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RESEARCH PAPER

Comparative Economics of Natural and Conventional Farming in Sugarcane cultivation in Belagavi District of Karnataka

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ABSTRACT

This study assesses the economic benefits of natural versus conventional sugarcane farming in Belagavi district of Karnataka for the time period of 2023-24. Amid India's economic ambitions and the critical role in agriculture played during the COVID-19 pandemic, natural farming methods, particularly Zero Budget Natural Farming (ZBNF) advocated by Shri Subhash Palekar, are examined. The research, involving 120 sample farmers including 60 practicing natural farming and 60 conventional farming for the analysis total cost method was employed. The results reveal that in conventional farming yield was more sugarcane per hectare and provides higher gross returns, natural farming proves more cost-effective. Natural farming's total cost of cultivation was ₹ 2,24,544.71 per hectare, when compared to conventional farming (₹ 2,55,587.89). This difference is largely due to lower variable costs and more efficient input use in natural farming. Although natural farming has lower yields but it fetches a higher price per tonne (₹ 3,300 versus ₹ 2,900), contributing to higher net returns of ₹ 2,07,633 compared to ₹ 1,81,532 from conventional methods. The cost of production per tonne is also higher in natural farming (₹ 1,715) compared to conventional farming (₹ 1,696), whereas, the overall returns per rupee of expenditure was better in natural farming (1.92) than the conventional farming (1.71). The findings highlights the natural farming's potential for economic sustainability and reduced dependence on costly inputs, despite its lower yields. The study suggests that, with increased awareness, government support and incentives natural farming practices could gain broader adoption in the study area. This not only benefit farmers economically but also promote long-term sustainability and resilience in agriculture.

HIGHLIGHTS

- India is on track to become a trillion-dollar economy by 2024-25, with a current GDP growth rate of 8.4% (Anon., 2021). However, the farming community, a critical sector during the COVID-19 pandemic, has often been overshadowed. Agriculture contributed approximately 4.5% to India's GDP and was the only sector that sustained the economy during the pandemic.
- Traditional agricultural practices come with significant drawbacks, including high cultivation costs, environmental pollution, and health issues (Singh, 2011).
- Zero Budget Natural Farming (ZBNF), promoted by Padma Shree awardee Shri Subhash Palekar, offers an alternative by reducing input costs and promoting soil health (Shankaranna, 2018). The Indian Prime Minister has also encouraged natural farming to reduce costs and boost yields.
- Natural farming, based on Masanobu Fukuoka's principles in *The One-Straw Revolution*, emphasizes minimal monetary investment and self-reliance.

  ZBNF includes four key components:

  1. Beejamritha: Seed treatment using cow dung and urine.
  2. Jeevamrita: A mixture to enhance microbial activity and soil health.

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3. Acchadana: Mulching to retain soil moisture.
4. Whapasa: Optimal soil conditions for root development.

Karnataka has actively promoted natural farming through initiatives like the "Zero Budget Natural Farming Project" (2018) and the "Chief Minister's Natural Farming Scheme" (2022-23), aiming to improve soil health and reduce input costs.

Keywords: Variable and fixed costs, Natural farming and conventional farming

Natural farming gained traction in Karnataka through the efforts of the Karnataka Rajya Raita Sangha (KRRS), which advocated for this practice as an alternative to conventional agriculture. In the year 2018, Government of Karnataka officially endorsed natural farming and launched the "Zero Budget Natural Farming Project" to demonstrate its effectiveness in improving soil health, reducing input costs and increasing yields (Veluguri, 2021). Later the "Chief Minister's Natural Farming Scheme" was introduced in 2022-23 to advance natural farming practices in Karnataka. This initiative, implemented through agricultural and horticultural universities, involved participatory research on 2000 hectares in each AEZ across five universities. The aim was to integrate best practices from previous natural and organic farming experiments and develop a comprehensive protocol for sustainable agriculture.

Karnataka's promotion of natural farming through government schemes reflects its commitment to sustainable agricultural practices. The state has conducted impact studies, such as in Belagavi district, to provide evidence-based insights beneficial to policymakers, researchers and practitioners. In light of these developments, this comparative study was undertaken to evaluate the impact of natural farming on the cost of sugarcane cultivation compared to conventional practices with following objective.

- To study comparative economics of natural farming with respect to conventional farming in sugarcane cultivation in the study area.

METHODS

The study was conducted in Belagavi district of Karnataka during the year 2023-24. The multi-stage purposive random sampling technique was employed to select the natural farming farmers in the study area. In first phase, Belagavi district was chosen purposively due to its high concentration of natural farming practitioners as identified by experts in the field. In the second stage, within Belagavi district, Belagavi and Hukeri taluks were selected purposively based on highest number of natural farming farmers. In the third stage, two villages are selected from each taluk: Mutnal and Hirebagevadi from Belagavi taluk and Bellad Bagevadi and Hitni from Hukeri taluk. At village level, natural farming farmers were selected purposively by employing random sampling technique. A total of 120 farmers were surveyed, with 60 each from natural and conventional farming systems. For this study, sugarcane has been selected due to its prominence among the sample farmers, who primarily grow it as a major crop using natural farming practices. For the analysis of cost and returns total cost concepts were used the cost breakdown in the following sub costs

Cost Breakdown as Follows:

1. Variable Costs:

Sugarcane Setts: Costs of purchased and imputed farm-produced setts.

Farm Yard Manure: Costs of purchased manure and imputed farm-produced manure.

Biofertilizers and Chemicals: Based on actual prices paid.

Labour Costs: Includes human, bullock, and machine labour, with family labour imputed at the same rate as hired labour (Tripathi, 2010).

Machine Labour Charges: Based on ₹ 700 per hour for hired machines.

Harvesting and Transportation: Contracted costs.

Irrigation Charges: Calculated using amortized costs for borewells and related infrastructure.

Interest on working capital: The prevailing bank interest rate of seven per cent per annum.

2. Fixed Costs:

Land Revenue and Taxes: Based on government rates.

Rental Value of Land: Based on prevailing rental rates.

Depreciation: Calculated using the straight-line method.

Interest on Fixed Capital: At 12% per annum.

Returns:

Gross Return: Total value of sugarcane sold.

Net Return: Gross return minus total costs.

Return per Rupee of Expenditure: Gross income divided by total cost.

Cost of Production: Total cost per hectare divided by average yield.

RESULTS AND DISCUSSION

The table one depicts the Natural farming as cost-effective alternative to conventional farming in sugarcane cultivation, despite differing approaches and inputs. For setts, natural farming incurs a slightly lower cost (₹ 22,619.53/ha) compared to conventional farming (₹ 25,221.50/ha), primarily due to reduced sett requirements and the use of less expensive, locally sourced planting materials. However, natural farming's sett treatment materials are more costly (₹ 887.09/ha) than those in conventional farming (₹ 261.93/ha), reflecting the use of traditional, labour-intensive treatments versus synthetic ones. The expenditure on FYM in natural farming (₹ 29,214.63/ha) is higher compared to conventional farming (₹ 28,505.46/ha), as FYM serves as the main source of nutrients in natural systems. On the other hand, natural farming benefits from lower costs for bio-fertilizers and organic manure (₹ 3,879.47/ha) compared to the higher costs of synthetic fertilizers in conventional farming (₹ 14,168.71/ha), due to the on-farm preparation of inputs in natural farming.

The cost of bio-pesticides in natural farming (₹ 1,620.98/ha) is also lower compared to the expense of plant protection chemicals in conventional farming (₹ 3,916.54/ha), showcasing the cost-saving nature of natural pest management. Despite this, natural farming has higher miscellaneous costs (₹ 2,421.58/ha) compared to conventional farming (₹ 988.40/ha), likely due to additional expenses related to the preparation of traditional inputs. The results of the study are in line with the study conducted by Khan and Sreeja (2022) on microeconomic comparison of natural and conventional farming in Andhra Pradesh. Their field survey revealed that, approximately 10 percent of the total respondents were practicing natural farming and reported significant satisfaction with its benefits compared to conventional methods. The study found that, average input costs decreased by 70-80 percent, yields increased by 53 percent and farmers' incomes were doubled.

Labour costs in natural farming was generally lower due to reduced reliance on mechanization and chemical management. Hired labour costs (₹ 33,314.02/ha) and machine labour costs (₹ 16,956.00/ha) are both lower in natural farming compared to conventional farming (₹ 40,287.18/ha and ₹ 18,952.57/ha, respectively). Interest on working capital is also lower in natural farming (₹ 10,897.11/ha) compared to conventional farming (₹ 12,802.25/ha), reflecting the reduced need for external credit. Additionally, depreciation costs are lower in natural farming (₹ 2,777.40/ha) than in conventional farming (₹ 3,130.76/ha), due to less reliance on depreciable assets. Interest on fixed capital is marginally lower in natural farming (₹ 6,209.62/ha) compared to conventional farming (₹ 6,308.46/ha), indicating a lesser investment in capital-intensive machinery.

The total cost of cultivation (table 1) was ₹ 2,24,544.71 per hectare in natural farming, which is lower than the ₹ 2,55,587.89 per hectare for conventional farming. This cost difference highlights the cost-saving potential of natural farming, driven by lower variable costs and more efficient use of inputs, despite slightly higher fixed costs as a percentage of the total cost.

Table two depicts the yield and return structures in conventional farming achieves a higher yield (150.73 t/ha) compared to natural farming (130.96 t/ha), due to the use of synthetic inputs. However, natural farming fetches a higher price per tonne (₹ 3,300) than conventional farming (₹ 2,900), largely due to premium pricing for organic products like jaggery. Although gross returns are slightly higher in conventional farming (₹ 4,37,119.90/ha) compared to natural farming (₹ 4,32,177.90/ha), the higher cultivation costs in conventional methods result in lower net returns (₹ 1,81,532/ha) compared to natural farming (₹ 2,07,633/ha). Natural farming thus offers a better return per rupee of expenditure

Table 1: Cost of cultivation of sugarcane under Natural and Conventional farming by the sample farmers in the study area (n = 120) (per ha)

Sl. No.	Particulars	Natural farming (n=60)		Conventional farming (n=60)	
		Value (₹)	Per cent	Value (₹)	Per cent
(I)	**Variable cost**				
(A)	**Material cost**				
1	Setts	22,619.53	10.07	25,221.50	9.87
2	Setts treatment material	887.09	0.40	261.93	0.10
3	FYM / Ganajeevamrutha	29,214.63	13.01	28,505.46	11.15
4	Bio-fertilizer and organic manure/Chemical fertilizer	3,879.47	1.73	14,168.71	5.54
5	Bio-pesticides/Plant protection chemicals	1,620.98	0.72	3,916.54	1.53
6	Irrigation charges	12,799.78	5.70	13,108.66	5.13
7	Miscellaneous cost	2,421.58	1.08	988.40	0.39
	Subtotal (A)	73,443.06	32.71	86,171.18	33.71
(B)	**Labour cost**				
1	Hired labour	33,314.02	14.84	40,287.18	15.76
2	Machine labour	16,956.00	7.55	18,952.57	7.42
	Subtotal (B)	**50,270.02**	22.39	59,239.75	23.18
(C)	Harvesting and transportation cost [contract]	31,984.62	14.24	38,490.77	15.06
(D)	Interest on working capital at 7%	10,897.11	4.85	12,802.25	5.01
	Total variable cost (A+B+C+D)	1,66,594.82	74.19	1,96,703.96	76.96
(II)	**Fixed cost**				
1	Land revenue	86.49	0.04	86.49	0.03
2	Rental value of land	48,876.38	21.77	49,358.23	19.31
3	Depreciation	2,777.40	1.24	3,130.76	1.22
4	Interest on fixed capital at 12%	6,209.62	2.77	6,308.46	2.47
	Total fixed cost	57,949.89	25.81	58,883.93	23.04
(III)	**Total cost of cultivation (I+II)**	**2,24,544.71**	**100.00**	**2,55,587.89**	**100.00**

Table 2: Yield and Returns structure in sugarcane cultivation under natural and conventional farming practices in the study area (n = 120) (₹ /ha)

Sl. No.	Particulars	Unit	Natural farming	Conventional farming
1	Yield	t/ha	130.96	150.73
2	Price	₹ /t	3,300	2,900
3	Gross return	₹ /ha	4,32,177.90	4,37,119.90
4	Cost of cultivation	₹ /ha	2,24,544.71	2,55,587.89
5	Cost of production	₹ /t	1,715	1,696
6	Net return	₹ /ha	2,07,633	1,81,532
7	Return per rupee of expenditure	—	1.92	1.71

(1.92) compared to conventional farming (1.71), demonstrating greater cost efficiency.

Overall, while conventional farming excels in yield and gross returns while natural farming proves to be more economically favourable due to its lower total cultivation costs and better net returns, underscoring its potential for long-term sustainability and reduced reliance on costly synthetic inputs.

CONCLUSION

Natural farming is low input based, climate resilient and low-cost farming system because all the inputs are made-up of natural herbs and locally available inputs, thereby reducing the use of artificial fertilizer and industrial pesticides. In natural farming, farmers operating on tight budgets were particularly sensitive to cost savings, which made this a critical factor in their decision-

making (Shyam, 2019). Natural farming practices which often focused on enhancing soil health through organic methods aligned well with this priority, making soil fertility a significant factor for many farmers. Embracing natural approaches to sugarcane cultivation reduces cultivation expenses by ₹ 31,043.18/ha and also increased net return of ₹ 2,07,633/ha in natural farming compared ₹ 1,81,532/ha in conventional farming. In this regard, to raise awareness, the government and agricultural agencies could encourage and support farmers to adopt natural farming practices by providing incentives, training and technical assistance and launch public campaigns that educate consumers about the benefits of natural farming for health, the environment and community resilience. These efforts can stimulate demand for sustainably produced food and increases support for relevant policy initiatives. Extension services will be instrumental in disseminating knowledge and offering ongoing assistance. Based on the results of the study the farmers were advised to adopt the natural farming in the study area to gain more economic benefits than conventional farming.

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