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Production of food grains in Haryana: A District wise analysis

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Abstract
Agriculture being the prime moving force plays a considerable role in the economic development of India. It accounts 17.4 per cent share in the GDP of India and provides employment to more than 50 per cent workforce. The production of total food grains has increased substantially in the country but providing food grains to the growing population is a matter of concern as it is possible only by increasing the production and productivity of food grains. The present research work discusses the district-wise trends in the growth of food grains production in Haryana. Secondary sources of data have been used for the period from 2005-06 to 2014-15. The result revealed that growth in the production of food grains was due to the growth in area and productivity; and largely affected by the increase in area under food grains. The study also revealed that the highest growth in the production of food grains has been recorded by Sirsa (5.25) while Kurukshetra, Karnal, Panipat and Nuh districts recorded negative growth rate.

Keywords: food grains, production, productivity, economic development

Introduction
Agriculture plays an essential role in the economic development of a country. It has already made a significant contribution to the development of less developed countries. Since agriculture meets the demand for necessities and provides employment to vast majority of population in developing countries, its development is of vital importance. Agriculture is the primary sector and it plays a vibrant role in the economic development of India as about 17.4 per cent (Economic Survey) share in the gross domestic product is accounted by agriculture sector and more than 50 percent of the workforce is dependent on this sector for their livelihood. India has a variety of soil and climatic conditions. This results in varied agro-climatic zones and makes it likely to grow a wide range of agricultural crops. India has become self-sufficient in food grains as the production of food grains has achieved a record level of 271.98 million tonnes in 2016-17 which is quite higher as compare to the 251.57 million tonnes in 2015-16. Agricultural exports accounted 12.1 per cent of India's total exports for the year 2014-15(Economic Survey).

Agriculture sector also plays a considerable role in the economy of Haryana and predominantly it is an agriculture economy. The area under wheat and rice is continuously increasing in the state. The increase in area under wheat in the state is on the cost of decrease in area of other rabi crops such as barley, gram etc. while the increase in area under rice is on the cost of decrease in area of Jowar, bajra, maize etc. These clearly indicate that the cropping pattern in the state is skewed towards the wheat rice rotation.

Now Indian agriculture has been going through a serious crisis during the post-reform period. Besides domestic concerns, such as decline in productivity, high input cost, stagnant net shown area, declining public sector investment, inadequate availability of institutional credit and rising agricultural imports, Indian agriculture has been facing external challenges under WTO (World Trade Organization) regime.

Objectives
1. To examine the trends of food grains production in Haryana
2. To examine the division wise similarities in Haryana.

Review of Literature
Review of literature is an important exercise in research because it helps the researcher to find out the research gap. A number of research studies have been undertaken by different researchers in the field of horticulture crops in India.

Ramphul (2012) [1] has examined the performance of Growing Crops in Haryana in his study. The researcher used secondary sources of data obtained from Statistical Abstract of Haryana in his study. The author analysed the data by using Location Quotient, Crop Versatility Index and District Versatility Index. The study revealed that the specialization of wheat was found in Panipat, Hissar and Faridabad, that of Rice was in Kurukshetra, Kaithal and Karnal, Jowar in Rohtak and Faridabad was highest during the study period.

Joshi, *et al.* (2006) [2] has examined the Sources of Agricultural Growth in India in their study. The main objective of the study was to measure the changes in the relative contribution of different sources of agricultural growth. The researchers revealed that the technological advancement was considered as the prime mover for agricultural growth in 1980s, while rising prices and diversification towards high-value crops were the dominant sources of growth during 1990s.

Tuteja (2015) [3] has examined the "Possibilities and Constraints in Adoption of Alternative crops to Paddy in Haryana" in his study. The study revealed that switching

over from paddy to other alternative crops was not easy because of higher returns from cultivation of paddy as compared to alternative crops. Therefore, by ensuring the profitability of alternative crops with suitable policy reforms appears to be a pre-requisite for successful crop diversification in the state.

Goyal and Kumar (2013) [4] observed the cropping pattern and production of different crops in Uttar Pradesh and India. The researchers found that the area and production of wheat and rice increased during the entire period but still there is scope for improvement. The study also suggested that a huge quantity of water could be saved by crop diversification towards less water consuming crops and improvement in technology could help to reduce the consumption of water in wheat, rice and sugarcane.

Data Analysis and Research Methodology

The study is based on time-series data which is collected from Statistical Abstract of Haryana (2005-06 to 2014-15) and Economic Survey of India. Simple statistical techniques have been used to examine the district-wise trends of food grains production in Haryana i.e., CAGR and percentage. Jonckheere-Terpstra Test has been used in the paper to examine the division-wise similarities in the production of food grains for the year 2014-15.

Null Hypothesis

There is no significance difference in total food grain production in four divisions of Haryana.

Changes in cropping pattern in Haryana

The cropping pattern in Haryana has changed considerably over the time period as the share of area under food grains in gross cropped area (GCA) has increased marginally from 4311.4 thousand hectares in 2005-06 to 4481.7 thousand hectares in 2014-15. Decrease in area under coarse cereals and pulses were mainly responsible for that.

Table 1: Share of area under food grains in Haryana (percentage of GCA) (Area in 000 hectares)

Year	Rice	Wheat	Coarse cereals	Total cereals	Total pulses	Total food grains
2005-06	1046.6 (24.28)	2302.7 (53.41)	766.8 (17.78)	4116.1 (95.47)	195.3 (4.53)	4311.4 (100)
2006-07	1042 (23.97)	2377.1 (54.67)	759.2 (17.46)	4178.3 (96.1)	169.3 (3.9)	4347.6 (100)
2007-08	1072.5 (23.95)	2460.7 (54.96)	772 (17.24)	4305.2 (96.15)	172 (3.85)	4477.2 (100)
2008-09	1211.2 (26.21)	2461.4 (53.27)	764.3 (16.54)	4436.9 (96.02)	184.1 (3.98)	4621 (100)
2009-10	1206.4 (26.56)	2487.7 (54.78)	715.9 (15.76)	4410 (97.1)	131.6 (2.9)	4541.6 (100)
2010-11	1243.3 (26.45)	2504 (53.27)	777.3 (16.54)	4524.6 (96.26)	175.6 (3.74)	4700.2 (100)
2011-12	1234.1 (26.94)	2531.3 (55.25)	693.1 (15.13)	4458.5 (97.32)	123 (2.68)	4581.5 (100)
2012-13	1206.3 (28.04)	2496.9 (58.04)	523.5 (12.17)	4226.7 (98.25)	75.3 (1.75)	4302 (100)
2013-14	1244.6 (28.53)	2499.1 (57.29)	513 (11.76)	4256.7 (97.58)	105.3 (2.42)	4362 (100)
2014-15	1277.9 (28.51)	2628.1 (58.64)	491.9 (10.98)	4397.9 (98.13)	83.8 (1.87)	4481.7 (100)

Source: Statistical Abstract Haryana

The area under rice and wheat has increased from 24.28 and 53.41 per cent of gross cropped area under food grains in 2005-06 to 28.51 and 58.64 per cent in 2014-15 while the area under coarse cereals and pulses has decreased from 17.78 and 4.53 per cent of GCA under food grains to 10.98 and 1.87 per cent during the study period. After the introduction of green revolution, high yielding varieties of seeds, irrigation facilities, and subsidies on chemical fertilizers were provided to the farmers. As a result, the farmers were shifted towards rice and wheat from coarse cereals and pulses in Haryana as Haryana is one of the states which was highly affected by the green revolution.

Table 2: Share of various crops in the production of food grains in Haryana (Production in 000 tonnes)

Year	Rice	Wheat	Coarse cereals	Total cereals	Total pulses	Total food grains
2005-06	3194 (24.75)	8853 (68.6)	847 (6.56)	12894 (99.91)	111.8 (0.9)	12905.8 (100)
2006-07	3375 (22.86)	10059 (68.14)	1193 (8.1)	14627 (99.91)	136 (0.9)	14763 (100)
2007-08	3606 (23.58)	10232 (66.90)	1355 (8.86)	15193 (99.34)	101.1 (0.66)	15294 (100)
2008-09	3299 (20.39)	11360 (70.22)	1341.2 (8.29)	16000.2 (98.9)	177.6 (1.1)	16177.8 (100)
2009-10	3628 (23.64)	10488 (68.35)	1132 (7.38)	15248 (99.37)	97.3 (0.63)	15345.3 (100)

2010-11	3465 (20.92)	11578 (69.89)	1370 (8.27)	16413 (99.08)	153.1 (0.92)	16566.1 (100)
2011-12	3575 (19.46)	13119 (71.42)	1569 (8.54)	18263 (99.42)	107 (0.58)	18370 (100)
2012-13	3941 (24.10)	11117 (67.97)	1011 (6.18)	16069 (98.25)	285.6 (1.75)	16354.6 (100)
2013-14	4041 (23.81)	11800 (69.53)	1038 (6.12)	16879 (99.46)	90.9 (0.54)	16969.9 (100)
2014-15	4007 (26.04)	10707 (69.58)	619 (4.02)	15333 (99.64)	54.5 (0.36)	15387.5 (100)

Source: Statistical Abstract Haryana

Table 2 explains the share of food grains in Haryana for the time period from 2005-06 to 2014-15. During this period the study revealed that the production of total food grains has increased considerably from 12905.8 thousand tonnes to 15387.5 thousand tonnes in 2014-15. The production of rice and wheat in the food grains has increased from 24.75 and 68.6 per cent in 2005-06 to 26.04 and 69.58 per cent in 2014-15 while that of coarse cereals and pulses has decreased. This result is similar to the changes in the area of food grains in table 1. The area of rice and wheat has increased as a result production is also increased while the area under coarse cereals and pulses has decreased therefore the production is also having similar trend. So the result here has shown that the changes in area under different crops has positive impact on the production of food grains.

Growth Performance of Food grains in Haryana

Table 3 highlight the annual growth rate in area and production of food grains in Haryana. The growth in area (2.02 and 1.33 per cent per annum) and productivity of rice and wheat (0.20 and 0.35 per cent per annum) were responsible for the considerable growth in the production of food grains.

Table 3: Compound annual growth rates of area, Production and yield of food grains in Haryana

Crops	Area	Production	Productivity
Rice	2.02	2.29	0.20
Wheat	1.33	1.92	0.35
Coarse cereals	-4.34	-3.09	1.31
Total cereals	0.66	1.75	1.08
Total pulses	-8.11	-6.93	1.29
Total food grains	0.39	1.77	1.38

Source: Statistical Abstract Haryana

The area, production and productivity of rice and wheat has recorded the positive and significant growth during the study period (2005-06 to 2014-15). The growth in the productivity of rice and wheat is quite low as compare to growth in its area. Growth rate of production of these crops were 2.29 and 1.92 per cent per annum which was considerable and the growth in area was mainly responsible for that.

Negative growth rate has been recorded in area and production under coarse cereals and pulses while productivity growth rate has positive trend for these crops.

The result i.e., explained above shows that the increase in the production of rice and wheat has been mostly influenced by the growth in the area under these crops. As it is not feasible to increase the area in the long run so there is an urgent need to adopt the alternative measures for long run benefits which will improve the productivity of these crops without putting so much pressure on land resources.

District Wise Growth Performance of Food grains in Haryana

Table 4 explains the district-wise annual compound growth rate of area under food grains in Haryana. The table shows that the maximum growth rate for area under rice i.e., 12.79 has been recorded for Rewari, while the minimum is for Panipat i.e., the area under rice has decreased in Panipat.

Table 4: Compound annual growth rates of area

Districts	Rice	Wheat	Coarse cereals	Total cereals	Total pulses	Total food grains
Ambala	1.40	0.62	-11.34	0.58	-6.3	0.50
Panchkula	4.96	0.35	-6.87	-0.36	-8.29	-0.63
Yamunanagar	1.70	2.05	-13.41	1.66	-9.62	1.56
Kurukshetra	1.67	0.32	8.84	1.04	-6.70	1.01
Kaithal	0.70	0.13	-14.87	0.11	-14.87	0.09
Karnal	0.20	0.06	-5.59	0.11	-4.42	0.10
Panipat	-2.64	0.07	-3.97	-1.10	0	-1.10
Sonipat	2.11	0.37	-4.95	0.55	-20.26	0.26
Rohtak	8.69	1.96	-1.48	2.29	-18.58	1.54
Jhajjar	7.49	2.96	-1.48	2.28	-11.59	1.93

Faridabad	-	-	-	-	-	-
Palwal	-	-	-	-	-	-
Gurugram	8.56	0.25	-0.93	0.09	-5.44	0.06
Nuh	-2.61	-1.59	-1.54	-1.64	-20.16	-1.99
Rewari	12.79	1.94	0.72	1.36	7.18	1.40
Mahendragarh	-	2.62	-0.64	0.36	-1.51	0.26
Bhiwani	5.37	6.35	-8.27	-0.68	-7.10	-1.68
Jind	2.43	0.68	-13.13	0.13	-	0.08
Hisar	3.02	1.24	-8.51	0.06	-6.27	-0.41
Fatehabad	3.82	0.63	-13.75	1.03	-6.70	0.99
Sirsa	5.85	1.94	-4.02	2.46	-9.05	2.18

Source: Statistical Abstract Haryana

In Panipat except area under wheat, the area under other food grains has decreased and at the same time Nuh districts also shows the decreasing trend in area under all food grains. Nuh is the only district that shows the negative growth rate in area under wheat. Only two districts (i.e., Kurukshetra and Rewari) showed positive growth rate in the area under coarse cereals and except Rewari district area under total pulses also registered negative growth rate throughout Haryana. The area under total food grains has increased marginally in Haryana as in some districts area under food grains has increased marginally while in some districts has decreased.

Table 5: Compound annual growth rates of production

Districts	Rice	Wheat	Coarse cereals	Total cereals	Total pulses	Total food grains
Ambala	1.71	2.40	0	0.92	-7.58	0.91
Panchkula	5.49	5.18	-4.42	3.06	-13.47	2.86
Yamunanagar	2.89	3.81	-	3.25	-6.00	3.23
Kurukshetra	0.17	0.42	-	-0.27	-19.73	-0.27
Kaithal	0.87	1.45	-14.15	1.06	-6.70	0.77
Karnal	0.71	-0.70	-3.97	-0.11	-8.12	-0.11
Panipat	0.16	-1.78	-	-1.13	-6.70	-1.14
Sonipat	2.93	-0.48	-2.21	0.33	-20.11	0.22
Rohtak	9.84	2.05	2.19	3.09	-10.00	2.96
Jhajjar	11.09	2.94	4.60	3.98	-8.33	3.84
Faridabad	-	-	-	-	-	-
Palwal	-	-	-	-	-	-
Gurugram	10.31	-0.80	3.63	0.67	-	0.66
Nuh	-2.03	-1.10	3.21	-0.64	-11.95	-0.69
Rewari	8.84	0.51	10.41	3.75	-6.70	3.74
Mahendragarh	-	3.94	3.28	3.67	-0.48	3.61
Bhiwani	1.84	6.48	-2.64	4.33	-5.38	3.85
Jind	2.49	1.87	-12.48	1.38	-	1.37
Hisar	4.57	2.48	-8.10	1.86	-5.83	1.77
Fatehabad	3.81	2.39	-10.89	2.48	-18.77	2.46
Sirsa	5.95	5.21	2.54	5.29	-3.05	5.25

Source: Statistical Abstract Haryana

Table 5 explains the district-wise annual growth rate of food grains production in Haryana. In the production of rice, the table shows that the maximum growth rate has been recorded in Jhajjar (11.09) district followed by Gurugram (10.31) and Rohtak (9.84) while minimum growth rate has been recorded by Nuh district (-2.03). Negative growth rate has been recorded in the production of wheat in Karnal, Panipat, Sonipat, Gurugram, and Nuh districts and Bhiwani (6.48) district has recoded highest growth rate in the production of wheat. Rewari (10.41) district has recorded highest growth rate in the production of coarse cereals while Kaithal (-14.15) has recorded the minimum growth. Negative growth rate has been recorded in the production of total pulses by all the districts of Haryana. In the production of total food grains Kurukshetra, Karnal, Panipat, and Nuh districts has recorded the negative growth rate.

Table 6: Compound annual growth rates of productivity

Districts	Rice	Wheat	Coarse cereals	Total cereals	Total pulses	Total food grains
Ambala	0.98	-0.34	12.80	0.34	-1.38	0.40
Panchkula	1.20	4.63	2.63	3.43	-5.65	3.51
Yamunanagar	1.12	0.42	-	1.56	4	1.65
Kurukshetra	-0.63	-1.19	-	-1.29	-13.96	-1.27
Kaithal	0.21	0.13	0.83	0.96	9.60	0.97
Karnal	0.48	-0.76	1.71	-0.22	-3.87	-0.21
Panipat	-0.38	-2.02	-	-0.03	-6.70	-0.03

Sonipat	0.74	-0.76	2.88	-0.23	0.20	-0.03
Rohtak	1.28	0.08	3.71	0.79	10.53	1.40
Jhajjar	3.45	-0.05	6.17	1.66	3.68	1.87
Faridabad	-	-	-	-	-	-
Palwal	-	-	-	-	-	-
Gurugram	0.20	-1	4.60	0.58	-	0.60
Nuh	0.20	0.46	4.83	1.01	10.27	1.32
Rewari	0.20	-1.46	9.63	2.35	-12.94	2.31
Mahendragarh	-	0.27	3.94	3.29	1.04	3.34
Bhiwani	-2.82	1.62	6.14	5.04	1.91	5.61
Jind	0.09	-0.96	0.75	1.25	-	1.28
Hisar	1.29	1.22	0.44	1.80	0.45	2.18
Fatehabad	-0.11	1.78	3.32	1.42	-11.43	0.52
Sirsa	0.10	3.21	6.84	2.75	6.60	3.00

Source: Statistical Abstract Haryana

Table 6 explains the district-wise annual growth rate of productivity of food grains in Haryana. The growth rate of productivity of rice has decreased in Kurukshetra, Panipat, Bhiwani, and Fatehabad districts while Jhajjar (3.45) has recorded the highest growth rate in the productivity of rice. Maximum growth rate in the productivity of wheat has been recorded for Panchkula (4.63) followed by Sirsa (3.21). The productivity of coarse cereals has shown the positive growth rate throughout Haryana and Ambala (12.80) has achieved the maximum growth rate followed by Rewari (9.63) and Sirsa (6.84). The highest growth rate of productivity of total pulses has recorded by Rohtak (10.53) while Kurukshetra (-13.96) has shown the lowest growth rate. Kurukshetra, Karnal, Panipat and Sonipat has recorded the negative growth rate in the productivity of total food grains while the other districts have shown the positive growth rate.

Similarities in the production of food grains in Haryana

Table-7 explains the results of Jonckheere-Terpstra Test on the production of total food grains in 2014-15 for all four divisions of Haryana. The null hypothesis is that there is no significance difference in total food grain production in four divisions of Haryana.

Table 7: Jonckheere-Terpstra Test

	Food grain
Number of Levels in divisions	4
N	21
Observed J-T Statistic	90.000
Mean J-T Statistic	82.500
Std. Deviation of J-T Statistic	15.956
Std. J-T Statistic	.470
Asymp. Sig. (2-tailed)	.638

Source: Authors calculations based on Statistical Abstract of Haryana (2014-15)

The results show that the value of Observed J-T Statistic is 90.00, mean J-T Statistic is 82.50 and Std. Deviation of J-T Statistic is 15.95. The table shows that z score which is obtained by subtracting the Mean J-T Statistic from Observed J-T Statistic and then divide it with Std. Deviation of J-T Statistic [90-82.5)/15.95= 0.470]. The Z score value is 0.470 is insignificant ($p > 0.638$). The null hypothesis is accepted; it means the food grains production is same in all divisions. The value of Std. J-T Statistic is positive (0.470), it shows the increasing trends of food grains production in all divisions of Haryana.

Conclusion

The cropping pattern in Haryana has changed considerably with a shift from the production of coarse cereals and pulses to rice and wheat. Among food grains the area under coarse cereals and pulses has decreased from 17.78 and 4.53 per cent of GCA under food grains in 2005-06 to 10.98 and 1.87 per cent in 2014-15 while the area under rice and wheat has increased from 24.28 and 53.41 per cent of gross cropped area under food grains in 2005-06 to 28.51 and 58.64 per cent in 2014-15. The result of the growth performance of the food grains in Haryana has indicated that the growth in the productivity of food grains was responsible for the higher growth in the production of food grains. The study revealed that the highest growth in the production of food grains has been recorded by Sirsa (5.25) while the lowest in Panipat (-1.14). The results of Jonckheere-Terpstra Test on the production of total food grains in 2014-15 revealed that there is no significance difference in total food grain production in all the divisions of Haryana.

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