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Agriculture in Haryana: Sustainability and Concerns

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Abstract | **Original Research Article**

The study examines the spatio-temporal changes in cropping patterns in Haryana from 1980–82 to 2010–12, with a focus on variations across four agro-climatic zones northern, central, southern, and western Haryana. Using secondary data from the Statistical Abstract of Haryana, the analysis is based on triennial averages of area under major crops and their percentage share in total cropped area. The findings reveal a significant shift in cropping patterns, primarily driven by changes in crop area rather than expansion of total cultivated land. The rice–wheat cropping system has emerged as dominant across the state, with substantial increases in the share of rice (from 9.15% to 19.04%) and wheat (from 27.46% to 38.89%). In contrast, traditional crops such as bajra, jowar, maize, barley, and pulses have experienced a consistent decline, with pulses showing the sharpest reduction due to technological stagnation and expansion of irrigation favoring wheat cultivation. Regional analysis highlights that the northern zone remains strongly dominated by the rice–wheat system due to favorable irrigation and infrastructure, while the central and western zones have witnessed the most dramatic shifts towards wheat and rice. The southern zone shows diversification towards oilseeds alongside wheat expansion. Overall, the study indicates that infrastructural development, irrigation expansion, and economic incentives have significantly influenced cropping decisions, leading to increased monoculture tendencies. However, this shift has raised concerns regarding sustainability, particularly groundwater depletion and rising input intensity. The study suggests the need for policy interventions to promote crop diversification, especially towards less water-intensive crops, oilseeds, and coarse cereals, ensuring both environmental sustainability and nutritional security.

Keywords: Agriculture, cropping, sustainability, Haryana.

INTRODUCTION

Cropping pattern refers to the yearly sequence and spatial arrangement of crops in a given area. It changes over space and time in response to the change in physical and socio-economic factors. Cropping pattern of any area is mainly determined by the geographical features as climate, rainfall, soil etc. Apart from this it depends on the nature and availability of irrigation facilities. Economic motivation such as crop prices are also important in determining the cropping pattern. Haryana being an agriculturally rich state with various physiographic dimensions has presented variations in its agro climatic conditions. Such variations have led to the gradual evolution of zonal specialisation. The extent of changes in cropping patterns varied considerably among different agro climatic zones of Haryana depending upon variations in their agro climatic factors and infrastructural facilities. In view of these considerations present study pertains to examine the extent of change in cropping patterns in different agro climatic zones of Haryana during the study period.

OBJECTIVE OF THE STUDY

- To analyse the Spatio-Temporal Trends in the cropping pattern in Haryana from 1980-82 to 2010-12

DATABASE AND METHODOLOGY

- Data has been taken from the statistical abstract of Haryana (Concerned time period).
- Methodology has been adopted in consonance with basic objective of the study. State has been divided into four homogeneous agro climatic zones. This division has been taken from Economic & Statistical Organisation, Planning Department, Haryana. Agro Climatic Zones, Districts included
  1. Northern:- Panchkula, Ambala, Yamunanagar, Kurukshetra, Karnal, Panipat
  2. Central:- Kaithal, Jind, Sonipat, Rohtak, Jhajjar
  3. Southern:- Faridabad, Gurgaon, Rewari, Mahendergarh
  4. Western:- Bhiwani, Hisar, Fatehabad, Sirsa

- At each point of time three yearly average of data on area under individual crops have been taken and used for working out the share in total cropped area
- The minor crops for which separate analysis could not be done has been grouped in the category of residual crops.
- The temporal points at which the analysis of cropping pattern is done are 1980-82, 1990-92, 2000-02 and 2010-12.

Spatio-Temporal Change in Cropping Pattern

Changes in cropping patterns have been examined in terms of changes in percentage share of individual crops in total cropped area during the period of 1980-82 to 2010-12. The cropping pattern of Haryana state during this period is presented in Table1.

Table 1: Haryana: Change in Area under different crops, 1980-82 to 2010-12

Sr No.	Crops	1980-82		1990-92		2000-02		2010-12		Percent Change			
		A	%	A	%	A	%	A	%	A	%	2001 to 2011	1981 to 2011
1	Rice	492.53	9.15	633.30	10.86	1054.97	17.14	1227.93	19.04	1.71	6.29	1.90	9.89
2	Wheat	1478.10	27.46	1827.63	31.33	2323.73	37.76	2507.67	38.89	3.87	6.43	1.13	11.43
3	Jowar	136.73	2.54	128.97	2.21	108.33	1.76	71.07	1.10	-0.33	-0.45	-0.66	-1.44
4	Bajra	851.83	15.82	650.43	11.15	593.50	9.64	606.53	9.41	-4.67	-1.51	-0.24	-6.42
5	Maize	73.13	1.36	35.77	0.61	17.80	0.29	10.93	0.17	-0.75	-0.32	-0.12	-1.19
6	Barley	109.87	2.04	56.83	0.97	36.17	0.59	40.20	0.62	-1.07	-0.39	0.04	-1.42
7	Gram & Other Pulses	772.10	14.34	533.47	9.14	122.47	1.99	91.50	1.42	-5.20	-7.15	-0.57	-12.92
8	Total Oilseed	210.70	3.91	498.30	8.54	465.00	7.56	518.90	8.05	4.63	-0.99	0.49	4.13
9	Cotton	319.73	5.94	476.50	8.17	576.17	9.36	533.40	8.27	2.23	1.19	-1.09	2.33
10	Sugarcane	130.10	2.42	146.80	2.52	146.97	2.39	86.17	1.34	0.10	-0.13	-1.05	-1.08
12	Total (Above Crops)	4574.83	84.98	4988.00	85.50	5445.10	88.48	5694.30	88.31	0.52	2.98	-0.17	3.33
13	Residual Crops	808.50	15.02	845.67	14.50	708.90	11.52	754.03	11.69	-0.52	-2.98	0.17	-3.33
14	Total Cropped Area (In Thousand Hectares)	5383.33		5833.67		6154.00		6448.33					

Source: *Statistical Abstract of Haryana, 1980-82 to 2010-12*

As evident from the table 1 that rice in kharif season and wheat in rabi season has gained substantial proportion of the total cropped area. Wheat, which accounted for 1478.10 thousand hectares and 27.46% of the total cropped area in 1980-82, has increased its share to 2507.67 thousand hectares and 38.89% of the total cropped area in 2010-12. Similarly, rice increased its share from 9.15% to the total cropped area to 19.04% in 2010-12 and area under rice increased from 492.53 thousand hectares in 1980-82 to 1227.93 thousand hectares in 2010-12. Thus, shift in area had been relatively more important source of change in the cropping patterns that the increase in total cropped area in the state. As total cropped area has increased from 5383.33 thousand hectares to 6448.33 thousand hectares. All the other cereal crops like bajra, jowar, maize and barley were observed to decrease as a percentage of the total cropped area. It was observed that the area under gram & other pulses had recorded a sharp decline from 14.34% to the total cropped area in 1980-82 to 7.15% to the total cropped area in 2010-12. It showed a negative growth of -12.92% over the period. With the spread of irrigation, cultivation of gram had given way to wheat because of lack of any breakthrough in technology in the case of gram. The area under cotton increased from 5.94% to the total cropped area in 1980-82 to 8.27% to the total cropped area in 2010-12. On the other hand, the area under sugarcane decreased despite the rise in support price and the opening up of more sugar mills in the state. It has declined from 2.42% to the total cropped area in 1980-82 to 1.34% to the total cropped area in 2010-12. The share of area under total oilseeds increased from 3.91% to the total cropped area in 1980-82 to 8.05% to the total cropped area in 2010-12.

The changes in cropping pattern in different agro climatic zones of Haryana during the study period is examined below:

Cropping Pattern Change in Northern Agro Climatic Zone

The percentage share of individual crops in the northern zone is presented in the Table2 which indicates that rice-wheat cropping system was prominent in the zone in 1980-82 and occupied 67.60% to the total cropped area. Wheat occupied 39.72% to the total cropped area whereas rice occupied 27.88% to the total cropped area. Gram, maize and sugarcane came next in row accounting for 5.50%, 4.40% and 4.31% to the total cropped area respectively in the northern zone. Coming to the next decade that is 1990-92 area under rice increased from 390.73 thousand hectares to 396.30 thousand hectares and its percentage share to the total cropped area increased from 27.88% to 32.22 % to the total cropped area. Percentage area under Wheat also increased from 39.72% to 40.46% to the total cropped area. Except rice wheat and sugarcane all other crops showed decline both area wise as well as percent share to the total cropped area. Gram showed a sharp decline from 5.50% to the total cropped area to 0.93% to the total cropped area. If we focus on 2000-02, percentage

share as well as area increased in case of rice, wheat almost remained static and rest of the crops further showed a decline. In 2010-12, rice and wheat again showed increase from the previous decade all other crops showed a decline including sugarcane which was on increase in the previous decade. If we analyse over a period of 30 year i.e. from 1980-82 to 2010-12 the all increase was in case of rice and wheat. Rest of the crops showed a negative growth during the study period.

Table 2: Haryana: Change in Area under different crops in total cropped area in northern agro climatic zone, 1980-82 to 2010-12

Crops	1980-82		1990-92		2000-02		2010-12		% Change
	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	
Rice	390.73	27.88	396.30	32.22	481.07	37.74	535.00	40.87	12.99
Wheat	556.57	39.72	497.60	40.46	513.73	40.30	558.10	42.64	2.92
Jowar	6.70	0.48	1.30	0.11	1.53	0.12	0.70	0.05	-0.42
Bajra	19.77	1.41	5.10	0.41	3.97	0.31	3.50	0.27	-1.14
Maize	61.70	4.40	29.90	2.43	16.13	1.27	8.20	0.63	-3.78
Barley	9.60	0.69	2.70	0.22	0.60	0.05	0.10	0.01	-0.68
Gram & Other Pulses	77.10	5.50	11.40	0.93	11.80	0.93	0.70	0.05	-5.45
Total Oilseeds	22.70	1.62	8.50	0.69	9.50	0.75	7.80	0.60	-1.02
Cotton	13.13	0.94	2.60	0.21	0.17	0.01	0.00	0.00	-0.94
Sugarcane	60.47	4.31	83.80	6.81	92.40	7.25	61.20	4.68	0.36
Residual Crops	182.87	13.05	190.80	15.51	143.77	11.28	133.70	10.21	-2.84

Source: *Statistical Abstract of Haryana, 1980-82 to 2010-12*

Cropping Pattern Change in Central Agro-Climatic Zone

If we analyse the cropping pattern in the central zone during the study period given in table3, it is clear that cropping pattern of this zone was dominated by rice and bajra in the kharif season and wheat and gram during the rabi season in 1980-82. Wheat dominated the zone with a whopping 33.58% to the total cropped area followed by bajra, gram, jowar and rice. In 1990-92 area under rice and wheat increased rapidly and reached upto 13.00% and 14.09% to the total cropped area respectively. Except the total oilseeds and cotton all other crops showed a decline. Percent share of residual crops also increased from 12.15% to 14.76% to the total cropped area. In 2000-02, again wheat the rabi crop and rice the kharif crop registered a tremendous growth and reached upto 44.90% and 24.98% to the total cropped area respectively. Whereas all other crops showed a decline in the central agro-climatic zone during this decade. The maximum decline noticed in the case of gram & other pulses. In 2010-12, again wheat and rice registered a growth and reached upto 45.21% and 26.69% to the total cropped area respectively.

Table 3: Haryana: Change in Area under different crops in total cropped area in Central Agro Climatic Zone, 1980-82 to 2010-12

Crops	1980-82		1990-92		2000-02		2010-12		% Change
	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	
Rice	63.73	5.59	192.2	13.00	391.33	24.98	436.6	26.69	21.09
Wheat	382.67	33.58	593	40.09	703.23	44.90	739.7	45.21	11.64
Jowar	72.17	6.33	74.4	5.03	65.90	4.21	44.9	2.74	-3.59
Bajra	189.50	16.63	110	7.44	87.90	5.61	134.1	8.20	-8.43
Maize	5.63	0.49	2.1	0.14	0.67	0.04	1.2	0.07	-0.42
Barley	19.20	1.68	10.3	0.70	6.57	0.42	4.8	0.29	-1.39
Gram & Other Pulses	157.13	13.79	69	4.67	17.67	1.13	1.8	0.11	-13.68
Total Oilseeds	27.17	2.38	95.4	6.45	48.93	3.12	49.1	3.00	0.62
Cotton	33.47	2.94	65.1	4.40	56.50	3.61	59.7	3.65	0.71
Sugarcane	50.57	4.44	49.2	3.33	37.37	2.39	17.8	1.09	-3.35
Residual Crops	138.43	12.15	218.3	14.76	150.27	9.59	146.3	8.94	-3.20

Source: *Statistical Abstract of Haryana, 1980-82 to 2010-12*

Cropping Pattern Change in Southern Agro Climatic Zone

The data on percentage sgare of individual crops in total cropped area during the study period is presented in Table 4. An examination of the data presented in the study reveals that the cropping pattern of southern zone has shifted substantially in favour of wheat and rice as against the gram, jowar and barley crops. In 1980-82 the crops which dominated the scene in southern zone were wheat, bajra, gram & other pulses and total oilseeds. Bajra was grown on more than 30% of the total cropped area and wheat occupied the second position with 29.99% of the total cropped area. In 1990-92, wheat registered a decline percent share of the total cropped area whereas rice showed a marginal increase and percent area of the total cropped area increased

from 0.55% to 0.92% of the total cropped area. Bajra which was grown on maximum area in the previous decade came down to second position with a percent share of 22.39% and overtaken by wheat with 27.51% of the total cropped area. Percent share of total oilseeds increased significantly and reached upto 18.31% of the total cropped area from 5.47% in the previous decade. In the decade 2000-02 wheat and rice both showed increased growth both areawise as well as percent share to the total cropped area. Oilseeds also showed an increase growth whereas all other crops declined sharply. In decade 2010-12, wheat, rice and bajra showed increasing trends whereas oilseeds remained constant and all other crops declined.

Table 4: Haryana: Change in Area under different crops in total cropped area in Southern Agro Climatic Zone, 1980-82 to 2010-12

Crops	1980-82		1990-92		2000-02		2010-12		% Change
	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	
Rice	4.80	0.55	9.3	0.92	38.73	3.76	56.7	5.54	4.99
Wheat	263.20	29.99	278.1	27.51	360.57	34.98	348.8	34.06	4.07
Jowar	42.63	4.86	51.1	5.05	38.03	3.69	25.2	2.46	-2.40
Bajra	264.73	30.16	226.4	22.39	228.47	22.17	251.8	24.59	-5.57
Maize	3.13	0.36	1.9	0.19	0.83	0.08	0	0.00	-0.36
Barley	61.53	7.01	22.1	2.19	8.93	0.87	5.7	0.56	-6.45
Gram & Other Pulses	78.30	8.92	88.6	8.76	21.13	2.05	11.6	1.13	-7.79
Total Oilseeds	47.97	5.47	185.1	18.31	197.53	19.17	191.9	18.74	13.27
Cotton	1.77	0.20	0.5	0.05	4.60	0.45	1.4	0.14	-0.06
Sugarcane	8.30	0.95	9.4	0.93	7.67	0.74	3.1	0.30	-0.64
Residual Crops	101.30	11.54	138.5	13.70	124.17	12.05	127.8	12.48	0.94

Source: *Statistical Abstract of Haryana, 1980-82 to 2010-12*

Cropping Pattern Change in Western Agro Climatic Zone

The cropping pattern of western zone during the study period is presented in Table 5. It is worth to note that Gram & Other Pulses was the most important crop in the decade 1980-82 with 26.69% of the total cropped area followed by bajra 18.41%, wheat 15.45% and residual crops 15.24% of the total cropped area. Sugarcane, rice, jowar, maize and barley were having negligible proportion. In 1990-92, wheat, total oilseeds, cotton and rice showed increased growth wheat contributing for the maximum growth. In 2000-02, again wheat showed a tremendous growth in this decade reaching from 21.89 to 32.69% of the total cropped area. Whereas gram & other pulses showed a sharp decline from 21.84% to 4.83% of the total cropped area. Cotton showed a consistent growth in this decade too and share of residual crops further declined from 12.47% to 10.99% of the total cropped area. In 2010-12, wheat, rice and total oilseeds showed an increasing trend. Maximum growth has been achieved by wheat in 30 years of study period with increase of 18.36%.

Table 5: Haryana: Change in Area under different crops in total cropped area in Western Agro Climatic Zone, 1980-82 to 2010-12

Crops	1980-82		1990-92		2000-02		2010-12		% Change
	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	Area (000Hec)	% Area	
Rice	40.03	2.04	63.4	2.88	143.90	6.30	215	8.48	6.44
Wheat	303.47	15.45	481.4	21.89	746.20	32.69	857.4	33.81	18.36
Jowar	8.93	0.45	2.6	0.12	2.87	0.13	0	0.00	-0.45
Bajra	361.70	18.41	267.1	12.15	266.07	11.66	270.2	10.65	-7.76
Maize	2.27	0.12	0.9	0.04	0.17	0.01	0.2	0.01	-0.11
Barley	18.10	0.92	15.4	0.70	20.07	0.88	26.7	1.05	0.13
Gram & Other Pulses	524.47	26.69	480.3	21.84	110.13	4.83	97.4	3.84	-22.85
Total Oilseeds	124.40	6.33	184.8	8.40	217.73	9.54	260.9	10.29	3.96
Cotton	271.37	13.81	422.7	19.22	514.90	22.56	432.2	17.04	3.23
Sugarcane	10.53	0.54	6.1	0.28	9.53	0.42	2.4	0.09	-0.44
Residual Crops	299.40	15.24	274.3	12.47	250.77	10.99	373.6	14.73	-0.51

Source: *Statistical Abstract of Haryana, 1980-82 to 2010-12*

CONCLUSION

As evident from the above analysis, Haryana has been facing rapid change in cropping pattern during the study period of 1980-82 to 2010-12. It has been observed that the shift in area had been a relatively more important source of change in the cropping patterns than the increase in the total cropped area of the state. With regard to changes in cropping pattern, the share of area under rice crops in the kharif season and wheat in rabi season has gained substantial proportion of the total cropped area. All the other cereal crops like bajra, jowar, maize and barley were observed to decrease as a percentage of the total cropped area. It was observed that the area under gram & other pulses had recorded a sharp decline. This is because of the lack

of any breakthrough in technology in the case of gram. Also, with spread in irrigation, cultivation of gram had given way to wheat. The area under cotton also decreased. On the other hand, area under sugarcane decreased despite the rise in MSP and the opening up of more sugarmills in the state.

Rice-wheat cropping system was prominent in northern zone because these areas have flat land with fertile soil and developed agricultural infrastructure, adequate irrigation facilities and high concentration of tubewell irrigation.

The cropping pattern in the central agro climatic zone changed substantially. The change was most spectacular in the case of rice. The area share of which increased to 26.69% from 5.59% of the total cropped area. Wheat is the most significant crop in this zone with a share of 45.21% of the total cropped area. And wheat continues to be the most important crop in the western agro climatic zone. The western agro climatic zone appears to have had the best potential for increasing area in favour of oilseeds and pulses yet in this zone area under wheat and rice had shown the sharpest increase.

The cropping pattern in the study area has undergone a substantial change with wheat and rice emerging as a major crop rotation in Haryana in the western and southern agro climatic zones. Crops that have been replaced by wheat and rice are gram & other pulses, bajra and barley. Area under cotton has alsodecreased in Haryana. The cropping pattern of the state has unnecessarilily become energy intensive and it is affecting the static balance of the underground water resources in the plain of Haryana. The growth of infrastructure, irrigation and other technological factors are responsible for a major shift in cropping pattern in favour of wheat and rice in the state. A number of policy steps must be taken to encourage farmers to switch from rice which is a water and fertilizer intensive crop in the state to crops of a less water consuming. Furthermore, oilseeds and coarse cereals should be given due weightage by government and farmers should be given support throught policy framework to make their cultivation a more profitable venture. This shall be linked to nutrition policy of the state.

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