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RESEARCH ARTICLE

Economics of production and marketing of tomato and cabbage in the Ukhrul district of Manipur

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Abstract

The marketing effectiveness of tomato and cabbage in the Ukhrul District of Manipur was evaluated using Acharya's modified marketing efficiency approach, with a focus on identifying the key factors influencing marketing efficiency. The economic viability of tomato and cabbage production in the state was also analyzed. The per quintal production costs of tomatoes and cabbage were found to be Rs. 219.36 and Rs. 249.31 respectively, with benefit-cost ratios of 5.76 and 2.30 respectively. Due to the perishable nature of tomatoes and cabbage, combined with limited processing and storage infrastructure, insufficient knowledge among stakeholders and the presence of numerous intermediaries, significant price fluctuations were observed, which negatively impacted both the farmers and consumers. Most tomatoes were sold through Channel 1 (Producer-Retailer-Consumer), while cabbage was mainly marketed via Channel 3 (Producer-Wholesaler-Retailer-Consumer). Marketing costs and margins varied with the length of the distribution channel; more extended channels led to higher costs and wider price spreads. As the number of intermediaries increased, both the consumer price and marketing margin rose, reducing overall marketing efficiency. Factors such as transportation, market price, marketing margin and volume significantly influenced efficiency. The highest efficiency was found in the direct channel from farmers to retailers to consumers. Developing a dedicated farmers' market model with essential infrastructure, such as storage, weighing systems, water, electricity and shelter, could streamline the supply chain, reduce costs and improve overall market performance by minimizing intermediary roles.

Keywords: marketing channels; marketing efficiency; marketing of vegetable; price spread

Introduction

Vegetables serve as essential sources of carbohydrates, proteins, vitamins and minerals, making them a cornerstone of balanced diets, especially for India's largely vegetarian population. Beyond their nutritional benefits, vegetable crops have the potential to yield nearly five times more biomass per unit area than cereal crops making them a vital component in addressing the nation's food security needs. This sector also plays a crucial role in enhancing farm income through increased productivity, job creation and export opportunities (1, 2). Due to its diverse and favorable agro-climatic zones, India holds the position of the world's second-largest vegetable producer, just after China (3). In recent years, the country has experienced notable growth in vegetable output, rising from 156.33 mT in 2011-12 to 200.45 mT in 2020-21 (4). Despite these gains, the handling and distribution of perishable crops, such as vegetables, remain a significant challenge, limiting farmers' ability to achieve fair value. Since vegetables go through several stages before reaching consumers, the involvement of efficient marketing systems is crucial. Streamlined marketing can stimulate agricultural growth at the regional or state level through ripple effects (5). To reduce post-harvest losses and ensure better price realization, a well-structured marketing network is necessary. Likewise, a robust input supply chain, particularly for high-quality seeds, fertilizers and plant protection products, can help minimize production costs, given the high dependency on external inputs in vegetable farming (6). Market inefficiencies, including inconsistent supply patterns, often result in sharp price fluctuations. As agriculture remains the backbone of the Indian economy, its development significantly influences other sectors and plays a vital role in alleviating poverty and unemployment (7).

Manipur's diverse climate, ranging from subtropical to temperate, combined with its fertile soil, provides favourable conditions for growing a wide variety of vegetable crops, including off-season varieties. The state produced 339.87 metric tonnes of vegetables from an area of 32.9 thousand hectares in 2020-21, which accounted for only 0.17 % and 0.30 % of the national figures, respectively (4). The area under vegetables recorded an increase of 12.07 thousand hectares over the period 2011-12 to 2020-21. Cabbage

accounts for the largest cultivated area and highest production among vegetable crops in the state, covering 5.72 thousand hectares and yielding 57.63 thousand metric tonnes. In comparison, tomato is grown on 2.59 thousand hectares with a production of 26.32 thousand metric tonnes (4). However, the state's agricultural sector is dominated by a large number of small and marginal farmers, with generally low productivity and minimal investment in farming activities. In light of these conditions, the current study focuses on examining the marketing systems of two major vegetable crops in Manipur *viz*., cabbage and tomato, which occupy the most significant area under vegetable cultivation.

Materials and Methods

The present study was conducted in Ukhrul District, Manipur, Northeast India, during 2022. Three villages from this district, where tomato and cabbage are grown on a large scale were selected. 120 farm households growing tomato and another 120 farm households growing cabbage were selected randomly. Data were collected from the farmers and market intermediaries through personal interviews conducted using a pre-tested interview schedule.

Cost of production

To estimate costs, the average expenditure on machine power, labor, fertilizers, manure, seed, pesticides, irrigation and fencing was calculated. These costs, along with the interest on working capital (12 % for four months), formed the total variable cost. The total cost of production includes the total variable, the rental value of the land and the transportation cost of bringing the produce from the farm to the home. The gross return is calculated by taking Rs. 1322 and Rs. 714.17 as the average selling prices per quintal for tomatoes and cabbage, respectively.

$$\text{Return over variable cost} = \text{Gross return} - \text{Total variable cost} \quad \text{(Eqn. 1)}$$

$$\text{Net return} = \text{Gross return} - \text{Total variable cost} \quad \text{(Eqn. 2)}$$

$$\text{Benefit cost ratio (over variable cost)} = \frac{\text{Gross return}}{\text{Total variable cost}} \quad \text{(Eqn. 3)}$$

$$\text{Benefit cost ratio (over total cost)} = \frac{\text{Gross return}}{\text{Total cost}} \quad \text{(Eqn. 4)}$$

Marketing efficiency

Marketing efficiency is calculated using Acharya's Modified Marketing Efficiency using Eqn. 5 (8). Higher the ratio, higher is the marketing efficiency and vice-versa.

$$\text{Modified Marketing Efficiency (MME)} = \frac{\text{Net price received by the farmers}}{(\text{Marketing cost} + \text{Marketing margin})} \quad \text{(Eqn. 5)}$$

Factors affecting marketing efficiency

$Y = f(x_1 \ldots x_n)$ (Eqn. 6)

Where,

y = Marketing efficiency (%)

x_1 = Marketing cost (Rs.)

x_2 = Marketing margin (Rs.)

x_3 = Transport cost (Rs.)

x_4 = Open market price (Rs.)

x_5 = Labour wages (Rs.)

x_6 = Controlling middlemen (put '1', if middlemen are controlled & '0' if not)

x_7 = volume of produce handled (kg)

x_8 = presence of cold storage facilities (put '1', if present & '0' if not present)

x_9 = length of the market channel (No. of market intermediaries)

x_{10} = Existence of competition in selling

x_{11} = nature of produce (put '1', if semi-perishable and '0' if perishable)

Price spread

Price spread refers to the gap between the amount a consumer pays and the amount a producer receives. An inverse correlation exists between the farmer's net earnings and the length of the marketing chain, meaning that as the marketing channel becomes longer, the producer's share of the final price tends to decrease (9). The price spread was calculated using the following equations (Eqn. 7 and 8).

$$\text{Net price received by the farmers} = \text{Gross price received} - \text{Cost incurred on marketing} \quad \text{(Eqn. 7)}$$

$$\text{Price spread} = \text{Price paid by consumers} - \text{Net price received by the farmers} \quad \text{(Eqn. 8)}$$

$$\text{Producer's share in consumer's rupee} = \frac{\text{Net price received by the farmers}}{\text{Price paid by consumer}} \times 100 \quad \text{(Eqn. 9)}$$

Results and Discussion

Economics of tomato and cabbage production

The cost estimates and returns from tomato and cabbage production have been presented in Table 1. The cost data is prepared taking one hectare as the basis for calculation. The total variable cost comprises the costs of machine power, human labour, chemical fertilizers, farmyard manure, seeds, plant protection chemicals, irrigation, fencing and interest on working capital (12 % for four months). The total cost of production includes the total variable cost, the rental value of the land and the transportation cost of bringing the produce from the farm to the market.

The average total cost of tomato and cabbage production per hectare was observed to be Rs. 71906.72 and Rs. 86056.80 respectively. On average, the rental value of land accounted for the highest share (22.04 %) in the total cost of tomatoes (Table 1). The cost of human labour, fertilizers, FYM, machine power and seed were the other major items, which accounted for 21.72 %, 16.97 %, 14.15 % and 12.07 % of the total cost, respectively. Plant protection

Table 1. Costs and returns from the cultivation of tomato and cabbage on sample farm (Rs. per hectare)

Particulars	Tomato	Cabbage
Machine labour	10172.84 (14.15 %)	4132.22 (4.80 %)
Human labour	15614.81 (21.72 %)	26111.03 (30.34 %)
Fertilizers & FYM	12203.73 (16.97 %)	6335.07 (7.36 %)
Seed	8675.56 (12.07 %)	3411.23 (3.96 %)
Pesticides/Insecticides	3124.94 (4.35 %)	1937.08 (2.25 %)
Irrigation	4108.64 (5.71 %)	1742.73 (2.03 %)
Fencing	0.00 (0 %)	317.64 (0.37 %)
Interest on working capital	2156.02 (3.00 %)	1759.48 (2.04 %)
Total variable cost	56056.54 (77.96 %)	45746.48 (53.16 %)
Rental value of land	15850.17 (22.04 %)	15200 (17.66 %)
Transportation	0.00 (0 %)	25110.31 (29.18 %)
Total cost	71906.72 (100 %)	86056.80 (100 %)
Production (quintals)	313.41	277.09
Gross return	414333.27	197889.74
Return over variable cost	358276.73	152143.26
Net return	342426.56	111832.95
Benefit cost ratio (over variable cost)	7.39	4.33
Benefit cost ratio (over total cost)	5.76	2.30
Cost of Production (Rs./q)	219.36	249.31

Figures in the parentheses indicate percentages to the total cultivation cost

chemicals, irrigation charges and interest on working capital collectively accounted for 13.06 % of the total cost.

It can be seen from the table that for cabbage, human labour, on average, accounted for the highest share (30.34 %) in the total cost. A similar result was reported, where human labour was found to be the major cost component in the cultivation of vegetables in Manipur (10). The transportation cost and the rental value of land were the other major items, which accounted for 29.18 % and 17.66 % of the total cost, respectively. Machine labour, fertilizers, FYM, seed, plant protection chemicals, irrigation charges, fencing and interest on working capital, together, accounted for 22.82 % of the total cost.

The table also revealed that the per-hectare production of tomatoes and cabbage was 313.41 quintals and 277.09 quintals, respectively. The gross return is computed by taking Rs. 1322 and Rs. 714.17 as the average selling prices per quintal for tomatoes and cabbage, respectively. The gross returns were calculated to be Rs. 414333.27 and Rs. 197889.74 for tomatoes and cabbage, respectively. The net returns from tomato and cabbage production were Rs. 342426.56 and Rs. 111832.95. The benefit-cost ratio (total cost) was 5.76 and 2.30 for tomatoes and cabbage, respectively. The per quintal cost of production of tomato and cabbage was Rs. 219.36 and Rs. 249.31 respectively.

Marketing channels

Marketing channels refer to the pathways through which agricultural and horticultural produce is transferred from farmers to end consumers. The length and structure of these channels can vary based on the type of commodity, consumer preferences and the level of regional production specialization. Fig. 1-2 illustrate the main marketing channels for tomato and cabbage in Manipur, respectively. As shown in Fig. 1, the majority of tomato produce (62.20 %) was marketed through Channel 1, followed by 28.74 % through Channel 2, while Channel 3 accounted for the smallest share at 9.07 %. In the case of cabbage (Fig. 2), the highest proportion moved through Channel 3 (46.82 %), followed by Channel 4 (31.40 %), Channel 2 (13.31 %) and the least through Channel 1 (8.48 %).

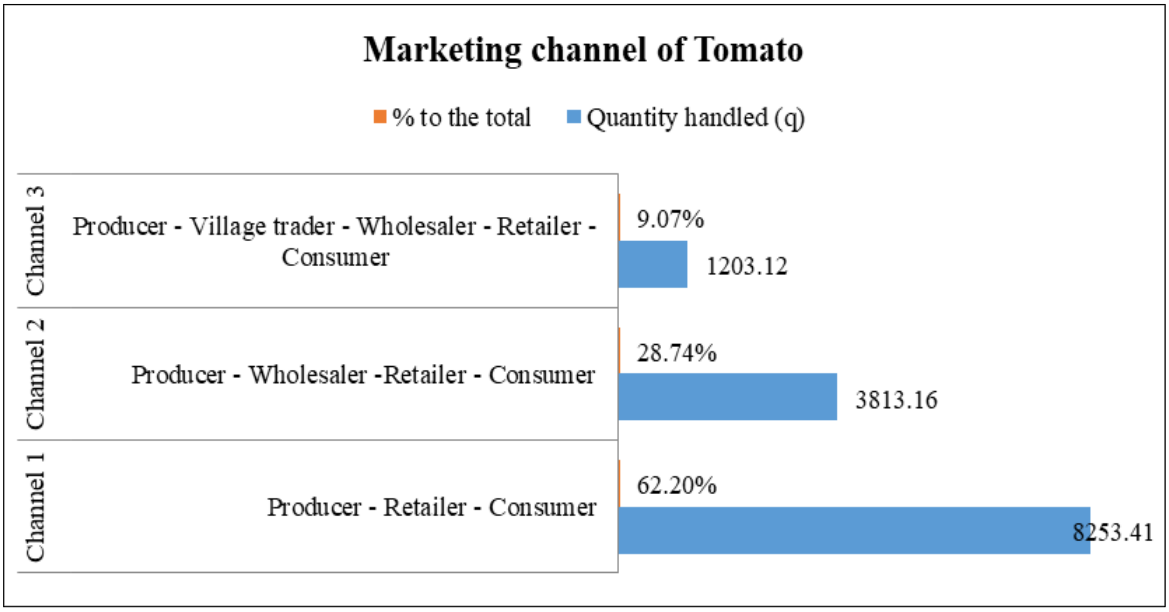

Fig. 1. Marketing channel of tomato.

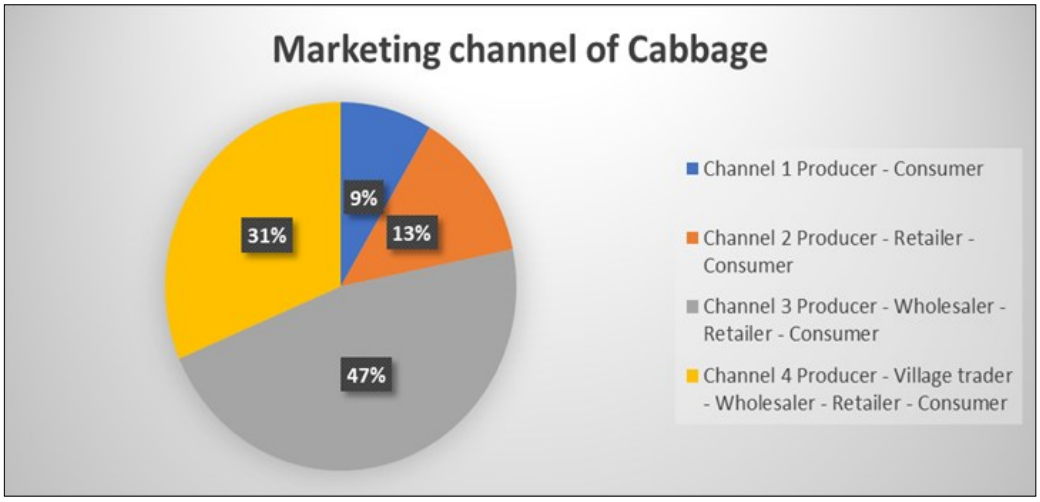

Fig. 2. Marketing channel of cabbage.

Marketing cost and margin

Table 2 presents the marketing costs and margins for tomatoes across different channels. These costs and margins vary significantly depending on the marketing route, with a direct correlation between the length of the channel and the associated expenses. More extended channels incur higher costs and margins. This is due to the involvement of multiple stages such as handling, storage, transportation and intermediary commissions, all of which contribute to the total marketing expenditure. Channel 3 (Producer → Village Trader → Wholesaler → Retailer → Consumer), being the most extended route, recorded the highest marketing cost and margin per quintal, at Rs. 437.10 and Rs. 1328.97 respectively (Table 2).

In contrast, Channel 1 (Producer → Retailer → Consumer), the shortest route, involved the lowest costs and margins, at Rs. 191.45 and Rs. 188.47 per quintal respectively. The data also reveal that consumers paid the lowest price for tomatoes, Rs. 2202.75 per quintal when purchasing directly from retailers who sourced from producers (Channel 1) (Table 2). Conversely, the highest price, Rs. 3087.83 per quintal, was observed when the produce passed through three intermediaries *-village trader, wholesaler and retailer* -before reaching the consumer in Channel 3.

Similarly, Table 3 shows the marketing costs and margins for cabbage. Channel 4 (Producer → Village Trader → Wholesaler → Retailer → Consumer), being the longest, showed the highest marketing cost and margin per quintal at Rs. 132.98 and Rs. 421.63 respectively. On the other hand,

Table 2. Marketing cost and marketing margin of tomato (Rs./q)

Item	Channel 1		Channel 2		Channel 3	
	Cost	% Consumer Price	Cost	% Consumer Price	Cost	% Consumer Price
Net price received by farmers	1822.83	82.75	1436.04	51.90	1321.76	42.81
Marketing cost						
Producer	122.41	5.56	131.09	4.74	70.98	2.30
Assembler/trader	-	-	-	-	93.06	3.01
Wholesaler	-	-	196.03	7.08	190.70	6.18
Retailer	69.04	3.13	95.44	3.45	82.36	2.67
Total marketing cost	191.45	8.69	422.56	15.27	437.10	14.16
Marketing margin						
Assembler/trader	-	-	-	-	414.19	13.41
Wholesaler	-	-	386.47	13.97	370.15	11.99
Retailer	188.47	8.56	522.09	18.87	544.62	17.64
Total marketing margin	188.47	8.56	908.56	32.83	1328.97	43.04
Consumer price	2202.75	100	2767.16	100	3087.83	100

Table 3. Marketing cost and marketing margin of cabbage (Rs./q)

Item	Channel 1		Channel 2		Channel 3		Channel 4	
	Cost	% Consumer Price	Cost	% Consumer Price	Cost	% Consumer Price	Cost	% Consumer Price
Net price received by farmers	662.02	94.57	806.35	80.63	753.11	68.43	644.12	53.73
Marketing cost								
Producer	37.98	5.43	58.61	5.86	55.39	5.03	34.48	2.88
Assembler/ trader	-	-	-	-	-	-	57.36	4.78
Wholesaler	-	-	-	-	36.40	3.31	22.43	1.87
Retailer	-	-	24.91	2.49	22.92	2.08	18.71	1.56
Total marketing cost	37.98	5.43	83.52	8.35	114.71	10.42	132.98	11.09
Marketing margin								
Assembler/ trader	-	-	-	-	-	-	114.03	9.51
Wholesaler	-	-	-	-	105.10	9.55	127.57	10.64
Retailer	-	-	110.13	11.01	127.64	11.60	180.03	15.02
Total marketing margin	-	-	110.13	11.01	232.74	21.15	421.63	35.17
Consumer price	700.00	100.00	1000.00	100.00	1100.56	100.00	1198.74	100.00

Channel 1 (Producer → Consumer), the shortest path, had the lowest cost of Rs. 37.98 per quintal. Channel 2 (Producer → Retailer → Consumer), which is slightly longer than Channel 1, showed relatively lower costs and margins, Rs. 83.52 and Rs. 110.13 per quintal, respectively. These findings confirm that both marketing costs and margins increase with the number of intermediaries involved. In other words, as the marketing chain becomes longer, more expenses are incurred at each stage.

Furthermore, consumer prices followed a similar pattern. The lowest price for cabbage, at Rs. 700 per quintal, was recorded when purchased directly from producers (Channel 1), while the highest, at Rs. 1198.74 per quintal, occurred in Channel 4, where three intermediaries were involved (Table 3). This trend indicates that consumer prices increase with the number of intermediaries in the supply chain. A similar observation was made by a previous study (11) conducted in Bishnupur district of Manipur.

Price spread

Tomato and cabbage reached end consumers through a series of intermediaries, beginning with the producers. These intermediaries provided various marketing services, aiming to generate profit in the process. The details of the price spread across different marketing channels for tomatoes and cabbage are presented in Table 4-5, respectively. Price spread refers to the gap between the amount paid by the consumer and the amount received by the farmer for the same quantity of produce. This gap encompasses both the marketing costs and the margins earned by intermediaries, which are crucial in evaluating the efficiency of the marketing structure. For tomatoes, Channel 1 showed the smallest price spread at Rs. 379.92 per quintal, while Channel 3 recorded the largest at Rs. 1766.07 per quintal (Table 4). In the case of cabbage, the lowest spread was observed in Channel 1 at Rs. 37.98 per quintal, followed by Rs. 193.65 in Channel 2, Rs. 347.45 in Channel 3 and the highest at Rs. 554.62 per quintal in Channel 4 (Table 5). Tables 4-5 illustrate that in all the channels for both tomato and cabbage, the price spread exceeded the producer's share of the final consumer price except for cabbage in channel 1. The findings suggest that the perishable nature of vegetables, inadequate access to affordable storage solutions and an unorganized marketing infrastructure in the region have led to higher marketing costs, allowing retailers to capture a disproportionate share of the final price. These results are consistent with previous studies (12-14).

Marketing efficiency

Marketing efficiency for agricultural produce is measured by the producer-farmer's share of the price paid by consumers. The findings were supported by a market analysis efficiency as proposed earlier (8). Marketing efficiency for tomatoes and cabbage was calculated for the identified channels and presented in Table 6-7, respectively. A higher ratio indicates greater marketing efficiency, while a lower ratio reflects reduced efficiency. Among the marketing channels for tomato, Channel 1 exhibited the highest efficiency with a value of 4.80, followed by Channel 2 at 1.08 and the lowest efficiency was recorded in Channel 3 at 0.75 (Table 6). Similarly, for cabbage, Channel 1 showed the greatest efficiency at 17.43, followed by Channel 2 (4.16) and Channel 3 (2.17) and the lowest in Channel 4 at 1.16 (Table 7). These findings suggest that marketing efficiency tends to decline as the number of intermediaries in the channel increases. The observed results align closely with earlier studies that

Table 4. Price spread of tomato (Rs./q)

Particulars	Channel 1	Channel 2	Channel 3
Gross price received by the farmer	1945.24	1567.12	1392.75
Marketing cost incurred	122.41	131.09	70.98
Net price received by the farmer	1822.83	1436.04	1321.76
Village trader's purchase price	-	-	1392.75
Marketing cost incurred	-	-	93.06
Marketing margin	-	-	414.19
Wholesaler's purchase price	-	1567.12	1900.00
Marketing cost incurred	-	196.03	190.70
Marketing margin	-	386.47	370.15
Retailer's purchase price	1945.24	2149.62	2460.85
Marketing cost incurred	69.04	95.44	82.36
Marketing margin	188.47	522.09	544.62
Price paid by consumer	2202.75	2767.16	3087.83
Price spread	379.92	1331.12	1766.07
Producer's share in consumer's Rupee (%)	82.75	51.89	42.79

Table 5. Price spread of cabbage (Rs./q)

Particulars	Channel 1	Channel 2	Channel 3	Channel 4
Gross price received by the farmer	700.00	864.95	808.50	678.61
Marketing cost incurred	37.98	58.61	55.39	34.48
Net price received by the farmer	662.02	806.35	753.11	644.12
Village trader's purchase price	-	-	-	678.61
Marketing cost incurred	-	-	-	57.36
Marketing margin	-	-	-	114.03
Wholesaler's purchase price	-	-	808.50	850
Marketing cost incurred	-	-	36.40	22.43
Marketing margin	-	-	105.10	127.57
Retailer's purchase price	-	864.95	950.00	1000.00
Marketing cost incurred	-	24.91	22.92	18.71
Marketing margin	-	110.13	127.64	180.03
Price paid by consumer	700.00	1000.00	1100.56	1198.74
Price spread	37.98	193.65	347.45	554.62
Producer's share in consumer's rupee	94.57	80.64	68.43	53.73

Table 6. Measurement of marketing efficiency of tomato

Sl.No.	Particulars	Unit	Channel 1	Channel 2	Channel 3
1	Retailer's sale price	Rs./q	2202.75	2767.16	3087.83
2	Total marketing cost	Rs./q	191.45	422.56	437.10
3	Total margins of intermediaries	Rs./q	188.47	908.56	1328.97
4	Net price received by farmers	Rs./q	1822.83	1436.04	1321.76
	Acharya's method (MME) [4/(2+3)]	Ratio	4.80	1.08	0.75

Table 7. Measurement of marketing efficiency of cabbage

Sl.No.	Particulars	Unit	Channel 1	Channel 2	Channel 3	Channel 4
1	Retailer's sale price	Rs./q	700.00	1000.00	1100.56	1198.74
2	Total marketing cost	Rs./q	37.98	83.52	114.71	132.98
3	Total margins of intermediaries	Rs./q	-	110.13	232.74	421.63
4	Net price received by farmers	Rs./q	662.02	806.35	753.11	644.12
	Acharya's method (MME) [4/(2+3)]	Ratio	17.43	4.16	2.17	1.16

analyzed the production and marketing economics of guava and wheat, respectively (15, 16).

Table 8 outlines the factors influencing the marketing efficiency of vegetables in Manipur. The data indicate that 76 % of the variation in marketing efficiency can be attributed to the selected independent variables. The efficiency of marketing for vegetables, specifically tomatoes and cabbage, is significantly influenced by marketing cost, marketing margin, open market price and the volume of produce handled, all at the 1 % significance level. Additionally, transport costs were found to have a statistically significant impact at the 10 % level (Table 8). The findings suggest that marketing efficiency improves when marketing and transport costs, as well as open market prices, decrease and when both the marketing margin and the quantity of produce handled increase. On the other hand, factors such as labor wages and the perishable nature of the produce did not show a statistically significant effect on marketing efficiency.

Conclusions and Recommendations

The average production cost per hectare was Rs. 71906.72 for tomatoes and Rs. 86056.80 for cabbage. Net returns were much higher for tomatoes (Rs. 342426.56) compared to cabbage (Rs. 111832.95). The benefit-cost ratio was 5.76 for tomatoes and 2.30 for cabbage. The cost to produce one quintal was Rs. 219.36 for tomatoes and Rs. 249.31 for cabbage. Most tomatoes were sold through Channel 1 (Producer → Retailer → Consumer), while most cabbage was sold through Channel 3 (Producer → Wholesaler → Retailer → Consumer). Marketing costs and margins increased with the number of intermediaries involved (the longer the channel, the higher the cost and margin). For tomatoes, Channel 3 (the longest: Producer → Village trader → Wholesaler → Retailer → Consumer) had the highest marketing cost (Rs. 437.10/ quintal) and margin (Rs. 1328.97/quintal). For cabbage, Channel 4 (also the longest) had the highest cost (Rs. 132.98/ quintal) and margin (Rs. 421.63/quintal). Consumer prices and price spreads also rose with the increased presence of intermediaries. The smallest price spread for tomatoes was in Channel 1 (Rs. 379.92/quintal) and the highest in Channel 3 (Rs. 1766.07/quintal). For cabbage, the lowest was in Channel 1 (Rs. 37.98/quintal) and the highest in Channel 4 (Rs. 554.62/ quintal). Marketing efficiency decreases as the channel length increases. In Manipur, marketing efficiency is significantly influenced by marketing cost, margin, market price and production volume (at a 1 % level), as well as transport cost (at a 10 % level). Efficiency improves with lower costs, higher margins and increased volume.

Vegetable farmers should receive government-supported training on post-harvest handling, including better methods for grading, packaging, cooling, storing and transporting vegetables. Since tomatoes spoil quickly after harvest, storage facilities should be established near farms, especially to manage surpluses during peak seasons. This will help reduce waste, ensure steady supply and stabilize prices. Incentives and credit should be provided to encourage farmers to grow more horticultural crops. The government should also improve logistics to strengthen the current marketing system. Combining production and marketing efforts can reduce losses. Forming vegetable or producer cooperatives can make marketing more efficient and give

Table 8. Factors affecting marketing efficiency of vegetables (tomato and cabbage) in Manipur

Sl.No.	Factors	Coefficient	Standard error	't' value
1	Constant	14.138***	3.616	3.910
2	Marketing cost	-1.143***	0.001	-4.447
3	Marketing margin	0.765***	0.002	3.572
4	Transport cost	-0.487*	0.002	-1.774
5	Open Market price	-0.868***	0.063	-6.453
6	Labour wages	-0.046	0.024	-0.444
7	Controlling middlemen	-	-	-
8	Volume of produce handled	0.935***	0.001	6.841
9	Presence of cold storage facilities	-	-	-
10	Length of market channel	-	-	-
11	Existence of competition in selling	-	-	-
12	Nature of produce	-0.057	0.153	-1.158
13	R-square		0.760	
14	Adjusted R-square		0.745	
15	No. of observation		120	

(***) Significant at 1 % ; (**) Significant at 5 % ; (*) Significant at 10 %

farmers more control, especially as market conditions evolve. Finally, more research on post-harvest management should be supported.

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Authors' contributions

AR conceptualized the research work and contributed to its design and direction. SB co-conceptualized the study and provided intellectual input during the initial planning phase. TB drafted the manuscript and structured its content. AY contributed to writing the manuscript and organizing the draft. PP analyzed the research data and assisted in interpreting the results. NS performed data analysis and contributed to refining the analytical approach. BP reviewed and edited the final version of the manuscript. HN was responsible for collecting the research data used in the study. All authors read and approved the final version of the manuscript.

Compliance with ethical standards

Conflict of interest: Authors do not have any conflict of interest to declare.

Ethical issues: None

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