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Title: Comparative Study of Cost-Benefit Ratio between Organic and Inorganic Farming in Maharashtra: A Case Study of Sugarcane and Wheat Crops in Ahmednagar District

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Abstract:

This study compares the cost-benefit ratio (BCR) of organic and inorganic farming practices in Maharashtra, focusing on sugarcane and wheat crops in the Ahmednagar district. Using a sample of 50 farmers practicing organic farming and 50 farmers practicing inorganic farming, the research examines the economic viability of these practices. The study employs descriptive statistics and hypothesis testing to analyze data collected on operational and fixed costs, yields, and returns. Results indicate that while inorganic farming provides a higher yield and gross return, organic farming shows a comparable BCR due to lower costs in specific areas. The study concludes with policy recommendations to support the adoption of organic farming practices.

Keywords: Organic farming, Inorganic farming, Cost-benefit ratio, economics, Sugarcane, Wheat, Ahmednagar, Maharashtra

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1. Introduction

1.1 Global Scenario for Organic Farming The global organic industry has seen significant growth, particularly in Asia, driven by increased consumer awareness and the impacts of the COVID-19 pandemic. Many Asian countries have developed new policies and regulations to support organic agriculture. Despite challenges faced by inspection bodies, the market for organic products has expanded significantly.

1.2 Area under Organic Farming Globally, the area of cropland used for organic farming has increased substantially, reaching approximately 74.9 million hectares by 2020. India, with a total of 57.82 lakh hectares under organic certification in 2020-21, represents 1.78% of the global organic agricultural land. The shift towards organic farming is driven by health concerns related to chemical usage in conventional agriculture. This study aims to estimate the

productivity and cost-efficiency of organic versus inorganic farming, focusing on wheat and sugarcane production in India.

Objectives of the Study:

1. To compare the cost-benefit ratio of organic and inorganic farming systems for wheat and sugarcane crops in the Ahmednagar district of Maharashtra.
2. To analyze the impact of organic farming on input use patterns, production, and productivity of wheat and sugarcane crops.
3. To evaluate the economic viability and sustainability of organic versus inorganic farming.
4. To examine market dynamics and price realization for organic and inorganic wheat and sugarcane.

Literature Review

Rajesh Kumar (2022) highlighted the ancient roots of organic farming in India, dating back to the Vedic period. The traditional farming systems, which emphasized harmony with nature, have been revisited in recent years due to growing consumer demand for chemical-free, healthful foods. The Green Revolution, while increasing food production, also led to the widespread use of chemicals in agriculture, raising health concerns and driving the shift toward organic farming.

Yadava (2019) argued that organic farming is not only a consumer-driven need but also a necessity for sustainable agriculture. He suggested that organic farming could serve as a foundation for transforming rural agriculture into a sustainable system, offsetting conversion costs and maintaining soil health.

Vangelis Tzouvelekas et al. (2001) conducted a study on cotton farms located in Greece and used Stochastic Production Frontier (SPF) framework. Results showed that organic farms had low efficiency score vis-à-vis conventional farming. Both farming types were almost equally inefficient. The Swiss scientist Mader Paul et al., (2002)13 articulated that organic yields were on average 20% lower than from conventional farming. But the ecological benefits are more. They concluded that organic farming is a viable alternative to conventional way of farming.

Kurma Charyulu et.al.,(2010)20 developed a study to test economic efficiency among organic & inorganic farming system in four states namely Gujrat, Maharashtra, Punjab and U.P. on four

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major crops i.e. cotton. Sugarcane, paddy and what. A nonparametric mode Data Envelopment was used for analyzing the efficiency. Results stated that efficiency levels are lower in organic farming compared to conventional farming, relative to their production frontiers

4. Research Methodology

Study Area

The study was conducted in the Ahmednagar district of Maharashtra, focusing on sugarcane and wheat, two significant crops in the region. A total of 100 farmers (50 organic and 50 inorganic) from the talukas of Rahata, Sangamner and Srirampur were surveyed using structured questionnaires to gather data on various economic aspects of their farming practices.

Data Collection

Data were collected through direct interviews with farmers. The survey focused on operational costs, fixed costs, yield, gross returns, and net returns for both sugarcane and wheat crops.

Statistical Analysis

The data were analyzed using descriptive statistics, and hypothesis testing was conducted to compare the BCR between organic and inorganic farming practices. T-tests were used to determine if there was a statistically significant difference between the two farming method.

Scope and Limitation: The study focused on the sugarcane and wheat crop for the duration of one year. The study is limited by its geographic focus on the Ahmednagar district and the sample size of 100 farmers. The findings may not be generalizable to other regions or crop types. Future research could expand the sample size and include other districts to provide a more comprehensive analysis.

5. Results and Discussion

5.1 Economics of Sugarcane Farming

The maturity of sugarcane is depending upon the variety of sugarcane and sowing period. The sugarcane crop takes averagely twelve to sixteen months to get the yields since plantation period. The cost of sugarcane crops is given in the table

Table 1 Comparative chart for Cost of Production of Sugarcane in a acre.

Cost	Organic Sugarcane(₹)	Inorganic Sugarcane (₹)

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Operational Cost (1 to 12)	80407.40 (79.01)	75056.85 (77.85)
Human Labour (1.1 + 1.2)	19900 (19.55)	12650 (16.85)
Hired (Male= 3250, Female= 3450)	6700 (6.58)	6500 (8.66)
Family (Male= 12750, Female= 450)	13200 (12.97)	6950 (9.26)
Bullock Labour (2.1+2.2)	-	-
Hired	-	-
Owned	-	-
Machine Labour (3.1 + 3.2)	1750 (1.72)	1750 (2.33)
Hired	1750 (1.72)	1750 (2.33)
Owned	-	-
Hired Animal & Machinery Charges (4.1+4.2+4.3)	6950 (6.83)	6950 (9.26)
Bullock (Pair)	-	-
Tractor (Ploughing/Snowing/ Other cultivation work)	6950 (6.83)	6950 (9.26)
Harvester (Harvesting)	-	-
Seeds	7500 (7.37)	7000 (9.33)
Fertilizer	17163.70 (16.87)	6000 (7.99)
Manure (Dung/Ghanjivamrut)	12810 (12.59)	22350 (29.78)
Insecticides & Pesticide	1606.48 (1.58)	4000 (5.33)
Irrigation & Electricity Charges	5990 (5.89)	7190 (9.58)
Miscellaneous	1000 (0.98)	1500 (2.00)
Interest on Working Capital (14months)	5737.22 (5.64)	5666.85 (7.55)
Crop Insurance Premium	-	-
Fixed Cost (13 to 17)	21361.49 (20.99)	21361.49 (22.15)
Rental Value of Owned Land	14204.04 (13.96)	14204.04 (13.96)
Rent Paid Leased in land	0.00	0.00
Land Revenue, Cesses & Taxes	54 (0.05)	54 (0.05)
Depreciation of Farm Builds & Implements	539.53 (0.53)	539.53 (0.53)
Interest on Fixed Capital	6563.92 (6.45)	6563.92 (6.45)
Total Cost of Cultivation (I + II)	101768.89 (100)	96418.34 (100.0)
Marketing Cost (18 to 20)	-	-

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Transportation Cost	-	-
Weight Measurement Cost	-	-
Other Expenses	-	-
Total Cost of Production (III + IV)	**101768.89**	**96418.34**

Source: Primary data analysis

Table 2: Comparative Analysis of Sugarcane Economics

Particulars	**Organic Sugarcane (₹)**	**Inorganic Sugarcane (₹)**
Operational Cost	80,407.40 (79.01%)	75,056.85 (77.85%)
Fixed Cost	21,361.49 (20.99%)	21,361.49 (22.15%)
Total Cost of Cultivation	1,01,768.89 (100%)	96,418.34 (100%)
Gross Returns	1,67,400.00	1,91,280.00
Net Returns	65,631.11	94,861.66
Benefit-Cost Ratio (BCR)	1.64	1.98

Source: Primary data analysis

The higher operational cost for organic sugarcane is primarily due to labor and fertilizer expenses, while inorganic sugarcane yields higher gross returns and a better BCR of 1.98 compared to 1.64 for organic farming.

4.2 Wheat Economics

Table 3: Cost of Production for Wheat (₹ per hectare)

Cost Item	**Organic Wheat (₹)**	**Inorganic Wheat (₹)**	**Overall (₹)**
Seed	5005.00 (5.82%)	4661.00 (6.13%)	4833.00 (5.97%)
Hired Labour	4150.00 (4.82%)	2827.00 (3.72%)	3488.50 (4.31%)
Machine Labour	10433.00 (12.13%)	11292.00 (14.86%)	10862.50 (13.41%)

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Cost Item	Organic Wheat (₹)	Inorganic Wheat (₹)	Overall (₹)
Fertilizers (FYM/Organic/Chemical)	19213.00 (22.33%)	15132.00 (19.92%)	17172.50 (21.18%)
Irrigation & Other Costs	3135.00 (3.64%)	3643.00 (4.79%)	3389.00 (4.18%)
Total Cost of Cultivation	86031.26 (100%)	76003.06 (100%)	81017.16 (100%)

Sources: Primary data Analysis

Table 4 Cost benefit ratio of wheat

Particulars	Organic Wheat (₹)	Inorganic Wheat (₹)	Overall (₹)
Per Hectare Cost	86,031.26	76,003.06	81,017.16
Yield (qtl.)	22.35	35.84	29.10
Price Per Quintal	5,335.00	2,750.00	4,042.50
Main Produce (₹)	1,19,237.30	98,560.00	1,08,898.60
By Produce (₹)	4,377.00	5,700.00	8,038.50
Total Income (₹)	1,23,614.30	1,04,260.00	1,16,937.10
Net Returns (₹)	37,583.00	28,256.94	35,919.97
Per Quintal Cost (₹)	3,849.27	2,120.62	2,984.94
Benefit-Cost Ratio (BCR)	1.38	1.29	1.34

Source: Analysis of primary data

The total cost of cultivation in organic wheat is higher than in inorganic wheat. However, organic wheat commands a higher market price, resulting in a comparable BCR. The analysis of wheat production reveals a contrasting scenario compared to sugarcane. Despite higher per-hectare costs and lower yields, organic wheat farming achieves a better BCR of 1.38 compared to 1.29 for inorganic wheat. This is due to the significantly higher price per quintal received by organic wheat farmers, which compensates for the reduced yield and higher production costs. The results suggest that, in the case of wheat, organic farming can be more profitable under certain market conditions, particularly when there is a premium price for organic products.

4.3 Hypothesis Testing

Hypothesis 1:

- **H0:** There is no significant difference in the BCR between organic and inorganic farming for sugarcane.
- **H1:** There is a significant difference in the BCR between organic and inorganic farming for sugarcane.

Test Result: A t-test on the BCR values for sugarcane revealed a significant difference ($p < 0.01$) between organic (BCR = 1.64) and inorganic farming (BCR = 1.98). This indicates that inorganic sugarcane farming is more profitable.

Hypothesis 2:

- **H0:** There is no significant difference in the BCR between organic and inorganic farming for wheat.
- **H1:** There is a significant difference in the BCR between organic and inorganic farming for wheat.

Test Result: The t-test on the BCR for wheat showed no significant difference ($p > 0.05$) between organic (BCR = 1.38) and inorganic farming (BCR = 1.29). Organic wheat farming's higher market price compensates for the higher costs.

Table 5: T-Test Results for Net Returns and BCR

Crop	Parameter	Mean Difference	t-Value	p-Value
Sugarcane	Net Returns	-29,230.55	-3.56	0.001**
	Benefit-Cost Ratio	-0.34	-4.12	0.000**
Wheat	Net Returns	9,326.06	2.11	0.038*
	Benefit-Cost Ratio	0.09	2.72	0.010**

Significance Level: *$p < 0.05$, **$p < 0.01$

Discussion: The t-test results show significant differences in net returns and BCR for sugarcane, with inorganic farming outperforming organic. For wheat, organic farming shows a significant advantage in net returns, though the BCR difference is not statistically significant.

Conclusion and Recommendations

Based on the findings, policy-makers should consider incentives for organic farming, such as subsidies and training programs. Despite the current higher returns from inorganic farming, the comparable BCR for organic practices suggests potential for growth if market conditions continue to favor organic products. Reducing the cost of organic inputs or increasing market prices for organic products could further enhance the viability of organic farming.

In conclusion, while inorganic farming currently offers higher profitability for sugarcane and shows a better BCR, organic farming presents a viable alternative with competitive profitability for wheat. With appropriate policy support and market enhancements, organic farming could become more economically attractive and contribute to sustainable agricultural practices in Maharashtra.Future studies should explore the long-term sustainability and environmental benefits of organic farming compared to inorganic methods. Additionally, research could investigate the impact of different organic practices on productivity and profitability, and examine consumer preferences for organic products to better understand market dynamics.

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