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Changing Pattern of Major Foodgrain Crops in Haryana and its Impact on Environment

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Introduction

India is an agriculture based economy as it accounts for 18% of Country's gross domestic product. During the period of independence, the country was suffering from deficit of foodgrains for its population. Due to the green revolution, India has not become only self dependent in foodgrains production but also exporter of various foodgrains. Among the various states, Haryana is the second largest contributor to the national reserves of foodgrains despite of its very small geographical area (Ranade, 2016). Major foodgrain crops sown in the state at time of its establishment (1 November 1966) were pearl millet and maize during kharif season, and barley and gram in rabi season. Cropping pattern in the state has rapidly changed among kharif as well as rabi crops. In the current period, major kharif and rabi crops have changed from pearl millet and gram (during 1966-67) to rice and wheat, respectively (Aggarwal and Moudgil, 2015). This rapid cropping pattern change has occurred due to various reasons as advancements in irrigation facilities, agricultural machineries, research and developments in production of high producing varieties of crops etc. Due to this increasing rice-wheat cultivation pattern in last one or two decades has led to various problems viz depletion of groundwater, deterioration in quality of water, deficiency of major macro and micronutrients in the soil, air pollution problems due to burning of stubbles of wheat and rice crops, climate change etc.

Considering the impact of changing foodgrain crops mainly wheat-paddy cultivation has satisfied the foodgrains demand on one hand, while on the other hand, it has negatively impacted the environment. Wheat-paddy being most water intensive crops requires excess water for irrigation as compared to less water consuming crops, leading excessive drafting of groundwater. In a recent study on temporal analysis of groundwater in Haryana, the state has shown a depletion rate of 0.21 m/year from 1974 to 2015 leading to scarcity of groundwater in the region (Kharb, 2017).

Wheat-paddy cultivation produces huge amount of stubbles (crop residues) which are burnt in the field itself causing air pollution by release of CO_2, CO, CH_4, ammonia oxides of N & S, particulate matter etc (Mittal et al., 2009). Stubble burning also causes destruction of minerals and beneficial microflora of soil.Therefore, the present study has been conducted by keeping in view the following objectives:

- Patterns of changes in area and production of major foodgrain crops
- Impact of wheat-paddy cultivation on environment

Study area

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Haryana is the seventeenth state of India located on the north-western part of the country between 27°39' to 30°35' N latitude and between 74°28' and 77°36' E longitude. The state has 4.42 m ha of geographical area which is divided into six administrative divisions having 22 districts, 126 blocks, 154 cities & towns and 6848 villages. Geologically, Haryana is a part of the Indo-Gangetic alluvial plain containing sand, clay, silt and hard calcareous concretions with sand dunes formation in south-western parts. Average rainfall of the state was 456.3 mm with a range of 158-870 mm in 2015. The state's economy is mainly based on agriculture as 70 per cent of residents are engaged in agriculture with wheat-paddy cropping pattern occupying more than half of the gross cropped area with 193.8% intensity of irrigation and 63% irrigation through tube-wells. Location map of study area is shown in figure 1.

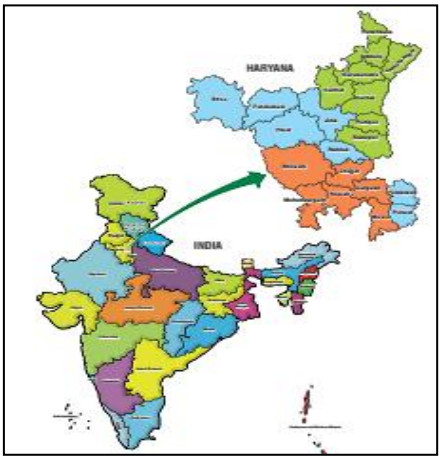

Figure 1 Location map of study area

Materials and Methodology

The present study has been conducted on secondary data collected from various reports of statistical abstracts and groundwater cell, Haryana. The trends have been estimated from year 1966-67 to 2016-17. Percent growth in area and production has been calculated using simple mathematical and statistical formulas. Various formulas used for analyses are-

$$\%\ \text{Groundwater irrigation area} = \frac{\text{Area irrigated by Groundwater}}{\text{Total irrigated area}} \times 100$$

$$\text{Pesticides used (kg/ha)} = \frac{\text{Amount of pesticides used}}{\text{Area covered}}$$

Results and Discussion

Trends of cropping intensity

With the advancement of farming and irrigation techniques, total area under cropping in Haryana has increased significantly since 1966-67. In the 50 years of study period, total cropped area has increased by 40.3%. Instead of a small increase in net sown area (2.2%), area sown more than once has increased by 151.1% from 1966-67 to 2016-17 (Table 1). This can be attributed to increased irrigation facilities, use of expensive agricultural equipments and various irrigation schemes by the state as well as central Government as subsidized installation of tubewells and electricity rates.

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Table 1:Trends of area under cultivation in Haryana (in 000 ha)

Sr. No.	Year	Net area sown	Area sown more than once	Total cropped area
1	1966-67	3423	1176	4599
2	1970-71	3565	1392	4957
3	1980-81	3602	1860	5462
4	1990-91	3575	2344	5919
5	2000-01	3526	2589	6115
6	2010-11	3518	2987	6505
7	2016-17	3499	2953	6452

Source: Statistical abstracts of Haryana

Trends of area sown and production of major foodgrain crops

During the study period of 50 years, area under rice cultivation has increased significantly by 622% among major kharif crops whereas area of bajra and maize has decreased considerably. Similarly, among major rabi foodgrain crops, area of wheat cultivation has increased by 204% whereas that of barley and gram decreased significantly. Results of the present study have indicated significant shifting towards rice cultivation during kharif season and towards wheat cultivation during rabi season (Table 2). Moreover, area under wheat-paddy cultivation during 1966-67 was only 20.3%, which has increased by 178.3% in 2016-17; however, total cropped area has increased by 40% only. Erenstein (2010) has also reported high wheat and rice yield in Haryana with suggestions of reduction in production costs for better returns. Other workers have also reported extended area and production use for wheat-paddy in the state (Akshu and Sharma, 2017; Roy and Datta, 2000). Similarly, the production of rice among kharif foodgrain crops has significantly increased by 1897%, whereas that of maize and pulses decreased. Production of wheat among rabi foodgraincrops has increased significantly by 1069%, whereas that of other rabi crops decreased in last 50 years. The results clearly show that production of rice and wheat crops has increased rigorously during the study period (Figs. 1 and 2). The increased area and production of wheat-paddy cultivation has directly related to enhanced minimum support price, hybrid seeds, advanced farming techniques and subsidized installation and bills of electric pumps.

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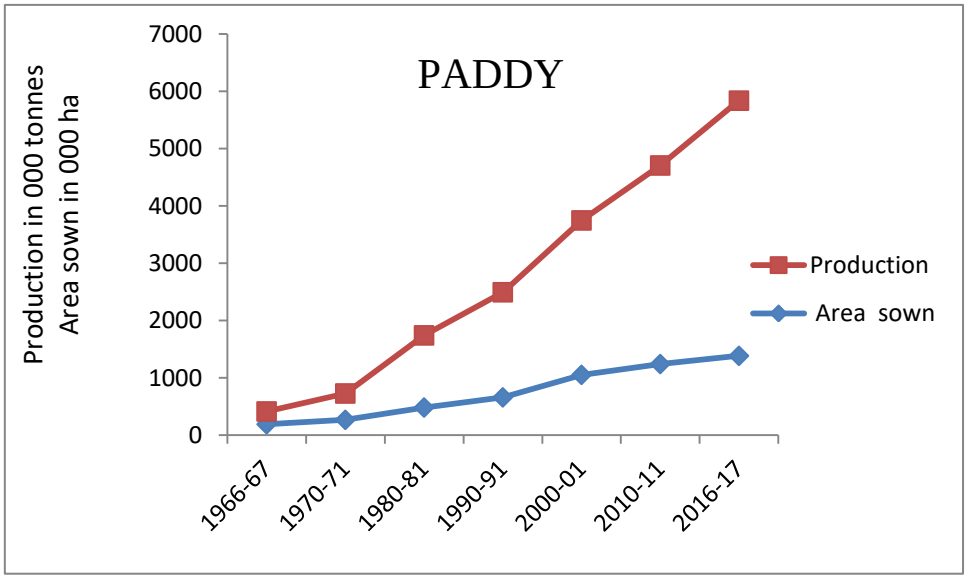
Table 2:

Changing patterns of area sown in (A in '000' hectares) and production(P in '000' tonnes)of major foodgrains in Haryana from 1966-67 to 2016-17

Sr. No.	Major Foodgrain Crops	1966-67		2016-17		Percent Growth	
		A	P	A	P	A	P
(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
A	Kharif Foodgrains						
1	Rice	192	223	1386	4453	621.90%	1896.90
2	Bajra	893	373	478	964	-46.50%	158.50
3	Maize	87	86	5	17	-94.30%	-80.30
4	Kh. Pulses	60	58	43	27	-28.30%	-53.50
B	Rabi Foodgrains						
1	Wheat	743	1059	2258	12384	204%	1069.40
2	Gram	1062	531	37	44	-96.50%	-91.70
3	Barley	182	239	20	73	-89%	-69.50
4	Rabi Pulses	12	11	5	5	-58.3	-54.50

Source: Statistical abstracts of Haryana for Col. No. (i)-(vi); Col. No.(vii) & (viii) computed by Author

Figure 1 Trends of area and production of Paddy in Haryana



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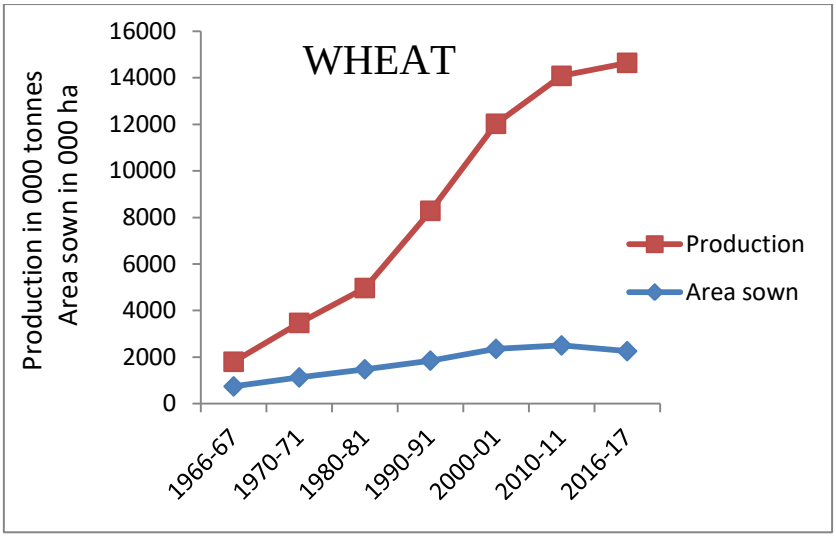

Figure 2 Trends of area and production of Wheat in Haryana

Adverse effects of wheat-paddy cultivation on environment

The continuous wheat-paddy mono-cropping has made Haryana self secure in fulfilling the grains requirement as well as major contributor of India's foodgrain export. However, this pattern adversely affected the environment in form soil degradation,depleting groundwater and pollution. The area irrigated from groundwater resource has been increased from 22.7% to 62.8% of total irrigated area i.e. 177% increase has been observed in last 50 years of study period. The trends of increasing irrigation through groundwater in the state have also been depicted by increasing number of tubewells in the state i.e. number of tubewells have been increased more than 32 times in 2016-17. Similarly, chemical fertilizers consumption has also been increased by more than 100 times to increase the production of foodgrains. This excessive consumption of pesticides and chemical fertilizers has deteriorated the soil fertility as well as groundwater quality and indiscriminate use of groundwater for irrigation has depleted the groundwater resource (Table 3). The levels of groundwater were 9.19 m in June 1974 in Haryana, which have been depleted to 19.57 m in June 2018 (Groundwater cell, Department of Agriculture, Haryana) i.e. levels of groundwater have been depleted by more than 50% mainly because of over drafting for irrigation purpose and less recharge due to low rainfall in the region. Various other workers have also reported wheat-paddy cultivation as cause of groundwater depletion in Haryana (Singh, 2000; Duhan, 2017; Kharb, 2017).

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Table 3:

Trends of groundwater irrigation and use of pesticides & fertilizers in Haryana

Sr. No.	Year	No. of Tubewells	GW Irrigation Area (%)	PesticidesUsed (Kg/ha)	Chemical Fertilizers Used (tonnes)
(i)	(ii)	(iii)	(iv)	(v)	(vi)
1	1966-67	25311	22.7	0.14	13347
2	1970-71	104358	37.5	0.13	70060
3	1980-81	332027	45.3	0.43	230823
4	1990-91	497571	48	0.80	586292
5	2000-01	589473	49.6	0.57	930295
6	2010-11	723457	57.2	0.57	1357622
7	2016-17	811944	62.8	0.57	1339279

Source: Statistical abstracts of Haryana for Col. No. (iii)&(vi); Col. No.(iv) & (v) computed by Author

Air Pollution: Air pollution due to *in situ* wheat-paddy stubbles burning has adversely affected the environment.Accumulation of smog in Delhi NCR during October-November months of year 2016 and 2017 is the result of paddy stubble burning which deteriorated the air quality causing health problems to humans as well as animals (Singh, 2018).

Suggestions:

- Crop diversification could be ideal remedy for deteriorating soil, water and environmental health in Haryana.
- Regulations for indiscriminate use of natural resources: Groundwater extraction should be strictly banned in dark zones and strict laws should be adopted to avoid depletion of this precious natural resource.
- Efficient management of stubbles can be done by amalgamation of stubbles into the soil, bio-fuel generation, utilization in mushroom cultivation etc. along with its traditional use as cattle feed, bedding and rooftops.
- Farmers' awareness programs for horticulture, crop diversification, modern farming techniques etc. should be organizedregularly.These steps have to be taken instantaneously otherwise it would be difficult for sustainability of agriculture in Haryana in near future.

Conclusion

Presently, Haryana state has adopted wheat-paddy intensive cultivation which has increased the production of major foodgrains. The cropping area for rice among kharif and wheat among rabi crops has increased by 622 and 204% respectively during 50 years of study period indicating shifting towards the wheat-paddy system in the state. Similarly, production

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of rice and wheat has been increased by 1897 and 1069% making the state self secure in foodgrains and net exporter. However, this Wheat-paddy system has depleted the groundwater by more than 50% and degraded the soil quality. Further, stubble burning incidences have severely deteriorated the air quality causing various health hazards.

References

Aggarwal, K.P., Moudgil, A. (2015). Structural change and growth of agriculture in Haryana. International Journal of Applied Research, 1(13):133-139.

Akshu, Sharma, L. (2017). Production of food grains in Haryana: A district wise analysis. International Journal of Academic Research and Development, 2: 182-187.

Duhan, A.K. (2017). Groundwater pumping irrigation in Haryana: Issues and Challenges. International Journal of Research in Geography, 3: 18-21.

Erenstein, O. (2010). A comparative analysis of rice-wheat systems in Indian Haryana and Pakistan Punjab. Land Use Policy, 27: 869-879.

Groundwater Cell, Department of Agriculture and Farmers Welfare, Govt of Haryana.

Kharb, P.S. (2017). Depleting groundwater in Haryana: A temporal analysis. Environment & Ecology, 35: 3172-3178.

Mittal, S.K., Susheel, K., Singh, N., Agarwal, R., Awasthi, A., Gupta, P.K. (2009). Ambient air quality during wheat and rice crop stubble burning episodes in Patiala. Atmospheric Environment, 43(2):238-244.

Ranade, C.G. (2016). Growth of productivity in Indian agriculture. Economic & Political Weakly, 22(39):82-92.

Roy, B.C., Datta, K.K. (2000). Rice-wheat system in Haryana: Prioritizing production constraints and implication for future research. Indian Journal of Agricultural Economics, 55: 671-682.

Singh, J. (2018). Paddy and wheat stubble blazing in Haryana and Punjab states of India: A menace for environmental health. Environ Qual Manage, 1-7.

Singh, R.B. (2000). Environmental consequences of agricultural development: a case study from the Green Revolution state of Haryana, India. Agriculture, Ecosystems & Environment, 82: 97-103.

Statistical Abstract of Haryana, various issues, Department of Economics & Statistical Analysis, Govt. of Haryana.

