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A comparative analysis of agricultural productivity of rice and wheat in Haryana and Punjab

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Abstract
India is one of the world's leading agricultural nations, with the sector employing a significant portion of the population and contributing substantially to the country's GDP. The diverse climatic conditions across the country support the cultivation of a wide variety of crops. Haryana and Punjab, in particular, are characterized as predominantly agricultural states. This study aims to compare the agricultural productivity of major crops, specifically yield per hectare, in Haryana and Punjab. The research design of the study is descriptive in nature, covering the period from 2011 to 2022. Secondary sources of data collection were utilized, with data gathered from various articles, reports, websites, and primarily from the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare. The collected data was analyzed using data analytical tools and techniques such as descriptive statistics. The results revealed that Punjab has traditionally been known for its high crop yields, particularly in wheat and rice production. However, in recent years, Haryana has made significant progress in improving its crop yields, effectively narrowing the productivity gap between the two states.

Keywords: Agriculture productivity, comparison, major crops, Haryana Punjab

Introduction
India's agriculture sector is vital to its economy and food security, employing over half of the workforce and contributing significantly to the GDP. The sector benefits from diverse climatic conditions, enabling the cultivation of a wide variety of crops. While small-scale farming remains predominant, commercial farming is increasingly gaining momentum. However, the sector faces several challenges, including land fragmentation, water scarcity, outdated farming techniques, and limited market access. In response, the government has implemented initiatives to modernize agriculture through technological advancements, policy reforms, and infrastructure development, including the promotion of precision farming, digital agriculture platforms, and improved irrigation systems.

Haryana and Punjab are often regarded as the agricultural hubs of India. This study aims to compare the agricultural productivity of major crops, specifically yield per hectare, in Haryana and Punjab. The research design is descriptive, covering the period from 2011 to 2022. Secondary data sources were utilized, including reports, articles, websites, and data from the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare. Analytical tools such as descriptive statistics were employed to interpret the data.

The findings highlight that Punjab has traditionally been a leader in crop yields, especially in wheat and rice production, supported by the Green Revolution. However, recent advancements in Haryana's agricultural practices, including better irrigation management and crop diversification, have helped narrow the productivity gap between the two states. Both states continue to adapt to emerging challenges, such as climate change and depleting groundwater resources, with government-backed initiatives and technological interventions driving their progress.

Agriculture in Haryana
Agriculture plays a crucial role in Haryana's economy, making a significant contribution to the state's GDP and providing substantial employment. The state cultivates a wide variety of crops, including wheat, rice, sugarcane, cotton, maize, pulses, and vegetables.

Haryana was a key player in India's Green Revolution, which significantly boosted agricultural productivity through the adoption of high-yield crops and improvements in irrigation. The state benefits from a well-developed irrigation infrastructure and various government support programs aimed at assisting farmers. In addition to crop farming, horticulture and livestock, particularly dairy, are important sectors in Haryana's agricultural landscape.

However, the state faces several challenges, including water scarcity, soil degradation, and the need for sustainable farming practices. To address these issues, Haryana is focused on modernizing its agricultural practices, implementing new technologies, and promoting sustainable development in rural areas. The state's ongoing efforts aim to enhance productivity while ensuring environmental sustainability and improving the overall quality of life for its rural population.

Agriculture in Punjab

Punjab, often referred to as the "Granary of India," plays a vital role in the country's food security, known for its high agricultural productivity. Major crops grown in the state include wheat, rice, barley, and maize. Punjab was instrumental in India's Green Revolution, adopting high-yield crop varieties and extensive use of fertilizers and pesticides, which led to significant increases in productivity. The state benefits from a robust irrigation infrastructure that supports multiple cropping seasons and high crop yields. Government policies further assist farmers through subsidies, crop insurance, and initiatives aimed at promoting sustainable agricultural practices.

In addition to crop farming, horticulture and livestock, particularly dairy farming, are important sectors in Punjab. However, the state faces several challenges, including the declining levels of groundwater, soil degradation, and the need for more sustainable farming practices. To overcome these issues, Punjab is focusing on modernizing its agricultural sector, promoting crop diversification, and adopting more sustainable practices to ensure long-term agricultural growth and environmental sustainability.

Literature Review

Douglas, *et al*. (2023) [1]. This study explores the future of the feed and livestock industries in the 1980s and 1990s by evaluating domestic grain and non-grain feed supplies, livestock product demand, and feed-to-output relationships. Between 1960 and 1959, the total area seeded rose by 39% compared to the 1949-1953 average, with Khrushchev's policies significantly increasing planted acreage throughout the 1950s and 1960s. Bhatia *et al*. (2020) [2] The study, covering Haryana's agroclimatic zones from 1970 to 2014, found increases in the areas for cotton, wheat, rapeseed, mustard, and paddy, while areas for gram, maize, jowar, barley, and bajra declined. Specific districts remained specialized in crops like wheat, paddy, mustard, and cotton, with sugarcane continuing to be prominent in Yamunanagar. Kataria *et al*. (2020) [3] This research introduces new indicators for comparing productivity growth and performance over time. The study finds that these indicators provide a more intuitive and aesthetically pleasing measure of productivity compared to traditional growth rates, particularly for rice and wheat in India. Kumari *et al*. (2020) [4]: Analyzing data from 1995-1996 to 2015-2016, this study found a 2.46% annual increase in food grain production, with minor rises in area and productivity. Cereals dominate the land use, with pulses as a secondary crop. The study emphasizes the need to focus on improving food grain production for future sustainability. Rani (2019) [6]: This study reviewed cropping patterns in Haryana from 1967 to 2016, showing increased productivity in land and water use over 49 years, though growth rates have slowed. Notable declines were observed in wheat and rice productivity, despite rising aggregate production. Panwar and Dimri (2018) [5] Despite its small size, Haryana has led in food crop production with increases in planted area and irrigation from 1966-1967 to 2015-2016. Adoption of high-tech practices improved productivity, though recent shifts to organic farming have reduced it. Efforts are underway to enhance resource management.

Research Objective

The main objective of the study is to compare the agriculture productivity of major crop yield per hectare in Haryana and Punjab.

Research Methodology

Research methodology involves systematically addressing research problems (Kothari, 1999).

Research Design

The study uses a "Descriptive Research Design" to compare agricultural productivity, focusing on rice and wheat yields per hectare in Haryana and Punjab.

Sample Design

The study covers various regions in Haryana and Punjab, focusing on rice and wheat.

Period of the Study

The research spans from 2011 to 2022.

Sources of Data Collection

Secondary data is sourced from books, magazines, newspapers, journals, websites, and reports, particularly from the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare.

Procedure of Data Collection

Data is collected through articles, reports, and databases, with a primary focus on the Directorate of Economics and Statistics, Department of Agriculture and Farmers Welfare.

Data Analytical Tools and Techniques

Descriptive Statistics are used to analyze the secondary data collected for comparing crop yields.

Data Analysis

The study uses secondary data from articles, websites, and the Directorate of Economics and Statistics to compare rice and wheat yields in Haryana and Punjab. Agricultural productivity is often measured by yield per unit area, calculated as total output divided by the land area cultivated. For example, harvesting 10,000 kilograms of wheat from 1 hectare gives a yield of 10,000 kg/ha.

Table 1: Agriculture productivity of major crops yield per hectare (food grains) in Haryana

Years	Production of Food Grains (in Tons MN)	Agricultural Productivity (tons/ha)
2011	16.630	16.630
2012	17.960	17.960
2013	16.230	16.230
2014	16.970	16.970
2015	15.240	15.240
2016	16.360	16.360
2017	17.160	17.160
2018	16.190	16.190
2019	18.150	18.150
2020	17.860	17.860
2021	18.310	18.310
2022	16.330	16.330

Source: www.ceicdata.com

The above table shows agriculture productivity of major crops yield per hectare (food grains) in Haryana from 2011 to 2022. Haryana data was reported at 16.330 Ton mn in 2022. This records a decrease from the previous number of 18.310 Ton mn for 2021. The statistics clearly depicts that there is a roller coaster journey of agricultural productivity of food grains in Haryana as 2015 shows the lowest production i.e. 15.240 tons mn whereas the year 2021 shows the highest production of food grains of Haryana i.e. 18.310 tons mn. In mid-way there is an increment or decrement both of production of food grains (Haryana data is updated yearly, averaging 13.032 Ton mn from Mar 1981 to 2022, with 42 observations).

Table 2: Agriculture productivity of major crops yield per hectare (Rice) in Haryana

Years	Production of Rice (in Tons mn)	Agricultural Productivity (in Tons/ha)
2010	3625.000	3625.000
2011	3472.000	3472.000
2012	3759.000	3759.000
2013	3976.000	3976.000
2014	3998.000	3998.000
2015	4006.000	4006.000
2016	4145.000	4145.000
2017	4453.000	4453.000
2018	4523.000	4523.000
2019	4516.100	4516.100
2020	4824.300	4824.300

Source: www.ceicdata.com

The above table shows agriculture productivity of major crops yield per hectare (Rice) in Haryana from 2010 to 2020. Haryana data was reported at 4824.300 Ton mn in 2020. This records an increase from the previous number of 4516.100 Ton mn for 2019. The statistics clearly depicts that there is a primarily increment in the journey of agricultural productivity of rice in Haryana as 2009 shows the lowest production i.e. 3298.000 tons mn whereas the year 2020 shows the highest production of food grains of Haryana i.e. 4824.000 tons mn. In mid-way there is an increment of production of rice (Haryana data is updated yearly, averaging 2569.500 Ton mn from Mar 1981 to 2022, with 40 observations).

Table 3: Agriculture productivity of major crops yield per hectare (Wheat) in Haryana

Years	Production of Wheat (in Tons mn)	Agricultural Productivity (tons/ha)
2010	4213.000	4213.000
2011	4624.000	4624.000
2012	5030.000	5030.000
2013	4452.000	4452.000
2014	4722.000	4722.000
2015	3981.000	3981.000
2016	4407.000	4407.000
2017	4514.000	4514.000
2018	4412.000	4412.000
2019	4925.000	4925.000
2020	4687.000	4687.000
2021	4834.000	4834.000
2022	4533.000	4533.000

Source: www.ceicdata.com

The above table shows agriculture productivity of major crops yield per hectare (Wheat) in Haryana from 2010 to 2022. Haryana data was reported at 4533.000 Ton mn in 2022. This records a decrease from the previous number of 4834.000 Ton mn for 2021. The statistics clearly depicts that there is a roller coaster journey of agricultural productivity of wheat in Haryana as 2015 shows the lowest production i.e. 3981.000 tons mn whereas the year 2012 shows the highest production of food grains of Haryana i.e. 5030.000 tons mn. In mid-way there is an increment and decrement both in the production of rice (Haryana data is updated yearly, averaging 4390.500 Ton mn from Mar 1981 to 2022, with 23 observations).

LAST	PREVIOUS	MIN	MAX	UNIT	FREQUENCY	RANGE
▲ 4,836.000 2021	▼ 4,687.000 2020	3,844.000 2006	5,030.000 2012	kg/ha	yearly	2000 - 2021

Source: www.ceicdata.com

Fig 1: Agricultural Productivity of Wheat in Haryana in 2021

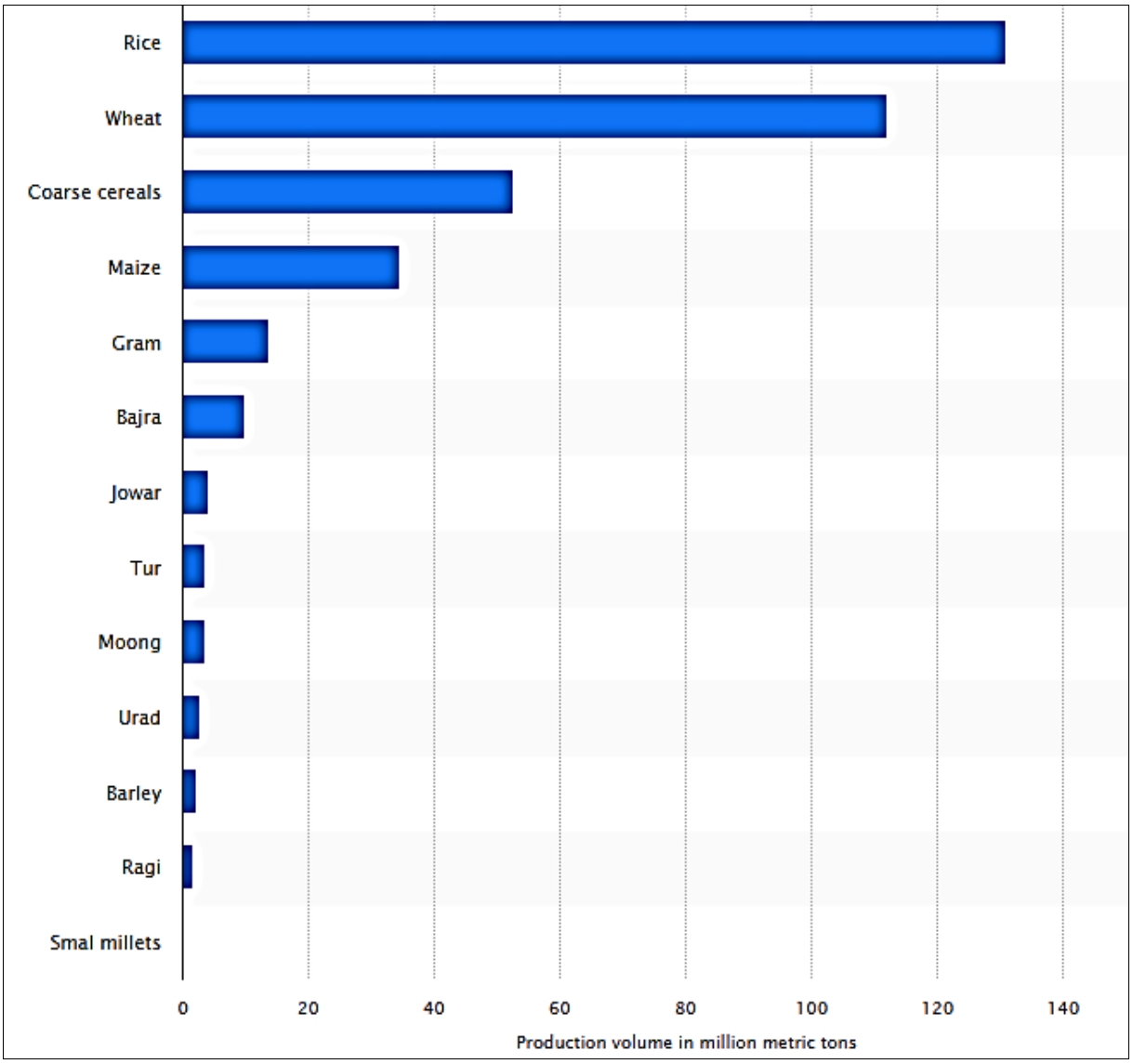


Fig 2: Estimated volume of food grains produced in India in financial year 2023, by type *(in million metric tons)*

The above figure shows estimated volume of food grains produced in India in financial year 2023. The production of rice was the highest with over 130 million metric tons in fiscal year 2023 across India among the other food grains. Rice is one of the staple foods of the south Asian country. The production of wheat saw the second highest volume after rice in that year.

Table 5: Agriculture productivity of major crops yield per hectare (food grains) in Punjab

Years	Production of Food Grains (in Tons mn)	Agricultural Productivity (tons/ha)
2011	27.870	27.870
2012	28.390	28.390
2013	28.540	28.540
2014	29.480	29.480
2015	26.700	26.700
2016	28.400	28.400
2017	28.540	28.540
2018	31.690	31.690
2019	31.530	31.530
2020	29.860	29.860
2021	30.420	30.420
2022	28.210	28.210

Source: www.ceicdata.com

In the above table Punjab data was reported at 28.210 Ton mn in 2022. This records a decrease from the previous number of 30.420 Ton mn for 2021. Punjab data is updated yearly, averaging 24.808 Ton mn from Mar 1981 to 2022, with 42 observations. The data reached an all-time high of 31.690 Ton mn in 2018 and a record low of 11.903 Ton mn in 1981. The journey of agricultural production of food grains in Punjab shows a high and low journey.

Table 6: Agriculture productivity of major crops yield per hectare (Rice) in Punjab

Years	Production of Rice (in Tons mn)	Agricultural Productivity (in tons/ha)
2009	11000.000	11000.000
2010	11236.000	11236.000
2011	10837.000	10837.000
2012	10542.000	10542.000
2013	11374.000	11374.000
2014	11267.000	11267.000
2015	11107.000	11107.000
2016	11823.000	11823.000
2017	11586.200	11586.200
2018	13381.800	13381.800
2019	12821.600	12821.600
2020	11779.300	11779.300

Source: www.ceicdata.com

In the above table shows Punjab data was reported at 11,779.300 Ton th in 2020. This records a decrease from the previous number of 12,821.600 Ton th for 2019. Punjab data is updated yearly, averaging 8,766.000 Ton th from Mar 1981 to 2020, with 40 observations. The data reached an all-time high of 13,381.800 Ton th in 2018 and a record low of 3,223.000 Ton th in 1981. The journey of rice production shows an increment during the selected period in Punjab.

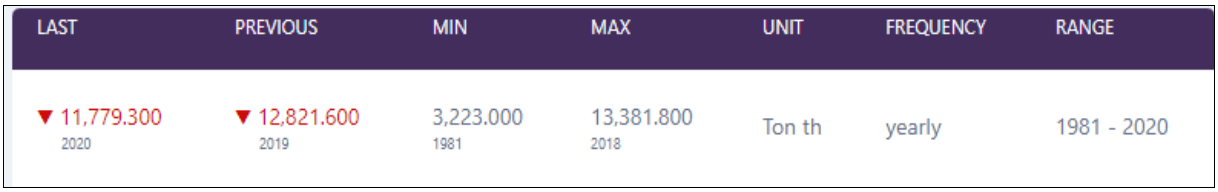


Fig 3: Agricultural Productivity of Rice in Punjab in 2020

Table 7: Agriculture productivity of major crops yield per hectare (Wheat) in Punjab

Years	Production of Wheat (in Tons Mn)	Agricultural Productivity (tons/ha)
2010	4307.000	4307.000
2011	4693.000	4693.000
2012	4898.000	4898.000
2013	4724.000	4724.000
2014	5017.000	5017.000
2015	4294.000	4294.000
2016	4583.000	4583.000
2017	4704.000	4704.000
2018	5077.000	5077.000
2019	5188.000	5188.000
2020	5003.000	5003.000
2021	4868.000	4868.000
2022	4206.000	4206.000

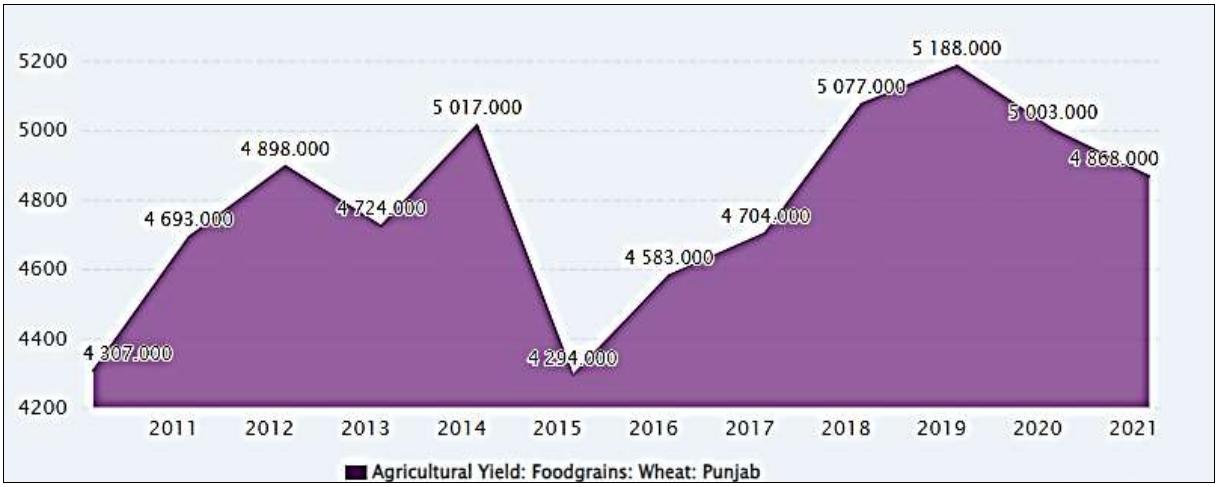
Source: www.ceicdata.com

LAST	PREVIOUS	MIN	MAX	UNIT	FREQUENCY	RANGE
▼ 4,862.000	▼ 5,003.000	4,179.000	5,188.000	kg/ha	yearly	2000 - 2021

Source: www.ceicdata.com

Fig 4: Agricultural Productivity of Wheat in Punjab in 2021

This is in accordance with:
Yield per unit area = Total output / Total land area
For example, if agriculture production of wheat in 2011 is 4693.000 tons from a 1-hectare field, the yield per unit area would be 4693 tons/ha.
Similarly, for 2012 would be 4898 tons/ha and so on.



Source: www.ceicdata.com

Fig 5: Agriculture productivity of major crops yields per hectare (Wheat) in Punjab

In the above table and figure Punjab data was reported at 4,206.000 kg/ha in 2022. This records a decrease from the previous number of 4,868.000 kg/ha for 2021. Punjab data is updated yearly, averaging 4,563.000 kg/ha from Mar 2000 to 2022, with 23 observations. The data reached an all-time high of 5,188.000 kg/ha in 2019 and a record low of 4,179.000 kg/ha in 2006. The journey of wheat production in Punjab shows an increment in half period and decrement in another one.

A Comparative Analysis in the Agriculture Production of Rice and Wheat in Haryana and Punjab

Table 8: Agriculture Production of Rice in Haryana and Punjab

Years	Production of Rice in Haryana (in Tons mn)	Agriculture Productivity (tons/ha)	Production of Rice in Punjab (in Tons mn)	Agriculture Productivity (tons/ha)
2010	3625	3625	11236	11236
2011	3472	3472	10837	10837
2012	3759	3759	10542	10542
2013	3976	3976	11374	11374
2014	3998	3998	11267	11267
2015	4006	4006	11107	11107
2016	4145	4145	11823	11823
2017	4453	4453	11586.2	11586.2
2018	4523	4523	13381.8	13381.8
2019	4516.1	4516.1	12821.6	12821.6
2020	4824.3	4824.3	11779.3	11779.3

Source: www.ceicdata.com

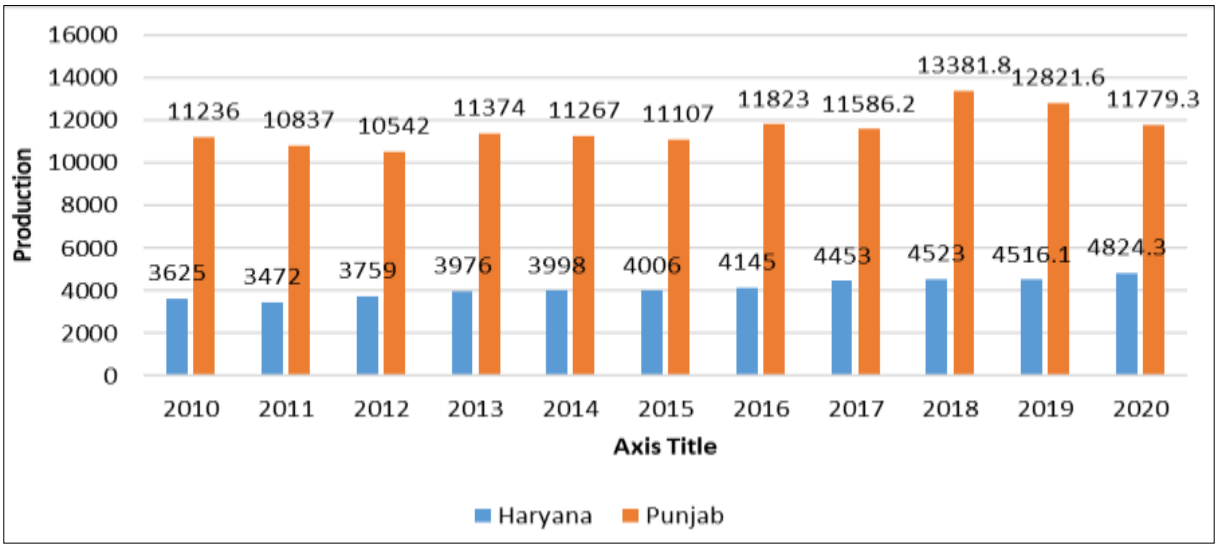


Fig 6: Comparative Study of Rice Production Haryana and Punjab

The above figure shows the comparison of production of rice in Haryana and Punjab. The above figure clearly depicts that the production of rice in Punjab is lot more as compared to Haryana. In other words, the agriculture productivity in Punjab is more than in Haryana.

Table 9: Agriculture Production of Wheat in Haryana and Punjab

Years	Production of Wheat in Haryana (in Tons MN)	Agricultural Productivity (tons/ha)	Production of Wheat in Punjab (in Tons MN)	Agricultural Productivity (tons/ha)
2010	4213.000	4213.000	4307.000	4307.000
2011	4624.000	4624.000	4693.000	4693.000
2012	5030.000	5030.000	4898.000	4898.000
2013	4452.000	4452.000	4724.000	4724.000
2014	4722.000	4722.000	5017.000	5017.000
2015	3981.000	3981.000	4294.000	4294.000
2016	4407.000	4407.000	4583.000	4583.000
2017	4514.000	4514.000	4704.000	4704.000
2018	4412.000	4412.000	5077.000	5077.000
2019	4925.000	4925.000	5188.000	5188.000
2020	4687.000	4687.000	5003.000	5003.000
2021	4834.000	4834.000	4868.000	4868.000
2022	4533.000	4533.000	4206.000	4206.000

Source: www.ceicdata.com

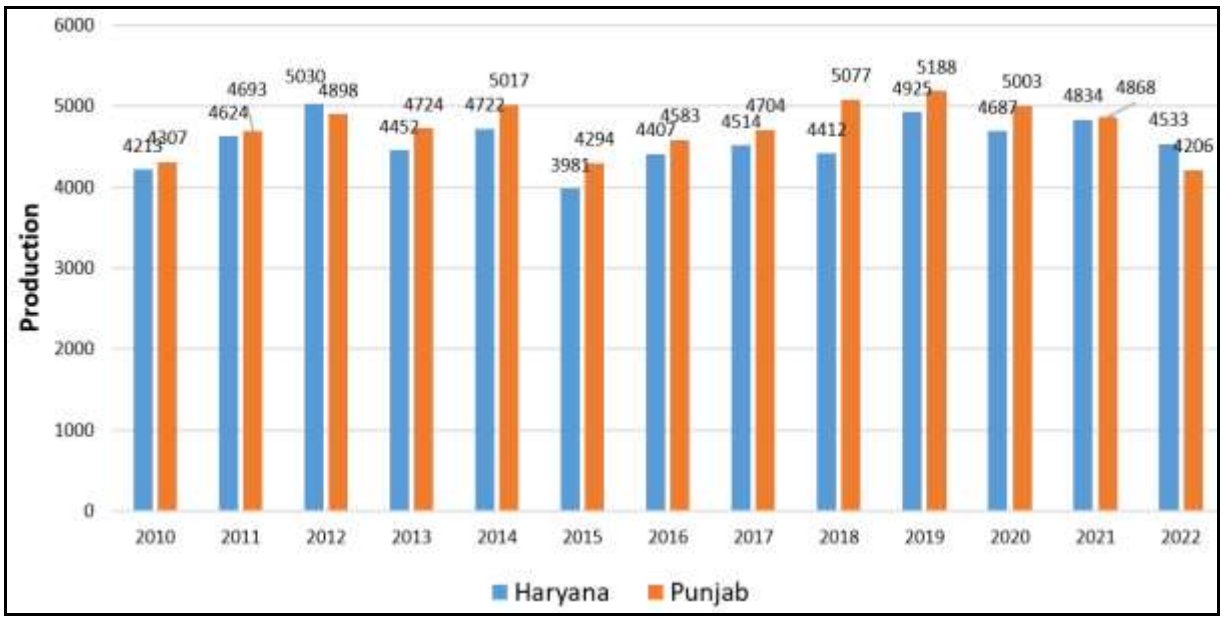


Fig 7: Comparative Study of Wheat Production Haryana and Punjab

The above figure shows the comparison of production of rice in Haryana and Punjab. The above figure clearly depicts that the production of wheat in Punjab is more as compared to Haryana expect two years 2012 and 2022. The figure also shows that there is not much difference in the production of wheat in Haryana and Punjab.

Conclusion

Punjab has traditionally been known for its high crop yields, particularly in wheat and rice production. However, in recent years, Haryana has made significant strides in improving its crop yields, narrowing the productivity gap between the two states. This is exactly shown by our findings that the production of wheat in Punjab is more as compared to Haryana expect two years 2012 and 2022. Also there is not much difference in the production of wheat in Haryana and Punjab.

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