



TEMPORAL AND SPATIAL DYNAMICS OF CROPPING PATTERN IN HARYANA (1970-71 TO 2020-21): A GEOGRAPHICAL ANALYSIS

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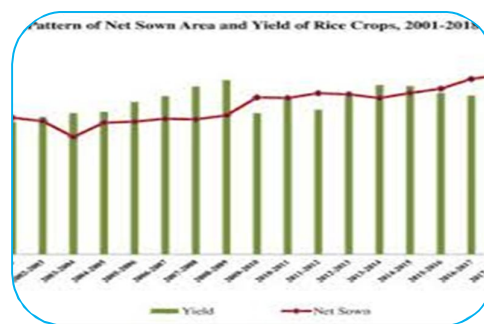
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ABSTRACT:

Cropping pattern is a dynamic geographical phenomenon that reflects the interaction of physical, technological, economic, and institutional factors over time and space. This paper examines the temporal and spatial changes in the area and production of five major crops of Haryana - wheat, rice, sugarcane, pulses, and cereals - over a fifty-year span (1970-71 to 2020-21), and analyses the district-wise spatial pattern for 2010-11 and 2020-21. Secondary data were obtained from the Statistical Abstract of Haryana, and analysed using percentage change and choropleth mapping techniques at the district level. The results reveal a consistent long-term expansion in the area and production of wheat, rice, and cereals, a steady decline in pulses cultivation, and fluctuating trends in sugarcane. Spatially, the northern and north-eastern districts (Karnal, Kaithal, Kurukshetra, Yamunanagar) dominate rice and sugarcane cultivation, while the south-western and western districts (Hisar, Sirsa, Bhiwani) lead in wheat and pulses. Decadal (2010-11 to 2020-21) district-level comparison indicates a shift of cropped area away from peri-urban districts such as Palwal, Rohtak, and Gurugram, attributable to urbanisation and water-resource constraints. The study concludes that a combination of irrigation development, crop-specific price incentives, and urban expansion continues to reshape Haryana's agricultural geography, and highlights the need for targeted policy interventions in lagging districts to ensure balanced agricultural development.



KEYWORDS: Cropping pattern, Temporal-spatial analysis, Haryana, Cereals, Agricultural change, Land use.

1. INTRODUCTION

Cropping pattern denotes the proportion of area under different crops at a given point in time, and represents a succession of harvests obtained from an area over the course of an agricultural year. It mirrors the farmer's decisions regarding the choice of crops, decisions that are shaped by household food and fodder requirements, irrigation availability, soil quality, marketing opportunities, and expected returns (Askari & Cummings, 1977). Since no single cropping pattern remains optimal for all times, it is inherently a dynamic concept that must ensure the efficient use of land, water, fertiliser, and labour, while enabling farmers to raise output per unit area.

The pace of change in the acreage of individual crops mirrors the techno-economic transformation of an agrarian economy, with price expectation regarded as the single most important determinant of land allocation among competing crops. A substantial body of empirical literature corroborates the positive relationship between price and area response for major crops across different

regions of India and elsewhere (Askari & Cummings, 1977). Developmental strategies in Indian agriculture have historically sought not merely to raise aggregate output but also to maintain a nutritionally desirable output-mix, an issue that became especially pertinent when the impressive growth in foodgrain output during the late 1960s and early 1970s coincided with a marked change in the cropping pattern (Acharya & Bhatia, 1974).

Haryana is one of India's most agriculturally advanced states, yet its physiography is far from uniform. South-western Haryana is distinctly less developed, agriculturally, than the rest of the state, a disparity attributable in large part to unequal canal and tube-well irrigation development (Kumar, 2023). Successive agricultural reforms - the Green Revolution, land reforms, minimum support price policy, and post-1991 economic liberalisation - have together reshaped the state's cropping pattern over the decades (Rani, 2019). Against this backdrop, the present paper traces the temporal evolution of area and production of major crops in Haryana between 1970-71 and 2020-21, and examines the spatial pattern of these crops across the state's districts for 2010-11 and 2020-21, so as to identify the districts that have gained or lost prominence in the state's cropping economy over the past decade.

2. STUDY AREA

Haryana, carved out of the erstwhile Punjab in 1966, lies in the north-western part of India between approximately 27°39' and 30°55' North latitude and 74°27' and 77°36' East longitude. The state is bordered by Punjab and Himachal Pradesh in the north, Rajasthan in the west and south, and Uttar Pradesh and the National Capital Territory of Delhi in the east. Physiographically, the state can be divided into the Shivalik foothill tract in the north-east, the alluvial Indo-Gangetic plain that dominates the central and eastern parts, and the semi-arid, sandy south-western tract bordering the Thar Desert. This physiographic gradient underlies much of the inter-district variation in irrigation development, soil fertility, and cropping intensity discussed in this paper.

3. OBJECTIVES

The specific objectives of the present study are:

1. To examine the temporal change in the area and production of major crops (wheat, rice, sugarcane, pulses, and cereals) in Haryana from 1970-71 to 2020-21.
2. To analyse the district-wise spatial pattern of area and production of these crops for the years 2010-11 and 2020-21.
3. To identify the districts that have registered a positive or negative change in the spatial pattern of cropped area and production over the decade 2010-11 to 2020-21.

4. DATABASE AND METHODOLOGY

The study is based entirely on secondary data drawn from the Statistical Abstract of Haryana (various issues, Economic and Statistical Organisation, Government of Haryana). District-wise and state-level time-series data on area (in thousand hectares) and production (in thousand metric tonnes) of wheat, rice, sugarcane, pulses, and cereals were compiled for six reference years - 1970-71, 1980-81, 1990-91, 2000-01, 2010-11, and 2020-21 - to capture the temporal dimension, and for 2010-11 and 2020-21 at the district level to capture the spatial dimension. Simple statistical techniques, namely absolute and percentage change, were employed to measure temporal change, while each district's percentage share in the state total area and production was computed and mapped using standard choropleth cartographic techniques to depict the spatial pattern and decadal change across the 21-22 districts of Haryana (district reorganisation added Charkhi Dadri as a new district after 2010-11).

5. RESULTS AND DISCUSSION

5.1 Temporal Change in Area and Production of Major Crops, 1970-71 to 2020-21

Table 1 presents the consolidated area (A, in '000 ha) and production (P, in '000 tonnes) of the five major crops of Haryana across six reference years. Wheat has shown the most consistent expansion, with the cultivated area rising from 1,129.30 thousand hectares in 1970-71 to a peak of 2,504.00 thousand hectares in 2010-11, before moderating slightly to 2,354.00 thousand hectares in 2020-21; corresponding production rose nearly five-fold, from 2,342 to 11,406 thousand tonnes,

reflecting the combined effect of area expansion, assured irrigation, high-yielding varieties, and the minimum support price regime that has historically favoured wheat.

Rice recorded the sharpest relative growth among the five crops, with area increasing almost six-fold (from 269.20 to 1,525.80 thousand hectares) and production rising more than twelve-fold (from 460 to 5,633 thousand tonnes) over the study period, an outcome closely linked to the expansion of tube-well irrigation and the diffusion of high-yielding paddy varieties in the north-eastern districts. Sugarcane, in contrast, has shown a fluctuating trajectory, contracting sharply between 1970-71 and 1980-81 before stabilising and registering a marginal recovery after 2010-11. Pulses present the clearest case of long-term decline: cultivated area collapsed from 1,158.90 thousand hectares in 1970-71 to just 40.50 thousand hectares in 2020-21, a fall of over 96 percent, as farmers progressively substituted pulses with more remunerative wheat, rice, and cash crops. Cereals as a group, which subsume wheat and rice along with coarse grains, expanded steadily throughout the period, area rising from 2,708.80 to 4,526.50 thousand hectares and production increasing more than four-fold, from 3,939 to 18,524 thousand tonnes.

Table 1: Temporal Change in Area (A, '000 ha) and Production (P, '000 tonnes) of Major Crops in Haryana, 1970-71 to 2020-21

Sr. No.	Crop	1970-71	1980-81	1990-91	2000-01	2010-11	2020-21
1	Wheat (A)	1129.30	1479.00	1850.10	2354.80	2504.00	2354.00
	Wheat (P)	2342	3490	6436	9669	11578	11406
2	Rice (A)	269.20	483.90	661.20	1054.30	1243.30	1525.80
	Rice (P)	460	1259	1834	2695	3465	5633
3	Sugarcane (A)	155.70	113.10	147.80	143.00	84.50	99.70
	Sugarcane (P)	707	460	780	817	604	858
4	Pulses (A)	1158.90	794.80	742.00	157.00	111.50	40.50
	Pulses (P)	832	502.5	541.7	99.8	110	40.1
5	Cereals (A)	2708.80	3167.70	3337.30	4186.50	4524.60	4526.50
	Cereals (P)	3939	5533	9017	13195	16413	18524

Source: Compiled from Statistical Abstract of Haryana (various issues).

5.2 Spatial Pattern of Major Crops in Haryana, 2010-11 and 2020-21

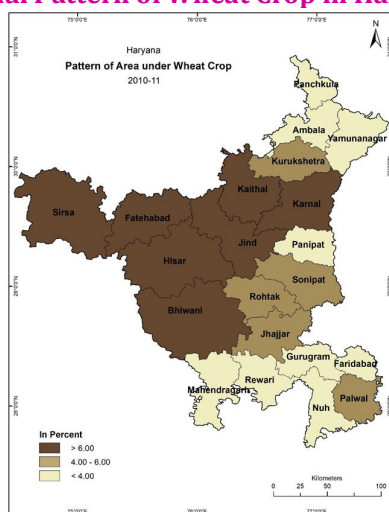
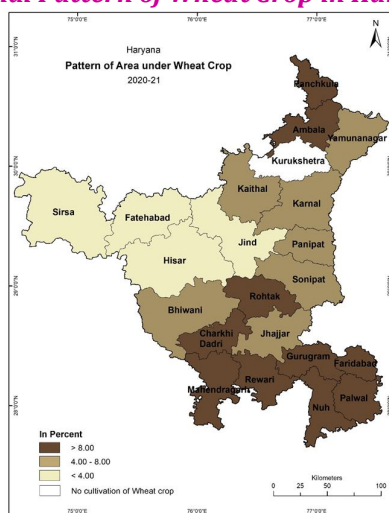
The district-wise spatial pattern reveals a marked geographical division of agricultural specialisation across Haryana in both reference years. Wheat cultivation is most concentrated in the western and south-western districts - Sirsa, Hisar, Jind, and Fatehabad - which together account for over a third of the state's wheat area in both 2010-11 and 2020-21, reflecting the extension of canal irrigation into these otherwise semi-arid tracts. Rice cultivation, in contrast, remains concentrated in the north-eastern districts of Karnal, Kaithal, and Kurukshetra, where assured canal and groundwater irrigation and suitable clay-loam soils favour paddy cultivation. Sugarcane shows the most spatially concentrated pattern of all five crops, with Yamunanagar alone accounting for roughly a fifth to a third of the state's sugarcane area in both years, followed by Karnal and Kurukshetra.

Pulses cultivation, though declining overall, remains disproportionately concentrated in Bhiwani and Hisar, districts with lighter soils and lower irrigation intensity where pulses continue to be grown as a rain-fed rotation crop; between 2010-11 and 2020-21, Hisar's share of the state's pulses area rose sharply (from 16.11 to 45.86 percent) even as the state's total pulses area contracted, indicating a spatial consolidation of pulses cultivation into fewer, drier districts rather than its uniform decline. Cereals, as an aggregate category, are led by Hisar, Karnal, and Kaithal in both years, districts that combine high wheat and rice shares with substantial coarse cereal cultivation. Table 2 summarises the leading districts for each crop in the two reference years.

Table 2: Leading Districts by Percentage Share of Cropped Area, Haryana, 2010-11 and 2020-21

Crop	Leading districts, 2010-11 (% area)	Leading districts, 2020-21 (% area)
Wheat	Sirsa (11.22), Hisar (9.05), Jind (8.65)	Sirsa (12.48), Hisar (9.82), Jind (9.16)
Rice	Karnal (14.22), Kaithal (13.12), Kurukshetra (9.78)	Karnal (11.63), Kaithal (11.55), Jind/Fatehabad (9.16/8.26)
Sugarcane	Yamunanagar (32.07), Kurukshetra (17.55), Ambala (12.12)	Yamunanagar (19.80), Karnal (11.40), Kurukshetra (11.00)
Pulses	Bhiwani (48.10), Hisar (16.11), Rohtak (5.24)	Hisar (45.86), Bhiwani (22.21), Mahendragarh (11.43)
Cereals	Hisar (7.28), Kaithal (7.73), Jind (8.37)	Hisar (7.65), Karnal (8.06), Kaithal (7.94)

Source: Compiled from Statistical Abstract of Haryana (2012, 2022).

Figure 1: Spatial Pattern of Wheat Crop in Haryana, 2010-11**Figure 2: Spatial Pattern of Wheat Crop in Haryana, 2020-21**

5.3 Decadal Change in Spatial Pattern, 2010-11 to 2020-21

A comparison of the two reference years highlights a modest but discernible redistribution of cropped area across districts over the decade. For wheat, districts such as Karnal (+1.04%), Sirsa

(+1.25%), and Kaithal (+0.83%) recorded a rising share of area, aided by continued irrigation development and strong agricultural infrastructure, whereas peri-urban and southern districts - Palwal (-3.53%), Rohtak (-2.35%), and Bhiwani (-1.35%) - registered a marked decline, plausibly reflecting urban expansion, groundwater depletion, and diversification towards other land uses. A similar pattern is evident for rice, with Fatehabad and Hisar gaining share while Karnal and Kurukshetra, despite remaining the state's leading rice districts, recorded a relative decline, suggesting an incipient westward shift in rice cultivation.

The sugarcane crop shows the greatest volatility at the district level: Kurukshetra's area share fell by 6.52 percentage points, one of the sharpest declines recorded for any crop-district combination in the dataset, while several central and southern districts recorded modest gains, indicating a partial dispersal of sugarcane cultivation away from its traditional core in the Yamunanagar-Kurukshetra belt. For pulses, Hisar registered an exceptionally large gain in area share (+29.75 percentage points) even as most other districts, including the erstwhile leader Bhiwani (-25.89 percentage points), saw sharp declines, confirming the trend towards spatial concentration noted above. For cereals as a whole, most districts recorded only marginal change (typically under one percentage point), with Palwal (-1.55%) and Rohtak (-1.32%) again standing out as the principal districts of decline, and Sirsa (+0.86%) among the more prominent gainers.

Figure 3: Spatial Pattern of Cereals Production in Haryana, 2020-21

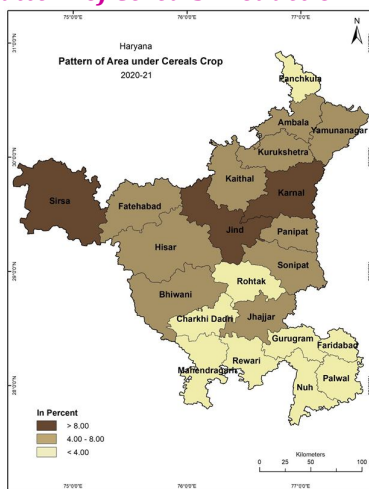
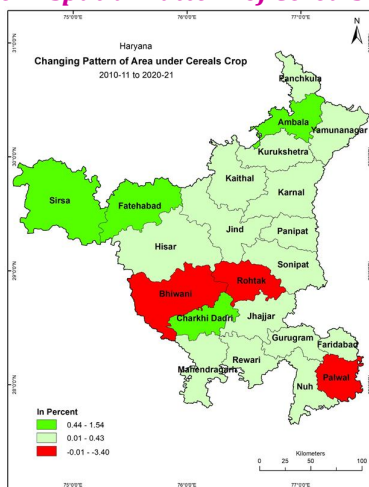


Figure 4: Decadal Change in Spatial Pattern of Cereals Crop, 2010-11 to 2020-21



6. CONCLUSION

The temporal analysis for 1970-71 to 2020-21 demonstrates that Haryana's cropping pattern has undergone a fundamental transformation, characterised by the sustained expansion of wheat, rice, and cereals, the near collapse of pulses cultivation, and a fluctuating but ultimately recovering sugarcane sector. These shifts are best understood as the cumulative outcome of irrigation development, minimum support price incentives skewed towards foodgrains, and the diffusion of high-yielding crop varieties since the Green Revolution. The spatial analysis for 2010-11 and 2020-21 reveals a persistent north-south and east-west specialisation - rice and sugarcane concentrated in the irrigated north-east, and wheat and pulses in the semi-arid west and south-west - with only limited convergence over the intervening decade.

The decadal comparison further indicates that peri-urban districts such as Palwal, Rohtak, and Gurugram are steadily losing cropped area across almost all major crops, most plausibly on account of urbanisation, non-farm land conversion, and groundwater stress, whereas districts with stronger irrigation and input-delivery infrastructure, such as Karnal, Kaithal, Sirsa, and Hisar, continue to consolidate or expand their share. These findings underscore the continuing importance of district-differentiated agricultural policy: while the leading districts require support in sustaining productivity gains and managing input-intensive cultivation, the declining districts warrant targeted interventions - improved irrigation, crop diversification incentives, and market linkages - to arrest the erosion of their agricultural base and to promote a more balanced pattern of agricultural development across Haryana.

REFERENCES

1. Acharya, S. S., & Bhatia, M. S. (1974). Changing pattern of agricultural production in India: An analysis of the growth performance of foodgrains. *Indian Journal of Agricultural Economics*, 29(3).
2. Anand, M. (2015). The spatio-temporal analysis of cropping pattern in Haryana. *Golden Research Thoughts*, 4(12), 132-139.
3. Askari, H., & Cummings, J. T. (1977). Estimating agricultural supply response with the Nerlove model: A survey. *International Economic Review*, 18(2), 257-292.
4. Krishnan, P., Aggarwal, P., Mridha, N., & Bajpai, V. (2019). Spatio-temporal changes in wheat crop cultivation in India. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 42, 385-395.
5. Kumar, S. (2023). Spatio-temporal analysis of irrigation development in southwestern Haryana, India. *Asian Journal of Geographical Research*, 6(3), 74-88.
6. Rani, P. (2019). Changing land use pattern in Haryana: A spatio-temporal study. *International Journal of Research and Analytical Reviews*, 6, 567-573.
7. Rawat, S. D., & Bala, S. (2021). Changing cropping pattern in Haryana: A spatio-temporal analysis of major food crops. *International Journal of All Research Education and Scientific Methods*, 9(3), 212-225.
8. Statistical Abstract of Haryana. (2012). Economic and Statistical Organisation, Planning Department, Government of Haryana.
9. Statistical Abstract of Haryana. (2022). Economic and Statistical Organisation, Planning Department, Government of Haryana.