Original Research Article

An Economic Analysis of Wheat Cultivation under Sprinkler Irrigation in Southern Haryana

Abstract

The present study was conducted in the southern Haryana districts (Bhiwani and Rewari), selected on the basis of high rate of adoption of sprinkler irrigation system. For the selection of sample farmers, multistage random sampling technique was used. Blocks named Tosham and Loharu in Bhiwani district and Khol at Rewari, Nahar were selected for sampling. Primary data was taken from a total of 120 wheat farmers from various villages. The profitability of adopter farmers was analyzed using Benefit cost ratio concept. Information regarding cost and returns of wheat crop were gathered from sampled farmers for the year 2021-22 and the net return was worked out accordingly. The total variable cost incurred for cultivation of wheat accounted for ₹45958.36 and ₹45655.04 in Rewari and Bhiwani districts respectively. Total cost incurred was ₹86136.85 and ₹85178.89 in Rewari and Bhiwani district respectively. Farmers got higher net returns in Rewari district (₹18665.70) as compared to Bhiwani district (₹18547.61). The B:C ratio over total cost in Rewari, Bhiwani and overall were 1.21, 1.22 and 1.21 respectively.

Keywords: B:C ratio, economic analysis, net returns, sprinkler irrigation, wheat

1. Introduction

Wheat is the most widely cultivated food crop of the world. It has been grown since pre historic time and being consumed in various form in the world. It is not only the major source of carbohydrates, vitamins, and proteins but also an important staple food of nearly 2.5 billion of world population. China was the leading wheat producing nation during the year 2022 with production volume of over 137 million metric tons. This was followed by the European Union and India with production volume of over 134 and 103 million metric tons respectively [2]. In India, this crop is cultivated in almost all the states, however the five major states in wheat production are Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, and Rajasthan. Uttar Pradesh and Madhya Pradesh accounts for 50 per cent production of wheat in the country. In the year 2021-22, Uttar Pradesh ranked first in wheat production with 33.95 million tonne (31.77%) followed by Madhya Pradesh with 22.432 million tonne (20.98%), Punjab having 14.82 million tonne (13.87%), Haryana with 10.44 million tonne (9.77%) and Rajasthan with 94.84 million tonne (8.87%) [1]. The state with the largest area under cultivation of wheat were Uttar Pradesh (9853 thousand hectares) followed by Madhya Pradesh (6551 thousand ha), Punjab (3521 thousand ha), Rajasthan (3118 thousand ha), and Haryana (2534 thousand ha) [1].

Water is the most precious gift of nature. It is used for drinking, industrial purpose, domestic purposes and agricultural activities. It has economic value but it is unevenly distributed all over the world and because of its uneven distribution and availability it is to be properly used and managed for a long-term sustenance of life on earth. Our planet earth has about 1.38 billion cubic km of water [1]. About 97 per cent of this is distributed in seas and oceans. Due to saline in nature these water masses are not suitable for direct consumption such as drinking, cooking and for irrigational and industrial purposes. Remaining 3 per cent of water available on earth is fresh water. If we look at the further distribution of this fresh water percentage, about 68.7 per cent is locked in the form of glaciers and ice and about 30.1 per cent is existing as groundwater, 0.3 per cent as surface water and 0.9 per cent in other form like water vapour and soil water. Therefore, it is imperative to use water efficiently.

The agricultural sector, which consumes over 80 per cent of the available water in India, continues to be the major water consuming sector due to the intensification of agriculture [4]. Irrigation is most important input for enhancing crop intensity as well as productivity of crops [7] and therefore expansion of irrigation has been key strategy in the development of agriculture in the country. At present, the coverage of irrigation in the country is only about 36.2 per cent (71.6 mha) of the gross cropped area (197.3 mha) [3]. One of the main reasons for the low coverage irrigation is the predominance of surface method of irrigation where water use efficiency is only about 35-40 per cent. This method of irrigation causes uneven distribution of water, water loss in the seepage and deep percolation, promotes excessive weed growth besides creating salinity, water logging thus, effect the land and crop productivity. The increasing demand on water resources by India's growing population and diminishing quality of existing water resources because of population and the additional requirements of serving India's spiralling industrial and agricultural growth have led to a situation where the water consumption is rapidly increasing while the supply of water remains more or less constant. Surveys conducted by the tata institute of social sciences (TISS) showed that most of the urban cities are water deficient. Around 40 per cent of water demand in urban cities of country is met by ground water. As a result, ground water table is falling at alarming rates of 2-3 meters per year in most of the cities. As per OECD environment outlook 2050, India would face severe water constraints by 2050.

Considering the water availability for future use and the increasing demand for water from various sectors, efficient irrigation methods (sprinkler irrigation) should be used. The conveyance and distribution losses are reduced to minimal under this system resulting in greater water use efficiency. The sprinkler method of irrigation saves water by 30-60 per cent [8] and can irrigate much more area than surface irrigation. It also eliminates channels and land leveling and more land is available for crop production. It involves low operating cost due to reduction in labour. The other reasons for adopting sprinkler system in crop cultivation is to increase crop yield, improve crop quality, enhance the fertilizer/ chemical application efficiency, conserve energy, improve pest management, increase feasibility of irrigating in difficult terrains, improve suitability in problem soils, and improve tolerance to salinity. Keeping in mind all the things, this study was planned to study the economic analysis of wheat cultivation under sprinkler irrigation system.

2. Methodology

The study was conducted in two districts (Bhiwani and Rewari) from southern zone of Haryana selected on the basis of high rate of adoption of sprinkler irrigation system due to scarcity of water. Two blocks from each district were selected purposively on the basis of the number of sprinklers sets installed in the area, these are Tosham and Loharu blocks from district Bhiwani, and Khol at Rewari and Nahar blocks were selected from Rewari district. From each block, two village were selected randomly and from each village fifteen farmers were selected further for the investigation. Thus, a total of 120 wheat farmers from various villages were taken for the study. The primary data for 2021-22 was collected using survey method by conducting personal interviews of the selected farmers with the help of specially designed schedule.

2.1 Analytical tools

To achieve the study's goals, the collected data was analyzed using various formulas and statistical tools.

- 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
- B:C Ratio = Gross return/Total cost
- Cost of production per quintal without by-product = Total cost/Main product quantity in quintals
- Cost of production per quintal with by-product = $Total\ cost * \frac{Gross\ return - Value\ of\ by\ product}{Main\ quantity * Value\ of\ gross\ return}$

3. Results and Discussion

Comparative economic analysis of wheat cultivation under sprinkler irrigation in selected districts were made on per hectare basis. Result pertaining to cost details of wheat in Rewari and Bhiwani district is shown in table 1. The results shows that total cost spent in growing wheat in Rewari district (₹86136.85/ha) is higher than the cost incurred in Bhiwani district (₹85178.89/ha). Total variable cost constituted for 53.35 per cent (₹45958.36/ha) and 53.59 per cent (₹45655.04/ha), in Rewari and Bhiwani district respectively, of total cost incurred in the cultivation of wheat. The overall average for both the districts for variable cost and total cost observed to be ₹45806.70 and ₹85657.87. Overall average of principal components of variable cost in decreasing order are preparatory tillage, harvesting cost, irrigation charges and threshing contributing 8.55, 8.36, 8.34 and 6.91 per cent, respectively of the total cost. While in fixed cost these were rental value of land, management charges, risk factor and transportation charges contributing 33.69, 5.34, 5.34, and 2.13 per cent, respectively. Returns from wheat cultivation in Rewari and Bhiwani district shown in the table shows that yield of wheat obtained to be 34.27 and 34.00 quintal per hectare respectively. Whereas, gross return received in Rewari district were found to be ₹104802.55 and in Bhiwani it was obtained ₹103726.50 per hectare. While, net returns in Rewari district (₹18665.70/ha) were estimated to be higher compared to Bhiwani district (₹18547.61/ha). The benefit cost ratio (B:C ratio) for Rewari and Bhiwani district were recorded to be 1.21 and 1.22 respectively.

4. Conclusions

It is concluded from the study that in comparative economic analysis of wheat, analysed on per hectare basis, the estimated total cost, gross return, net return, and B:C ratio of wheat cultivation were ₹86136.85, ₹104802.55, ₹18665.70 and 1.21 respectively in Rewari district whereas, ₹85178.89, ₹103726.50, ₹18547.61, and 1.22 in Bhiwani district respectively. Although B:C ratio was found to be greater than one in both the districts but farmers realized higher yield of wheat in Rewari district as compared to Bhiwani district which indicates that sprinkler irrigation is more feasible in the study area.

5. References

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Table 1 Comparative economics of wheat crop grown under sprinkler irrigation system in southern Haryana (₹/ha)

Sr. No.	Particulars	Rewari district			Bhiwani district			Overall Average		
		No./Qty	Value	Per cent	No./Qty	Value	Per cent	No./Qty	Value	Per cent
1	Preparatory tillage	4.52	7015.78	8.14	4.68	7635.10	8.96	4.60	7325.44	8.55
2	Pre sowing irrigation		1254.60	1.45		1232.14	1.44		1243.37	1.45
3	Sowing		1503.28	1.74		1417.85	1.66		1460.56	1.70
4	Seed (kg)	115.56	3658.38	4.24	111.78	3354.32	3.93	113.67	3506.35	4.09
5	Total Fertilizer Investment	371.78	5514.80	6.40	356.56	5427.85	6.37	364.17	5471.32	6.38
6	Irrigation	6.10	7008.88	8.13	6.23	7283.50	8.55	6.16	7146.19	8.34
7	Hoeing/Weeding	1.73	2144.07	2.48	1.68	2123.21	2.49	1.70	2133.64	2.49
8	Plant Protection	0.96	1325.65	1.53	0.75	1552.88	1.82	0.85	1439.26	1.68
9	Harvesting		7335.52	8.51		6992.85	8.20		7164.18	8.36
10	Threshing		6190.78	7.18		5648.57	6.63		5919.67	6.91
11	Interest on working capital @7%		3006.62	3.49		2986.77	3.50		2996.69	3.49
12	Total Variable Cost		45958.36	53.35		45655.04	53.59		45806.70	53.47
13	Management Charges		4595.83	5.33		4565.50	5.35		4580.67	5.34
14	Risk factor		4595.83	5.33		4565.50	5.35		4580.67	5.34
15	Transportation charges		1940.78	2.25		1714.28	2.01		1827.53	2.13
16	Rental value of land		29046.05	33.72		28678.57	33.66		28862.31	33.69
17	Total costs		86136.85	100		85178.89	100		85657.87	100

18	Production (Qtl)									
	Main	34.27	69054.05		34.00	68510.00		34.13	68782.02	
	By-product		35748.50			35216.50			35482.50	
19	Gross return		104802.55			103726.50			104264.53	
20	Return over variable cost		58844.19			58071.46			58457.82	
21	Net return		18665.70			18547.61			18606.65	
22	Cost of production									
	With by-product		1636.60			1618.39			1627.49	
	Without by-product		2513.47			2505.26			2509.36	
23	B:C Ratio		1.21			1.22			1.21	