
HARYANA'S SPATIOTEMPORAL PATTERN OF CROPPING

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Abstract

Cropping intensity is the quantity of crops produced in a given field during a certain agricultural year. A greater percentage of the seeded area gets cropped more than once when there is a higher cropping intensity. The availability of better irrigation systems, the use of fertilisers, modern agricultural technology, insecticides, and pesticides, among other factors, make it feasible to boost cropping intensity. Cropping intensity aids farmers in implementing fresh agricultural tactics to boost crop output. In the current study, cropping intensity patterns in Haryana from 1980–1981 to 2016–17 are being examined at the state, agroclimatic zone, and district levels. This essay is based on secondary data that was gathered from the Haryana Department of Economic & Statistical Analysis. Cropping intensity in the state increased steadily over time, rising from 156.69% in 1980–81 to 186.01% in 2016–17. The cropping intensity has grown consistently throughout all agroclimatic zones, although it rose very quickly in the western zone from 157.54% in 1980–81 to 195.48% in 2016–17. In addition, during the state's 2016–17 fiscal year, the cropping intensity index exhibits geographical variance, ranging from a low of 156.08 percent in Rewari district to a high of 205.51 percent in Bhiwani district.

Keywords: Cropping intensity, Temporal change, Spatial pattern, Haryana, Agro climatic zone.

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Introduction

After the start of the green revolution, agriculture in Haryana made significant advancements. As a result, the state is now India's second-largest producer of food grains. Numerous crops were cultivated throughout the state to maintain the production of food grains in order to meet the state's continually growing population's need for food. In many crops and places, the possibility for increasing the net planted area has already reached a saturation point, and the potential for improving the yield is almost gone. Therefore, crop diversification will be necessary to increase agricultural output (Hayami et al, 1971). Cropping intensity is the quantity of crops produced in a given field during a certain agricultural year. To put it another way, cropping intensity is the ratio of net seeded area to gross cropped area expressed as a percentage. A greater percentage of the seeded area gets cropped more than once when there is a higher cropping intensity. During the last thirty eight years net sown area showed a negative growth and it has decreased with -2.59% although gross cropped area increased with a growth rate of 15.63% presenting a substantial increase in the cropping intensity. The enrichment of cropping intensity is possible due to availability of better irrigation facilities, use of fertilizers, new agricultural technologies, insecticides and pesticides. Cropping intensity helps agriculturalists in adopting new agricultural strategies for accelerating productivity of crops.

Objectives of the Study

The main objectives of the study are:

- To describe the parameters influencing cropping intensity.
- To explain the factors influencing cropping intensity.

Database and Methodology

Database

The current analysis is built on secondary information taken from a number of publications. The information was gathered from the Haryana Department of Economic & Statistical Analysis for the years 1980–1982, 1990–1992, 2000–2002, 2010, and 2012, as well as for the years 2015, 2016, and 2017.

Methodology

The study is interested in examining cropping intensity by decade, namely 1980–1981, 1990–1991, 2000–2001, 2010–2011, and 2016–2017, taking the three year average in each case. The current investigation was conducted in both time and space. Cropping intensity trends have been studied at the state and agroclimatic zone levels. On a geographical scale, the current situation (years 2016–17) will be assessed at the state, district, and agroclimatic zone levels. An agro-climatic zone is a land unit uniform in respect of climate and length of growing period which is climatically suitable for a certain range of crops and cultivators (FAO, 1983). Economic and Statistical Organization, Planning Department Haryana, (2007) has divided the state into four agro climatic zones which are conducive for different crops. These four Agro-climatic zones are:

1. **Northern Zone-** Panchkula, Ambala, Yamunanagar, Kurukshetra, Karnal and Panipat districts.
2. **Central Zone-** Kaithal, Jind, Sonipat, Rohtak and Jhajjar districts.
3. **Western Zone-** Bhiwani, Hisar, Fatehabad and Sirsa districts.
4. **Southern Zone-** Faridabad, Gurugram, Palwal, Nuh, Rewari and Mahendragarh districts.

For measuring cropping intensity method has been taken from Singh (1979), it is defined as:

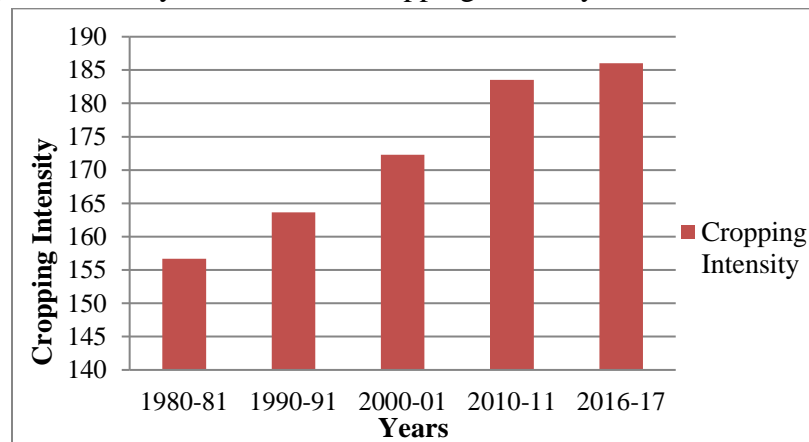
$$\text{Cropping Intensity} = \frac{\text{Gross Cropped Area}}{\text{Net Sown Area}} \times 100$$

Higher cropping intensity thus means that more of the net area is harvested more than once within a single agricultural year. If the land is only planted once a year, the cropping intensity is 100.

Spatial-Temporal Pattern of cropping Intensity

From 1980–81 to 2016–17, Haryana had a rise in cropping intensity on a consistent basis. Cropping intensity increased by 29.32 percent from 156.69% in 1980–81 to 186.01% in 2016–17. Approximately 84% of the state's arable land is watered by irrigation systems. Without a doubt, Haryana is one of the states in the nation with the most advanced agriculture.

Figure 1.1- Haryana: Trend of Cropping Intensity, 1980-81 to 2016-17.



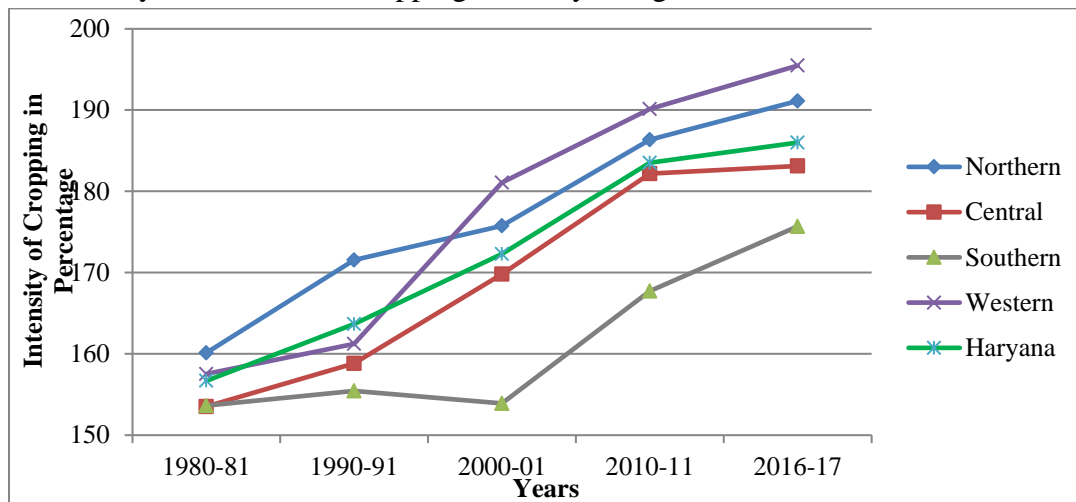
Source: Statistical Abstract of Haryana, (Various Issues)

In 2016–17, Haryana's cropping intensity was 186.01%, which is much higher than India's cropping intensity of 144.5%. Various causes, including the availability of better irrigation infrastructure, a growth in the use of modern agricultural technology, fertilisers, and High Yielding Variety seeds, are responsible for the state's cropping intensity continuously enhancing. These are the numerous elements that affected the state's cropping intensity during the course of the time period; as a result, the cropping intensity was continuously raised in Figure 1.1. As a result, there are changes in the state's cropping intensity throughout both space and time. Temporal analysis of cropping intensity has been done on the bases of agro climatic zones over the time period 1980-81 to 2016-17, while spatial pattern at the district level for the time period 2016-17 has been done in the state.

Cropping Intensity Trends in Haryana's Agro Climate Zones

In all of the state's agroclimatic zones, crop intensity has been steadily rising over time. According to figure 1.2, the western agroclimatic zone had the highest cropping intensity (195.48%), while the southern agroclimatic zone had the lowest cropping intensity (175.70%) in 2016–17. Contrarily, cropping intensity in southern and central agroclimatic zones is lower than that of the state. Cropping intensity in northern and western agroclimatic zones is greater than the state's total cropping intensity. Cropping intensity in the western agroclimatic zone grew quickly, rising by 37.94% from 157.54% in 1980–81 to 195.48% in 2016–17. In this agroclimatic zone, cropping intensity increased at a rate of 24.08% between 1980–1981 and 2016–17, which is a greater pace than in other zones. Gross cultivated area increased by 20.4% throughout the period, but net sown area only marginally fell by -2.96%. The two thirds of this agroclimatic zone that are irrigated by canals facilitate the expansion of agriculture.

Figure 1.2- Haryana: Trends of Cropping Intensity in Agro climatic zones, 1980-81 to 2016-17



Source: Statistical Abstract of Haryana, (Various Issues)

Figure 1.2 shows that cultivation intensity has rapidly grown in the northern agroclimatic zone. The percentage grew by 30.99% from 160.14% in 1980–81 to 191.13% in 2016–17. This is because the area's cropping intensity has been steadily increasing due to highly developed irrigation systems, agricultural mechanisation, fertile soil, and fresh subsurface water.

Cropping intensity in central agro climatic zone increased from 153.53% in 1980-81 to 183.12% in 2016-17, with 19.27% growth rate. But the cropping intensity in this agro climatic zone is less than the state's which is 156.69% in 1980-81 and 186.01% in 2016-17. Gross cropped area increased in this zone by 15.05 per cent, whereas net sown area increased by 37.22 per cent represents an increase in the cropping intensity. In this zone developed irrigation facilities available, both sources of irrigation i.e. canal and tube wells occurred. Thus, cropping intensity designates an increasing trend in this agro climatic zone during the study period. In southern agro climatic zone cropping intensity is low as comparison to other three agro climatic zones. Cropping intensity in this agro climatic zone is increasing at the growth rate of 14.35%, which is below than the other zones growth rate. After the analysis the figure 1.2 revealed that cropping intensity increased from 153.64% in 1980-81 to 175.70% in 2016-17, an increase of 22.06 per cent. In this zone net sown area increased by 13.51 per cent and gross cropped area showed minor decrease by -0.73 per cent. In this zone due to less fertile soil, gross cropped area also less as comparison to rest of the zones and irrigation facilities developed at a lesser extent so low cropping intensity found in this zone.

Spatial Pattern of Cropping Intensity

During the state's 2016–17 fiscal year, the cropping intensity index exhibited a geographical variance that ranged from the lowest value of 156.08 percent in Rewari district to the highest value of 205.51 percent in Bhiwani district. The districts have been divided into the following categories in order to analyse the geographical inequalities in the state.

Table 1.1- Haryana: Spatial Pattern of Cropping Intensity, 2016-17

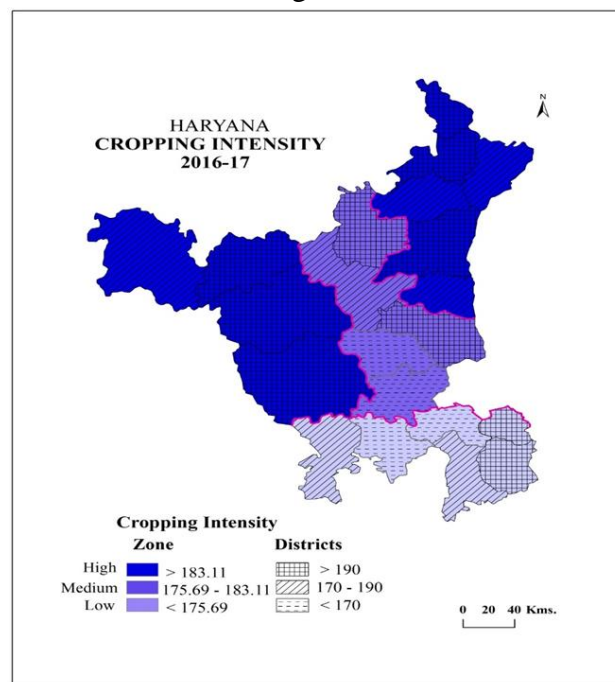
Cropping Intensity (%)	Categories	No. of Districts	Districts
190 and Above	High	10	Bhiwani, Ambala, Panchkula, Karnal, Kaithal, Sonipat, Faridabad, Palwal, Hisar, Fatehabad
170 to 190	Medium	7	Yamunanagar, Kurukshetra, Panipat, Jind, Mahendragarh, Sirsa, Nuh
170 and Below	Low	4	Rohtak, Jhajjar, Gurugram, Rewari,

Source: Statistical Abstract of Haryana, (Various Issues)

High Cropping Intensity

Ten districts namely Bhiwani (205.51%), Ambala (191.57%), Panchkula (195.24%), Karnal (197.36%), Kaithal (191.32%), Sonipat (197.37%), Faridabad (192.47%), Palwal (190.85%), Hisar (195%) and Fatehabad (192.86%) with above 190 per cent intensity index have included in the category of high cropping intensity. These districts have high net sown area and gross cropped area. In Ambala, Panchkula, Karnal, Kaithal and Sonipat districts endowed with a relatively more level relid, a high rainfall, small holdings, a larger agricultural work force and much larger proportion of net sown area under irrigation, which ensure cultivation of several crops. Further in Faridabad, Palwal, Fatehabad and Hisar districts due to the facility of canal irrigation larger proportion of cultivated area has irrigated.

Fig 1.3



Medium Cropping Intensity

These districts are included in this group if their cropping intensity index is between 170 and 190 percent. The districts included in this group are Yamunanagar (184.21%), Kurukshetra (188.76%), Panipat (188.34%), Jind (188.38%), Mahendragarh (189.30%), and Sirsa (187.96%). Furthermore, Jind, Mahendragarh, and Sirsa districts are favoured by canal irrigation, use of fertilisers & pesticides, and mechanised agriculture but less than the districts listed in the category of high intensity index, so moderate cropping intensity is found in these districts. Yamunanagar, Kurukshetra, and Panipat districts have fertile land and guaranteed irrigation facilities; tube wells are the main source of irrigation.

Low Cropping Intensity

This group comprised the districts of Rohtak (168.86%), Jhajjar (161.25%), Gurugram (159.09%), and Rewari (156.08%). Due to issues with water logging, soil salinity, and alkalinity, agricultural intensity is low in these areas. In contrast, Gurugram district has low cropping intensity due to its less rich soil, limited dependence on agriculture, and development as the nation's commercial centre.

Conclusion

It is clearly obvious from the study above that cropping intensity has grown over time in the state and agroclimatic zones, and at the district level, there are variances in the cropping intensity that have been observed. Without a shadow of a doubt, the adoption of new agricultural technology in the middle of the 1960s—commonly referred to as the "green revolution"—provided a boost to the expansion of irrigation, HYV (High Yielding Varieties), new chemical fertilisers, and pesticides, which in turn led to a continuous rise in cropping intensity in the state. Because all these agricultural inputs directly correlated with cropping intensity, hence intensity index increases as well as there is an expansion in the use of these inputs during the time period from 1980-81 to 2016-17. So, cropping intensity has increased from 156.69% to 186.01% respectively, an increase of 29.32 per cent in the state. In all the agro climatic zones cropping intensity has continuously increased, highest cropping intensity 195.48% has identified in western agro climatic zone, while lowest 175.70% in southern agro climatic zone. In western agro climatic zone cropping intensity has rapidly increased by 24.08% rate of growth, because two third area of this zone fall under canal irrigation which supports the increase in the cropping intensity. In the northern agroclimatic zone, cropping intensity has rapidly grown from 160.14% in 1980–81 to 191.13% in 2016–17 as a result of highly developed irrigation infrastructure, agricultural mechanisation, fertile soil, and fresh subsoil water enabling intensive tube well irrigation. Cropping intensity also indicated an upward trend in the central and southern agroclimatic zones, however these zones' intensity indices are lower than the state's average cropping intensity. The growth rate of increase in cropping intensity in both zones is 19.27% and 14.35% respectively. In southern agro climatic zone cropping intensity is low as comparison to other three agro climatic zones, because of less fertile soil, gross cropped area also less as comparison to rest of the zones and irrigation facilities developed at a lesser extent

in the zone. It is also observed from the above description that there are spatial disparities among the districts in the state during the year 2016-17. Cropping intensity appeared lowest 156.08 per cent in Rewari district, whereas highest 205.51 per cent in Bhiwani district. In the category of high cropping intensity Bhiwani, Ambala, Panchkula, Karnal, Kaithal, Sonapat, Faridabad, Palwal, Hisar and Fatehabad districts included. That is because of high rainfall, a larger agricultural work force and much larger proportion of net sown area under irrigation, which ensure cultivation of several crops. Seven districts namely Yamunanagar, Kurukshetra, Panipat, Jind, Mahendragarh, Sirsa and Nuh have medium level of cropping intensity. These districts has favoured by canal as well as tube well irrigation, use of fertilizers & pesticides and mechanisation of agriculture but less than the districts included in the category of high intensity index, so moderate cropping intensity found in these districts. While, Rohtak, Jhajjar, Gurugram and Rewari districts having low cropping intensity, due to soil salinity, alkalinity and water logging problems evident in these districts.

Following examination, it was shown that cropping intensity in the state had increased rapidly. However, the study region is affected by this rise in cropping intensity in both good and bad ways. On the plus side, it indicates the growth of agriculture, the self-sufficiency of food grains, and the improvement of farmers' economic standing. Contrarily, it demonstrates a significant strain on groundwater and land resources, posing a risk to the sustainability of intensive agriculture. To increase cropping intensity, it is necessary to employ techniques for conserving soil and water.

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