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Comparative Economics of Groundnut Cultivation under Sprinkler and Conventional Irrigation Methods

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ABSTRACT

The research explores the economic and resource use patterns of groundnut cultivation among farmers adopting and not adopting sprinkler irrigation in Gujarat's Sabarkantha, Mehsana, and Patan districts. A total of 99 adopters and 105 non-adopters were selected through a multistage sampling method, wherein blocks and villages were chosen based on the concentration of adopters, and withing the villages farmers were randomly sampled. The study revealed that farmers who adopted sprinkler irrigation incurred lower labour costs and achieved higher yields compared to non-adopters. The resource use pattern revealed that seed, machinery cost and labour cost were major contributors to total cost across both the categories. The returns over variable cost (ROVC) were ₹77,681.83 per hectare for adopter and ₹69415.26 per hectare for non-adopter for all three districts. The benefit-cost ratios were 1.85 for adopter and 1.73 for non-adopter for all three districts. These findings display that adopter achieved higher profitability in groundnut cultivation. The payback period for investment in sprinkler irrigation ranged from 2 to 3 years, compared to its 10-year operational lifespan across all districts. Regression analysis using the power function showed that seed, fertilizer, pesticide, and machinery costs significantly influenced output for adopters, while fertilizer, machinery, and labour costs were key factors for non-adopters. This suggests underutilization of these inputs, indicating potential for increased usage to enhance returns. The study concludes that adopting sprinkler irrigation improves yield and boosts profitability in groundnut cultivation. It recommends strengthening efforts to promote micro-irrigation through training, subsidy awareness, and demonstrations.

Key Words: ROVC, Resource use, Benefit-cost ratio, sprinkler irrigation

INTRODUCTION

Oilseed production has long been a crucial part of Indian agriculture, with oilseed crops covering 16.76% of the total cultivated agricultural land (GoI, 2024). The emphasis on the oilseed production in India is expected to gain momentum with launch of National Mission on Edible Oils – Oilseeds (NMEO-Oilseeds) which aims to reduce the dependency on imports for domestic consumption.

In India, Groundnut holds a significant position among oilseed crops, accounting for 15.59% of the total oilseed area and contributing 25.67% to total oilseed production in 2023-24 (GoI, 2024).

Gujarat leads the country in groundnut cultivation, holding the top position in both area and production. At the all-India level, Gujarat contributes 45.62% to the total groundnut production and covers 36.06% of the total area under groundnut cultivation. The significance of groundnut in Gujarat is evident from its share in the state's total oilseed area and production. According to the final advance estimates for 2023-24, groundnut accounted for 54.02% of the total oilseed area and 61.42% of the total oilseed production (GoG, 2024).

These figures highlight the need to examine the economics and resource utilization of groundnut cultivation and explore potential improvements in resource use at the farm level. With this aim, a study was carried out in Northern Gujarat to analyse the economics and resource utilization of groundnut cultivation among farmers adopting sprinkler irrigation and those relying on conventional flood irrigation.

The comparison between these two categories of farmers was conducted to highlight the need for more efficient use of water in Northern Gujarat, a region experiencing a declining water table for the past few

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Table 1: Overview of Groundnut Cultivators by District, Block, Village, and Adoption Category.

Sr. No.	District	Block	Village	Adopters	Non- Adopters
1)	Sabarkantha	Idar	Kukadiya, Umedgarh	32	41
		Vijayanagar	Kundla Kampa, Andropa		
2)	Mehsana	Satlasana	Vaghar, Isakpura	35	44
		Kheralu	Moti Hiravani, Gajipur		
3)	Patan	Siddhpur	Nagvasan, Lukhasan	32	20
		Patan	Sariyad, Sampra		
Total Farmers				**99**	**105**

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decades. The study emphasizes that adopting this water-saving technology can help farmers reduce cultivation costs, enhance crop yields, improve the marginal productivity of water, and increase profitability (Kumar and Palanisami, 2010; Chandrakanth *et al* 2013; Singh and Singh, 2021).

In this context, this paper seeks to achieve two main objectives: a) To analyse the cost and returns of groundnut cultivation among adopters and non-adopters of water-saving technology ; and b) To assess resource utilization and returns to scale using the power production function.

MATERIALS AND METHODS

This study is part of broader research on estimating water productivity in crops and livestock by comparing water-saving technologies with conventional irrigation methods. The proposed study is based on a sample of 240 farmers, with this paper specifically utilizing data from those cultivating groundnut in the study area. The data for this paper was collected from farmers for Kharif season of 2024.

The survey was carried out in three districts- Sabarkantha, Mehsana, and Patan-using a multistage sampling approach, two blocks were selected from each district and two villages from each block were chosen based on data from the Gujarat Green Revolution Company (GGRC) on water-saving technology adopters at the block and village levels.

a) Cost and Returns Analysis:

Profit analysis is essential for determining the viability of any agricultural activity. The profitability was computed using variable cost which includes, expenses on farmyard manure, seeds, seed treatment, human labour, machinery for tillage, intercultural and threshing operations, as well as pesticide (herbicide, fungicide, and insecticide) and fertilizer.

Per hectare returns over variable costs, gross returns, and the benefit-cost ratio were calculated using the following formulas:

GR= (Quantity of main product × Value of main product) + (Quantity of by- product × Value of by-product)

ROVC = GR- TVC

B-C Ratio = GR/ TVC

Where,

GR= Gross revenue

ROVC= Return over variable cost

TVC= Total variable cost

B-C ratio= Benefit – cost ratio

b) Payback- Period:

To determine the time required to recover the investment in sprinkler irrigation, the widely recognized payback period method was utilized (Ali *et al*, 2019, Gautam and Singh, 2020). It is calculated by dividing the total cost of installing sprinkler irrigation (₹/ha) by the incremental benefits gained from this investment in groundnut cultivation (₹/ha).

$$\text{Payback Period (years)} = \frac{\text{Total Cost of Sprinkler Irrigation Installation}}{\text{Incremental Benefits in Groundnut CUltivation}}$$

c) Power function or Cobb- Douglas production function:

The power function is commonly used in agriculture to assess the extent to which changes in input levels impact output levels. It also helps identify the inputs that significantly influence on production and is widely utilized to evaluate the returns to scale of a production activity (Singh and Singh, 2023. Singh and Thakur, 2023, Borisagar *et al,* 2024, Singh *et al,* 2024).

Table 2: Cost and return estimation of groundnut cultivation in Patan District (₹/ha)

Sr. No.	Particular	Adopter		Non- Adopter	
1)	Seed	16877.12	(18.54)	16760.64	(17.79)
2)	Seed Treatment	678.08	(0.75)	657.28	(0.70)
3)	FYM	6464.64	(7.10)	6061.12	(6.43)
4)	Pesticides	4516.00	(4.96)	4764.00	(5.06)
5)	Fertilizers	11489.92	(12.62)	10512.32	(11.16)
a)	Urea	819.52		1015.04	
b)	DAP	4476.16		4043.52	
c)	Ammonium Sulphate	1726.40		1385.28	
d)	12:32:16	4467.84		4068.48	
6)	Labour cost	17975.36	(19.75)	19651.84	(20.86)
7)	Machinery cost	21261.76	(23.36)	21632.00	(22.97)
8)	Electricity Cost	9676.78	(10.63)	12007.51	(12.75)
9)	Sub total	88939.66		92046.71	
10)	Interest on Working Capital	2075.26	(2.28)	2147.76	(2.28)
11)	TVC (9+10)	91014.92	(100.00)	94194.46	(100.00)
12)	Gross Returns	167941.96		163755.50	
13)	ROVC (12-11)	76900.06		69561.00	
14)	BC over VC (12/11)	1.84		1.74	
15)	Price (Rs. / Quintal)	6521.90		6526.25	
16)	Yield (Quintals/ ha)	23.59		22.92	

The general form of the production function is as follow:

$$Y = \beta_0 X_1^{\beta 1} X_2^{\beta 2} X_3^{\beta 3} X_4^{\beta 4} X_5^{\beta 5} e^{ui}$$

After applying the log transformation, the

$$ln\ Y = ln\ \beta_0 + \beta_1 ln\ X_1 + \beta_2\ ln\ X_2 + \beta_3\ ln\ X_3 + \beta_4\ ln\ X_4 + \beta_5\ ln\ X_5 + u_i$$

Where,

Y = Total returns from groundnut production (Rs/ha)

X_1 =Total seed cost (Rs/ha)

X_2 = Total fertilizer Cost (Rs/ha)

X_3 = Total pesticide cost (Herbicides, Insecticides and fungicides) (Rs/ha)

X_4 = Total labour cost (Rs/ha)

X_5 = Total Machinery cost (Rs/ha)

β_0 = Constant term

β_1-β_5 = Regression coefficients

X_1-X_5 = Independent variables

u_i = Stochastic error term

Returns to scale refer to the change in output when all inputs are varied simultaneously. If output increases more than proportionally to the change in inputs, it indicates increasing returns to scale. If the increase in output is less than proportional, it reflects decreasing returns to scale. When output changes in the same proportion as inputs, it is termed constant returns to scale. For a power function, which is a homogeneous production function, the sum of its coefficients indicates the returns to scale.

$$RTS = \sum_{i=1}^{j} \beta_j$$

Here, β_i is the production or regression coefficients of variable X_1 to X_j

Consequently, if the returns to scale (RTS) > 1, it indicates increasing returns to scale; if <1, it signifies decreasing returns to scale; and if equal to 1, it represents constant returns to scale.

RESULTS AND DISCUSSION

Groundnut is a major Kharif crop in the state. This section examines the cost and return structure of groundnut cultivation among adopters and non-adopters of the sprinkler irrigation system across three districts.

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Table 3: Cost and Return estimation of groundnut cultivation in Mehsana District. (₹/ha)

Sr. No.	Particular	Adopters		Non- Adopters	
1)	Seed	16971.90	(19.15)	15875.19	(17.82)
2)	Seed Treatment	629.67	(0.71)	575.46	(0.65)
3)	FYM	6613.62	(7.46)	6217.47	(6.98)
4)	Pesticides	4856.00	(5.48)	4517.00	(5.07)
5)	Fertilizers	11721.87	(13.23)	12430.77	(13.95)
a)	Urea	917.40		950.76	
b)	DAP	4357.65		4391.01	
c)	Ammonium Sulphate	1367.76		1309.38	
d)	12:32:16	5079.06		5779.62	
6)	Labour cost	22451.28	(25.34)	23702.28	(26.60)
7)	Machinery cost	20116.08	(22.70)	19961.79	(22.40)
8)	Electricity Cost	3229.90	(3.65)	3787.65	(4.25)
9)	Sub total	86590.32		87067.61	
10)	Interest on Working Capital	2020.44	(2.28)	2031.58	(2.28)
11)	TVC (9+10)	88610.76	(100.00)	89099.18	(100.00)
12)	Gross Returns	166197.92		157678.43	
13)	ROVC (12-11)	77587.16		68579.25	
14)	BC over VC (12/11)	1.88		1.77	
15)	Price (Rs. / Quintal)	6059.30		5995	
16)	Yield (Quintals/ ha)	24.69		23.59	

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Cost and Return analysis

a) Patan District

Table 2 presents the cost and return structure of groundnut cultivation in Patan district. The gross returns per hectare were higher for adopters of sprinkler irrigation (₹1,67,941.96) compared to non-adopters (₹1,63,755.49), primarily due to the higher yield achieved under sprinkler irrigation (23.59 q/ha) versus the flooding method (22.92 q/ha). Additionally, the variable cost was lower for adopters (₹ 91,014.92/ha) than for non-adopters (₹ 94,194.46/ha). This difference can be attributed to lower labour costs in sprinkler irrigation, as no labour is required for irrigation in sprinkler system.

Machinery, seed, and labour were the major cost affecting factors for both adopter and non-adopter farmers. Among adopters, these inputs contributed 23.36%, 19.75%, and 18.54% of the total variable cost, respectively, while for non-adopters, the shares were 22.97%, 20.86%, and 17.79%, respectively. Due to lower costs and higher gross returns, the return over variable cost (ROVC) was higher for adopters at ₹76,900.06/ha, compared to ₹69,561.00/ha for non-adopters. The benefit-cost ratio over variable cost was 1.84 for adopters and 1.74 for non-adopters, indicating greater profitability for those using sprinkler irrigation.

b) Mehsana District

Table 3 outlines the cost and return structure of groundnut cultivators in Mehsana district. Adopters of sprinkler irrigation achieved higher gross returns per hectare (₹1,66,197.92) compared to non-adopters (₹1,57,678.43), primarily due to the increased yield under sprinkler irrigation (24.69 q/ha) compared to the flooding method (23.59 q/ha). Additionally, the variable cost was slightly lower for adopters at ₹88,610.76/ha, compared to ₹89,099.18/ha for non-adopters.

Labor, machinery, and seed were the key cost components for both adopter and non-adopter farmers. Among adopters, these inputs constituted 25.34%, 22.70%, and 19.15% of the total variable cost, respectively, while for non-adopters, the proportions were 26.60%, 22.40%, and 17.82%, respectively. Due to lower costs and higher gross returns, adopters achieved a higher return over variable cost (ROVC) of ₹77,587.16/ha, compared to ₹ 68,579.25/ha for non-adopters. The benefit-cost ratio over variable cost was 1.88 for adopters and 1.77 for non-adopters.

Table 4: Cost and Return estimation of groundnut cultivation in Sabarkantha District (₹/ha)

Sr. No.	Particular	Adopters		Non- Adopters	
1)	Seed	14361.48	(15.04)	13802.70	(13.59)
2)	Seed Treatment	562.95	(0.59)	546.27	(0.54)
3)	FYM	11346.57	(11.88)	11154.75	(10.98)
4)	Pesticides	5264.00	(5.51)	5490.00	(5.40)
5)	Fertilizers	7593.57	(7.95)	8252.43	(8.12)
a)	Urea	771.45		846.51	
b)	DAP	3657.09		4032.39	
c)	Ammonium Sulphate	1463.67		1676.34	
d)	12:32:16	1701.36		1697.19	
6)	Labour cost	27576.21	(28.87)	32634.42	(32.14)
7)	Machinery cost	25236.84	(26.42)	25145.10	(24.76)
8)	Electricity Charges	1389.11	(1.45)	2205.51	(2.17)
9)	Sub total	93343.24		99264.54	
10)	Interest on Working Capital	2177.72	(2.28)	2315.39	(2.28)
11)	TVC (9+10)	95508.45	(100.00)	101546.58	(100.00)
12)	Gross Returns	158660.04		156615.66	
13)	ROVC (12-11)	63151.59		55069.08	
14)	BC over VC (12/11)	1.66		1.54	
15)	Price (Rs. / Quintal)	26.69		26.10	
16)	Yield (Quintals/ ha)	5944.55		6000.6	

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c) Sabarkantha District

Table 4 details the cost and return structure of groundnut cultivators in Sabarkantha district. Sprinkler irrigation adopters achieved higher gross returns per hectare (₹1,74,039.74) compared to non-adopters (₹1,71,652.08), primarily due to their higher yield (26.69 q/ha) versus the flooding method (26.10 q/ha). Additionally, adopters incurred a lower variable cost of ₹95,508.45/ha, whereas non-adopters had a higher variable cost of ₹1,01,546.58/ha.

Labor, machinery, and seed were the major cost components for both adopter and non-adopter farmers. Among adopters, these inputs contributed 28.87%, 26.42%, and 15.04% of the total variable cost, respectively, while for non-adopters, the shares were 32.14%, 24.76%, and 13.59%, respectively. Notably, labour costs in this district were the highest among the three studied. With lower costs and higher gross returns, adopters achieved a higher return over variable cost (ROVC) of ₹78,531.29/ha, compared to ₹70105.50/ha for non-adopters. The benefit-cost ratio over variable cost was 1.82 for adopters and 1.69 for non-adopters.

d) All three districts

Table 5 summarizes the cost and return structure of groundnut cultivators across all three districts. Farmers adopting sprinkler irrigation achieved higher gross returns per hectare (₹ 1,69,393.21) compared to non-adopters (₹1,64,362), primarily due to their higher yield (24.69 q/ha) versus the flooding method (23.59 q/ha). Additionally, adopters had a lower variable cost of ₹91,711.38/ha, whereas non-adopters incurred a higher variable cost of ₹94,946.74/ha.

Labor, machinery, and seed were the key cost components for both adopter and non-adopter farmers. Among adopters, these inputs accounted for 24.72%, 24.21%, and 17.52% of the total variable cost, respectively, while for non-adopters, the shares were 26.68%, 23.43%, and 16.30%. Adopters benefited from reduced costs and increased revenue, resulting in a return over variable cost (ROVC) of ₹77681.83/ha, surpassing the ₹69415.26/ha recorded for non-adopters. The profitability advantage of sprinkler irrigation was further evident in the benefit-cost ratio, which stood at 1.85 for adopters compared to 1.73 for non-adopters.

Ramoliya and Prajapati (2022) has also found that Seed, machinery and labours were highest contributing inputs to the cost. Hiren and Ramchandra (2023) found the benefit-cost ratio in Jamnagar's groundnut farms at 1.53 (marginal), 1.68 (small), and 1.85 (semi-

Table 5: Cost and Return estimation of groundnut cultivation in all three districts (₹/ha)

Sr. No.	Particulars	Adopters		Non- Adopters	
1)	Seed	16070.17	(17.52)	15479.51	(16.30)
2)	Seed Treatment	623.57	(0.68)	593.00	(0.62)
3)	FYM	8141.61	(8.88)	7811.11	(8.23)
4)	Pesticides	4878.67	(5.32)	4923.67	(5.19)
5)	Fertilizers	10268.45	(11.20)	10398.51	(10.95)
a)	Urea	836.12		937.44	
b)	DAP	4163.63		4155.64	
c)	Ammonium Sulphate	1519.28		1457.00	
d)	12:32:16	3749.42		3848.43	
6)	Labour cost	22667.62	(24.72)	25329.51	(26.68)
7)	Machinery cost	22204.89	(24.21)	22246.30	(23.43)
8)	Electricity Charges	4765.26	(5.20)	6000.22	(6.32)
9)	Sub total	89620.24		92781.83	
10)	Interest on Working Capital	2091.14	(2.28)	2164.91	(2.28)
11)	TVC (9+10)	91711.38	(100.00)	94946.74	(100.00)
12)	Gross Returns	164283.28		159358.78	
13)	ROVC (12-11)	72571.90		64412.04	
14)	BC over VC (12/11)	1.79		1.68	
15)	Price (Rs. / Quintal)	24.99		24.20	
16)	Yield (Quintals/ ha)	6175.25		6173.95	

Table 6 : Evaluation of the Payback Period for Sprinkler Investment in Groundnut Cultivation

Sr. No.	District	Cost of Sprinkler (₹/ha)	Incremental Benefit (₹/ha)	Payback Period (in yrs)
1)	Sabarkantha	24863.50	8082.51	3.08
2)	Patan	23925.62	7418.76	3.23
3)	Mehsana	25264.30	8978.33	2.81

medium). According to Narayanmoorthy *et al* (2020), groundnut farmers who adopted drip irrigation earned ₹25,911 more per acre than those using the furrow method, right due to a yield improvement of 10 quintals per acre.

Payback Period

Table 6 presents the number of years required to recover the investment in the sprinkler irrigation system across three districts. The cost of the sprinkler system was calculated after deducting subsidies. Mehsana recorded the shortest payback period of 2.80 years to recover the investment of ₹25,264.30 per hectare in sprinkler irrigation, followed by Sabarkantha, where the payback period was 2.95 years for a cost of ₹24,863.50 per hectare. Patan required the longest duration, with a payback period of 3.26 years to recover ₹23,925.62 per hectare from groundnut cultivation. The incremental benefits from adopting sprinkler irrigation were ₹9007.91, ₹8425.79, and ₹7339.06 per hectare for Mehsana, Sabarkantha, and Patan, respectively.

Power Production Function

The power function or Cobb- Douglas production function was employed to identify the resource use pattern.

a) Adopters of sprinkler irrigation system

Table 7 presents the regression results for adopter categories across all three districts. In Sabarkantha, seed and fertilizer were found significant at the 5% and 1% level of significance, respectively. This indicates that a 1% increase in seed and fertilizer usage would result in a 0.26% and 0.23% rise in gross returns per hectare. The model's R^2 value was 75.6%, with an adjusted R^2 of 70.9%, suggesting that 75.6% of the variability in gross returns could be explained by the

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Table 7: Power Production Function for adopters of sprinkler irrigation system.

Independent Variable	Sabarkantha		Patan		Mehsana	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Constant (β_0)	9.0193**	2.019	8.9457	29.472	4.4526**	1.026
Seed (β_1)	0.2608*	0.051	-0.0321	3.854	0.1129	0.106
Fertilizer (β_2)	0.2303**	0.029	-5.2321	4.925	0.5752**	0.073
Pesticides (β_3)	-0.0049	0.022	0.5812**	0.178	0.0012	0.044
Labour Cost (β_4)	0.053	0.039	4.7621	5.201	-0.0266	0.119
Machinery Cost (β_5)	-0.1184	0.203	0.7234**	0.173	0.0252	0.159
R^2	75.6		80.5		70	
Adjusted R^2	70.9		77.3		64.8	
RTS= $\sum \beta_{1-5}$	0.67		0.80		0.69	
No. of Observations	32		32		35	

****, * indicate significance at 1 and 5 % level of significance, respectively.**

Table 8: Power Production Function for non- adopters of sprinkler irrigation system

Independent Variables	Sabarkantha		Patan		Mehsana	
	Coefficients	Standard Error	Coefficients	Standard Error	Coefficients	Standard Error
Constant (β_0)	8.0472**	1.0341	3.3211	4.939	6.9124**	2.542
Seed (β_1)	0.0459	0.0625	0.2933	0.589	0.0347	0.098
Fertilizer (β_2)	0.0935*	0.037	0.0786	0.124	0.3894**	0.068
Pesticides (β_3)	0.0005	0.0275	-0.1263	0.1	-0.0523	0.087
Labour Cost (β_4)	0.0435	0.0476	0.1559	0.305	0.6853**	0.159
Machinery Cost (β_5)	0.2784*	0.0571	0.9947*	0.427	-0.4231	0.451
R^2	57.5		51.4		77.3	
Adjusted R^2	49.3		44.3		74.6	
RTS= $\sum \beta_{1-5}$	0.46		1.39		0.63	
No. of Observations	41		20		44	

****, * indicate significance at 1 and 5 % level of significance, respectively.**

included variables.

In Patan, pesticide and machinery cost were found significant at 1% level. This indicates that a 1% increase in pesticide and machinery cost would result in a 0.58% and 0.72% rise in gross returns per hectare. The model's R^2 value was 80.6%, with an adjusted R^2 of 77.3%, suggesting that 80.6% of the variability in gross returns (dependent variable) could be explained by the independent variables.

In Mehsana, fertilizer was found significant input at 1% level. This indicates that a 1% increase in fertilizer levels would result in a 0.57 % increase in gross returns per hectare. The observed R^2 value was 70%, with an adjusted R^2 of 64.8%, suggesting that 70 % of the variability in gross returns could be explained by the included variables.

Regression analysis showed returns to scale of 0.67 in Sabarkantha, 0.80 in Patan, and 0.69 in Mehsana, implying that a 1% increase in all the inputs included in model will raise gross returns by 0.67%, 0.80%, and 0.69%, respectively.

b) Non-adopters of sprinkler irrigation system

Table 8 presents the regression results for non-adopters of the sprinkler irrigation system. In Sabarkantha, machinery and fertilizer were found significant at 5% level of significance, indicating that a 1% increase in their usage would result in 0.28% and 0.09% increase in gross returns per hectare, respectively. The model exhibited an R^2 value of 57.5% and an adjusted R^2 of 49.3%, suggesting that the included variables explained 57.5% of the variation in gross returns.

In Patan, machinery was found significant at the 5% level, indicating that a 1% increase in machinery usage would result in 0.99% increase in gross returns per hectare. The observed R^2 value of model was 51.4% and an adjusted R^2 of 44.3%, suggesting that the included variables explained 51.4% of the variation in gross returns.

In Mehsana, fertilizer and machinery were found significant at 1% level, indicating that a 1% increase in their usage would result in 0.39% and 0.68% increase in gross returns per hectare, respectively. The model shown an R^2 value of 77.3% and an adjusted R^2 of 74.6%, suggesting that the included variables explained 77.3% of the variation in gross returns.

Regression analysis revealed returns to scale of 0.46 in Sabarkantha, 1.39 in Patan, and 0.63 in Mehsana,

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indicating that a 1% rise in all inputs considered in the model would increase gross returns by 0.46%, 1.39%, and 0.63%, respectively. Singh *et al* (2014) and Devi *et al* (2020), through their regression analysis, also identified seed, fertilizer, human labour, and machine labour as key factors influencing groundnut output.

CONCLUSION

The groundnut farmers using sprinkler micro-irrigation earned higher returns than those practicing conventional open flooding method. Yield under sprinkler irrigation was 2–4% higher across the three districts compared to the conventional method. A detailed analysis of the cost composition in groundnut cultivation for adopters and non-adopters revealed that machinery, labour, and seed were the major cost-contributing inputs across all districts. Adopters had lower labour costs than those using the conventional method, as micro-irrigation eliminates the need for labour for irrigation. The payback period was shorter than the warranty provided by suppliers for sprinkler irrigation equipment across all three districts, highlighting its profitability as an investment. Regression analysis of groundnut farmers revealed that for sprinkler irrigation adopters, seed, fertilizer, and pesticides significantly impacted returns, whereas for non-adopters, fertilizer, machinery, and labour were the key contributing factors.

The findings of this research suggest that farmers adopting sprinkler irrigation not only enhance their profitability but also improve the efficiency of scarce resources like water. In regions where livestock farming has thrived, there is a need to transition towards technologies that can increase the marginal productivity of water, electricity, and farm inputs. Policymakers and state governments should remain committed to initiatives such as "More Crop per Drop," ensuring that awareness about the benefits of these schemes, along with the subsidy structure, effectively reaches farmers at the grassroots level.

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