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A Comparative Study of Cost, Efficiency, and Profitability in Organic and Chemical Basmati Farming in Punjab

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Abstract: This study compares the economic viability, technical efficiency, and profitability of organic versus chemical Basmati farming in Punjab, India, based on data collected from 88 organic and 88 chemical farms. The cost analysis reveals that organic farming incurs lower input costs, particularly for synthetic chemicals and other inputs, while labour costs in organic farming are higher due to the more labour-intensive nature of the practices, such as manual weeding and organic input management. Organic Basmati farming had an operational cost of Rs. 32,125 and fixed costs of Rs. 54,890 per hectare, while chemical farming's operational cost was Rs. 45,149 and fixed costs Rs. 57,434. Despite lower yields in organic farming, organic Basmati fetched a higher price, with organic farmers earning Rs. 3,307 per quintal compared to Rs. 2,746 for chemical farmers. Efficiency was assessed using technical, pure technical, and scale efficiency. The mean technical efficiency score for organic Basmati farming was 0.7811, while chemical farming had a mean score of 0.9127. Mann-Whitney U tests were applied to compare Benefit-Cost (B:C) ratios for both farming methods. Significant differences were found in all cost categories, with organic farming yielding higher B:C ratios across A2+FL (U=1813, p=0.00) and C2 (U=2932, p=0.005), indicating that organic farming is more profitable. Specifically, the A2+FL ratio for organic farming was 0.43, compared to 0.33 for chemical farming, and the C2 ratio was 0.37 for organic versus 0.29 for chemical. In conclusion, while organic Basmati farming faces challenges related to lower yield, it proves to be more cost-efficient and profitable than chemical farming. The study suggests that improving technical efficiency and expanding organic farming could enhance its economic potential, and that policy support for organic agriculture should focus on research, development, and better market access.

Keywords: Cost-Benefit Analysis, Basmati Rice, Resource Use Efficiency, Sustainability

Introduction

Punjab has long been regarded as the rice bowl of India, playing a pivotal role in the country's agricultural productivity, particularly in the cultivation of Basmati rice. Known for its aromatic qualities and premium market price, Basmati rice is not only a staple in Indian cuisine but also a significant export commodity. The high demand for this variety, particularly in international markets, makes it a key driver of Punjab's agricultural economy. However, the cultivation of Basmati rice is associated with high input costs and intensive management practices, which are required to maintain its quality and yield. These practices, including the use of synthetic fertilizers, pesticides, and water-intensive irrigation, have raised concerns over long-term sustainability, particularly given the region's depleting water resources and the rising cost of chemical inputs.

While non-Basmati rice varieties are often more cost-efficient, offering higher yields at lower input costs, Basmati cultivation remains more profitable due to its premium pricing. Nevertheless, the challenges of stagnant yields, soil degradation, and excessive use of water have placed significant pressure on Basmati farmers in Punjab. These issues, coupled with the increasing costs of chemical inputs, have prompted interest in exploring alternative, more sustainable farming practices, including organic agriculture.

Organic farming, although associated with lower yields and higher labour costs, offers several advantages over conventional farming, particularly in terms of reducing reliance on synthetic chemicals and improving soil health. The global shift towards sustainable, environmentally-friendly agricultural practices has made organic Basmati farming an attractive option for some farmers. However, despite these benefits, organic Basmati farming requires a more labour-intensive approach and presents challenges in terms of achieving competitive yields while maintaining the quality required for export markets.

This paper seeks to compare organic and chemical Basmati rice farming in Punjab, focusing on critical factors such as resource use efficiency, cost-benefit analysis, profitability, and sustainability. By evaluating the economic and environmental viability of both farming systems, this study aims to provide a comprehensive understanding of the challenges and opportunities associated with organic Basmati cultivation, offering insights into its potential as a sustainable alternative to conventional farming practices.

Various studies have highlighted the differences between Basmati and non-Basmati rice farming in Punjab. Previous studies, such as those by Ramesh, Singh, and Rao (2005), have pointed out the long-term environmental consequences of intensive farming systems, including increased chemical inputs and water scarcity. Singh and Grover (2011) found that while organic farming yields lower than chemical methods, its reduced reliance on chemicals and higher premium prices help offset the costlier production methods. Thakur and Sharma (2005) noted that while Basmati farming has a number of advantages, including higher returns, its long-term sustainability is threatened by the high input costs and the need for intensive water usage.Recent studies in Gujarat, Maharashtra, and Uttar Pradesh have pointed out that Basmati farming tends to have higher costs but can be more profitable due to its premium prices. This paper seeks to explore whether organic Basmati rice farming offers a more sustainable and profitable alternative to chemical Basmati, considering the escalating challenges faced by Punjab's agricultural sector.

Data and Methodology

A sample of 176 rice farmers was studied in four districts of Punjab i.e. Fatehgarh Sahib, Sangrur, Patiala, and Gurdaspur, based on the highest concentration of basmati growers. The farmers selected for the study were only those who had been growing organic and inorganic Basmati rice for over three years. Data was collected through a well-structured questionnaire designed to capture information on cropping patterns, input costs, resource use, and profitability.

The cost structure for Basmati rice farming was calculated using the cost accounting method, as suggested by the FAO. Gross returns, net returns, and benefit-cost ratios were calculated based on yield and market prices. Efficiency in resource use was assessed using Data Envelopment Analysis (DEA) to determine technical, pure technical, and scale efficiency scores for both types of rice farming.

Analytical Tools

In order to find out the profitability of organic basmati versus chemical basmati farming, we compared the cost and output data for both systems. The cost of cultivation for each cost type was calculated using the formula:

Cost A1 = Casual human labour + Hired labour + Machinery costs + Seed + Fertilizers and pesticides + Depreciation + Marketing costs

Cost A2 = Cost A1 + Rental value of land

Cost B1 = Cost A1 + Interest on fixed capital

Cost B2 = Cost B1 + Rental value of land

Cost C1 = Cost B1 + Imputed value of family labour

Cost C2 = Cost B2 + Imputed value of family labour

Cost C3 = Cost C2 + 10% of cost C2

From this, the gross return, net return, and benefit-cost ratio were computed for both techniques of farming. The efficiency of resource use was determined using the DEA approach to calculate both technical efficiency and returns to scale.

Result and Discussion

Cost Structure:

Table 1 presents a detailed breakdown of the costs associated with cultivating Basmati rice using both organic and chemical farming methods. The data reveals that, on average, the operational cost for organic Basmati farming amounted to Rs.

32,125 per hectare, while the fixed cost was Rs. 54,890 per hectare. In contrast, for chemical Basmati farming, the operational cost was Rs. 45,149 per hectare, with fixed costs reaching Rs. 57,434 per hectare. As shown, the total costs associated with chemical Basmati cultivation were higher than those for organic Basmati cultivation across both operational and fixed categories.

Table 1: Comparative Cost Breakdown of Organic and Chemical Basmati Rice Cultivation (Rs/Hectare)

Input cost (Rs/Hectare)	**Type of farming**		
	Organic Basmati	**Chemical Basmati**	**Difference**
Casual labour	10967	9634	-1333
Attached labour	2592	1333	-1259
Family labour	2238	1676	-562
Total Human Labour	15444	12446	-2998
Hired machine labour	3071	3482	411
Owned machine labour	3389	3838	449
Total machinery labour	5266	5970	704
Seed cost	1582	1182	-400
Seed treatment	245	0	-245
Fertilizer, insecticide and pesticide and bio products	796	17865	17069
FYM and jeevamrit	5464	5525	61
Interest on working capital (12.5%)	1890	2655	765
Sub-total of operational cost	32125	45149	13024
Rental value of owned land	49419	51605	2186
Depreciation on implements and farm buildings	2857	3093	236
Interest on fixed capital (10%)	2613	2734	121
Sub-total of fixed cost	54890	57434	2544
Total marketing cost	1922	1170	-752

Source: Field Survey (2018)

The table below highlights the key factors contributing to the differences in costs between organic and chemical farming. The operational cost for chemical farming was higher by Rs. 13,024, primarily due to a greater expenditure on synthetic chemicals, which amounted to Rs. 17,865. In contrast, organic farmers utilized traditional methods such as jeevamrit, beejamrit, and other homemade remedies, incurring a significantly lower cost of Rs. 796. Organic farming, being more labour-intensive (Jansen, 1999), required higher labour inputs, which totalled Rs. 15,444, whereas chemical farming had a slightly lower labour cost of Rs. 12,446. Furthermore, the marketing cost for organic produce was higher by Rs. 752, as many organic farmers opted to sell their produce directly to local shops in search of better prices, rather than using mandis, which involved additional transportation and handling charges. The analysis also shows that organic farmers incurred additional costs in human labour (Rs. 2,998), seed (Rs. 400), seed treatment (Rs. 247), and marketing (Rs. 752). For most other inputs, organic farmers spent less compared to their chemical counterparts, as demonstrated in Table 1.

Cost of Cultivation on Different Cost Components

The comparative cost estimates for the production of both organic and chemical Basmati farming are presented below. As shown in Table 2, the total cost of cultivation is consistently higher for chemical farming across all cost categories. The A2+FL cost for chemical farming exceeded that of organic farming by Rs. 15,282. Regarding the C2 cost, organic Basmati cultivation incurred Rs. 86,021 per hectare, while the cost for chemical Basmati farming was Rs. 101,424, resulting in a difference of Rs. 15,403. The A2+FL cost concept includes family labour and the rental value of land, while the C2 cost component takes into account family labour, the rental value of land, and the interest on fixed assets. As more inputs are incorporated, the costs increase, illustrating the trend of rising expenses. This analysis confirms that organic farming generally incurs lower production costs compared to chemical farming, suggesting that organic practices for Basmati cultivation can help reduce input costs for farmers.

Table 2: Detailed Cost Structure of Organic and Chemical Basmati Rice Cultivation (Rs./Hectare)

Types of costs (Rs./ Hectare)	Organic Basmati	Chemical Basmati	Difference
A1	31750	45407	13657
A2	81170	97013	15843
A2+FL	83407	98689	15282
B1	34364	48142	13778
B2	83783	99748	15965
C1	36602	49818	13216
C2	86021	101424	15403
C3	94623	111566	16943

Source: Author's Own Calculations

Gross Return

Gross return is determined by multiplying the yield per hectare with the price per quintal of Basmati. For chemical farming, the gross return was higher at Rs. 1,27,830 per hectare, while organic farming generated Rs. 1,15,727. Although the yield from organic farming was considerably lower than that of chemical farming, organic farmers were able to secure higher prices for their produce. These farmers primarily sold their crops to regular customers and traders. On average, organic Basmati fetched Rs. 3,307 per quintal, which was higher than the Rs. 2,746 per quintal received by chemical Basmati farmers. While organic Basmati yields were lower, resulting in a reduced gross return, the price advantage of organic produce was notable. Therefore, to increase their gross returns, organic farmers should prioritize improving yield levels.

Table 3: Yield (Quintal/Hectare), Price and Gross Return (Rs./Hectare) Comparison for Organic and Chemical Basmati Rice Cultivation

	Organic Basmati	**Chemical Basmati**
Yield of Basmati (Quintal/ Hectare)	35	47
Price of Basmati(Rs./ Hectare)	3307	2746
Gross Return(Rs./ Hectare)	115727	127830

Source: Field Survey (2018)

Net Return

Table 4 presents the net returns for both organic and chemical Basmati farming, providing a clear comparison based on different cost structures. Net returns are calculated by subtracting the input costs for each component from the gross return. In all cost components, organic Basmati farming resulted in higher net returns. Specifically, the net return for organic Basmati was Rs. 3,179 higher for the A2+FL cost, and Rs. 3,300 higher for the C2 cost, indicating that organic farmers experienced greater benefits compared to chemical farmers. The higher net returns for organic farming can be attributed to the lower input costs involved in the production of organic Basmati rice.

Table 4: Table 4: Net Returns from Organic and Chemical Basmati Rice Cultivation (Rs./Hectare)

Net Return (Rs./Hectare)	**Organic Basmati**	**Chemical Basmati**	**Difference**
A1	83976	82423	1553
A2	34558	30817	3741
A2+FL	32320	29141	3179
B1	81363	79688	1675
B2	31943	28082	3861
C1	79125	78012	1113
C2	29706	26406	3300
C3	21104	16263	4841

Source: Author's Own Calculations

Benefit-Cost Ratio

The benefit-cost (B:C) ratio is an important metric for assessing the economic viability of a crop and is calculated by dividing the net return by the cost of cultivation. The B:C ratios for both organic and chemical Basmati are presented in Table 5, categorized by different cost structures. For organic Basmati, the B:C ratio at various cost levels (A1, A2, A2+FL, B1, B2, C1, C2, and C3) were 2.82, 0.43, 0.39, 2.50, 0.39, 2.27, 0.35, and 0.23, respectively. In comparison, the B:C ratios for chemical Basmati were 1.89, 0.33, 0.30, 1.72, 0.29, 1.62, 0.27, and 0.15, respectively.

As shown, organic Basmati consistently achieved higher B:C ratios across all cost structures. To test for statistical significance between the B:C ratios of organic and chemical Basmati, a Mann-Whitney U test was applied.

Table 5: Benefit-Cost Ratio and Mann-Whitney U Test Results for Organic and Chemical Basmati Rice (Per Hectare)

BC Ratio per Hectare	Organic Basmati	Chemical Basmati	Mann-Whitney U	Z	Significance
A1	2.66	1.90	1813	-6.093	0.000
A2	0.46	0.34	2932	-2.781	0.005
A2+FL	0.41	0.33	3026	-2.503	0.012
B1	2.37	1.73	1888	-5.871	0.000
B2	0.41	0.30	2969	-2.672	0.008
C1	2.15	1.67	2043	-5.412	0.000
C2	0.37	0.29	3076	-2.355	0.019
C3	0.25	0.18	3078	-2.355	0.019

Source: Author's Own Calculations

A1 Cost Component:

To assess the difference in the benefit-cost (B:C) ratio between organic and chemical farming under the A1 cost structure, the Mann-Whitney U test was applied. The results revealed a significant difference in the B:C ratios: organic farming had a median value of 2.6 (n=88), while chemical farming had a median value of 1.90 (n=88), with U = 1813, z = -6.09, p = 0.00, and r = 0.46. Thus, the null hypothesis of equal B:C ratios is rejected, confirming that organic Basmati farming offers a higher benefit compared to chemical farming when evaluated under the A1 cost component.

A2 Cost Component:

Similarly, to examine the B:C ratio difference for the A2 cost structure, the Mann-Whitney U test was used. The findings showed a significant difference in the B:C ratios: organic farming had a median value of 0.46 (n=88), and chemical farming had a median of 0.34 (n=88), with U = 2932, z = -2.78, p = 0.005, and r = 0.21. This leads to the rejection of the null hypothesis, indicating that organic Basmati farming provides a higher benefit than chemical Basmati when considering the A2 cost component.

A2+FL Cost Component:
For the A2+FL cost structure, the Mann-Whitney U test was again applied. The test showed a significant difference in the B:C ratio between organic farming (median = 0.41, n=88) and chemical farming (median = 0.33, n=88), with U = 3026, z = -2.50, p = 0.012, and r = 0.19. Consequently, the null hypothesis is rejected, confirming that organic farming yields a higher benefit than chemical farming when calculated under the A2+FL cost component.

B1 Cost Component:
In evaluating the B:C ratio for the B1 cost structure, the Mann-Whitney U test revealed a significant difference: organic farming had a median value of 2.37 (n=88), while chemical farming had a median of 1.73 (n=88), with U = 1888, z = -5.87, p = 0.00, and r = 0.44. These results reject the null hypothesis of equal B:C ratios, suggesting that organic Basmati farming provides a higher benefit compared to chemical farming under the B1 cost structure.

B2 Cost Component:
For the B2 cost structure, the Mann-Whitney U test showed a significant difference in the B:C ratios: organic farming had a median of 0.41 (n=88), whereas chemical farming had a median of 0.30 (n=88), with U = 2969, z = -2.67, p = 0.008, and r = 0.20. The null hypothesis is rejected, supporting the conclusion that organic Basmati yields higher benefits than chemical Basmati under the B2 cost component.

C1 Cost Component:
When comparing the B:C ratios for the C1 cost structure, the Mann-Whitney U test indicated a significant difference: organic farming had a median of 2.15 (n=88), while chemical farming had a median of 1.67 (n=88), with U = 2043, z = -5.41, p = 0.00, and r = 0.41. This rejection of the null hypothesis further confirms that organic Basmati farming offers higher net benefits compared to chemical farming when evaluated at the C1 cost level.

C2 Cost Component:
To assess the B:C ratio for the C2 cost structure, the Mann-Whitney U test showed a significant difference: organic farming had a median of 0.37 (n=88), while chemical farming had a median of 0.29 (n=88), with U = 3076, z = -2.35, p = 0.019, and r = 0.18. The null hypothesis is rejected, indicating that organic Basmati yields higher returns than chemical Basmati when computed on the C2 cost structure.

C3 Cost Component:
Lastly, for the C3 cost structure, the Mann-Whitney U test revealed a significant difference in the B:C ratio: organic farming had a median value of 0.25 (n=88), while chemical farming had a median of 0.18 (n=88), with U = 3076, z = -2.35, p = 0.019, and r = 0.18. This test also leads to the rejection of the null hypothesis, confirming that organic Basmati farming offers higher net benefits compared to chemical farming when analysed under the C3 cost component.

From the analysis of the B:C ratios across all cost components, it can be evidently concluded that organic Basmati farming is economically more beneficial for farmers than chemical farming. Organic Basmati provides a higher return on investment, with significant advantages in each cost category. However, the main challenge identified during the study was the lower yield of organic Basmati, which needs to be addressed to further enhance the economic viability of organic farming. Therefore, promoting organic Basmati farming, despite its lower yield, could reduce financial burdens on farmers while ensuring better returns and encouraging sustainable agricultural practices.

Efficiency Results

Table 6 provides the descriptive statistics for the estimated Technical Efficiency (TE), Pure Technical Efficiency (PTE), and Scale Efficiency (SE) for both organic and chemical Basmati farmers. The range of technical efficiency scores was between 0.40 and 1.00 for organic farmers, and between 0.74 and 1.00 for chemical farmers. A TE score closer to 1 indicates higher technical efficiency. The average technical efficiency for organic Basmati farmers was 0.7811, while for chemical farmers it was higher at 0.9127. These results align with findings from previous studies, such as Charyulu & Biswas (2010), which suggested that the differences in efficiency between farming methods are due to their distinct technological frontiers. This does not imply that conventional farming is inherently more efficient, but rather that chemical farmers tend to operate closer to their specific production frontier than organic farmers. Similar conclusions were drawn in a study by Madau (2005), which focused on output-oriented measures of efficiency.

The technical efficiency scores derived in this study suggest that, by adopting best practices, organic Basmati farms could reduce their input usage by an average of 22%, while chemical Basmati farms could potentially reduce inputs by 8.73%, without compromising output levels. However, the degree of input reduction varied across different Decision-Making Units (DMUs).

Regarding Pure Technical Efficiency (PTE), the mean value for organic farmers was 0.9382, while for chemical farmers it was 0.9889, reflecting strong managerial capabilities in both farming groups. Scale efficiency (SE) was 0.8319 for organic farmers and 0.9231 for chemical farmers, indicating that chemical farmers operated more efficiently in terms of scale utilization.

For organic farms, 37 farms had technical efficiency scores above 80%, 9 farms scored above 90%, and 14 farms achieved full technical efficiency (100%). These 14 farms set the benchmark for best practices, serving as reference points for less efficient farms. The inefficiency observed in organic farming could be attributed to lower yields compared to chemical farming, which leads to reduced gross returns. In the case of chemical farming, 78 farms scored above 80% in technical efficiency, 22 farms exceeded 90%, and 30 farms operated at full efficiency (100%), marking them as efficient farms.

In terms of Pure Technical Efficiency, 60 organic farms and 71 chemical farms operated at full efficiency. When considering Scale Efficiency, 14 organic farms and 31 chemical farms were operating at maximum efficiency (SE = 1).

Efficiency improvements are possible for inefficient farms in both organic and chemical categories. Inefficiency may arise from underdeveloped production technology or suboptimal scale, where farms fail to fully capitalize on economies of scale or misallocate available resources (Alemdar & Oren, 2006). The average scale efficiency was 0.8319 for organic farms and 0.9231 for chemical farms, while the mean technical efficiency was 0.78 and 0.91 for organic and chemical farms, respectively. Since scale efficiency was higher than technical efficiency, it suggests that the primary cause of inefficiency was related to agricultural technology, rather than the scale of production.

In conclusion, it can be asserted that enhancing research and development efforts should be a key focus for the Punjab government to improve agricultural techniques for both organic and chemical Basmati farming. The only way to further improve efficiency for the 14 organic and 30 chemical farms operating at full technical efficiency is through adjustments in production scale.

Table 6: Distribution of Technical, Pure Technical, and Scale Efficiency for Organic and Chemical Basmati Farmers (in Decimal Ranges)

	Organic farmer			**Chemical farmer**		
	T.E. CRS	**Pure TE**	**Scale Efficiency**	**T.E. CRS**	**Pure TE**	**Scale Efficiency**
Equal to 1	14	60	14	30	71	31
1-.90	9	2	16	22	13	26
.90-.80	14	11	20	26	4	22
.80-.70	23	11	25	10		9
.70-.60	13	2	5			
.60-.50	12	2	8			
.50-.40	2					
Less than .40	1					
Total	88	88	88	88	88	88
Mean	.78	.94	.83	.91	.99	.92
SD	.157	.106	.132	.082	.030	.79
Coefficient of variance	.025	.011	.017	.007	.001	.006
Min	.40	.56	.54	.74	.86	.74
Max	1	1	1	1	1	1

Source: Author's Own Calculations

Returns to Scale

The scale characteristics of Decision Making Units (DMUs) were analyzed to determine whether the farms fell into the categories of increasing, decreasing, or constant returns to scale. Returns to scale refer to the relationship between changes in input quantities and the resulting output. Specifically, it describes how output behaves in response to a proportional and simultaneous change in the combination of inputs used in production.

Table 7: Summary of Returns to Scale for Organic and Basmati Crop

	Organic Farmer	**Chemical Farmer**
Constant returns	14	30
Increasing returns	74	54
Decreasing return		4

Source: Author's Own Calculations

Table 7 highlights that 14 organic farmers and 30 chemical farmers were operating at constant returns to scale, indicating that these farmers maintained their current input combinations to achieve the desired output. Conversely, 4 chemical farmers (and none in the organic category) were found to be operating at decreasing returns to scale, suggesting that these farmers need to adjust their input combinations to improve efficiency. Increasing their production scale would not be advisable, as it would not lead to greater efficiency.

On the other hand, 74 organic and 54 chemical farmers were operating at increasing returns to scale, meaning their output increased at a higher rate than the increase in their input levels. For these farmers, enlarging their production scale would be beneficial as it would allow them to allocate more resources at a lower cost compared to others, thereby improving scale efficiency. This indicates that 74 organic and 58 chemical Basmati farmers were operating in the inefficient region of their production function, where there is potential to improve efficiency by expanding the production scale.

In terms of cost, the difference between organic and chemical Basmati farming was Rs. 15,282 in A2+FL costs and Rs. 15,403 in C2 costs, showing that organic Basmati had lower input costs. Although chemical Basmati farming resulted in higher output, organic Basmati farmers were able to command significantly higher prices. As a result, organic Basmati was found to be a more profitable crop due to the substantial difference in the benefit-cost ratio for the A2+FL and C2 cost components.

Conclusion

This study provides a comprehensive comparison of organic and chemical Basmati farming in terms of cost, efficiency, and profitability. The findings reveal that while organic Basmati farming tends to have lower yields compared to chemical farming, it offers a more cost-efficient and profitable option for farmers. Organic farming incurs lower input costs, particularly due to reduced reliance on synthetic chemicals, and benefits from a higher price per unit of output, leading to significantly higher gross returns. Although organic farmers face higher labour costs and lower yields, the overall net returns for organic Basmati are superior when compared to chemical Basmati, as evidenced by the higher Benefit-Cost (B:C) ratios across all cost structures.

In terms of technical efficiency, organic Basmati farms had a slightly lower average efficiency score (0.7811) than chemical farms (0.9127). However, this difference is attributed to the distinct technological frontiers of each farming method rather than inefficiency in organic farming itself. The study also highlights that many farmers in both categories are operating in the inefficient region of their production function, suggesting a potential for improving efficiency through better resource utilization, adoption of best practices, and scaling up operations.

Despite the lower yield, organic Basmati farming emerges as a more economically viable and sustainable option due to its lower input costs and the price premium it commands in the market. The findings suggest that with improvements in agricultural techniques, such as better technology adoption and optimized production scales, organic Basmati farming has significant potential for increased profitability. To further support this transition, government and agricultural agencies should prioritize research and development, enhance market access for organic farmers, and promote policies that encourage the adoption of sustainable farming practices. In conclusion, organic Basmati farming, while currently facing challenges in yield, presents a financially rewarding and environmentally sustainable alternative to chemical farming.

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