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Benefit cost ratios of organic and inorganic wheat production in Haryana: A case study of Rohtak district

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Abstract
Agriculture is the primary sector and main stay of Indian economy as it provides the employment to more than 50 per cent of the workforce and enriched the country in food grain production. For the production of food grains the farmers of Haryana are using two type of farming methods i.e., organic and inorganic but the majority of the farmers in Haryana are using inorganic farming because the productivity and profit margins are higher in inorganic farming as compare to the organic farming which shows that the farmers are concerned about the quantity of the produce instead of quality. Therefore, it is important to disclose the reality after investigating and analyzing the BCR (benefit cost ratio) of organic and inorganic wheat production in Rohtak district of Haryana on per acre basis. The study showed that the cost of cultivation of organic wheat crop was low as compare to the inorganic wheat. Furthermore, the BCR of organic wheat was 1:1.04 while that of inorganic wheat was 1:1.009 which was lower than that of organic.

Keywords: organic, benefit cost ratio, food grains, productivity, profit margins

Introduction
Agriculture sector in India is considered as the prime moving force for the growth and development of the economy. Since this sector fulfill the demand for food grains of the people and provide employment to the huge majority of the population in the developing countries like India. Agriculture is primary sector and it plays a considerable role in the economic development of the country as more than 50 per cent of the workforce is directly or indirectly dependent on this sector for their livelihood. Two main common cropping seasons was rabi and kharif as adopted by the farmers of the country and wheat is the dominant crop of rabi season as well as the staple food of the nation.

The farmers of Haryana are using two type of farming methods i.e., organic and inorganic. Traditionally in Haryana, the whole agriculture was practiced by using organic techniques, where plant and animal products were used for fertilizers and pesticides. But after 1966-67 with the introduction of green revolution more of chemical/synthetic fertilizers and pesticides were used. During the last few years, due to the growing awareness of people about their health and environmental issues i.e., associated with the exhaustive use of synthetic inputs has led to interest of people in alternative form of agriculture like organic farming. As with the help of organic farming the use of inputs is less and the produce will be nutritious and of high quality. As organic farming relies more on crop rotation, organic composted manure which helps in maintaining the fertility of the soil.

Even after the growing awareness of the people for quality food the organic farming is still negligible in Haryana. It may be due to the question in the mind of inorganic wheat growers who wish to transfer from inorganic to organic methods is that whether the organic farming is profitable or not.

Hence an attempt has been made in this research to examine the economies of organic and inorganic farming of wheat by comparing the production cost and benefit cost ratios of organic and inorganic wheat crop per acre production from district Rohtak of Haryana province.

Objectives
1. To examine the trends in area and production of wheat in Haryana.
2. To examine the economics of organic and inorganic farming of wheat in Rohtak.

Review of Literature
Review of literature is an important exercise in research because it helps the researcher to find out the research gap. A number of research studies have been undertaken by different researchers in the field of food grains in India.

Ramphul (2012) [1] has examined the performance of Growing Crops in Haryana in his study. The researcher used secondary sources of data collected from Statistical Abstract of Haryana in his study. The author analyzed the data by using Location Quotient, Crop Versatility Index and District Versatility Index. The study revealed that the specialization of wheat was found in Panipat, Hissar and Faridabad, that of Rice was in Kurukshetra, Kaithal and Karnal, Jowar in Rohtak and Faridabad was highest during the study period.

Akshu and Sharma (2017) [2] highlighted the production of food grains in Haryana in their study. The objectives of the study were to examine the trend and division wise similarities in the production of food grains in the state. Simple CAGR and Jonckheere- Terpstra test was used for the analysis of data. The study revealed that the area and production of wheat and rice was increases while that of coarse cereals and pulses was decreased. The results of Jonckheere- Terpstra test revealed that there was no significant difference in the production total food grains among the divisions of Haryana.

Goyal and Kumar (2013) [3] observed the cropping pattern and

production of different crops in Uttar Pradesh and India. The researchers found that the area and production of wheat and rice increased during the entire period but still there is scope for improvement. The study also suggested that a huge quantity of water could be saved by crop diversification towards less water consuming crops and improvement in technology could help to reduce the consumption of water in wheat, rice and sugarcane.

Mehmood *et al*. (2011) [4] has examined the cost benefit ratio of organic and inorganic farming of wheat crop in their study. The study is based on cross –sectional data and the researchers analyzed the data by using simple statistical tools like average, percentage and T test. The study revealed that the cost of production was higher in case of inorganic farming while that of lower in organic farming but the cost benefit ratio was higher in organic farming of wheat as compare to the inorganic farming.

Data Analysis and Research Methodology

The study is based on the time series and cross-sectional data. Time series data has been obtained from various issues of Statistical Abstract of Haryana while the cross-sectional data was collected from Rohtak district of Haryana. A random sampling method has been used for this purpose. A total of 60 farmers has been selected from which 30 were using organic and 30 inorganic farming. The farmers were interviewed with the help of well-structured and pre-tested questionnaire. After collecting the data from farmer's simple statistical tools like average, percentage has been used to analyze the data. For comparing the cost and benefits of organic and inorganic wheat, benefit cost ratio analysis has been used in the paper.

Production cost and gross margin

$$C_P = C_L + C_I + C_S + C_{LA} + C_{FM} + C_{PO} + C_O$$

Where

C_P = Total production cost

C_L = Land preparation cost

C_I = Cost of irrigation

C_S = Cost of seeds

C_{LA} = Labour cost (manual + machine)

C_{FM} = Fertilizers / manure cost

C_{PO} = Pesticides / organic plant protection cost

C_O = Other costs of input (transportation and marketing)

Gross margin

Gross margin was obtained by deducting the total cost of production from gross returns as shown below:

Gross margin = Gross returns – total cost of production

Benefit cost ratio analysis

To assess the economies of crops / farming system benefit cost ratio analysis is an important tool. It is the ratio of benefit with the cost. As the ratio indicates the rate of net returns from the use of an input.

BCR =

Gross returns – total production cost / total production cost

Results and discussion

Wheat in Haryana is a dominant crop among food grains and it is the staple food of state. In recent years the area and production of wheat is stagnant in Haryana. As area has increased from 2302.7 thousand hectares in 2005-06 to 2576 thousand hectares in 2015-16 as maximum area under the crop was in 2014-15.

Table 1: Area production and productivity of wheat crop in Haryana

Year	Wheat		
	Area	Production	Productivity
2005-06	2302.7	8853	3844
2006-07	2377.1	10059	4232
2007-08	2460.7	10232	4158
2008-09	2461.4	11360	4614
2009-10	2487.7	10488	4215
2010-11	2504.0	11578	4624
2011-12	2531.3	13119	5183
2012-13	2496.9	11117	4452
2013-14	2499.1	11800	4742
2014-15	2628	10707	3981
2015-16	2576	11352	4406

***Source*:** Statistical Abstract Haryana

Area in 000 hectares

Production in 000 tonnes

Productivity in kgs. Per hectare

Production of wheat also increased from 8853 thousand tonnes to 11352 thousand tonnes has shown an increasing trend over the years but it was almost stagnant in last few years as it was maximum in 2011-12. Productivity of wheat has increased from 3844 kgs hectare in 2005-06 to 4406 kgs hectare in 2015-16.

Table 2: Cost of production of organic and inorganic wheat crop

Sr. No.	Inputs	Inorganic wheat	Organic wheat
1	Land preparation cost (a)	2470	2650
2	Cost of irrigation (b)	3500	2800
3	Cost of seeds (c)	1150	1450
4	Labour cost (manual + machine) (d)	4200	4550
5	Fertilizers / manure cost (e)	3850	850
6	Pesticides / organic plant protection cost (f)	900	1950
7	Other costs of input (transportation and marketing) (g)	1250	1050
8	Total production cost (C_p = a+b+c+d+e+f+g)	17320	15300

***Source*:** Primary survey

Table 3: Benefit cost analysis of inorganic and organic wheat

Sr. no	Particulars	Inorganic wheat	Organic wheat
1	Gross returns (a)	34800	31350
2	Total cost (b)	17320	15300
3	Gross margin (G_m= a-b)	17480	16050
4	Benefit cost ratio (BCR)	1:1.009	1:1.04

***Source*:** Primary survey

Cost analysis

After the interview of the farmers of both the categories i.e., organic and inorganic the results were presented in the tabular form which showed that average per acre cost on land preparation was Rs. 2470/- while Rs. 2650/- for per acre organic farming and the average cost of irrigation was Rs. 3500/- for inorganic and Rs. 2800/- for organic farming. Furthermore, average per acre cost of seed was Rs. 1150/- for inorganic farming while Rs. 1450 for organic farming and the combined (manual + machine) average labour cost per acre was Rs. 4200/- on inorganic and Rs. 4550/- on organic farms. The per acre average cost of fertilizers / manure was Rs. 3850/- for inorganic and Rs. 850/- for organic farming.

In addition, per acre average cost of pesticides was estimated Rs. 900/- and Rs. 1950/- was estimated for the protection of organic farming. Moreover, transportation and marketing costs were computed Rs. 1050/- on organic wheat while Rs. 1250/- on inorganic was due to the higher production of inorganic wheat. At last, Rs. 15300/- was calculated as total average cost of production of organic wheat while Rs. 17320/- for inorganic wheat.

Gross margin

The values of gross margin was obtained by deducting the total cost of production from the gross revenues of the organic and inorganic wheat growers. Table no. 3 showed that Rs. 16050/- was estimated as the gross margin of the organic wheat growers while Rs. 17480/- was the gross margin of the inorganic wheat growers. The gross margin of the inorganic wheat growers was higher as compare to the organic growers was due to the higher productivity of the inorganic wheat.

Benefit cost ratio analysis

After implying the statistical tools the results were estimated / obtained by computing the average cost of production which includes land preparation cost, cost of irrigation, cost of seeds, labour cost, cost of fertilizers / farm manure, pesticides / organic farm protection cost and cost of transportation and marketing. Table no. 3 showed that the average cost of production of inorganic wheat crop was Rs. 17320/- and that of organic was Rs. 15300/-. Similarly, per acre benefits / gross returns of both the farming was figured as Rs. 34800/- and Rs. 31350/- respectively and net income / gross margin was estimated Rs. 17480/- from inorganic while Rs. 16050/- from organic farming of wheat.

The BCR of both the farming system i.e., organic and inorganic were estimated by dividing the net income / gross returns with costs. The BCR per acre was 1:1.009 and 1:1.04 respectively for inorganic and organic wheat as shown in table no. 3. The average production per acre of organic farm was low as compare to the inorganic farms due to the higher productivity of inorganic farms.

Conclusion

In the agriculture sector the organic farming is considered as the best option as it produces the products which are healthy and of higher quality and the farmers have to bear less cost as compare to the inorganic farming. But the farmers in Haryana are less interested in the adoption of organic farming because the productivity is low and unavailability of market for these products. As the study clearly showed that the net income received from the inorganic farming of wheat was higher as compare to that of organic while the benefit cost ratio has shown opposite situation in this regard, i.e., BCR of organic was 1:1:04 and that of inorganic 1:1.009 which is lower than organic.

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