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DYNAMICS OF CROPPING PATTERN AND STATUS OF GROUND WATER A BLOCK LEVEL ANALYSIS OF SONIPAT DISTRICT, HARYANA

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Abstract

This paper is an attempt to analyze the changes in cropping pattern during 2000-02 to 2015-17 and status of ground water in Sonipat district at block level. The study is based on secondary data sources. The study reveals that the district has recorded some drastic changes in cropping pattern. It has been noted that within the increase in total cropped area, the area under wheat and rice has been increased drastically while the area under some crops such as sugarcane, cotton gram has declined. Cultivation of gram has totally disappeared. The increase in rice cultivation has becoming the cause of rapidly declined in ground water.

Introduction

Agricultural activities are being the one of fundamental work of people.Forthelastsix to seven thousand years,agriculture hasbeentheelementaryactivity for the survival and the development of mankind.In the early primitive period of his life, human being wandered in the search of food. They earned their livelihoods by hunting, gathering and fishing etc. They leaded a nomadic life.With the passage of time, human beings had started to growing crops and toestablish permanent settlement nearby the source of water in river valleys. "Agricultural practices enabled people to establish permanent settlements and expand urban based societies. Domestication of plants and animals transformed the profession of the early humans from hunting and gathering to selective hunting, herding and settled agriculture, (Gupta,2004)". When human beings would start to grow the seeds of different crops on available cultivable land, perhaps it was the emergent of first cropping pattern.

The Cropping pattern of any region or area represent the proportion of area under various crops during an agricultural year. Cropping pattern of any region is combined result of many factors. It depends on the selectionand allocation of land todifferent cropsand onnumber of decisions taken by individualfarmersbasedon physical, economic and sociological factors, (Sridharan andRadhakrishnan,1978). Cropping pattern of any region does not remain statics it changes with the passage of time according to the demands. "Basically, cropping pattern is determines through various factors viz., land size, climatic

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Vol-10 Issue-6 No. 5 June 2020

conditions, financial credits, technological advantages and in last seeds, fertilizers that are used by the farmers(Singh,2015)".

As it is well known that agriculture plays an important role in the Indian economy and more than fifty percent of its population has engaged in agriculture and allied sector. Being a large country, itcomprises with a large number of agro-climatic regions. Each and every agro-climatic region has some different and specific characteristics. Being a wide range of climatic conditions, it leads different cropping seasons. Every agroclimatic region has a wide range of cultivated crops. So, the cropping pattern differs from one agro-climatic region to another region. Some time it also differs within the region. Cause being that at micro level the surface nature doesn't similar, it varies flattish to undulating and water availabilities does not equally spread.It has been noted that after the 'green revolution' famers have inclined towards cultivation of food crops wheat and rice. These changes have been more clearly identified in north Indian plain more specifically in Haryana, Punjab and UP. Apart from this, the agricultural sector of the country has experienced remarkable changes in recent past. These changes have been noticed in terms of area under agriculture, cropping pattern, productivity and use of new technology etc. (Majhi andKumar, 2018).

The state of Haryana is located in great plain of India which has also known as Indo-Gangetic plain. This plain have rich and highly fertile alluvial soil. It is one of the highly fertile plains of the world, where cropping intensity is found very high. The state of Haryana is known for its surplus food production and major contributor to Indian economy."It isthesecondlargestcontributoroffoodgrainInIndia (Ahlawat and Renu, 2016:41)". And it is possible due to high productivity of land. Whole the state has been divided into two agro-climate zones i.e. eastern zone and western zone and cropping. The Sonipat located in eastern zone which is just adjacent to Yamuna River. So, the availability of surface and ground water provides it good agricultural conditions.

Study area

Sonipat is one of the very famous districts of Haryana having an area of 2260 square kilometers which is a little more than five percent of total area of the state. The district is located in middle east part of the state. The Sonipat city is the district headquarters of the district. It is just adjacent to national capital of Delhi anda part of NCR. The district is surrounded by National Capital, Delhi in east, Rohtak and Jhajjar district in west, Panipat and Jinddistrict in North while the eastern part it shares its border with Uttar Pradesh. Being located in Gangetic plain the soil of the district is well fertile and suitable for almost all crops.

ISSN: 2278-4632
Vol-10 Issue-6 No. 5 June 2020

Objectives:

The study is an attempt to examine the cropping pattern of Sonipat district at block level, change in cropping pattern during recent past and impact of cropping pattern to the status of ground water.

Database and Methodology

The present study is based on secondary data which has been collected from Department of Agriculture government of Haryana and Statistical Abstract of Haryana. Block wise area under each crop has been collected from Department of Agriculture Haryana while some data related status of underground water has been takenCentral GroundWaterBoard Report.To find out the cropping pattern triennial data has been used.

Cropping Pattern and Changes in Cropping Pattern

Table No. 1, present the area under some important cropsin Sonipat district at block level during 2000-02 to 2015-17. The table reveals that during a period of sixteen to seventeen years the gross cropped area in all blocks has increased with different growth. The Kathura block has recoded maximum increase in cross cropped area i.e.12582 hectares and followed by Gohana Rai and Kharkhoda blocks while Ganaur block has recorded minimum increase. At district level this gross cropped has gained nearly 18 percent i. e. nearly 41000 hectares in comparison 2000-02 to 2015-17.This increase in gross cropped area shows that expansion of agriculture in the district has reaching towards high cropping intensity. It has been possible due to favourable conditions for the development of agriculture. Being good fertile alluvial soil and availability of sufficient water for irrigation. It has been noted that with this increasing cropped area, the area under wheat and rice has been increased while area under some crops such as sugarcane, cotton gram has declined. Cultivation of gram has totally disappeared.

Table No. 2 reveals that during 2000-02 wheat and rice are two major crops grown in all the blocks. The area under wheat and rice varied from 76 percent to a little more than 94 percent. In Rai and Ganaur blocks area under these two crops was highest while in Gohana and Kathura blocks the area under wheat and rice was comparatively low. In 2015-17 the area under both the crops has increased in all blocks of the district. Kathura, Gohana and Sonipat blocks have noted maximum change in the area under these crops. It has increased nearly 13 to 17 percent. While Rai and Ganaurblocks has recorded minimum changes. Reason being that in these blocks area under wheat and rice is already high than to other blocks which blocks have noted maximum changes. If overview at district level it has been noticed that in

ISSN: 2278-4632
Vol-10 Issue-6 No. 5 June 2020

2000-02, wheat and rice was cultivated on an area of 85 percent of total cropped area while in 2015-17 it covers an area of more than 95 percent.

Table 1. Sonipat District Block wise Area under major Crops 2000-02&2015-17 (Area in Hectares)

Blocks	Years	Wheat	Rice	Sugarcane	Bajra	Mustard	Cotton	Barley	Maize	Gram	Gross Cropped area
Sonipat	2000-02	27333	16550	3233	533	1100	3333	200	167	50	52499
	2015-17	29988	23691	1178	601	0	221	45	116	0	55840
Rai	2000-02	18700	9350	433	400	433	50	200	167	37	29770
	2015-17	21278	13047	889	546	0	200	0	0	0	35960
Kharkhoda	2000-02	16633	5233	1400	1100	1133	100	100	100	42	25799
	2015-17	19533	9619	301	1952	0	328	119	48	0	31900
Gohana	2000-02	18867	6500	3567	1266	1000	667	100	37	100	32104
	2015-17	19697	17099	1383	1387	49	218	48	0	0	39881
Kathura	2000-02	10467	2700	2167	633	800	367	100	41	38	17313
	2015-17	16042	11867	1019	676	0	291	0	0	0	29895
Mundlana	2000-02	20600	7233	3100	1200	900	633	66	33	27	33765
	2015-17	22013	13384	2079	814	0	212	0	0	0	38502
Ganaur	2000-02	21033	13800	1933	366	566	50	100	100	29	37977
	2015-17	17865	19045	971	301	0	114	0	0	0	38296
District total	2000-02	133633	61366	15833	5498	5932	5200	866	645	323	229276
	2015-17	146416	107752	7820	6277	49	1584	212	164	0	270274

Source: Based on Data collected from Department of Agriculture,Haryana

Table 2. Sonipat District Block wise cropping Pattern 2000-02 & 2015-17 (Area in%)

Blocks	Years	Wheat	Rice	Sugarcane	Bajra	Mustard	cotton	Barley	Maize	Gram	Total
Sonipat	2000-02	52.06	31.52	6.16	1.02	2.10	6.35	0.38	0.32	0.10	100.00
	2015-17	53.70	42.43	2.11	1.08	0	0.40	0.081	0.21	0	100.00
Rai	2000-02	62.81	31.41	1.45	1.34	1.45	0.17	0.67	0.56	0.12	100.00
	2015-17	59.17	36.28	2.47	1.52	0	0.56	0	0	0	100.00
Kharkhoda	2000-02	64.45	20.27	5.42	4.25	4.38	0.39	0.39	0.39	0.16	100.00
	2015-17	61.23	30.15	0.94	6.12	0	1.03	0.37	0.15	0	100.00
Gohana	2000-02	58.77	20.25	11.11	3.94	3.11	2.08	0.31	0.12	0.31	100.00
	2015-17	49.39	42.88	3.47	3.48	0.12	0.55	0.12	0	0	100.00
Kathura	2000-02	60.46	15.60	12.52	3.66	4.62	2.12	0.58	0.24	0.22	100.00
	2015-17	53.66	39.70	3.41	2.26	0	0.97	0	0	0	100.00

Mundlana	2000-02	61.01	21.40	9.17	3.54	2.66	1.86	0.20	0.10	0.08	100.00
	2015-17	57.17	34.76	5.40	2.11	0	0.55	0	0	0	100.00
Ganaur	2000-02	55.38	36.34	5.09	0.96	1.49	0.13	0.26	0.26	0.076	100.00
	2015-17	46.65	49.73	2.54	0.79	0	0.30	0	0	0	100.00
District Total	2000-02	58.28	26.77	6.90	2.40	2.59	2.27	0.38	0.28	0.14	100.00
	2015-17	54.17	39.87	2.89	2.32	0.02	0.59	0.08	0.06	0	100.00

Source: Based on Data collected from Department of Agriculture, Haryana

Similarly, if it includes two or three more crops like sugarcane, bajra or cotton it has covered an area of more than 99 percent to total cropped area in all blocks excepting Kharkhoda block. It indicates that the numbers of cultivated crops have rapidly reduced, which indicates, farmers are focusing mainly two or three crops. One interesting thing is that the cultivation of sugarcane has replaced by rice cultivation. There is only one block, Rai where area under cultivation of sugarcane has increased more than fifty percent.

Farmers have given more thrust on cultivation of wheat and rice. The cropping diversity has shrunk between 2000-02 to 2015-17. It has been clearly seen in cultivation of gram, cotton, maize, barley and mustard.

According to a report by Haryana KisanAyog (2013), which is based on ecology and cropping pattern, the sequence of major crops in Sonipat district were wheat, rice, sugarcane and maize while the data received from department of agriculture shows that wheat, rice, sugarcane, bajra and cotton. It slightly differs from the above-mentioned report. At block level crop sequence differs to other blocks where bajra is the third major cultivated crops at the place of sugarcane.

Cropping Pattern and Status of Ground Water

Availability of water and cropping pattern has closely related to each other. Agriculture cannot be assumed without availability of water. Table No.4 present the availability of net annual ground water, water draft for irrigation and domestic use, water available for future irrigation development and status of water resource at block level. If we try to correlate it to present cropping pattern of all the blocks it seems a close relation. Table No. 3 shows that the area under the cultivation of rice has increased in all blocks of the district. This increase in area varies from one block to another block. It has been found that during 2015-17, in Kathura block the area under rice cultivation has more than three folds and followed by Gohana block where it gained an area of 163 percent than comparison to 2000-02.Similarly, the area under rice has notably increased in all blocks of the district. It recorded an increase of more than 75 percent. The cultivation of rice needed a huge quantity of water. This

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Vol-10 Issue-6 No. 5 June 2020

expansion in rice cultivation have severe impact on Ground water. More and more ground water is being exploited for rice cultivation. Exploitation of ground water in huge quantity created the problem of water deficiency. Table No. 4 shows that out of seven blocks five blocks namely Sonipat, Rai, Ganaur, Gohana, Mundlana are over exploited its water resources. One block Kharkhoda has consider in semi critical category. Only one block Kathura is considered in safe zone. Reason being that previously during 2000-02, the area under rice cultivation was less but recently it has noted maximum increase in cultivation of rice. While in all the other blocks the rice was already a more prominent crop.

Tabale-3. Block wise Ground water Availability, Consumption and Status(in Cubic metre)

Blocks	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draftfor domestic and industrial water supply	NetGround Water Availability forfuture irrigation development	Status
Ganaur	20226	26757	1702	-8233	Over-exploited
Gohana	7431	10962	132	-3663	Critical
Kathura	5150	4496	18	632	Safe
Kharkhoda	7828	12106	132	-4410	SemiCritical
Mundlana	15217	13546	29	1637	Safe
Rai	8038	17054	1320	-10336	Over-exploited
Sonipat	13108	17696	1297	-5885	Over-exploited
Sonipat District	76998	102617	4630	-30258	Over-exploited

Source: Central GroundWaterBoard Report, 2015

Table No. 4 Percentage increase in Area under Rice Cultivation 2000-02 to 2015-17

Blocks / District	**Percentage increase in area**
Sonipat	43.15
Rai	39.54
Kharkhoda	83.81
Gohana	163.06
Kathura	339.52
Mundlana	85.04
Ganaur	38.00
Sonipat District	75.59

Source: Based on Data collected Department of Agriculture, Haryana

Conclusion

Cropping pattern of always depends on many contemporary factors. It changes according to farmers mind set towards different crops and market demands. The cropping pattern in the study area has recorded a notable change. Area under food crops mainly wheat and rice has

increased very rapidly between 2000-02 and 2015-17. Expansion of rice cultivation has increased the demands of water for irrigation. To fulfill this demand farmers have over exploited the water resource. Excess use of ground water has created the water deficiency in the region.

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