

Population and Land Use in Haryana: A Comprehensive Analysis

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Abstract

The purpose of this research is to analyse the role that agriculture plays in the economy of Haryana, a state that is famously agrarian. When it comes to India's economy and food supply, the agricultural sector is paramount. When it comes to the amount of food that the country gets, Haryana is right up there with the top two states. The Green Revolution had a profound impact on Haryana, which led to unprecedented agricultural output and export performance compared to other states. The study's overarching goal is to better understand the current structural shifts in Haryana's economy by analysing historical trends in the agricultural sector's contribution to GDP. In this context, "structural change" refers to a shift in the relative importance of the primary, secondary, and tertiary sectors to gross domestic product. As economies grow, the relative importance of the primary sector—which includes agriculture—tends to decline, while that of the secondary and tertiary sectors—which include industry and services—tends to rise. This essay aims to go into these structural changes in Haryana's economy. As a nation's economy develops, the focus shifts from farming to industry and service supply, resulting in a decrease in the primary sector's contribution to GDP. Understanding the evolution of economies requires an appreciation of this transition. But because of this shift, the primary sector's contribution to economic growth is often disregarded. Even while agriculture isn't contributing as much to GDP as it used to, the study will examine how it's still important to Haryana's economy. In a constantly changing economic environment, this research is crucial for comprehending the full breadth of agriculture's impact and its evolving role. This article seeks to provide a more complex view of Haryana's advancement by analysing the present developments and their implications for the state's economic future.

Keywords: Population, Land Use, Haryana, Agricultural,

Introduction

On November 1, 1966, the Punjab Reorganization Act was passed, which directly led to the establishment of the state of Haryana (1966). On April 23, 1966, the Shah Commission was established by the Indian government, with Justice JC Shah chosen to preside over the body. The committee's mission was to partition the present-day state of Punjab and define the boundaries of the new state of Haryana taking the people's spoken languages into account. Hisar, Mahendragarh, Gurgaon, Rohtak, and Karnal were to become part of the new state of Haryana, according to the panel's findings announced on May 31, 1966. It was also intended to include Naraingarh, Ambala, Jagadhri, and the tehsils of Jind and Narwana, which are part of the Sangrur district. The consolidation was also supposed to include these three districts. The panel decided that Haryana should be expanded to include the tehsil of Kharar, which is now a part of Punjab's capital city Chandigarh. In contrast, the Kharar area was entrusted to Punjab. Due to its status as a union territory, the city of Chandigarh was made capital of both Punjab and Haryana because of its strategic location. Located in northern India, the state of Haryana is completely surrounded by neighbouring states. As for its longitude, it spans 74 degrees 28 minutes to 77 degrees 36 minutes east, and its latitude, 27 degrees 39 minutes to 30 degrees 35 minutes north. Just 1.4% of the United States' landmass is located inside the state's 4.42 million hectares of landmass. Located in northern India, the state of Haryana may be as high as 700–3600 feet (200–1200 metres) above sea level. Compared to the national average of 21.85 percent, which is held by Uttar Pradesh, Haryana's tree cover is far lower at just 4%. Located in the Sivalik Hills subrange of the Himalayas, Karoh Peak is a Himalayan peak with a height of 1,467 metres (4,813 ft). It stands as the highest peak in Haryana. The location is close to the Morni Hills region in the Panchkula district. The majority of the state is on the very fertile Ghaggar Plain, a part of the wider Indo-Gangetic Plain. Haryana has borders with the following states and union territories: Punjab, Rajasthan, Uttar Pradesh, Himachal Pradesh, Uttar Pradesh, and the federal territories of Delhi and Chandigarh. Another state with which Haryana shares a boundary is Uttar Pradesh.

Review of literature

1. **Saini (2018)** analysed the complex relationship between population growth and urbanisation, illuminating the effects of Haryana's rapid population increase on the state's land use patterns.
2. **Verma and Kapoor (2019)** explored the complex issues that land fragmentation presents to the agricultural industry in Haryana. Agricultural output and land management were the primary foci of their study.
3. **Gupta and Kumar (2016)** examined the complex issues caused by the division of land in Haryana's agricultural industry. The impacts on land management and agricultural production were the focus of their study.
4. **Rajput and Sharma (2020)** carried out an exhaustive study of the urbanisation of Haryana's once agrarian terrain. The causes and effects of this shift became better understood thanks to their study.
5. **Kumar and Singh (2017)** analysed the conversion of rural regions into cities in Haryana in great detail. Their findings provide light on the factors that prompted and resulted in this shift.
6. **Bansal and Yadav (2021)** in light of Haryana's shifting population, emphasised the need for environmentally responsible land management. The importance of prudent land management to the future of the state was emphasised in their analysis.

Profile of Haryana

Table 1: Profile of Haryana

Geographical Area	44,212 Sq Km
Density of Population	573
Cultivated Area	38.17 Lakh Hectares
Net Sown Area	36.01 Lakh Hectares
Total Cropped Area	66.05 Lakh Hectares
Cropping Intensity	190.32
Irrigated Area	29.56 Lakh Hectares
No. of Operational Farm Holdings	1,37,757

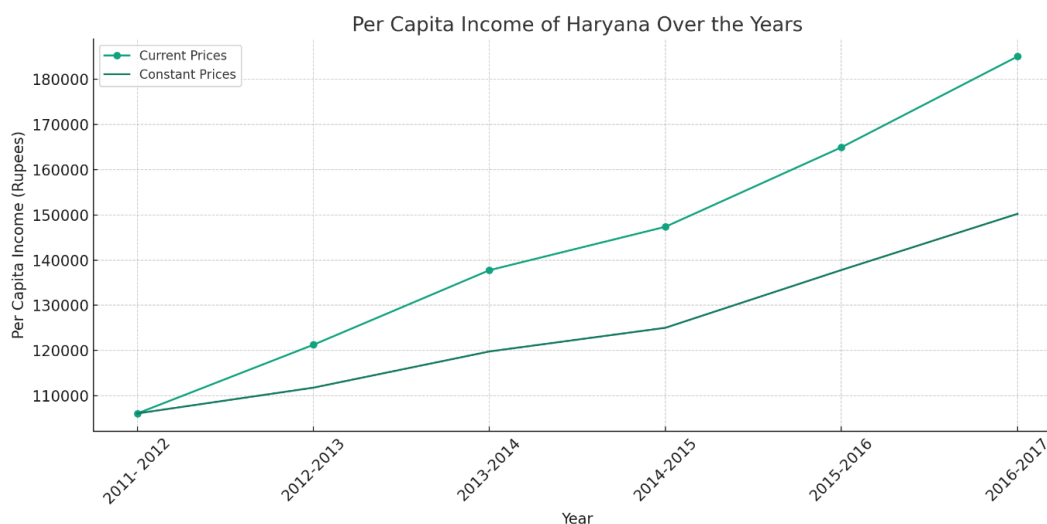
1. **Geographical Area:** The whole of the territory in issue, which has a total geographical size of 44,212 square kilometres. This is a measurement of the total surface area that falls inside the confines of the region's limits.
2. **Density of Population:** The whole of the landmass that makes up the area in issue, which totals 44,212 square kilometres. This is a measurement of the total surface area that is encompassed by the borders of the territory.
3. **Cultivated Area:** The whole of the landmass that makes up the territory in issue, which measures 44,212 square kilometres in total size. This is a measurement of the total surface area that falls inside the confines of the region's borders.
4. **Net Sown Area:** This is the portion of land on which crops are sown at least once a year, known also as the area sown more than once in an agricultural year plus net sown area gives the total cropped area. Here, it's 36.01 lakh hectares or 3,601,000 hectares.
5. **Total Cropped Area:** This is the entire area that is utilised for cropping, and it includes regions that have had crops planted in them more than once throughout the course of the same year. The figure is 66.05 lakh hectares, which suggests that there is significant multiple cropping (planting and harvesting more than one crop in a year on the same field), as this number is larger than the net sown area. Multiple cropping can be defined as the practise of planting and harvesting multiple crops in a single year on the same field.
6. **Cropping Intensity:** This is the entire area that has been utilised for cultivating crops, and it includes any places that have had crops planted in them more than once in the same year. Because this number is more than the net sown area, it suggests that there is a considerable amount of multiple cropping (the practise of planting and harvesting more than one crop in a single year on the same field). The value is 66.05 lakh hectares.
7. **Irrigated Area:** This is the entire area that is utilised for cropping, which includes places that have had crops planted in them more than once throughout the course of the same year. The result is 66.05 lakh hectares, which indicates that there is a considerable amount of multiple cropping (the practise of planting and harvesting

more than one crop in a single year on the same field), since this quantity is bigger than the net planted area.

8. **No. of Operational Farm Holdings:** This is the entire area that is utilised for cropping, which includes regions that have had crops planted in them more than once in the same year. The result is 66.05 lakh hectares, which suggests that there is a considerable amount of multiple cropping (the practise of planting and harvesting more than one crop in a single year on the same field), since this quantity is bigger than the net planted area.

Table 2: State Per Capita Income

Year	Per Capita Income of Haryana (Rupees)	
	At Current	At Constant (2011-12)
2011- 2012	106085	106085
2012-2013	121269	111780
2013-2014	137770	119791
2014-2015	147382	125032
2015-2016	164963	137818
2016-2017	185050	150241



The graph displays two trend lines, each representing the Per Capita Income of Haryana over a series of years, from 2011-2012 to 2016-2017. The two lines show income values in different price contexts:

- The current value of the per capita income is shown as a green line with circle marks along its length. This line displays the nominal income figures for each year without taking into account the effects of inflation. As such, it compares the value of the income to the prices of products and services that are available on the market in the same year that the income is received.
- The blue line with cross marks denotes the per capita income at constant prices. More precisely, this line is anchored to the price levels of the base year 2011-12. This revised metric takes into account the impacts of inflation and presents an analysis of the income in terms of the buying power that would have been comparable to that in 2011-2012.

The current value of the per capita income is shown by the green line with the round markers. This line displays the nominal income amounts for each year without making any adjustments for the effects of inflation. As a result, it compares the value of the income to the prices of products and services that are available on the market in the same year that the income is received.

The blue line with cross marks denotes the per capita income at constant prices, and it is particularly anchored to the price levels of the base year 2011-12. This modified measure takes into account the impacts of inflation and presents an analysis of the income in terms of the buying power that would have been comparable to that in 2011-2012.

Table 3 :Cropping Intensity in Haryana

Cropping Intensity in Haryana (base year-2007-08)	
Year	Intensity of Cropping
2007-08	179.74
2008-09	181.77
2009-10	178.9
2010-11	184.91
2012-13	181.5
2013-14	185.04
2014-15	187.96
2015-16	185.8
2017-18	189.76
2018-19	190.32

Source: Survey of Haryana, 2019 -20

Cropping intensity is the ratio of the total area cropped in a year to the net sown area during the same year, given as a percentage. This ratio is referred to as the total area cropped in a year. It is a measurement of how intensely the agricultural land is being utilised and may suggest multiple cropping if it is high enough (the practise of growing more than one crop on the same land in one agricultural year). The following is the formula that may be used to determine the cropping intensity:

Base Year 2007-08: This is the reference year, and the amount of land that was farmed in it was 179.74 percent. This indicates that some land was utilised to produce more than one crop in a year since for every 100 hectares of land that was sowed, there was cropping on roughly 180 hectares throughout the year.

Increasing Proportion: The cropping intensity has typically grown from 2007-08 to 2018-19, reaching a high point of 190.32 percent in 2018-19. This increase took place. This points to either an increase in the overall amount of land being farmed, an increase in the number of times the same land is farmed, or both of these things happening simultaneously.

A total of 184.57 percent of Haryana's land has been farmed intensively during the years 2007-2008 and 2018-19. Taking into account the fact that the same area may have been

farmed more than once throughout the course of a single year, this shows that the land was farmed an average of almost 1.85 times every year.

A collection of data has around 4.03 percent of variation or dispersion, as measured by the standard deviation, which is a measure of the degree of variation or dispersion. If the standard deviation is low, then the data points have a tendency to be clustered around the mean, while a large standard deviation suggests that the data points are dispersed across a broader range of values.

In this instance, the standard deviation of 4.03 percent implies that there was some change in the cropping intensity throughout the years, but that it was not very volatile. This is because the standard deviation is expressed as a percentage. This relatively low standard deviation suggests that cropping intensity in Haryana during the studied years has been reasonably steady, with a little trend to increase.

Table 4: Area under Principal Crops in Haryana

Year	Area under Principal Crops in Haryana				Sugarcane	Cotton	Oilseeds	Gross Area Sown
	Wheat	Rice	Total Food					
1966-67	743	192	3,250		150	183	212	4599
1970-71	1,129	269	3,868		156	193	143	4957
1980-81	1,479	484	3,963		113	316	311	5462
1990-91	1,850	661	4,079		148	491	489	5919
2000-01	2,355	1,054	4,340		143	555	420	6115
2005-06	2,303	1,047	4,311		129	584	736	6509
2010-11	2,504	1,243	4,702		85	493	521	6499
2011-12	2,531	1,234	4,581		95	602	546	6489
2012-13	2,497	1,206	4,302		101	593	568	6376
2014-15	2,628	1,277	4,479		96	647	495	6502
2015-16	2,576	1,353	4,451		93	615	526	6502
2016-17	2,542	1386	4,537		102	571	522	6502
2017-18	2,530	1,422	4,533		115	669	559	6549
2018-19	2,553	1,447	4,558		109	708	625	6550

Source: Survey of Haryana, 2019 -20

Wheat:Wheat is one of the most important crops grown in Haryana since it is used as a staple food. The steady rise from 743 (probably in '000 hectares) in 1966-1967 to 2,553 in 2018-19 is evidence of better agricultural techniques. These activities include the use of high-yielding cultivars and increased irrigation systems. This rise is a reflection of the effects of the Green Revolution, which was essential in Haryana's transition into a leader in India's agricultural sector.

Rice:The progression of rice agriculture from 192 to 1,447 follows a path that is similar to that of wheat cultivation. Rice growth indicates a shift in crop patterns, despite the fact that it requires a lot of water. This shift may be driven by market needs and procurement rules implemented by the government. Taking into consideration Haryana's arid-to-semi-arid environment, the shift that the state is making toward rice cultivation also implies improvements in irrigation.

Total Food:The expansion of the food production base is shown by the rise from 3,250 to 4,558 hectares in the total area planted in food crops. Cereals, pulses, and other food crops are probably included in this category, which jointly reflects the state's reaction to food security concerns and the diversification of agriculture.

Sugarcane:The relatively consistent numbers for sugarcane suggest that the cultivation of this commodity is less susceptible to changes in market conditions than the production of other cash crops. It is possible that sugarcane's consistency might be ascribed to the function it plays in crop rotation as well as the establishment of a consistent market owing to the presence of sugar mills.

Cotton:Cotton production in Haryana has increased dramatically over the last decade, from 183 tonnes to 708 tonnes, illustrating the state's transition toward commercial agriculture. Cotton, a crop that is grown during the kharif season, has been promoted as a result of technology breakthroughs such as genetically modified seeds. These seeds have enhanced yields and disease resistance.

Oilseeds: The dramatic move toward commercial agriculture in Haryana is shown by the surge in cotton production from 183 to 708. Cotton, a crop that is grown during the kharif season, has been given a boost as a result of technology breakthroughs such as genetically modified seeds, which have enhanced yields and disease resistance.

Gross Area Sown: The overall increase in gross area sown, from 4,599 to 6,550, encompasses the total area planted with crops. The numbers suggest an increase in double or multiple cropping practices, where a single field is used to grow successive crops in a year, indicating an intensification of agriculture.

Agricultural Evolution and Economic Implications: Haryana's agriculture has evolved from subsistence to a more diversified and market-oriented system. The expansion and intensification of agriculture in the state have not only contributed to India's food basket but also to the livelihood of millions of farmers. However, this growth comes with challenges such as groundwater depletion and soil health issues due to continuous and intensive cultivation.

Sustainability Concerns: The data hints at the need for sustainable agricultural practices. The push for higher yields has often come at the cost of environmental degradation. There is a pressing need to balance productivity with sustainability, possibly through the adoption of conservation agriculture practices, such as crop rotation, minimum tillage, and integrated pest management.

Adaptation to Climate Change: The agricultural sector must adapt to the realities of climate change. This involves developing and adopting crop varieties resistant to heat, drought, and flood, alongside efficient water management practices to ensure the resilience of agriculture.

Policy and Technology: Government policies have played a critical role in shaping the agricultural landscape, with initiatives aimed at boosting production, ensuring fair prices to farmers, and encouraging the adoption of new technologies. However, policies must also pivot towards addressing the emerging challenges of resource conservation and sustainable agricultural practices.

Production of Major Crops in Haryana

Table 5: Agricultural Production of Major Crops ('000' ton)

Year	Wheat	Rice	Total F/grain	Sugarcane	Cotton ('000' bales)	Oilseeds
1966-67	1059	223	2592	5100	288	92
1970-71	2342	460	4771	7070	373	98
1980-81	3490	1259	6036	4600	643	188
1990-91	6436	1834	9559	7800	1155	638
2000-01	9669	2695	13294	8170	1383	571
2005-06	8853	3194	13006	8310	1502	830
2010-11	11578	3465	16568	6042	1747	965
2011-12	13119	3757	18370	6953	2616	758
2012-13	11117	3941	16146	7500	2378	972
2013-14	11800	4041	16970	7427	2027	899
2014-15	10457	3989	15340	7035	1939	729
2015-16	11351	4142	16330	6992	995	841
2016-17	12310	4451	17877	8167	2046	956

Source: Economic Survey of Haryana, 2019 -20

Wheat: The steady increase in wheat production from 1,059 in 1966-67 to 12,310 in 2016-17 reflects the success of agricultural policies and the introduction of high-yielding varieties during the Green Revolution. Wheat, being a staple in India, has seen significant investments in terms of improved irrigation, fertilizers, and better seeds.

Rice: Rice production has also seen a substantial increase, indicative of diversification in agriculture and the expansion of irrigation facilities that allow for water-intensive crops like rice to be grown in a traditionally wheat-dominant region.

Total Food Grains: The total production of food grains includes cereals like wheat and rice, along with other grains. This number has more than sextupled over the 50-year span, highlighting the overall growth in agricultural output and potentially the impact of multiple cropping and improved agricultural practices.

Sugarcane: Sugarcane's production has seen fluctuations, with a notable decrease in 1980-81, followed by an increase peaking in the 2000s. This could be attributed to market demand, policy changes, and water availability for this water-intensive crop.

Cotton ('000 bales): Cotton production has significantly increased, particularly from 1990-91 onwards. This could be due to the introduction of Bt cotton in the late 2000s, which helped increase yields and pest resistance. However, there's a notable dip in 2015-16, possibly due to factors like pest attacks or market dynamics.

Oilseeds: The production of oilseeds shows an upward trend with some fluctuations. Oilseeds are a critical component in India's agriculture, providing edible oils and contributing to soil fertility through nitrogen fixation.

Analysis of Trends:

1. **Green Revolution Impact:** The marked increase in the production of wheat and rice from the 1960s to the 2010s is a direct result of the Green Revolution, which brought improved crop varieties and farming techniques.
2. **Crop Diversification:** The diversification into crops like rice and cotton reflects changes in agricultural policy, market demands, and farmers' responses to these.
3. **Technological Advancements:** The introduction of genetically modified crops, particularly in cotton, has led to higher yields.
4. **Water Use:** The production of water-intensive crops like rice and sugarcane suggests an increase in the availability of irrigation. However, this also raises concerns about sustainable water use and the long-term impact on water resources.
5. **Economic Factors:** Fluctuations in cotton and sugarcane production can be attributed to changes in global market prices, domestic demand, and policy incentives or disincentives.
6. **Sustainability and Challenges:** Increases in production must be weighed against the environmental impact, such as soil degradation, water table depletion, and biodiversity loss. There's a growing need for sustainable farming practices to maintain soil health and water resources.
7. **Climate Change:** With climate change, unpredictable weather patterns may affect production. Adaptation strategies, including the development of drought-resistant and heat-tolerant crop varieties, are essential.

8. **Policy Implications:** The data underscores the need for policies that promote sustainable agricultural practices, support farmers in times of crop failure, and ensure fair pricing and market access.

Table 6: Economic Surveys of Haryana

Year	Agriculture	Industry	Services
1969-70	60.7	17.6	21.7
Base year 1993-94			
1993-94	42.5	26.2	31.3
1994-95	42.4	26.7	30.9
1995-96	39.4	28.3	32.3
1996-97	39.2	27.1	33.7
1997-98	35.6	28.4	36
1998-999	34.9	28.8	36.3
1999-2000	33.9	28.2	37.9
2000-01	32.6	27.9	39.5
2001-02	31.1	28	40.9
2002-03	29.3	27.8	42.9
2003-04	29.5	27.5	43
Base year 2004-05			
2004-05	23.1	32.9	44
2006-07	21.3	32.1	46.6
2009-10	17.44	29.92	52.64
2011-12	16.8	28.7	54.5
2012-13	15.6	27.7	56.7
2013-14	15	27	58
2014-15	14.1	27	58.9
2015-16	18.2	30.5	51.3
2016-17	17.8	30.5	51.7
2017-18	17.6	31.5	50.9
2018-19	17.5	32.3	50.2
2019-20	16.6	32.8	50.6

Source: Economic Surveys of Haryana, Various years

The data provided offers a longitudinal view of the economic structure of Haryana, showing the percentage contribution of agriculture, industry, and services to the economy from 1969-

70 to 2019-20. This period encapsulates the state's transition from a predominantly agrarian economy to a more diversified one with significant contributions from industry and services.

Agricultural Shifts: Starting with a massive 60.7% contribution in 1969-70, agriculture's share has been on a consistent decline, reaching 16.6% by 2019-20. This decline doesn't necessarily mean that agricultural output decreased; rather, it suggests that other sectors have grown at a faster pace. The Green Revolution had a profound impact on Haryana, which saw significant increases in agricultural yields. However, given the limited land and the saturation of productivity improvements, the relative share of agriculture in the state's economy was bound to diminish.

Industrial Growth: The industry's share grew from 17.6% to 32.8% over the 50-year span. This growth is reflective of Haryana's strategic development policies, including the establishment of industrial corridors, SEZs, and incentives for manufacturing. The state's proximity to the national capital, Delhi, also facilitated this industrial growth, making it an attractive destination for both domestic and foreign investments.

Services Sector Expansion: The most significant growth is seen in the services sector, which jumped from 21.7% to 50.6%. This sector encompasses a wide range of activities including IT services, retail, banking, real estate, education, and health. The expansion of the services sector is a natural progression for developing economies, driven by urbanization, increased income levels, and technological advancements.

Economic Diversification and Development: The transition observed in the data is typical of a developing economy transforming into a more mature one. As Haryana's economy diversified, job opportunities in manufacturing and services attracted the labor force from agriculture. Increased productivity in agriculture due to mechanization allowed for labor to move out of agriculture without causing a decline in agricultural output.

Policy Implications: The shift towards industry and services suggests that policies have been effective in facilitating industrial growth and promoting service-oriented businesses. However, the volatility seen, especially in the later years where agriculture seems to regain

some share, may indicate policy recalibration or the impact of specific economic or climatic events.

Socioeconomic Factors: Economic growth has brought along challenges and opportunities. While industrialization and the expansion of services have improved living standards, they have also raised concerns about sustainable development, environmental impact, and the urban-rural divide. Haryana's challenge is to ensure that growth is inclusive and benefits all sections of society.

Urbanization and Infrastructure: The development of cities like Gurgaon, which has become a major IT and corporate hub, reflects the robust growth of the services sector. Urbanization has been accompanied by improvements in infrastructure, but it also demands better urban planning to avoid issues like traffic congestion and pollution.

Sustainability and Environmental Concerns: As the economy grows, sustainability becomes crucial. Industrial growth must be managed alongside environmental conservation, and the services sector should leverage technology to minimize its ecological footprint.

Agricultural Concerns: Despite the reduced share in GDP, agriculture remains vital for rural livelihoods and food security. Sustainable agricultural practices are needed to address issues like water scarcity and soil health.

Future Outlook: Going forward, Haryana's economy may continue to see a rise in the services and industry sectors' contribution. Emphasis on high-skilled services, along with value-added manufacturing, could define the state's economic trajectory. With the advent of digital technologies and a push towards renewable energy, Haryana's economic model could set a benchmark for balanced regional development.

Conclusion

A clear indicator of Haryana's transition to commercial agriculture is the dramatic increase in cotton production, from 183 to 708. Technological improvements, such as genetically

modified seeds, have promoted cotton, a kharif crop, by increasing yields and making it more resistant to diseases.

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