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ASSESSMENT OF SPATIO-TEMPORAL CHANGES IN CROPPING INTENSITY OF PUNJAB AND HARYANA

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Abstract: With the start of the Green Revolution and globalization, farming became more intensive in emerging nations.Punjab and Haryana are the pioneer states of India where increased agricultural productivity due to Green Revolution was witnessed. With passage of time and shortage of land resources due to increasing population, only an intensive strategy for food production was the viable option for states of Punjab and Haryana to maintain the agricultural productivity.Cropping intensity is an indicator which helps in determine that how often same parcel of land is being cultivated in one agricultural year. Thus, higher cropping intensity pinpoints towards the intensification of agriculture in that region. These two states have highest cropping intensity and it was 190.28 percent in Punjab and 186.93 percent in Haryana. The present study aims to evaluate the spatio-temporal variations and changes in cropping intensity.

Key words: Agricultural Intensification, Cropping Intensity, Green Revolution, Net Sown Area

Introduction: It has been noted that greater population growth results in increased food production, which may be achieved by either pursuing agricultural intensification (increasing the intensity of cultivating the given area) or agricultural intensification (expanding the area under cultivation). In Punjab and Haryana, agriculture intensification is being followed as further horizontal expansion of agricultural land is not viable.This intensification of agriculture has been made possible by scientific advancements. The proportion of total cropped area to net sown area is known as cropping intensity. Cropping intensity can be examined by remembering that its spatio-temporal variation depends on a wide range of physical, economic, and technological factors, including topography, an agriculturally suitable climate, fertile soil, the presence of irrigation facilities, the size of the landholding, the role of farm mechanization, marketing facilities, and the income level of the farmers.Crop production and pattern are largely determined by cropping intensity, as are opportunities for crop diversification and rotation, agricultural income potential, and rural employment (Mondal and Sarkar, 2021).

Objectives:

1. To study the spatial pattern of cropping Intensity.
2. To analyze the changes in cropping intensity.

Study Area: The study region has been selected to represent the northwest Indian states of Punjab and Haryana. These two states were unified into one state of Punjab, before 1966. These two states are considered as India's fertile crescent and are renowned for their agricultural excellence. Its location in the lush Indo-Gangetic plains, which have an abundance of surface and ground water supplies, made this possible.The study area spans the longitudinal range of 73°55' east to 77°46' east and the latitude range of 27°37' north to 32°32' north. The study region is bordered by Himachal Pradesh in the north and north east, Jammu and Kashmir in the northwestRajasthan in the west and south west, Uttar Pradesh and the Union Territory of Delhi in the east. Haryana and Punjab both have total areas of 44,212 square kilometers and 50,362 square kilometers, respectively.

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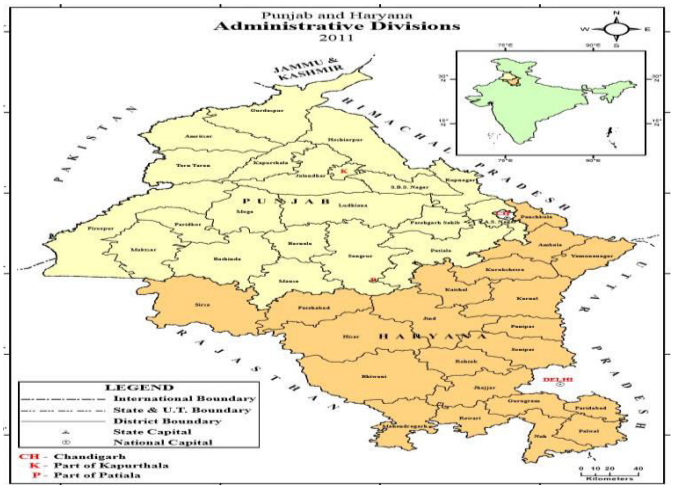


Source: Administrative Atlas of Punjab and Haryana, 2011.

Research Methodology: The present study is based on secondary data sources and district has been considered as the study unit. Relevant tables and maps have been prepared and analyzed.

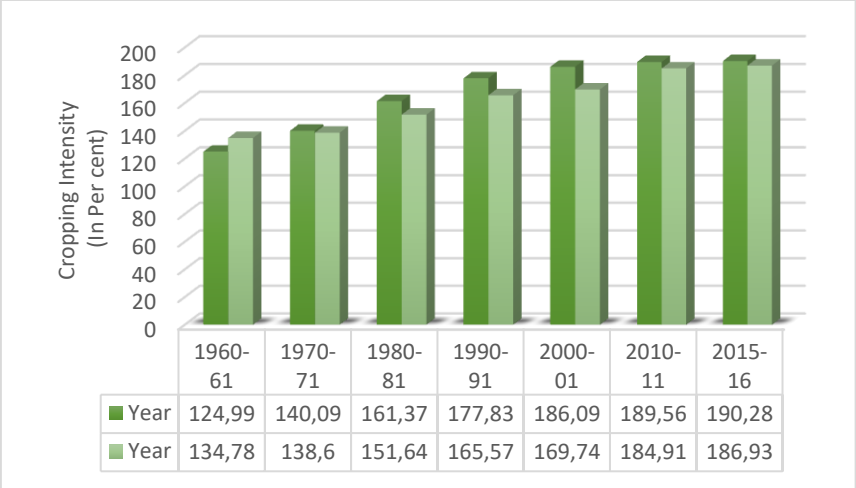
The formula used for calculation of Cropping Intensity is:

Cropping Intensity (CI) = (Total Cropped Area(TCA)/Net Sown Area (NSA)) x 100

Results:

Between 1960–1961 and 2015–2016, cropping Intensity increased from 124.99 to 190.28 percent in Punjab and from 134.78 to 186.93 percent in Haryana (Fig 1). It is the greatest in the nation.The primary reason for the rise in cropping intensity is that as population grows, more land is being used for non-agricultural purposes, while less land is being left fallow, barren, or unusable for cultivation. Thus, there is very little space for additional horizontal growth in Punjab and Haryana, which has resulted in intensive cultivation of the land.

Fig 1 Cropping Intensity in Punjab and Haryana



Source: S.A.P. 1961, 2016; and S.A.H. 1966-67, 2016-17

Mahendragarh district had the greatest cropping intensity in 1960–1961 (158.94%). Mahendragarh district has sandy, loamy sand, and light loam soil types. The light loam holds moisture well and requires little ploughing. Dry farming is particularly effective on this soil, and intensive farming is also possible(Gazetteer of India, 1988). The districts of Moga (102.17%) and Muktsar (104.39%) had the lowest agricultural intensity. Dry climate, sandy soils, and a lack of irrigation infrastructure were the major causes of low cropping intensity.The Panchkula district (215.79%) has the highest cropping intensity in 2015–16. The net sown area has drastically decreased, and as a result, crop intensity has grown to meet the demands of the growing urban population.

Table 1. Cropping Intensity and Change in Cropping Intensity (In Per cent)

State/District	1960-	1970-71	1980-81	1990-91	2000-01	2010-11	2015-16	Change

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	61							
Punjab								**65.29**
Gurdaspur	135.21	140.70	166.67	156.19	168.84	175.87	195.72	60.51
Amritsar	155.17	151.08	166.21	180.97	189.04	195.39	200.91	45.74
Tarn Taran	123.46	150.99	166.16	174.88	178.90	181.65	181.19	57.73
Kapurthala	113.39	117.42	142.86	177.30	194.07	201.49	198.51	85.11
Jalandhar	116.98	139.29	160.53	177.53	173.95	172.46	166.53	49.55
S.B.S Nagar	137.35	133.70	159.18	171.43	171.29	188.66	196.84	59.49
Hoshiarpur	129.90	144.34	150.68	160.47	167.89	178.50	166.67	36.77
Rupnagar	125.33	164.94	153.01	180.28	178.21	184.81	170.37	45.04
S.A.S Nagar	125.33	155.56	162.35	180.00	169.62	162.82	128.57	3.24
Ludhiana	112.77	155.81	173.48	184.84	198.68	199.00	200.67	87.90
Firozpur	129.64	140.86	158.28	183.19	190.11	187.74	189.81	60.17
Faridkot	125.64	127.82	155.22	179.84	187.12	200.00	195.28	69.63
Muktsar	104.39	129.44	155.46	174.15	184.19	192.92	199.56	95.17
Moga	102.17	111.28	156.78	176.50	197.98	193.43	198.47	96.30
Bathinda	115.79	137.30	155.92	170.13	187.96	187.84	189.80	74.01
Mansa	115.84	135.23	156.06	171.50	180.79	192.63	194.71	78.87
Sangrur	140.98	140.44	166.37	193.66	196.97	198.08	199.36	58.38
Barnala	128.46	143.85	167.72	192.97	199.21	210.48	200.00	71.54
Patiala	135.83	142.11	171.11	186.19	194.87	197.34	196.55	60.72
Fatehgarh Sahib	135.16	144.90	171.72	186.73	188.35	183.33	187.25	52.09
Haryana								**52.15**
Ambala	130.77	133.80	150.68	156.38	182.73	194.34	193.52	62.75
Panchkula	130.14	135.44	151.22	156.38	148.39	158.33	215.79	85.65
Yamunanagar	133.33	137.07	155.37	154.76	154.40	170.40	169.35	36.02
Kurukshetra	139.64	142.06	169.12	183.45	184.35	179.47	191.72	52.08
Kaithal	138.61	143.18	168.95	176.28	193.40	191.54	188.67	50.06
Karnal	139.02	142.06	152.63	189.68	182.69	195.00	201.55	62.52
Panipat	141.11	141.75	152.29	158.71	186.60	198.96	172.34	31.23
Sonipat	138.01	142.62	151.15	150.94	158.29	213.89	200.00	61.99
Rohtak	138.30	141.83	139.58	139.63	150.70	164.29	164.23	25.94
Jhajjar	137.41	142.68	138.75	141.51	147.95	143.71	174.10	36.69
Faridabad	127.78	135.71	145.76	161.82	242.11	191.43	203.45	75.67
Palwal	126.67	136.11	146.30	161.76	141.67	179.44	187.50	60.83
Gurugram	126.53	137.00	167.57	176.32	156.32	139.02	134.62	8.08
Nuh	127.52	135.40	168.18	153.33	151.40	163.21	164.86	37.34
Rewari	130.84	137.27	142.62	152.76	160.00	156.35	153.17	22.33
Mahendragarh	158.94	148.34	141.06	168.59	174.68	192.47	188.89	29.95
Bhiwani	139.33	138.01	153.81	165.74	155.64	202.16	199.00	59.67
Jind	135.07	153.62	162.29	193.95	194.07	198.74	195.08	60.01
Hisar	128.65	134.21	157.23	169.55	171.52	193.09	198.50	69.84
Fatehabad	128.77	133.33	157.85	176.85	181.82	189.73	188.26	59.49
Sirsa	128.85	133.70	131.41	158.45	166.22	177.72	187.66	58.81

Source: S.A.P. 1961, 1971, 1981, 1991, 2001, 2011, 2016; and S.A.H. 1966-67, 1971-72, 1981-82, 1991-92, 2001-02, 2011-12, 2016-17

The other districts having cropping intensities of greater than 200 percent in 2015-16 are Ludhiana (201.91%), Amritsar (200.91%), Karnal (201.55%), and Faridabad (203.45%). (200.67 per cent). Most of these districts have greater irrigation coverage than other districts in the research region, and they have more developed agricultural systems. The districts with the lowest cropping intensity are S.A.S. Nagar

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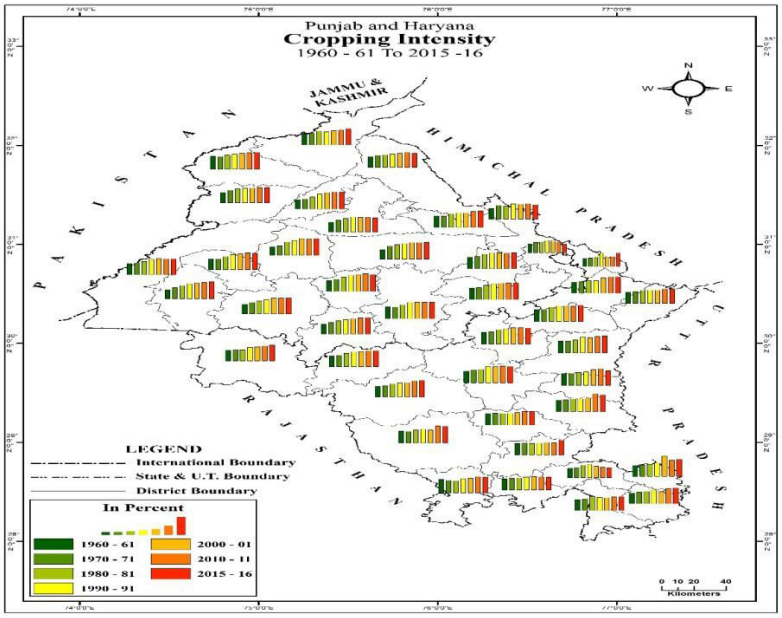
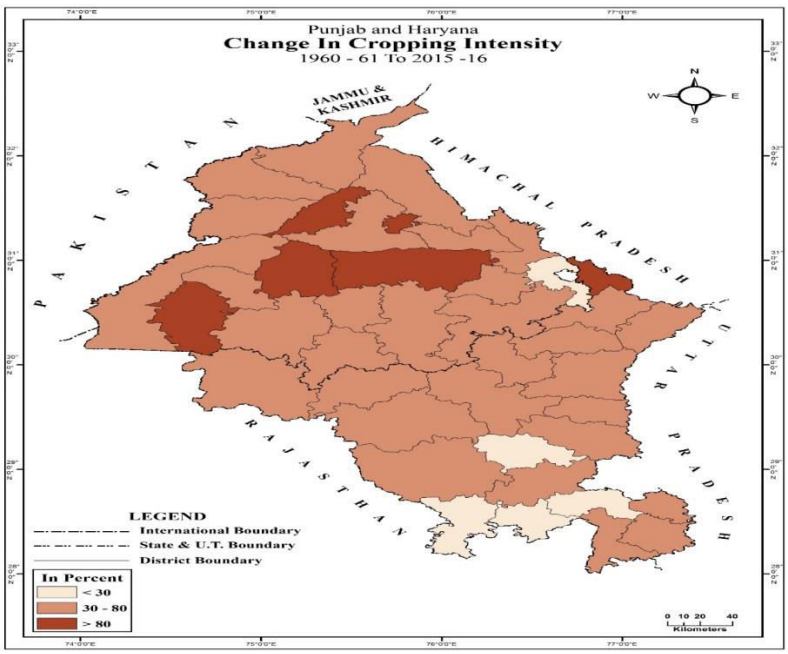
(128.57%%) and Gurugram (134.62%). The S.A.S. Nagar district is evolving into an urban area. The soils in the Gurugram districts have issues with salt and alkalinity.



Map 1.

Change in Cropping Intensity from 1960-61 To 2015-16: The analysis of the data indicates that there is limited scope for further increasing cropping intensity since agricultural land is currently supporting the maximum number of crops with the aid of chemical fertilisers and the level of soil fertility in the study area is decreasing. Between 1960–1961 and 2015–2016, cropping intensity in Punjab increased significantly by 65.29 percent and in Haryana by 52.15 percent.Despite positive improvement in every district in the research region, there are substantial geographical variances in the amount of change in cropping intensity. While S.A.S. Nagar district saw a low positive change of 3.24 percent between 1960–1961 and 2015–2016, Moga district saw the largest overall positive change of 96.30 percent (Map 2).



Map 2.

Source: Source: S.A.P. 1961, 2016; and S.A.H. 1966-67, 2016-17

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Conclusion: Cropping intensity has increased in the study area, according to a spatiotemporal analysis of cropping intensity change. This change is primarily attributable to the adoption of Green Revolution technology, such as increased irrigation, use of chemical fertiliser, and mechanisation, among other things.Even while crop intensity has increased in all of the study area's districts, there are notable regional disparities in the magnitude of change. A high degree of irrigation is the common element for a substantial positive change in cropping intensity. All those districts with relatively low cropping intensity share the decline in soil fertility and groundwater table as a contributing factor. Additionally, Mahendragarh and Rewari's southern districts' semi-arid climate, sandy soils, and rocky outcrops are to blame for the modest positive change in cropping intensity.

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