variation in productivity in different time periods. Overall productivity variation is low with highly unstable variation within group. Mostly districts show increase in variation but within low instability group from 2005-10 but later show decrease in variation in period 2015-20. Gurugram shows decrease in stability from 8 per cent to 16 per cent with revival in 2015-20. Variation in productivity might be inferred from the variations from area and production in respective districts as productivity is related with both the parameters.

LIMITATIONS:

Some districts were formed during the study period. Therefore, data is not available for some initial years.

CONCLUSION:

The study reveals positive trend in area, production and productivity from 1966-67 to 2019-20. Some fluctuations can be seen but overall trend has been increasing in the state. Productivity of the crop in state has been increasing and has surpassed that of India all the time. Compound annual growth rate (CAGR) in area shows decline from the period 2005-10 with -0.03 growth rate. Compound annual growth rate in production and productivity declines in period 2010-15 but later revived in 2015-20 with positive growth rate. Overall productivity is higher for all the districts in the state that is more than 2500 kg/ha. The study shows that instability in area, production and productivity has been low but more variations within the group. Overall less instability in productivity can be contributed to less instability in area and production. Efficient utilization of land, resources, fertilizers, suitable crop planning, management practices and research and development need to be taken to maintain and increase growth rate in the state.

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