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Comparative economics of manual and mechanical sowing in turmeric cultivation

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Abstract

Turmeric, the golden spice is an important commercial crop of India and its usage dates back to Vedic culture. India is a predominant player in the global turmeric market producing over three quarters of the world's supply. Karnataka is the country's third largest producer of turmeric. The Belgaum district is a leading turmeric producer in the state, where the turmeric cultivation is undertaken as an economically viable enterprise from decades, but the higher cost of cultivation of this crop is leading to a potential reduction in the profit. In recent days, a shift from conventional manual sowing to mechanical sowing of rhizome has been observed in study area. The comparative economics analysis of both the methods of sowing revealed that, the mechanical sowing reduces the dependency on the human labour by 20 per cent, brings down the cost by 4 per cent compared to manual sowing. Further, an enhancement 6 per cent in the yield followed by 6.7 per cent rise in gross returns leading to 36 per cent increment in the net returns was recorded over manual sowing. Hence, the study concluded that the machine sowing is economically viable over manual sowing and the technology needs to be popularised through various institutional approaches.

Keywords: Turmeric, mechanical sowing, net returns, labour saving, profitability

Introduction

India is acclaimed as the "spice bowl of the world" for its production of varieties of superior quality spices. Among the spices, Turmeric is the most imperative and ancient spice crops found in major part of India. It has a very good commercial value as a spice, oils and oleoresin. The botanical name of turmeric is *Curcuma longa* (Linn.) belongs to family Zingiberaceae (Prasath *et al.*, 2024) [1]. Turmeric, often referred to as "Indian saffron," is widely used across all segments of society in the preparation of flavourful curried dishes. It not only imparts its distinctive taste but also enhances the overall flavour, making dishes more enjoyable and healthier. India is the leading producer, consumer and exporter of turmeric in the world. It occupies about 7.77 per cent of the area under spices and condiments in India (Agricultural Market Intelligence Centre, PJTSAU) [2]. In 2022-23, India produced 11.61 lakh tonnes of turmeric over an area of 3.24 lakh hectares. This constitutes more than 75 per cent of the world's turmeric production. Karnataka is the third largest producer of turmeric in the country after Telangana and Maharashtra with an area of 21,496 ha and with production of 1,30,928 tonnes in 2020-21.

Belagavi, Chamarajanagar, Bagalkot, Mysuru and Bidar districts are the leading producers of turmeric in the state. Despite the financial rewards of novel technologies in turmeric cultivation, many farmers still rely on traditional methods such as manual sowing method that are labour-intensive, time consuming, and physically exhausting compared to the new mechanical sowing method. However, no comprehensive studies have been conducted to compare the profitability and technical feasibility of different sowing methods. To address this gap, the current study attempts undertake a comparative economic analysis of turmeric cultivation with reference to the conventional manual sowing and modern mechanical sowing techniques in the study area.

Methodology

The present study was carried out in the Belgaum district of Karnataka, The district is a forerunner in turmeric production (46,475 tonnes) in the state with an area of around 6885 ha. and an average productivity of around 6.75 tonnes per ha. The study adopted multistage purposive sampling technique to select and elicit the required data from the sample respondents. Considering the area occupied by turmeric crop; Raibag, Mudalagi and Gokak taluks were purposively selected in the first stage. Further, to elicit the required data, a total of 60 turmeric cultivating farmers, including 30 farmers practicing conventional manual sowing and 30 farmers adopting the advanced mechanical sowing were personally interviewed with the aid of well-structured and pre tested questionnaire in the month of February 2024. Additionally, a necessary secondary data

was compiled from records of developmental departments and other published sources.

Descriptive analysis and tabular presentation techniques were used to analyse the labour utilization pattern, estimate the cost of cultivation and returns from turmeric farming. The results were compared and presented using appropriate averages, ratios and percentages, following standard cost concepts to draw meaningful conclusions.

Results and Discussion

Comparative labour utilization pattern in Turmeric cultivation

Labour is the prime component of cost in turmeric cultivation and the comparative analysis of the labour utilisation pattern in turmeric cultivation by manual and mechanical sowing methods revealed that (Table:1) the manual sowing accounted for about of 121.31 man days of human labour, comprising 47.43 man-days of male labour, 73.88 man days of female labour, along with 6.88 hours of bullock labour and 14.77 hours of machine labour, for cultivation of one acre of turmeric. Where as in case of mechanical sowing, there was reduction in the human labour utilization by nearly 24 per cent (92.73 man days) with only 34.40 man-days of male labours, 58.27 man-days of female labours. However, a marginal increase (4.39 hrs) in the engagement of machine labour was recorded in the mechanical sowing.

The amount of labour engaged in sowing of turmeric rhizomes is substantially lower (3.42 man days) in mechanical sowing contrary to manual sowing (14.22 man days). Hence the dependency of the labour during the sowing period can be brought down by 76 per cent through the adoption of mechanical sowing, leading to timely sowing of the crop, which is the most curtail operation in turmeric. Since in either case the hired labours were the main source of labour supply (70%), the reduction in the total labour utilization by 20 per cent in mechanical sowing will significantly pull down the cost. These findings align with Ashwini *et al* (2022) [3].

Table 1: Comparative labour utilization pattern in turmeric cultivation (Per Ac.)

Sl. No.	Type of operations	Manual Sowing					Mechanical Sowing				
		Total men	Total women	Total human labour	Bullock labour (hrs)	Machine labour (hrs)	Total men	Total women	Total human labour	Bullock labour (hrs)	Machine labour (hrs)
1	Land preparation	2.26	0	2.26	2.12	7.38	1.82	0	1.82	1.39	6.78
2	FYM/compost (transportation & application)	3.43	0.89	4.32	1.83	0.58	3.63	0	3.63	0.84	0.59
3	Planting & gap filling	4.18	10.04	14.22	0	0	0.88	2.52	3.4	0	4.28
4	Fertilizers application	5.41	0.56	5.97	0	0	3.59	1.57	5.16	0	0
5	Weeding	4.87	35.12	39.99	0	0	4.65	34.38	39.03	0	0
6	Intercultural operation/Earthing up	2.46	1.89	4.35	1.37	3.65	1.53	0.59	2.12	0.42	1.67
7	PPC spraying	6.01	0	6.01	0	0	4.14	0	4.14	0	0
8	Irrigation	3.85	0	3.85	0	0	2.35	0	2.35	0	0
9	Harvesting	8.26	20.77	29.03	0	0.81	5.46	17.35	22.81	0	2.1
10	Primary Processing	1.58	2.53	4.11	0.94	0.46	2.28	0.48	2.76	1.9	1.42
11	Transportation	5.12	2.08	7.2	0.62	1.89	4.13	1.38	5.51	0	2.32
	Total	47.43	73.88	121.31	6.88	14.77	34.46	58.27	92.73	4.55	19.16

Comparative cost of Turmeric cultivation

The comparative analysis of cost and profitability of turmeric cultivation as depicted in the table 2 confirms that, the human labour accounts for the major share in the total cost of turmeric cultivation (28.58 and 25.77 per cent respectively) in both the methods of sowing. However, the decrease in the payments on human labour by Rs. 4975 was recorded in mechanical sowing. The table revealed that turmeric is labour intensive crop which requires semi-skilled labours. However, to some extent labours requirement can be reduced by adopting the modern mechanical sowing method of turmeric, these findings are consistent with results of Singh *et al.*, (2024) [4]. Further, a marginal decrease of Rs. 2707 was also recorded in expenditure on rhizome in mechanical sowing method. However, with respect to expenditure on other major inputs *viz.* chemical fertilizers, plant protection chemicals, seed treatment *etc.* no substantial differences have been observed.

The total variable expenditure in case of mechanical sowing method was relatively lower by Rs. 5907 compared to manual sowing. Since the total fixed cost and marketing expenses are alike in both the methods, the per acre cost of turmeric cultivation in conventional manual sowing method was estimated to be Rs. 1,88,693. When compared with the mechanical sowing (Rs.182641) the cost was inflated by Rs. 6052. Parallel findings were also quoted by Kiruthika *et al.*, (2023) [5]., and Renuka *et al.*, (2024) [6]. The examination of the data unveiled the fact that, the modern machine sowing method brings down the total cost of turmeric cultivation by 4 per cent compared to the conventional manual sowing.

Table 2: Comparative cost of turmeric cultivation (Rs. Per Ac.)

Sl. No.	Particulars	Manual Sowing			Mechanical Sowing		
		Qty	Amt. RS	% to TC	Qty	Amt. RS	% to TC
A	Variable cost						
1	Seed Rhizomes	11.28	37976.04	20.13	10.19	35268.91	19.31
2	FYM	8.14	10310.61	5.46	8.52	11011.33	6.03
3	Labour			0.00			

a	Women labour (human days)	73.88	17,631	9.34	58.27	14,133	7.74
b	Men labour (human days)	47.43	16,091	8.53	34.46	12,011	6.58
c	Bullock	6.88	2,628	1.39	4.55	1,811	0.99
d	Machine	14.77	15,683	8.31	19.16	19,103	10.46
	Total labour		52,033	27.58		47,058	25.77
4	Seed Treatment		650	0.34		780	0.43
5	Fertilizers						
a	Fertilizers (Soil Application)		9372.41	4.97		9828.23	5.38
b	Fertilizers+ Micronutrients (Fertigation /Drenching)		3386.66	1.79		3410.28	1.87
	Total fertilizer		12,759	6.76		13,239	7.25
6	Plant Protection Chemicals						
a	Herbicides		962.66	0.51		1023.28	0.56
b	Insecticides and Pesticides		2830.28	1.50		3136.25	1.72
	Total PPC		3792.94	2.01		4159.53	2.28
7	Primary Processing		9120.6	4.83		9876.28	5.41
8	Miscellaneous		248	0.13		248	0.14
9	Interest on working capital @ 7%		13,683	7.25		13,027	7.13
I	Total Variable cost		1,40,574	74.50		1,34,667	73.73
B	Fixed cost						
10	Irrigation (Drip)		8,523	4.52		8,523	4.67
11	Depreciation of farm assets		685	0.36		728	0.40
12	Land revenue		25	0.01		25	0.01
13	Rental value of land		15,000	7.95		15,000	8.21
14	Interest on fixed capital @ 12		2,908	1.54		2,913	1.60
II	Total fixed cost		27,141	14.38		27,189	14.89
C	Marketing Cost						
1	Packing		651	0.34		698	0.38
2	Transportation	94.75	3,049	1.62	96.26	3,298	1.81
3	Miscellaneous		124	0.07		185	0.10
III	Total Marketing cost		3,824	2.03		4,181	2.29
IV	Managerial cost		17153.90	9.09		16603.70	9.09
V	Total cost (I+II+III+IV)		1,88,693	100.00		1,82,641	100.00

Comparative Returns from turmeric cultivation

The sample respondents who have adopted the manual sowing method have realised an average yield of 27.72 qt of dry rhizome and 1.56qt of mother rhizome. However, the farmers employing the mechanical sowing method have harvested 29.37 qt of dry rhizome, 1.68 qt of mother rhizome. The comparative examination of the yield and returns (Table 3) revealed that, there was an enhancement in the turmeric yield the of by 1.65 qt and a marginal rise in yield of mother rhizome also (by product) in mechanical sowing. This enhancement in the yield is primarily attributed by the right time of sowing which is very crucial in turmeric cultivation and has a direct impact on the yield. The mechanical sowing requires 76 per cent less labour and lesser time to complete the sowing operation compared to manual sowing. Hence the farmer adopting mechanical sowing could complete the operation at the right time (i.e between second fortnight of May to first fortnight of June) which was impossible for the farmers adopting manual sowing due to the labour scarcity during the peak sowing period.

Owing to the enhanced yield farmers adopting mechanical sowing have realised addition gross revenue of Rs. 16816 compared to the manual sowing. Further the net earnings over the total and variable cost were also increased by Rs.22868 and Rs.22723 respectively, leading to the enhanced earnings over rupee of expenditure of 1.47 on total cost and 1.98 on variable cost compared to the manual sowing method (1.33 and 1.79 respectively).

Thus, in spite of huge variable costs, turmeric cultivation was found to be profitable venture in the study area with an encouraging return. Which can be further increased by adopting efficient farm management practices and employing simple and low-cost technologies and standard agronomic practices at every stage of crop cultivation. similar results were quoted in the studies of Navyashree *et al*., (2024) [7].

Table 3: Comparative returns from turmeric cultivation

Sl. No.	Particulars	Manual Sowing	Mechanical Sowing
1	Total cost of cultivation (Rs.)	1,88,693	1,82,641
2	Yield		
	Main Product (qt)	27.72 (Rs. 8433.33/qt)	29.37 (Rs. 8481.21/qt)
	By Product (qt)	1.56 (Rs. 11003/qt)	1.68 (Rs.11107/qt)
5	Gross returns (Rs.)	250936.59	267752.90
6	Net returns over total cost (Rs.)	62244	85112
7	Net returns over variable cost (Rs.)	1,10,363	1,33,086
8	Returns per rupee of expenditure over total cost	1.33	1.47
9	Returns per rupee of expenditure over variable cost	1.79	1.98

Conclusion

In Karnataka, turmeric is grown in an area of 21,496 hectares, with a production of approximately 1,30,928 tonnes. The Belgaum district is a leading producer of turmeric in the state, where the turmeric cultivation is practiced as an economically viable enterprise from many years. Despite the potential benefits, many turmeric growers in the study area still continue to rely on traditional cultivation methods and practices, which may limit crop productivity. Therefore, it is crucial to educate and encourage the adoption of modern technologies among turmeric growers. The change from conventional sowing to modern mechanical sowing, has resulted in higher production and better returns, by reducing the dependency on human laboured during sowing by 76 per cent and 20 per cent reduced labour utilization in the crop cultivation. Leading to the reduction in the total cost of cultivation by 4 per cent and enhancement in the yield by 6 per cent, resulting in 6.7 per cent increment in gross returns, and 36 per cent increase over the net returns compared to the conventional manual sowing. This indicates that adopting simple technologies like mechanical sowing, the enterprise can become is more economically viable and profitable in the study area. Hence, this technology needs to be popularised among turmeric growers through various institutional approaches.

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