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Cost and returns structure of Banana production: An empirical analysis of Satara district, Maharashtra

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Abstract

This study investigates the financial expenditure and profitability parameters associated with banana (*Musa spp.*) cultivation across the Satara region in Maharashtra. Field records for the 2024–25 agricultural cycle were gathered from 90 horticultural producers distributed across six settlements within the Phaltan and Man administrative subdivisions, chosen through multi-stage random sampling across small, medium, and large operating tiers. The analytical methodology integrated standard economic valuation frameworks, namely Cost A, Cost B, and Cost C. Among the surveyed holdings, mean operational acreage measured 1.68 hectares, with banana orchards representing 0.38 hectares. Cumulative outlays under total cultivation expenses (Cost C) averaged ₹4,56,220.63 per hectare against a mean productivity output of 651.84 quintals per hectare. Overall gross returns reached ₹8,80,820.02 per hectare, yielding a net profit of ₹4,24,599.39 per hectare over total expenses alongside a Benefit–Cost ratio of 1.93, indicating strong commercial viability across all operational scales.

Keywords: Banana economics, cost of cultivation, expenditure and returns, Satara region

Introduction

Horticultural fruit production is widely recognized as a foundational pillar of the Indian agricultural landscape, offering superior monetary returns per unit area and generating consistent rural employment relative to conventional cereal farming. India retains its standing as the global leader in banana volume, supported by rapid maturation cycles and steady market demand. Within Maharashtra, agricultural hubs such as Jalgaon, Solapur, and Satara achieve high regional productivity through modern farming techniques and efficient micro-irrigation infrastructure. Despite buoyant consumer demand and expanding plantation acreages, cultivators regularly face systemic challenges, including rising input expenses and market price fluctuations. This investigation focuses specifically on evaluating the cost of cultivation and financial returns of banana farming within the Satara district to supply practical data for growers and agricultural planners. Although Tamil Nadu leads the nation by securing the highest shares in both total plantation acreage (12%). Maharashtra accounts for the highest share in overall harvest volume (17.37%). Madhya Pradesh proves to be the most technologically or resource-efficient state, leading the country with an impressive productivity benchmark of 70.73MT/ha. In Maharashtra Jalgaon leads in sheer volume, yield efficiency varies notably across districts. Dhule records the highest productivity rate in the state at an exceptional 88.46 MT/ha, despite holding a modest land share of 4.78% (5.24 thousand ha) and a production share of 4.67% (463.55 thousand MT). Satara also demonstrates high yield efficiency at 61.82 MT/ha, surpassing the state average. In contrast, Nashik registers the lowest productivity among the listed districts at 34.62 MT/ha, producing 306.75 thousand MT (7.10%) across 8.86 thousand hectares (4.77%). Nandurbar maintains a balanced contribution, occupying 8.06% of the land (5.25 thousand ha) with a output yield of 58.05 MT/ha.

Materials and Methods

The research was executed in the Satara district of Maharashtra, focusing purposively on the Phaltan and Man tahsils due to their prominent share of banana cultivation acreage.

A random sampling approach was employed to select three villages from each tahsil, resulting in a total of 90 producers categorized into small (under 0.20 ha), medium (0.20 to 0.40 ha), and large (0.41 ha and above) farm tiers. Primary information for the 2024–25 agricultural season was compiled via personal interviews using structured interview schedules. The methodology utilized standard cost parameters to determine cultivation expenditures:

- **Cost A:** Approximates out-of-pocket expenses incurred in cash and kind, including hired human labor, hired bullock power, seeds/suckers, manures, fertilizers, plant protection charges, machinery charges, irrigation charges, land revenue, interest on working capital, and depreciation/repairs of farm implements.
- **Cost B:** Includes Cost A plus the imputed rental value of owned land and interest on fixed capital.
- **Cost C:** Comprises Cost B plus the imputed value of human family labor, representing the total cost of cultivation.

Results

Cost of Cultivation of Banana

The per-hectare banana production costs for different farm size groups and the overall average are summarized in Table 1. Banana cultivation requires a total per-hectare cost (Cost 'C') of ₹4,56,220.63, yielding an average output of 651.84 quintals and generating a total income of ₹8,80,820.02, which brings the average production cost to ₹699.90 per quintal. Operational paid-out expenses (Cost 'A') comprise 60.98% of this total at ₹2,78,185.40 per hectare, with the largest expenditures going toward planting material suckers at ₹67,910.85, hired human labour at ₹40,860.24, potassium fertilizer at ₹35,941.23, and machine labour at ₹31,864.82, alongside other inputs like organic manures, plant protection, micronutrients, and working capital interest. Fixed and imputed costs (Cost 'B') account for 93.82% of Cost 'C' at ₹4,28,025.17 per hectare, heavily driven by the rental value of land at ₹1,46,653.54 alongside family labour and fixed capital interest.

When evaluated across operational holding classes, total cultivation costs expand progressively from ₹4,35,223.21 per hectare in the small size group to ₹4,64,124.43 in the medium group, and peak at ₹4,69,314.26 in the large size group. Operational costs similarly scale upward with land size, ranging from 57.27% for small farms to 64.29% for large ones. Expenditure on suckers remains the leading

variable input across all categories, while small farms uniquely utilize bullock power and medium-to-large groups lean more heavily on machine power and plant protection. Ultimately, large farms demonstrate clear economies of scale by achieving the highest yield at 690.38 quintals per hectare and the lowest per-quintal production cost of ₹679.79, driven by higher input capitalization and reduced reliance on family labour.

Further detailing the financial structure, the input distribution highlights a heavy reliance on both material investments and manual labour across all categories. Under Cost 'A', minor variable expenses also contribute to the overall expenditure, including organic manures at ₹22,314.44 per hectare, plant protection charges at ₹17,464.95, micronutrients at ₹14,476.33, irrigation charges at ₹13,424.03, and interest on working capital at ₹15,638.82, while nitrogen and phosphorus fertilizers, depreciation, repairs, and land revenue make up the remaining operational costs. Meanwhile, Cost 'B' incorporates the imputed value of family labour at ₹28,195.47 per hectare split between male and female contributions and fixed capital interest, complementing the substantial land rental values. This detailed breakdown illustrates how capital allocation shifts across farm sizes, balancing intensive material usage with labour dynamics to maximize productivity.

Costs, Returns, Gross Income and B:C Ratio from Banana Cultivation

Costs, Returns, Gross Income and B:C Ratio from Banana Cultivation Presented in Table 2. Banana cultivation yields an overall mean gross return of ₹8,80,820.02 per hectare against a total cultivation cost (Cost 'C') of ₹4,56,220.63, resulting in an average net return of ₹4,24,599.39 and a robust aggregate benefit-cost (B:C) ratio of 1.93 (alongside 3.17 over Cost 'A' and 2.06 over Cost 'B'). Across operational holding categories, small-scale farmers generated gross returns of ₹8,71,211.47 per hectare and achieved the highest net profit over Cost 'C' at ₹4,35,988.26 with a B:C ratio of 2.00, while medium-scale farmers recorded gross returns of ₹8,92,218.10 and a net profit of ₹4,28,093.68 (B:C ratio of 1.92). Large-scale farmers realized gross returns of ₹8,79,030.49 and a net profit of ₹4,09,716.24 with a B:C ratio of 1.87, collectively confirming that banana production is economically lucrative and maintains strong capital productivity across all farm sizes.

Table 1: The per-hectare banana production costs for different farm size groups and the overall average (₹)

Sr. No	Group			Small			Medium			Large			Overall		
	Particulars	Qty	Value	Per cent	Qty	Value	Per cent	Qty	Value	Per cent	Qty	Value	Per cent	Value	Per cent
1	Hired Human labour (Man days)														
	a) Male	39.73	15890.41	3.65	47.11	18843.60	4.06	40.11	16043.96	3.42	42.31	16925.99	3.71		
	b) Female	74.32	18578.77	4.27	84.93	21232.23	4.57	127.97	31991.76	6.82	95.74	23934.25	5.25		
2	Bullock power (pair days)	5.65	8476.03	1.95	0.00	0.00	0.00	0.00	0.00	0.00	1.88	2825.34	0.62		
	Machine (hrs)	29.49	22114.73	5.08	46.71	35033.18	7.55	51.26	38446.57	8.19	42.49	31864.82	6.98		
3	Suckers (nos.)	3599.32	69410.96	15.95	3763.41	67550.16	14.55	3841.21	66771.43	14.23	3734.65	67910.85	14.89		
4	Manures (q)	85.45	17089.04	3.93	111.47	22293.84	4.80	137.80	27560.44	5.87	111.57	22314.44	4.89		
5	Fertilizers (kg)														
	N	670.90	9016.88	2.07	560.76	7536.59	1.62	594.62	7991.63	1.70	608.76	8181.70	1.79		
	P	190.03	2962.50	0.68	157.78	2459.82	0.53	207.40	3233.34	0.69	185.07	2885.22	0.63		
	K	784.08	33189.91	7.63	936.49	39641.74	8.54	826.65	34992.02	7.46	849.07	35941.23	7.88		
6	Micronutrients (₹)		7989.73	1.84		13862.18	2.99		21577.09	4.60		14476.33	3.17		

7	Plant protection charges (₹)		13840.07	3.18		18429.38	3.97		20125.38	4.29		17464.95	3.83
8	Irrigation Charges (₹)		12743.10	2.93		16286.05	3.51		11242.92	2.40		13424.03	2.94
9	Incidental charges (₹)		1273.97	0.29		1641.14	0.35		1588.85	0.34		1501.32	0.33
10	Repairs (₹)		948.63	0.22		1019.15	0.22		1021.92	0.22		996.57	0.22
	Working capital (₹)		233524.73	53.66		265829.05	57.28		282587.31	60.21		260647.03	57.13
11	Int.on Working Capital @ 6 % (₹)		14011.48	3.22		15949.74	3.44		16955.24	3.61		15638.82	3.43
12	Depre. on farm implements		1563.42	0.36		1653.25	0.36		2033.38	0.43		1750.02	0.38
13	Land revenue and taxes (₹)		150.00	0.03		148.58	0.03		150.00	0.03		149.53	0.03
	Cost 'A'		249249.63	57.27		283580.63	61.10		301725.93	64.29		278185.40	60.98
14	Rental value of land (₹)		145051.91	33.33		148554.44	32.01		146354.26	31.18		146653.54	32.15
15	Int .on fixed capital @ 10 % (₹)		1666.54	0.38		3302.29	0.71		4589.88	0.98		3186.24	0.70
	Cost 'B'		395968.08	90.98		435437.36	93.82		452670.07	96.45		428025.17	93.82
16	Family labour (mandays)											0.00	
	a.Male	71.92	28767.12	6.61	45.50	18199.05	3.92	30.77	12307.69	2.62	49.39	19757.96	4.33
	b. Female	41.95	10488.01	2.41	17.35	4337.5	2.26	13.02	4336.49	0.92	24.11	8437.51	1.85
	Cost 'C'		435223.21	100.00		464124.43	100.00		469314.26	100.00		456220.63	100.00
	Output (Q.) and income (₹)	602.57	871211.47		662.56	892218.10		690.38	879030.49		651.84	880820.02	
	Per quintal cost		722.28			700.50			679.79			699.90	

Table 2: Per hectare costs, return, gross income & B.C.ratio for banana Growers. (₹)

Sr.no.	Particulars	Unit	Size groups			Overall
			Small	Medium	Large	
1	Total cost					
	i) Cost 'A'	₹	249249.63	283580.63	301725.93	278185.40
	ii) Cost 'B'	₹	395968.08	435437.36	452670.07	428025.17
	iii) Cost 'C'	₹	435223.21	464124.43	469314.26	456220.63
2	Profit at					
	i) Cost 'A'	₹	621961.84	608637.48	577304.56	602634.63
	ii) Cost 'B'	₹	475243.39	456780.74	426360.42	452794.85
	iii) Cost 'C'	₹	435988.26	428093.68	409716.24	424599.39
3	Production	q	602.57	662.56	690.38	651.84
4	Gross income	₹	871211.47	892218.10	879030.49	880820.02
5	B:C ratio					
	i) Cost 'A'		3.50	3.15	2.91	3.17
	ii) Cost 'B'		2.20	2.05	1.94	2.06
	iii) Cost 'C'		2.00	1.92	1.87	1.93

Discussion

The empirical outcomes confirm that banana production in the Satara district operates as a highly remunerative perennial commercial venture, corresponding closely with prior economic analyses by Deshmukh and Pawar (2017) ^[1] and Rede *et al.* (2021) ^[2]. The robust Benefit–Cost ratio (1.93) highlights the financial feasibility of adopting modern horticulture, even when factoring in substantial upfront outlays for planting suckers and drip irrigation networks.

Conclusion

Banana farming across the Satara district is an economically viable and highly profitable activity, generating substantial net returns across all farm size classes. The cost structure analysis indicates that while initial capital outlays and variable inputs like suckers are high, the high fruit yield and gross returns comfortably outweigh total cultivation expenses (Cost C).

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