

Crop Combination and Agricultural Pattern in Haryana

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ABSTRACT: The state of Haryana has been playing a vital role in the economic growth and agricultural development of the country and farmers' prosperity in the country. The state achieved remarkable success in per hectare production and helped India in achieving self-sufficiency in food grains, especially in rice/paddy and wheat. At present more than 80 per cent of the total land in the state is under sustained agriculture of which nearly 83 per cent land is sown more than once. Haryana was among the leading states of the Green Revolution (1966-80). Since then, acreage under wheat and rice has continuously increased whereas pulses and oilseeds have registered a fall in their acreage. Increase in production of non-food commodities does not increase proportionately to the overall increase in agricultural production. Keeping in view of the ever increasing crop specialisation in the state, the Government of India and Government of Haryana have been endeavouring in the recent years to provide food security through ecologically sustainable and economically viable diversification of agriculture and promotion of scientific planning and cropping pattern to improve the yield per hectare by better and integrated crop management. The present study analyses the cropping pattern especially the crop combinations adopted in the select southern districts of Haryana.

INTRODUCTION

Agricultural Pattern in Haryana

Haryana, as a State, emerged on the political map of India on 1 November 1966. The region has been playing a vital role in the economic growth and agricultural development of the country and farmers prosperity in the country. Along with Punjab and Western Uttar Pradesh, Haryana championed the Green Revolution and focused on high yield cropping system thus helping India to overcome the acute food deficit from the mid-1960s onwards. Introduction of high end technology, improved socio-economic infrastructure, adequate geo-climatic conditions, high yield crop varieties (HYV), research and development complemented with unswerving state intervention

pushed Haryana towards agricultural prosperity. After its creation, the state achieved remarkable success in per hectare production and helped India in achieving self-sufficiency in food grains especially in rice/paddy¹ and wheat. At present more than 80 per cent of the total land in the state is under sustained agriculture of which nearly 83 per cent land is sown more than once. The contribution of the primary sector stood at 17 per cent of the Gross State Domestic Product (GSDP) in 2015-16 and is expected to grow further. (Indian Council of Agricultural Research 2017, Statistical Abstract of Haryana 2015-16). Within the primary sector, the share of crops (excluding livestock, fishing, forestry and aquaculture etc.) is 55 percent and it constitutes 10 per cent of the total GSDP.

The major crops grown in the state are wheat, rice, sugarcane, cotton, oilseeds, gram, barley, corn/maize, millets, fruits and vegetables. However, in last

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three decades or so state agriculture has witnessed a multi-fold shift of acreage under paddy and wheat. The production of paddy has increased by 10.44 per cent during the period 2010-11 (3,628 units²) and 2014-15 (4007 units). Between 2009-10 (1206.4 units³) and 2014-15 (1277.9 units), total area cropped under rice increased by 5.9 per cent. During the same period production of wheat grew by 5.64. per cent⁴ (Statistical Abstract Haryana, 2010-11 & 2015-16). Availability of high yielding seeds, chemical fertilizers, well connected irrigation facilities, improved road networks, opening of new markets and relatively secured per acre yield and procurement at the minimum support price (MSP) have promoted crop specialization to a significant level (Tuteja, 2015).

However, the mounting specialization of paddy and wheat has shown adverse impact on soil health and future agricultural output (Ghuman and Sharma, 2016). Environmentalists and agriculture experts warn of grave consequences in the coming times, if the practice of cultivating paddy and wheat specialization persists in the state. Studies confirm that persistent and repeated mono-cropping leads to soil degradation and subsequent loss in its retention capacity (Gill, 2016; Ghuman, 2017). Also, rice and wheat monopoly has reduced the leguminous pulses from the state agriculture scene. The increasing replacement of traditional crops such as maize, jowar and bajra not only disturbed the dietary habits in rural areas, but also raised economic constraints on poor and marginalised people by abstaining them from obtaining affordable sources of nutrition. The unabated use of pesticides and fertilisers has been causing serious health problems to the farmers and consumers as well.

In recent years, Haryana has introduced a number of progressive agricultural schemes to boost sustainable growth in agriculture. These schemes are being implemented by the state directly or in collaboration with the Central government. Major thrust of these schemes and policies are to make agricultural production more sustainable,

remunerative and climate resilient by promoting location specific integrated/composite farming. For instance, the objective of a Scheme for Promotion of crop Diversification is to promote alternate crops like summer moong, sunflower and maize in order to reduce wheat and paddy crop rotation.

Agricultural policy is a very important phenomenon especially the intervention through market to improve or stabilize the economic conditions (Hansen, 2016). The State of Haryana attaches high priority to formulate and implement farmers' friendly policies and schemes. The State has successfully implemented national schemes such as Rashtriya Krishi Vikas Yojana (RKVY), which was designed to give flexibility to spend more on agriculture on the basis of State plan. Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize (ISOPOM) and the National Food Security Mission (NFSM Rice, NFSM-Wheat and NFSM-Pulses) have also been effectively implemented to increase production of rice, wheat, oilseeds and pulses through area expansion and productivity enhancement in a sustainable manner. The State has formulated its draft State Water Policy (2018) to address major issues relating to the water sector. Schemes for enhancing productivity of degraded lands in the catchment of Flood Prone River and Scheme for Reclamation of Alkali Soils (USAR land) are being undertaken since 1980s. Integrated Wasteland Development Programmes, governed by the common guidelines issued by the Ministry of Rural Development, Government of India for Watersheds and Horticulture Mission, have been implemented. The reforms in making easy credit availability to farmers have been brought out and Kisan Credit Cards (KCC) are being issued. In Haryana, wheat, paddy, barley, gram, bajra and mustard are covered.

In early 2016, Agriculture and Farmer's Welfare Department Haryana, under the aegis of Pradhan Mantri Fasal Bima Yojana (PMFBY) notified 10 crops to be insured under Prime Minister Crop Insurance Plan. Cotton, paddy, bajra and maize during Kharif and wheat, barley, mustard, gram during Rabi 2016-17 have been notified under the plan (Kumar, 2017).

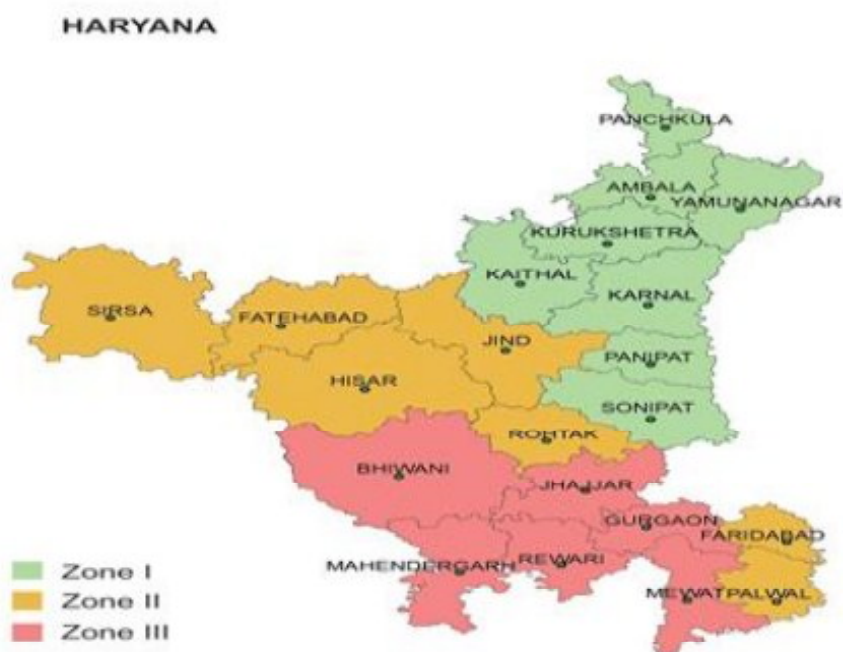


Fig. 1: Agro-climatic zones of Haryana

Source: Haryana State Agricultural Policy 2014:3

(Charkhi Dadri was carved out of Bhiwani as the 22nd district of Haryana on 01 December 2016 is not shown).

On the basis of prominent ecology and suitable cropping pattern, Haryana Kisan Ayog (Haryana Farmers Commission), Government of Haryana, has classified the State into three major agro eco-zones/ agro-climatic zones. Zone-I comprises Ambala, Panchkula, Yamuna nagar, Kurukshetra, Kaithal, Panipat, Karnal and Sonapat; Zone-II covers district Rohtak, Faridabad, Palwal, Jind, Hisar, Fatehabad and Sirsa. Zone-III comprises of the Districts of Jhajjar, Gurugram, Nuh (Mewat), Rewari, Mahendragarh and Bhiwani and Charkhi Dadri. Zone-I and II are adequately equipped with agricultural infrastructure and irrigation facilities and ideal for growing wheat, paddy, pulses, cotton and sugarcane as well as for raising dairy cows, buffaloes and poultry. However, Kandi area in these zones have serious problem of soil and water erosion and hence they are suitable for agro-forestry and agro-horticulture systems. Zone - III has arid climate and it covers about 29 per cent of the state area. The main crops of the region are Bajra, cotton, gour in Kharif and wheat, mustard, rapeseed in Rabi and it is also suitable for vegetables and arid-horticulture/forestry. The region has good climate for

dairy animals, sheep and goat rearing. (Haryana State Agricultural Policy 2014: 2-3).

Cropping Pattern in Haryana

Crop combination planning is related to many factors such as the types of lands, yield rates, weather conditions, irrigation and its intensity, dietary habits, facility of procurement by government, availability of capital and labour, etc. Some of these factors are quantifiable but the factors like rainfall, weather, floods, cyclones, and other natural calamities are difficult to predict. Accordingly, different alternatives or combinations are adopted which give different outputs. (Sarka *et al.*,1997).

Haryana was among the leading states of the Green Revolution (1966-80). Since then acreage under wheat and rice has continuously increased whereas pulses and oilseeds have registered a fall in their acreage. This trend was expedited due to the flat rate subsidized electricity for tube-wells, increasing and assured (Sangwan,1985; Ghuman, 2017; Shah and Chowdhury,2017). The trend is well reflected in Table 1.

TABLE 1
Total cropped area (000 hectares)

Year	Rice	Wheat	Maize	Barley	Bajra	Oilseeds	Cotton	Pulses
1966-67	192	743	87	182	893	212	183	1150
1970-71	269.2	1129.3	114.4	108.6	879.6	142.6	193.4	1158.9
1975-76	303.5	1226	138.7	177.1	1005.6	153.5	255	1193.9
1980-81	483.9	1479	71.3	124.5	870.3	311.2	316.2	794.8
1985-86	584	1701.3	54.9	87.7	649.5	380.1	344.1	846.3
1990-91	661.2	1850.1	34.8	50.5	608.6	488.5	490.6	742
1995-96	830	1972.1	26	40.6	575.2	611.0	651.8	449.8
2000-01	1054	2354.8	15.4	44.1	608.3	414	555.4	157
2005-06	1046.6	2302.7	17.5	28.2	631	735.8	583.8	195.3
2006-07	1042	2377.1	13.4	37.7	619	616.2	527.7	169.3
2007-08	1072.5	2460.7	13.8	39.5	628	511.3	482.5	172
2008-09	1211.2	2461.4	11.8	53	612.9	527.6	456.1	184.1
2009-10	1206.4	2487.7	12.2	42.1	583.8	523	505.1	131.6
2010-11	1243.3	2504	9.6	37.3	659.6	521	493.3	175.6
2011-12	1234.1	2531.3	11	41.2	576.2	754.8	601.8	123
2012-13	1206.3	2496.9	9.9	47.7	410.7	567.6	592.6	75.3
2013-14	1244.6	2499.1	8.5	38.6	403.6	548.5	567.8	105.3
2014-15	1277.9	2628.1	8.8	35.3	393.8	495.4	647.2	83.8
2015-16	1353.1	2575.6	6.1	28.9	369.9	526.8	615.2	63.3
2016-17	1385.2	2564.0	6.2	20.0	467.1	523.0	571.2	67.5
2017-18 (P)	1422.0	2530.5	6.4	20.2	449.3	559.6	668.5	56.6

(Source: Statistical Abstract of Haryana, various years. P= Provisional)

The table no. 1 shows that between 1966-67 to 2017-18, paddy, wheat, oilseeds and cotton have recorded a positive growth with an addition of 3742 thousand hectares under cultivation whereas 1793 thousand hectares of land previously cropped under maize, barley, bajra and pulses has been reduced. Therefore, total cropped area and overall production of various crops in Haryana reflect consistent expansion and dominance of paddy and wheat in the state. On the other hand, barley, bajra, oilseeds, maize, cotton and pulses have witnessed drastic downfall in the overall production and total area cropped throughout the last forty-nine years. Any crop failure (low yield or flat market prices) disturbs the input-output ratio thus pressurizing the farmers to opt for climate resistant crops. Inherent risk factors such as

poor monsoons, pest attack, inappropriate procurement and price shock restrain farmers of the state to switch from paddy and wheat to alternative crops.

The traditional crops such as maize, barley, bajra and pulses form 7.92% of the total cropped area. With the introduction of high yield crops, mechanization of agriculture, fertilizers and improved irrigation the yield of paddy and wheat has multiplied manifold during the past 48 years. The trends in yields of major crops are discussed ahead. Due to the increase of yield and area of paddy and wheat; there is a surge of 947% in their overall production in the state and an overall decline of 32% has been recorded in the production of maize, barley, bajra and pulses between 1966-67 and 2017-18 (Table 2).

TABLE 2
Total production (000 Tonnes)

Year	Rice	Wheat	Maize	Barley	Bajra	Oilseeds	Cotton	Pulses
1966-67	223	1059	86	239	373	92	287	563
1970-71	460	2342	130	124	826	99	373	832
1975-76	625	2428	171	221	608	79	465	952
1980-81	1259	3490	81	181	474	188	643	503
1985-86	1633	5260	64	160	315	288	745	687
1990-91	1834	6436	49	107	526	638	1155	542
1995-96	1847	7291	48	100	409	783	1284	4511
2000-01	2695	9669	34	118	656	563	1383	100
2005-06	3194	8853	36	79	706	822	1502	112
2006-07	3375	10059	30	115	1021	821	1805	136
2007-08	3606	10232	37	120	1156	617	1882	101
2008-09	3299	11360	25	185	1087	911	1862	178
2009-10	3628	10488	26	137	930	862	1918	97
2010-11	3465	11578	19	130	1183	965	1747	153
2011-12	3757	13119	30	149	1175	546	2621	107
2012-13	3941	11117	26	167	791	970	2378	286
2013-14	4041	11800	24	151	829	899	2025	91
2014-15	4007	10707	18	105	670	740	1943	55
2015-16	4144	11351	18	99	651	852	995	35
2016-17	4453	12384	26	73	964	985	2041	162
2017-18	4880	12263	19	69	721	1135	1626	1328

Source: Statistical Abstract of Haryana of Various Years

It may be noticed that price of pulses in India is vulnerable and volatile. In case of a crop failure, the prices shoot up while during a good harvest the prices land a touchdown. In Haryana 'the acreage under gram and rapeseed/mustard seed is positively and significantly associated with price but insignificantly related with yield and perhaps this explains the paradox of increasing prices but declining proportionate areas under pulses and oilseeds in the cropping pattern'. The market factors (natural/manmade) have functioned to control the flow of pulses

(Sangwan,1985: 184; Ghosh, 2017).

The variability in yield of groundnut, rapeseed/mustard seed and jowar, has affected their total area under cultivation. In both the cases farmers are not able to reap the best out of growing pulses and have thus shifted to other crops. The irregularities in output and lack of safety nets hinder farmers to deflect wheat and rice rotation. It is thus required to stabilize the price and gradually increase the yield with suitable seed varieties of groundnut, rapeseed/mustard seed and jowar.

Trends in Yields of Major Crops

TABLE 3
Yield per hectare in 000 tonnes

Year	Rice	Wheat	Maize	Barley	Bajra	Oilseeds	Cotton	Pulses
1966-67	1.2	1.4	1.0	1.3	0.4	0.4	1.6	0.5
1970-71	1.7	2.1	1.1	1.1	0.9	0.7	1.9	0.7
1975-76	2.1	2.0	1.2	1.2	0.6	0.5	1.8	0.8
1980-81	2.6	2.4	1.1	1.5	0.5	0.6	2.0	0.6
1985-86	2.8	3.1	1.2	1.8	0.5	0.8	2.2	0.8
1990-91	2.8	3.5	1.4	2.1	0.9	1.3	2.4	0.7
1995-96	2.2	3.7	1.8	2.5	0.7	1.3	2.0	1.0
2000-01	2.6	4.1	2.2	2.7	1.1	1.4	2.5	0.6
2005-06	3.1	3.8	2.1	2.8	1.1	1.1	2.6	0.6
2006-07	3.2	4.2	2.2	3.1	1.6	1.3	3.4	0.8
2007-08	3.4	4.2	2.7	3.0	1.8	1.2	3.9	0.6
2008-09	2.7	4.6	2.1	3.5	1.8	1.7	4.1	1.0
2009-10	3.0	4.2	2.1	3.3	1.6	1.6	3.8	0.7

2010-11	2.8	4.6	2.0	3.5	1.8	1.9	3.5	0.9
2011-12	3.0	5.2	2.7	3.6	2.0	0.7	4.4	0.9
2012-13	3.3	4.5	2.6	3.5	1.9	1.7	4.0	3.8
2013-14	3.2	4.7	2.8	3.9	2.1	1.6	3.6	0.9
2014-15	3.1	4.1	2.0	3.0	1.7	1.5	3.0	0.7
2015-16	3.1	4.4	3.0	3.4	1.8	1.6	1.6	0.5
2016-17	3.2	4.8	4.2	3.7	2.1	1.9	3.6	2.4
2017-18	3.4	4.8	3.0	3.4	1.6	2.0	2.4	2.3

Source: Statistical Abstract of Haryana of Various Years

The paradigm shift to rice and wheat specialization has helped India secure self-sufficiency in food production and also making her a major global leader in grain export. However, constant monocropping degrade the overall soil fertility; and thus affecting the yield quality of other crops as well. A recent report by Ministry of Finance reveals that in 2014-15 and 2015-16, India faced a 'pulses crises', the productivity of the pulses dropped due to weak monsoons, causing a sudden surge in the demands and inflation in consumer price. 'High prices in the pre-Kharif sowing period and a good monsoon led to a sharp increase in acreage under pulses. In anticipation of this positive supply shock (in India and overseas where too supply has surged), prices started plummeting. The report recommends appropriate and immediate increase in MSP for pulses to ensure sustainable and long term benefits to farmers and the consumers. Crop diversification is a possible breakthrough to overcome the plummeting agricultural economy and help soil retain its fertility (Ministry of Finance, 2016).

The implications of such fluctuation are dire for farmers and their livelihoods because in Haryana total cropped area under pulses in 2010-11 was 175.6 thousand hectares and production was 153.1 thousand tonnes. On a declining trend total area cropped under pulses and production stood at 123 thousand hectares and 107 thousand tonnes respectively. The acreage further slipped in 2012-13 to 75.3 thousand hectares but production rose to 285.6 thousand tonnes. In 2013-14 the acreage again rose to 105.3 thousand hectares with lowest ever production of 90.9 thousand tonnes (Statistical Abstract of Haryana, 2014-15: 226-27).

Horticulture

The acreage under horticulture has continuously increased specially since 1980s when production

surpassed area due to higher productivity (Table 4)

TABLE 4

Trend of horticulture crops in Haryana

Years	Area (hectares)	Production (Tonnes)
1966-67	19170	162887
1970-71	35054	289073
1975-76	54418	434992
1980-81	63220	680050
1985-86	70809	657437
1990-91	68050	902907
1995-96	115760	1568015
2000-01	181115	2491035
2005-06	277479	3298089
2006-07	328601	3712724
2007-08	326296	3622575
2008-09	355515	4264844
2009-10	364375	4457585
2010-11	415930	5149290
2011-12	429968	5711597
2012-13	436549	5696662
2013-14	450605	6295025
2014-15	439605	6144328
2015-16	490700	7050568
2016-17	490144	7097846
2017-2018	528598	7657849

Source: Horticulture Department Haryana, www.hortiharyana.gov.in

It is to be noted that the state has a small share from the rivers Yamuna and Sutlej to channelize through canals. Hence to meet its large demand for agriculture, industry and domestic needs, it has to rely heavily on the groundwater (Ravish *et al.*, 2018).

Cropping Pattern of Select Southern Districts of Haryana

It is now imperative to understand the cropping pattern especially the crop combinations adopted in the select southern districts of Haryana since 1990s. It is important to note here the district of Charkhi Dadri was carved out of Bhiwani in December 2016, analyse has been made on the basis of the then three districts of Rewari, Bhiwani and Mahendragarh. Their data was collected from Statistical Abstract of Haryana of various years. For the delineation of crop

combination region in the study area, J. C. Weaver's technique of crop combination (1954) has been adopted. Weaver's method of crop combination is measured by calculating the deviation of real percentages of crops (occupying over 1 percent of the cropped area) for all possible combinations in the component area units against a theoretical standard. Weaver's method has admirably been applied for the demarcation of crop combination regions and agricultural regionalization as its application results into suitable and accurate grouping of crops.

As understood by the Weaver's method, some environmental as well as geographical constraints owing to geographical location, soils and climate have put limit on agricultural productivity. The analysis below has identified 2 crop, 3 crop, 4 crop combinations in the study area. Farmers cultivate numerous crops in the field rather than a single crop which they find as remunerative combination but it may be noted that one or two crops emerge as predominant, such as Wheat and mustard in rabi season in these districts

TABLE 5
Percentage of area under different crops in (ha)

Name of Crops	During the Triennium 1990-93			During the Triennium 2009-12		
	Rewari	Bhiwani	Mahendragarh	Rewari	Bhiwani	Mahendragarh
Rice	0	0	0	1.39	2.62	0
Jowar	1.82	0.53	0.07	0.41	0.31	0
Bajra	28.06	30.28	37.8	32.21	24.64	39.41
Maize	0	0.02	0	0	0.01	0
Wheat	21.72	11.1	12.95	25.24	21.19	15.35
Barley	3.13	0.69	0.9	0.84	1.52	0.3
Gram	5.6	26.67	11.54	0.03	7.84	2.63
Other Pulses	0.04	0.68	0	0.58	0.61	0.16
Mustard	30.58	15.12	28.22	32.86	20.25	33.85
Cotton	0.02	4.65	0.07	0.38	5.78	0.4
Sugarcane	0	0.17	0	0	0.2	0
Oth. Crops	9.03	10.09	8.45	6.06	15.03	7.9
Total	100	100	100	100	100	100

Source: Crop Combination Regions: A Spatio-Temporal Analysis of Haryana:1990-93 & 2009-12 (Chander, 2017)

The Table indicates that during 20 years from 1990 to 2009, there is no significant change. New crop rice has come in Bhiwani and Rewari districts replacing Jowar and Bajra in some pockets.

TABLE 6
Crop combination regions of Haryana

Name of Districts	During the Triennium 1990-93		During the Triennium 2009-12	
	No of crops	Types of Crops	No of crops	Types of Crops
Rewari	3	Mustard, Bajra, Wheat	3	Mustard, Bajra, Wheat
Bhiwani	3	Bajra, Gram, Mustard	3	Bajra, Wheat, Mustard
Mahendragarh	2	Bajra, Mustard	2	Bajra, Mustard

The analysis recorded that the southern districts of Rewari, Bhiwani, and Mahendragarh concentrate on two or three crop combination with Mustard and Bajra being the common in all of them. The two or three crop combination identified because farmers grew these crop combination for their maximum economic profit.

During the period of 2009-12 not much deviation was found in the cropping combinations in these districts except that wheat replaced gram as new preferred crop due to various factors including

assured yield and income.

First crop only (First Rank crop in Southern Haryana): It was observed that the First rank crop of northern Haryana was wheat but in southern district of Rewari first rank crop was mustard, in Mahendragarh and Bhiwani districts first rank crops were bajra in 1990-93.

First two crop only: The first two crop combination in Haryana was mostly wheat and rice but in southern part of Haryana it is mustard and bajra are considered good combination. In 1990-93,

Gram was considered as good combination with mustard and bajra crops in southern Haryana but 2009-12 it was replaced by wheat.

First Three crop only: Three crop combination of Wheat-Mustard-Bajra was found in southern part of Haryana specially in Rewari, Bhiwani and Mahendragarh and in some parts wheat-mustard and jowar were good combination because southern and western part of Haryana are dry area and sandy soil

and receive low rainfall compared to eastern and northern part of Haryana in 1990-93 and also in during 2009-12, Bhiwani districts maintained three crop combination.

The results as corroborated with previous studies (Chander, 2017), show that there was no significant change in the cropping pattern of the select southern districts of the Haryana. Crops like mustard, bajra and wheat constituted major crops combinations.

TABLE 7
Area, production and average yield per hectare of important crops in Haryana
(Area in 000 Hectare, Production in 000 Tonne and Yield in Kg. per Hectare) (2018-19)

Name of crops	Charkhi Dadri			Rewari			Bhiwani			Mahendragarh		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Rice	9.4	17	1,845	1.8	5	2,311	21.7	56	2,523	0	0	0
Jowar	2.0	1	519	0.4	0	0	0	0	0	0.2	@	@
Bajra	40.4	30	751	67.7	133	1955	60.6	75	1237	98.5	147	1,505
Maize	@	0	1434	0	0	0	0.1	0	3567	0	0	0
Sugarcane	1.3	8	7652	@	@	0	2.8	23	7674	0	0	0
Wheat	54.4	227	4121	46.1	225	4893	117.4	506	4326	49.1	209	4265
Barley	2.1	7	3496	0.8	5	4532	3.1	9	3454	0.5	1	3056
Gram	1.3	1	1116	@	0	0	11.1	9	779	5.5	6	936
Pulses	1.7	1.3	0	0.6	0.6	0	15.2	10.8	0	6.1	6.5	0
Mustard	52.8	101	1897	66.2	151	2295	120	222	1847	80.9	153.1	1883
Cotton	27.6	46	0	7.8	23	0	86.3	203	0	25.9	79	0

Source: State Statistical Abstract of Haryana 2018-19

Note: (i) Total may not tally due to rounding off.(ii)Before working out production estimates on the basis of area and yield, figures of area were rounded off to the nearest thousand hectare.

A: Area P: Production Y: Average Yield @: Less than 500 hectares/ tonnes P: Provisional

If we rank crops in terms of area, Wheat, Mustard, Bajra and Cotton are foremost crops in Charkhi Dadri, whereas in Rewari, Bajra, Mustard, Wheat and Cotton would be the sequence in descending order. Similarly, in Bhiwani, Mustard is the forerunner which is followed by Wheat, Cotton and Bajra as majorly sown crops. In Mahendragarh this sequence is led by Bajra followed by Mustard, Wheat and Cotton. These crops are sown as single crops or in combination of these or some other crops by farmers. It is therefore evident that there is no change in cropping pattern in subsequent years as far as the dominance of the crop combination of the above-mentioned crops is concerned. There is significant amount of concentration of these crops for decades in this region.

From the above discussion it can be observed that increase in production of non-food commodities does not increase proportionately to the overall increase in agricultural production. Keeping in view

of the ever-increasing crop specialisation in the state, the Government of India and Government of Haryana have been endeavouring in the recent years to provide food security through ecologically sustainable and economically viable diversification of agriculture and promotion of scientific planning and cropping pattern to improve the yield per hectare by better and integrated crop management. The intensity of diversity is reflected by the number of crops produced in a state as well as by the aggregate level of spread or concentration. At the individual level combination of agricultural crops is supposed to increase the income level, at the regional level it is expected to mitigate negative externalities associated with mono-cropping, as well as at the national level it is perceived to help gain self-sufficiency in variety of agricultural produce. State-wise pattern of diversity on the basis of a 30 Crops Index reveal that most of the states in the northern region fall under the category of states producing less number of crops and hence are less

diverse. Haryana falls in the category of moderately diversified cropping state with 15 points (Kumar, 2017).

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NOTES

- 1 Paddy and rice have been used interchangeably across the successive chapters of this report.
- 2 Thousand tonnes.
- 3 Thousand hectares.
- 4 2488 thousand tonnes in 2009-10 as compared to 2628 thousand tonnes in 2014-15.

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