



Trend analysis of production and productivity of major crops and its sustainability: A case study of Haryana

Savita Panwar* and Anil K. Dimri

Indira Gandhi National Open University,
IGNOU Regional Centre, Panchkula-134 109, Haryana, India.

Received: 16-04-2018

Accepted: 20-09-2018

DOI: 10.18805/IJARE.A-5019

ABSTRACT

Haryana is a small state having 4.4 million hectares of land only, yet it has become pioneer in production of food crops in the country. The time series data collected from the secondary sources of information from 1966-67 to 2015-16 showed a significant increase in total cropped area, irrigated area and cropping intensity. The production of major crops of wheat, rice, sugarcane, cotton and oilseeds and productivity of food crops of wheat and rice increased progressively due to adoption of high-tech agricultural practices but the productivity of wheat and rice decreased in later years due to change in agricultural practices including adoption of organic farming. The state government has taken several initiatives to protect and better management of resources for the sustainability of production and productivity of major crops.

Key words: Agricultural practices, Organic farming, Sustainability.

INTRODUCTION

Sustainable development refers to the process of socio-economic development through the judicious utilisation of natural resources keeping in mind the needs of future generations. Therefore, the sustainable development must be the basic principle of all development policies of national/ state governments and international agencies. The problems of sustainable development are rooted in the issues of resource use and their uneven pattern of distribution along with the issues of economic and social inequities (IGNOU, 2017). During 'Green Revolution' period in mid-sixties, the traditional agricultural practices were replaced by modern high-intensity agricultural technologies, mechanisation, high-yielding varieties (HYV), increased use of fertilisers and chemicals, specialisation and government policies that favoured maximum production.

Haryana is a small state having 4.4 million hectares of land, forming 1.34% of the total geographical area of the country. Nearly 79% of the total geographical area of the state is under cultivation, of which 84% is irrigated, with cropping intensity of 185%. Based on ecology and cropping pattern the state can be divided into three agro-eco regions. Zone-I consists of 8 districts namely Panchkula, Ambala, Kurukshetra, Yamuna Nagar, Karnal, Kaithal, Panipat and Sonapat. Zone-II has 7 districts namely Sirsa, Fatehabad, Hisar, Zind, Rohtak, Faridabad and Palwal. Zone-III has six districts namely Bhiwani, Mahendragarh, Rewari, Jhajjar, Gurgaon and Nuh. The Zone I, II and III cover 32%, 39% and 29% area of the state, respectively. The area falling under Zone I and II are ideal for crop diversification with wheat, rice, sugarcane, cotton and pulses as well as allied activities

such as dairying and poultry farming. These Zones have better irrigation and other infrastructural facilities. However, Kandi area in these zones have serious problem of soil and water erosion and hence, are suitable for agro-forestry and agro-horticulture systems (GoH, 2017).

Agriculture is main occupation in Haryana and more than 2/3rd of its population is dependent on agriculture. The average size of land holding is 2.25 hectares only and about 48% farmers are marginal having land up to 1 hectare only. Therefore, sustainability of production and productivity of major crops is vital for sustainable agricultural development in the state.

Agricultural growth in Haryana showed an increase in area under specialised crops of wheat, rice and cotton while area under coarse cereals and pulses decreased in almost all districts since 1980. Thus, level of crop diversification decreased in the state (Sihmar and Meena, 2013). The fertiliser use on major crops in Hisar district of Haryana showed the expenditure on fertiliser use per hectare on net sown area was more on small farms than large farms due to higher percentage of irrigated area on small farms (Kaushik and Paharia, 2014). The sustainable agricultural development in Haryana showed prevalence of mono culture in the state and decline in water table and soil fertility. The crop diversification towards horticulture and pulses was suggested as a solution for sustainable agricultural development to retain natural resources and for economic benefit too (Gehlot and Kaur, 2015). Priscilla *et al.* (2017) analysed the time series data at all India level on the performance of agriculture in India. The area under food grains showed negative growth whereas production and productivity were positive during over all period. In general,

*Corresponding author's e-mail: drsavitapanwar@ignou.ac.in

for food grains the yield effect was higher than area effect due to increased use of high yielding varieties. Amin *et al.* (2017) analysed the secondary data on area, production and productivity of major crops in Jammu region from 1984-85 to 2013-14 and concluded that the production and yield were positive for rice, wheat and pulses and negative for maize for entire period of study. Tupkanloo and Yazdani (2018) conducted a study through a questionnaire survey in 2015-16 on a population of farmers using water for irrigation from Yengejeh dam in Neyshabur and found cultivation of legumes instead of wheat had better economic effect because it provided optimal resource allocation.

OBJECTIVES

- To study the pattern of land holding of the state in comparison with the other states of the country.
- To study the pattern of land utilisation and cropping intensity in the state.
- To study the trend of area, production and productivity under principal food crops and commercial crops.
- To discuss the strategy for sustainable agricultural development adopted in the state.

MATERIALS AND METHODS

The data on area, its utilisation, production and productivity of major crops were collected from the secondary sources of information. The important published sources of information are Statistical Abstract of Haryana 2015-16 and 2016-17 published by the Department of Economic and Analysis, Haryana 2017 and 2018, Economic Survey of Haryana, Draft Policy Document of Government of Haryana 2017, website of Ministry of Agriculture, Government of India and other such sources. Data thus collected was presented in the cross tables and trend analysis was made to understand the progress of different indicators over a period of fifty years starting from 1966-67 to 2015-16. The analysis is presented in the coherent frame of the study.

RESULTS AND DISCUSSION

Land holding: Haryana is an agrarian state and majority of its population is engaged in agriculture and allied activities. The farmers categorised as marginal, small, medium and big, having land up to 1, 1-3, 3-5 and more than 5 hectares, are 48.11, 30.28, 11.11 and 10.49% of total farmers in the state, respectively. The area, they possess, shows a reverse trend i.e. 9.88, 24.68, 19.11 and 46.3% of total area in the state for marginal, small, medium and big farmers, respectively. This shows that marginal farmers being 48% have about 10% area only while big farmers being 10%, have 46% of total area in the state (fig 1 and 2).

In Haryana the average size of land holding is 2.25 hectares which is higher than national average of 1.16 hectares. In Punjab it is 3.11 hectares. The states which have higher land holding are Arunachal Pradesh (3.51ha.) and Rajasthan (3.07ha.). The average land holding is lowest in Kerala (0.22ha.).

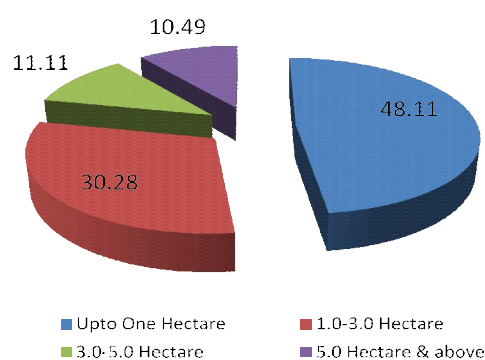


Fig 1: Number of Households under Different Category of Land Holding.

Source: Office of Director of Land Records, Haryana.

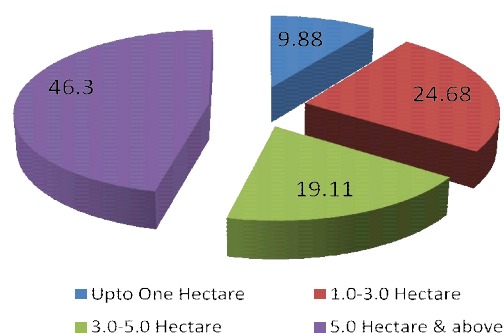


Fig 2: Area under Operational Holding.

Land utilisation: The area under cultivation showed a small increase in net sown area but area sown more than once increased about three folds from 1966-67 to 2015-16 (Table 1). Therefore, total crop area increased from 4599K.ha. in 1966-67 to 6578K.ha. in 2015-16 which is a significant increase in land utilisation. The irrigated area also increased from 1293K.ha. to 3014K.ha. during this period. The irrigated area to net sown area increased from 37.8% to 85.6% from 1966-67 to 2015-16. The cropping intensity also increased from 134.4% in 1966-67 to 186.9% in 2015-16. Thus, land utilisation in the state shows a positive growth during five decades.

The important crops grown in the state are wheat, rice, sugarcane, cotton and oilseeds. The trend analysis of cropping pattern over the years indicate that percent area under food grain started increasing from 1966-67 to 1970-71 and decreased thereafter. The area under food grain crops decreased about 9% over a period of time due to decrease in area under coarse food grain crops like Bajra etc. The area under wheat and rice increased continuously over the years. The area under sugarcane decreased in 1980-81 and same was shifted to cultivation of cotton and oilseeds after 1980-81, mainly due to higher commercial value of cotton and oilseeds. The significant increase in the cultivation of cotton

and oilseeds started in 1990-91 and was continuously increasing till 2015-16 (Table 2).

Production of major crops: The production of major crops of wheat, rice, sugarcane, cotton and oilseeds over the period (Table 3) shows the following trends. The production of major crops increased significantly over the years. The production of wheat was 1059K. tons in 1966-67 which increased to 11011K. tons in 2015-16, though there was some decrease in 2014-15. The production of rice was 223K. tons in 1966-67 which increased to 4145K. tons in 2015-16. The production of sugarcane increased from 5100K. tons to 7169K. tons in 2015-16, though decreased in 1980-81 and 2010-11. The production of cotton increased from 288K. bales in 1966-67 to 1943K. bales in 2014-15 and decreased to 50% in 2015-16. The production of oilseeds increased progressively from 92K. tons in 1966-67 to 965K. tons in 2010-11 and decreased to 743K. tons in 2014-15 but showed

an increase thereafter. The in-depth study would reveal the reasons for decreased in the production of sugarcane, cotton and oilseeds in some years.

One of the major reasons in increase in production of food crops of wheat and rice was due to HYV seeds. In 1970-71 only 11.1% area of rice was covered under HYV seeds which increased to 85.6% in 1980-81 and thereafter decreased to 32.4% in 2015-16 (Table 4). On the other hand area under wheat was 55.8% in 1970-71 which increased to 98.9% in 1990-91 with a slight decrease thereafter. This trend analysis reveals that farmers have started changing the cultivation of crops by using organic farming system thereby promoting the cultivation through natural system rather than using HYV seeds, fertilisers and pesticides.

Productivity of food crops: The productivity of food crops of wheat and rice showed increasing trend consistently over the years (Table 5). The yield of wheat was 1425kg/ha. in

Table 1: Classification of area in Haryana (000 Hectares).

Year	Total Reported Area	Net Area Sown (NAS)	Cultivable Area	Area sown more than once	Total cropped area	Total Irrigated Area	% to NAS	% of NAS to total Reported	Crop Intensity (%)
1966-67	4399	3423	3819	1176	4599	1293	37.8	77.81	134.4
1970-71	4802	3565	3813	1392	4957	1532	43.0	74.24	139.1
1980-81	4405	3602	3839	1860	5462	2134	59.2	81.77	151.6
1990-91	4378	3575	3792	2344	5919	2600	72.7	81.66	165.6
2000-01	4402	3526	3817	2589	6115	2958	83.9	80.10	173.4
2010-11	4370	3518	3681	2987	6505	2887	82.1	80.50	184.9
2014-15	4371	3522	3656	3014	6536	2973	84.4	80.58	185.5
2015-16	4371	3519	3672	3059	6578	3014	85.6	80.50	186.9

Source: Office of Director of Land Records, Haryana.

Table 2: Area under principal crops in Haryana (000 Hectares).

Year	Wheat (% of GAS)	Rice (% of GAS)	Total F/Grains (% of GAS)	Sugarcane (% of GAS)	Cotton (% of GAS)	Oilseeds (% of GAS)	Gross Area Sown (GAS)
1966-67	743 (16.12)	192 (4.17)	3520 (76.54)	150 (3.26)	183 (3.98)	212 (4.61)	4599
1970-71	1129 (22.78)	269 (5.43)	3868 (78.03)	156 (3.15)	193 (3.89)	143 (2.88)	4957
1980-81	1479 (27.08)	484 (8.86)	3963 (72.56)	113 (2.07)	316 (5.78)	311 (5.69)	5462
1990-91	1850 (31.25)	661 (11.17)	4079 (68.91)	148 (2.50)	491 (8.29)	489 (8.26)	5919
2000-01	2355 (38.51)	1054 (17.23)	4340 (70.97)	143 (2.34)	555 (9.07)	414 (6.77)	6115
2010-11	2504 (38.53)	1243 (19.13)	4700 (72.32)	85 (1.31)	493 (7.59)	515 (7.92)	6499
2014-15	2601 (40.19)	1287 (19.89)	4445 (68.69)	97 (1.50)	648 (10.01)	510 (7.88)	6471
2015-16	2511(38.80)	1354 (20.92)	4388 (67.81)	93 (1.44)	615 (9.50)	570 (8.81)	6471

Source: O/o Director of Agriculture and Farmers Welfare, Haryana.

Table 3: Production of principal crops in Haryana ('000' Tonne).

Year	Wheat	Rice	Total F/Grain	Sugarcane	Cotton (000 Bales)	Oilseeds
1966-67	1059	223	2592	5100	288	92
1970-71	2342	460	4771	7070	373	99
1980-81	3490	1259	6036	4600	643	188
1990-91	6436	1834	9559	7800	1155	638
2000-01	9669	2695	13295	8170	1383	563
2010-11	11578	3465	16568	6042	1747	965
2014-15	10354	4006	15236	7169	1943	743
2015-16	11011	4145	16293	7169	993	921

Source: O/o Director of Agriculture and Farmers Welfare, Haryana.

Table 4: Area under high yielding varieties of food grains in Haryana (000Hectares).

Year	Rice			Wheat		
	Total	HYV	%	Total	HYV	%
1966-67	192	-	-	743	-	-
1970-71	269.2	30	11.1	1,129.3	630	55.8
1980-81	483.9	414	85.6	1,479	1,360	92.0
1990-91	661.2	479	72.4	1,850.1	1,829	98.9
2000-01	1,054.3	656.7	62.3	2,354.8	2295	97.5
2010-11	1,243	779	62.7	2,504	2,470	98.2
2014-15	1,287	472	37.0	2,601.	2,470	95.0
2015-16	1,354	438	32.4	2,511	2,494	96.8

Source: Office of Director of Land Records, Haryana.

Table 5: Area, production and average yield per hectare.

Year	Wheat			Rice		
	Area	Production	Yield (Av.)	Area	Production	Yield (Av.)
1966-67	743.0	1059	1425	192.0	223	1161
1970-71	1129.3	2342	2074	269.2	460	1697
1980-81	1479.0	3490	2360	483.9	1259	2606
1990-91	1850.1	6436	3479	661.2	1834	2775
2000-01	2354.8	9669	4106	1054.3	2695	2557
2010-11	2504.0	11578	4624	1243.3	3465	2788
2014-15	2601	10354	3981	1287	4006	3113
2015-16	2511	11011	4385	1354	4145	3061

Source: Department of Agriculture and Farmers Welfare, Haryana.

1966-67 which increased to 4624kg/ha. in 2010-11 and decreased thereafter. The rice yield was 1161kg/ha. in 1966-67 which increased to 3113kg/ha in 2014-15 and decreased thereafter. This shows that Haryana has made a significant progress in the productivity of food crops of wheat and rice.

Strategy for Sustainable Agricultural Development:

Natural resource management has to be the number one strategy for accelerating and sustaining agricultural growth in Haryana. In fact, major weaknesses and threats to the sustainable growth in the State are natural resource induced, particularly in the context of soil health, water scarcity and quality, emerging threats due to climate change and bio-diversity management. The policy must be technically sound, economically viable, environment friendly and socially acceptable for the use of State natural resources-land/soil, water, energy, agro-biodiversity and climate. Concrete policies and measures should be pursued to contain/counter increasing biotic and abiotic pressures on natural resources, especially through rational use of land, soil organic content management, optimum use of available water, efficient use of energy, conservation and effective use of agro-biodiversity and mitigating the impact of several existing stresses. For this, programs and policies have to be formulated to ensure sustainable agriculture both for the present and for posterity ensuring clean air, water and food to the people of the State. These shall include policies to be formulated in respect of three basic natural resources i.e. land, water and bio-resources (GoH, 2017).

The draft policy document of Government of Haryana on the sustainable agriculture in the state has suggested the following measures:

- Land is to be managed sustainably and good cultivable land be protected from non-agricultural uses, diversion of only waste and less productive land for non- agriculture uses.
- Declining soil health needs priority attention, emphasis on organic matter recycling and balanced use of nutrients.
- Rules and procedures for land reforms to be revisited and scientific land use ensured for sustainability.
- The farmers should follow in situ water harvesting (*Khet Ka Pani Khet Me*), micro-irrigation, irrigation management through Water User Associations (WUAs), Preservation of Sub-soil Water Act 2009, speedy completion of irrigation projects, economic pricing of water, laser land leveling, water delivery system through pipes, recharging of aquifer and management and diversification of flood water.
- Un-interrupted supply of electricity, reasonable pricing of different forms of energy, use of non-conventional sources of energy, optimization of cow dung use, establishment of organized timber markets and protecting valuable agro-biodiversity.
- To reduce the vulnerability of agriculture to increasing weather and climate variability. The farmers should select short duration and less water demanding varieties, replace more water demanding crops with drought tolerant crops,

change crop calendar to adjust to the uncertain rainfall, follow conservation agriculture practices, mixed cropping to reduce the risk of crop failure, perennial crops and livestock rearing in rain fed areas, expand non-farm enterprises, etc. The mitigation measures mainly involve strengthening the area of bio-technology.

Haryana has made significant progress in agricultural development and production and productivity of various crops have increased manifolds. However, excessive use of basket technology has questioned the sustainable development of agriculture in the state. Although this issue has drawn the attention of planners and policy makers, however concerted efforts are required to translate it on the ground. Nevertheless, the state is performing relatively better in comparison to the other state in the country on number of parameters; however, for sustainable agricultural development in the state with proper land resource utilisation along with improving the water use efficiency is essentially required. Efforts should also be made to make proper utilisation of bio- resources which are also essential for sustainable agricultural development. The in-depth analysis of metrological data should also be carried out and farmers should be timely informed. Awareness programmes should also be organised from time to time to disseminate information about new technology (GoH, 2017).

There should be ban on the burning of the crop residue rather it must be added back in soil to improve fertility

and soil health. The government has imposed ban on the burning of crop residues and also penalty on violators of this ban. The government is encouraging the recycling of crop residue in the field by providing subsidy on the purchase of required machinery for this purpose. The government has also setup custom hiring centers for hiring the required machinery. In addition linking of super straw management system with the combine harvester by the farmers has also been made mandatory to ensure that crop residue is cut into small pieces and next crop is sown without burning the residue (The Tribune, 2018).

CONCLUSION

About 48.11% farmers with land holding up to 1 hectare possesses 9.88% of total area only. This trend is reversed with the increase in size of land holdings. Land utilisation showed an increase in cropped area, irrigated area and cropping intensity. The area under major crops increased while area under sugarcane decreased after 2001 which was replaced by cotton and oilseeds. The production of major crops increased but of sugarcane and oilseeds decreased during later years. The increase in production and productivity of wheat and rice may be attributed to the use of high yielding varieties (HYV). The decrease in their productivity after 2014-15 may be linked to the decrease in area under HYV, changes in agricultural practices and adoption of organic farming. The government of Haryana has formulated policies on protection and better management of resources for sustainable agricultural development in the state.

REFERENCES

- Amin, Rohullah; Kachroo, Jyoti; Bhat, Anil; Kachroo, Dileep; Singh, S.P. and Isher, A.K. (2017). Status of growth in area, production and productivity of major crops in Jammu province of J&K state. *Indian Journal of Agricultural Research*, **51** (4): 333-338.
- Gehlot, Neeru and Kaur, N. (2015). Crop diversification for sustainable agricultural development. A case of Haryana (India). *Indian journal of Economics and Developments*, **11** (1): 21-30.
- Government of Haryana (2017). Draft Haryana State Agriculture Policy, *Kishan Ayog, Chandigarh*.
- Indira Gandhi National Open University (2017). MED002, *Material Production and Distribution Division, New Delhi*.
- Kaushik, V.K. and Paharia, N.C. (2014). Pattern of fertilizer use on major crops in Hisar district of Haryana, India. *International Journal of Current Microbiology and Applied Sciences*, **3** (7): 665-672.
- Priscilla, Laishram; Balakrishnan, Arsha; Lalrinsangpuii and Chauhan, A.K. (2017). A Study on the performance of Agricultural Sector in India. *Indian Journal of Agricultural Research*, **51** (3): 282-286.
- Sihmar, Rakesh and Meena, Mukesh, Kumar(2013). Agricultural growth and crop diversification in Haryana: An analysis of pre and post economic reforms. *International Journal of trends in Commerce and Economics*. **2** (10): 183-220.
- Statistical abstracts of Haryana 2015-16 (2017). Department of Economic and Statistical Analysis, Government of Haryana, Haryana.
- Statistical abstracts of Haryana 2016-17 (2018). Department of Economic and Statistical Analysis, Government of Haryana, Haryana.
- The Tribune Newspaper (2018). Govt. to set up 900 custom hiring centres across state, says Likhi: Crop residue management tops agenda, says Principal Secretary. Chandigarh Edition, Friday, 24 August, **138** (233): 4.
- Tupkanloo, Z.N. and Yazdani, Saeed (2018). Simulations the cultivation of legumes instead of wheat and barley and examining its economic effects. *Indian Journal of Agricultural Research*, **52** (1): 51-55.