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A study on the economic performance of wheat cultivation in the Shivalik Belt of Haryana

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Abstract
The present study aimed to analyze the costs and returns of wheat cultivation in the Shivalik foothills of Haryana during 2023-24. The research was based on primary data collected from two purposively selected districts**:** Panchkula and Yamunanagar. Four villages were chosen from each District Bhareli, Golpura, Tharwa, and Barwala (Panchkula); Jhiwerheri, Uncha Chandna, Kazibans, and Pabni Kalan (Yamunanagar). From each village, 10 farmers were randomly selected, resulting in a total sample size of 80 farmers. The per hectare cost of wheat cultivation was estimated at Rs. 92,212 in Panchkula and Rs. 1,08,713 in Yamunanagar. The average yield per hectare was 44.0 quintals in Panchkula and 50.7 quintals in Yamunanagar. Corresponding gross returns were Rs. 1,20,022 and Rs. 1,34,922, while net returns amounted to Rs. 27,809 and Rs. 26,209, respectively. The benefit-cost (B:C) ratio stood at 1:1.30 for Panchkula and 1:1.24 for Yamunanagar. The slightly lower B:C ratio in Yamunanagar was mainly due to the higher rental value of land.

Keywords: B-C Ratio, Panchkula, cost, returns, cultivation

Introduction

Wheat cultivation plays a pivotal role in ensuring food security and sustaining rural livelihoods across India, particularly in the northern states where agro-climatic conditions favour its growth. It has been a vital component of human diets since ancient times and is consumed in many forms globally. It serves as a significant source of carbohydrates, proteins, and vitamins, and is a staple food for approximately 2.5 billion people. Globally, wheat plays a crucial role in food trade, cultivated over an estimated 222.79 million hectares, with a production total of 791.56 million tonnes (USDA). In the 2023-24 periods, China topped the list of wheat-producing nations with an output of around 136.59 million metric tons grown across 23.63 million hectares. Following China were the European Union with 135.38 million metric tons over 24.32 million hectares, and India producing 110.55 million metric tons across 31.40 million hectares (FAO, 2025) [3].

Wheat is cultivated in almost every state in India, covering an area of 29.86 million hectares and yielding 112.74 million tonnes (Directorate of Economics and Statistics, Government of India). However, the top five wheat-producing states are Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, and Rajasthan, with Uttar Pradesh and Madhya Pradesh alone accounting for nearly half of the nation’s total wheat output. In 2023-24, Uttar Pradesh led with a production of 35.34 million tonnes (31.77%), followed by Madhya Pradesh with 22.58 million tonnes (20.98%), Punjab with 17.74 million tonnes (13.87%), Haryana at 11.19 million tonnes (9.77%), and Rajasthan with 9.70 million tonnes (8.87%). The state with the largest area under cultivation of wheat were Uttar Pradesh (9.53million hectare) followed by Madhya Pradesh (7.50million hectare), Punjab (3.52 million ha), Rajasthan (2.74million hectare), and Haryana (2.37million hectare)”. Haryana, one of the leading wheat-producing states, contributes significantly to the nation's grain reserves. While regions like central Haryana have been extensively studied and developed, the Shivalik foothills comprising the north-eastern districts of the state present a unique agro-ecological landscape. Characterized by undulating terrain, variable rainfall, and mixed soil types, this zone poses distinct challenges and opportunities for wheat production.

Past studies have examined cost and input trends in wheat cultivation. Jha and Kumar (1976) [5] found that the proportion of costs spent on fertilizers had increased over time in Delhi, while expenses on bullock labor, land, and irrigation had declined. Agnihotri (2002) [1] evaluated various land-use systems with supplemental irrigation and found that poplar intercropped with maize-wheat rotation produced the highest annual returns (₹75,622) on fertile land. Other systems like Aonla, Ber, and Kinnow on less fertile land yielded annuities of ₹65,366, ₹32,356, and ₹31,502, respectively. Also studied the efficiency of resource use in wheat farming within Madhya Pradesh's Bundelkhand region. So, a comparative economic analysis of wheat cultivation in the Shivalik foothills is essential to understand regional disparities in productivity, input use efficiency, and profitability. Such an analysis not only reveals the economic viability of wheat in this region but also provides insights into how resource use, farming practices, and technological adoption affect outcomes. This study aims to evaluate the cost structures, returns, and resource allocation patterns in wheat farming within the Shivalik foothills, and to compare them with more intensively farmed areas. The findings are expected to aid in policy formulation and targeted interventions to enhance agricultural sustainability and farmer income in the region.

Methodology

The present study was conducted in Panchkula and Yamuna Nagar districts, located in the Shivalik foothills of Haryana. These districts were randomly selected due to their extensive wheat-rice cropping patterns. From the plain areas of each district, four villages were randomly chosen, and from each village, ten farmers were selected, resulting in 40 farmers per district and a total sample of 80 wheat farmers across eight villages. A multistage random sampling technique was employed for the selection process. Primary data for the year 2023-24 was collected through personal interviews, using a pre-tested survey schedule.

Selection of study area

The present study was undertaken in the state of Haryana with specific objectives focused on wheat cultivation. Haryana, which was carved out of Punjab in 1966, has a geographical area of 44,212 sq. km. The gross sown area in the state increased from 45.99 lakh hectares in 1966-67 to 65.70 lakh hectares in 2022-23, marking an expansion of 19.71 lakh hectares. The cropping intensity reached 146.0% during this period (Handbook of Statistics on Indian States, RBI, 2022). As of 2023-24, wheat occupies 2,400 thousand hectares in Haryana, with a total production of 11,217.6 thousand tonnes and an average yield of 4,674 kg/ha (Economics and Statistical Analysis, Department of Agriculture and Farmers Welfare, Haryana).

Selection of Villages

A total of eight villages were selected randomly from both the districts that is four villages from each district.

Collection of data

The present study is based on primary data and aims to analyze the cost and returns, study the economics of wheat cultivation, and assess wheat production in Panchkula and Yamunanagar districts of Haryana for the year 2023-24. Data was collected from selected farmers using the survey method, through personal interviews conducted with the help of a well-structured interview schedule, which covered various relevant aspects of wheat cultivation.

- General information of the selected farmers.
- A detailed information about the per hectare input use pattern, prices of inputs to work out cost of cultivation of wheat crop and detailed information about wheat seed, total quantity of fertilizer purchased and various charges incurred in production of wheat etc.
- Yield and returns from the crop and from the main and by-products obtained after harvesting of wheat.

Analytical Tools

Various statistical tools such as averages, percentages, costs, returns, and the Benefit-Cost ratio (B:C ratio) were used to derive meaningful conclusions from the study. To analyze the costs and returns associated with wheat cultivation, the following methods and formulas were applied:

- Gross return=Main product value + By product value
- Return over variable cost=Gross return-total variable cost
- Return over total cost (Net return)=Gross return-Total cost
- Benefit-cost ratio=Gross return/ Total cost
- Cost of production per quintal without by-product=

$$\frac{\text{Total cost}}{\text{Main product quantity in quintals}}$$

- Cost of production per quintal with by-product=

$$\frac{\text{Reduced Total cost}}{\text{Main product quantity in quintals}}$$

(Reduced Total Cost=Total Cost-Value of by-product)

- Working capital / variable cost=Total preparatory tillage cost + pre sowing irrigation charges + sowing value + FYM value + total fertilizer cost + irrigation value + pesticide cost + herbicide cost + manual weeding charges + Harvesting value + Threshing value + Miscellaneous charges.
- Management charges (10%)=Total variable cost *0.1
- Risk factor (10%)=Total variable cost *0.1
- Total fixed cost=Transportation charges +Rental value of land+ Management charges+ Risk factor.

Results and Discussion

A comparative economic analysis of wheat cultivation on a per hectare basis was conducted for the Shivalik foothills region, specifically focusing on the Panchkula and Yamunanagar districts. The cost details, as presented in Table 1, reveal that the total cost of wheat cultivation in Panchkula was ₹92,212/ha, which is lower than the ₹1,08,713/ha incurred in Yamunanagar. The variable cost accounted for 46.5% (₹42,858/ha) of the total cost in Panchkula, and 37.5% (₹40,818/ha) in Yamunanagar. The overall average variable cost across both districts was ₹41,838, while the average total cost stood at ₹1,00,462 per hectare. Among the principal components of variable costs (in descending order), the major contributors were: Preparatory tillage (8.1%), Fertilizers (6.6%), Harvesting costs (4.4%) and Irrigation charges (3.1%). In terms of fixed costs, the primary components were: Rental value of land (51.6%), Management charges (4.2%), Transportation (1.5%) and Risk factor charges (1.1%). With respect to returns, the wheat yield was recorded at 44.0 quintals/ha in Panchkula and 50.7 quintals/ha in

Yamunanagar. The gross returns were ₹1,20,022/ha and ₹1,34,922/ha for Panchkula and Yamunanagar, respectively. Interestingly, net returns were slightly higher in Panchkula (₹27,809/ha) compared to Yamunanagar (₹26,209/ha) due to the lower cost of cultivation. The Benefit-Cost (B:C) ratio was calculated as 1:1.30 for Panchkula and 1:1.24 for Yamunanagar indicating relatively better profitability in Panchkula, primarily attributed to lower fixed costs, especially land rental values.

Table 1: Comparative economics of wheat crop grown in Shivalik foothills of Haryana (₹/ha)

		Panchkula			Yamunanagar			Overall Average		
Sr. No	**Item**	**Qty.**	**Value**	**Percent**	**Qty.**	**Value**	**Percent**	**Qty.**	**Value**	**Percent**
1	Preparatory tillage	4.7	8247	8.9	4.6	8003	7.4	4.7	8125	8.1
2	Pre-sowing Irrigation		1050	1.1		1031	0.9		1040	1.0
3	Sowing		2134	2.3		2083	1.9		2108	2.1
4	Ridging		476	0.5		476	0.4		476	0.5
5	Seed (qtl.)	103.8	2827	3.1	104.0	2835	2.6	103.9	2831	2.8
6	Seed Treatment			0.0			0.0			0.0
7	FYM (qtl)	23.8	951	1.0	27.0	1081	1.0	25.4	1016	1.0
8	Fertilizer nutrients			0.0			0.0			0.0
9	(a)Nitrogen	154.3	2012	2.2	155.7	2030	1.9	155.0	2021	2.0
10	(b)Phosphatic	56.80	3044	3.3	56.8	3044	2.8	56.8	3044	3.0
11	(c) Potassic	22.8	1332	1.4	22.4	1304	1.2	22.6	1318	1.3
12	(d)Zinc Sulphate	3.0	297	0.3	1.7	175	0.2	2.4	236	0.2
13	Total Ferti.Invest		6684	7.2		6554	6.0		6619	6.6
14	Fertilizer Application		495	0.5		483	0.4		489	0.5
15	Irrigation	3.5	3151	3.4	3.4	2986	2.7	3.5	3068	3.1
16	Hoeing /Weeding			0.0			0.0			0.0
17	(a) Chemical		1675	1.8		1698	1.6		1686	1.7
18	(b) manual			0.0			0.0			0.0
19	Plant Protection		1143	1.2		1183	1.1		1163	1.2
20	Harvesting		4401	4.8		4407	4.1		4404	4.4
21	Threshing/ winnowing/Tying			0.0			0.0			0.0
22	Miscellaneous		506	0.5		480	0.4		493	0.5
23	Total(1to 15)		41409	44.9		39441	36.3		40425	40.2
24	Interest on working Capital		1449	1.6		1377	1.3		1413	1.4
25	Variable cost		42858	46.5		40818	37.5		41838	41.6
26	Management charges		4286	4.6		4082	3.8		4184	4.2
27	Risk factor		1093	1.2		1093	1.0		1093	1.1
28	Transportation		1510	1.6		1530	1.4		1520	1.5
29	Rentalvalue of land		42466	46.1		61190	56.3		51828	51.6
30	Total Cost		92212	100.0		108713	100.0		100462	100.0
31	Production (qtl.)									
32	(a) Main	44.0	100201		50.7	115283		47.4	107742	
33	(b)By Product		19821			19639			19730	
34	Gross return		120022			134922			127472	
35	Return over variable cost		77163			94104			85634	
36	Net return		27809			26209			27009	
37	Cost of Production/(qtl.)									
38	(a)Without by Product		5244			5371			5308	
39	(b)With by Product		4376			4588			4482	
40	B:C Ratio		1:1.30			1:1.24			1:1.26	
41	Number of farmers	40			40			80		
42	Area(acre)	240.5			293			534		
43	Labour									
44	(a) Human Days	91.0			92.0			91.5		
45	(b)Bullock days									
46	(c) Tractor hours	17.23			17.3			17.3		

Table 2: Resource use pattern in Wheat in Panchkula and Yamunanagar district, during2023-2024 (per hectare)

	Panchkula	**Yamunanagar**	**Overall average**
Preparatory tillage (No.)	4.7	4.6	4.7
Seed (qtls.)	103.8	104.0	103.9
Fertilizer nutrients (Kg)			
(a)Nitrogen	154.3	155.7	155.0
(b)Phosphatic	56.8	56.8	56.8
(c) Potassic	22.8	22.4	22.6
(d)Zinc Sulphate	3.0	1.7	2.4
FYM (qt)	23.8	27.0	25.4
Irrigation (No.)	3.5	3.4	3.5

Resource use pattern

Table 2 presents the details regarding input usage and cultural practices adopted in wheat cultivation in the Panchkula and Yamunanagar districts of Haryana. Field preparation for wheat sowing in Northern Haryana typically begins in November. On average, farmers carried out 4.7 preparatory tillage operations in Panchkula and 4.6 operations in Yamunanagar, primarily using tractor-drawn implements. The seed rate used per hectare was 103.8 kg in Panchkula and 104.0 kg in Yamunanagar. The application of Farm Yard Manure (FYM) was 23.8 quintals/ha in Panchkula and 27.0 quintals/ha in Yamunanagar. In terms of chemical fertilizer usage, the application of Nitrogen (N) was recorded at 154.3 kg/ha in Panchkula and 155.7 kg/ha in Yamunanagar. The Phosphorus (P_2O_5) application remained consistent across both districts at 56.8 kg/ha. The Potassium (K_2O) usage was slightly higher in Panchkula (22.8 kg/ha) compared to Yamunanagar (22.4 kg/ha). Meanwhile, the application of Zinc sulphate was 3.0 kg/ha in Panchkula and 1.7 kg/ha in Yamunanagar, indicating a relatively higher use in the former reported applying an average of 3.5 irrigations per hectare in Panchkula and 3.4 irrigations in Yamunanagar over the wheat-growing season.

Conclusion

The study concludes that wheat cultivation in the Shivalik foothills of the study area is economically viable. The gross returns per hectare from wheat cultivation were estimated at ₹1,20,022 in Panchkula and ₹1,34,922 in Yamunanagar. Corresponding net returns were ₹27,809/ha and ₹26,209/ha, with the total cost of cultivation amounting to ₹92,212/ha and ₹1,08,713/ha, respectively. The return over variable costs was recorded at ₹77,163/ha in Panchkula and ₹94,104/ha in Yamunanagar. Among the various variable cost components, the highest expenditure in Panchkula was on preparatory tillage (8.9%), fertilizers (7.2%), and harvesting (4.8%), while in Yamunanagar these figures were 7.4%, 6.0%, and 4.1%, respectively. In terms of fixed costs, the rental value of land constituted the largest share, contributing 46.1% in Panchkula and 56.3% in Yamunanagar to the total cost of cultivation. The Benefit-Cost (B:C) ratio was calculated to be 1:1.30 in Panchkula and 1:1.24 in Yamunanagar. Since the B:C ratio exceeds one in both districts, the findings indicate that wheat cultivation in the Shivalik foothill region is profitable, even under water-scarce conditions. Therefore, it is recommended that the promotion and expansion of wheat cultivation in such regions be encouraged to ensure better returns for farmers.

Competing Interest

Authors have declared that no competing interests exist.

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