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ARTICLES

Marketing Performance of Potato and the Determinants Influencing Farmers' Choice of Marketing Channels in Himachal Pradesh

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ABSTRACT

Agriculture remains the backbone of India's economy, with farmers playing a pivotal role in its sustenance. However, the farmers encounter numerous challenges, including limited market access and insufficient market information, negatively impacting their marketing performance. Therefore, this study aimed to scrutinise the marketing performance and factors influencing farmers' choice of marketing channels for potatoes in Himachal Pradesh. The study gathered primary data through structured questionnaires administered via interviews, targeting a sample of 180 farmers selected through a simple random sampling method. Descriptive statistics and the Acharya approach were employed to analyse the marketing channel choices. The findings revealed that farmers who directly sold their potatoes to consumers demonstrated superior marketing performance compared to those who engaged with market intermediaries like local traders, co-operative societies, and wholesalers. Furthermore, the study identified farm income, farming experience, market distance, and market information as significant determinants of farmers' marketing channel choices. These findings underscore the necessity for policymakers to implement interventions that enhance farmers' marketing skills, facilitate market access, improve negotiation power, and ultimately lead to increased incomes, improved livelihoods, higher-quality produce for consumers, and a more efficient and sustainable food system.

Keywords: Market efficiency, factors, choice, multinomial logit regression

JEL codes: M31, M38, Q13, R38

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INTRODUCTION

Potatoes, scientifically known as *Solanum tuberosum*, are integral to the livelihoods of Himachal Pradesh farmers, playing a vital role in enhancing agricultural sustainability and fostering economic prosperity in the region. Himachal Pradesh's varied agro-climatic zones offer favourable conditions for year-round potato cultivation, establishing it as a staple crop for numerous farmers (Singh et al., 2020). Vegetable cultivation in Himachal Pradesh spans approximately 93.83 thousand hectares, yielding a total production of 1914.61 thousand metric tonnes (MT), out of which the area under potato was found to be 15 thousand hectares with a production of 196.30 thousand MT, respectively. The leading potato-growing districts in terms of cultivated area are Shimla (5700 ha), Mandi (1600 ha), Sirmaur (1500 ha), Lahaul & Spiti (1300 ha), and Kangra (1250 ha). These districts also exhibit the highest potato production figures, with Shimla district leading at 74200 metric tonnes (MT), followed

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by Mandi (20820 MT), Sirmaur (19520 MT), Lahaul & Spiti (16920 MT), and Kangra (16270 MT) (Indiastat, 2023). Potatoes play a dual role in Himachal Pradesh, serving not just as a revenue generator but also as a key contributor to food security, particularly in the challenging terrains of hilly regions (Rana et al., 2019). Their adaptability and strong demand in the local and global markets make them an attractive choice for farmers, ensuring stable income streams (Sharma et al., 2018).

In Himachal Pradesh, potato farmers sell their produce through formal and informal markets. Informal markets, often unorganised and localised like roadside markets, contrast with formal markets that offer organised spaces and improved market access for the farmers. Formal markets tend to provide better pricing opportunities for agricultural produce, benefiting the farmers (Manjunath and Girish, 2016; Singh et al., 2020). As a result, farmers opting for formal markets stand a chance to optimise their profits from potato marketing. Nonetheless, the extent of participation in formal markets varies greatly. The marketing of potatoes encompasses a range of activities, including grading, packaging, transportation, storage, and distribution, all of which are pivotal in maintaining the quality and availability of potatoes in the market (Kumar et al., 2019).

The best marketing channels for agricultural produce are a critical choice influenced by various factors that affect the success and profitability of agricultural commerce. Grasping these determinants is critical for farmers, traders and academics involved in developing agricultural marketing strategies and making decisions (Bendroth et al., 2020).

This study aims to investigate supply chain management and address the compelling question: what factors influence farmers' choices regarding different marketing channels in the specified research area? To explore this inquiry, we employ a systematic survey approach to delineate the supply chain management and agricultural output marketing channels utilized by potato farmers in Himachal Pradesh.

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METHODOLOGY

Study Area

The study was conducted in Himachal Pradesh. The state of Himachal Pradesh is divided into four agro-climatic zones, distinguished by elevations ranging from below 650 to over 2200 meters above mean sea level (amsl). For this study, households were selected from two agro-climatic zones: wet temperate high hills (zone III) and dry temperate high hills (zone IV). Zone III is identified as having the maximum area under vegetable cultivation, according to a report by JICA (2021).

Sampling Procedure

Selection of Farmers

A simple random sampling method was used to choose the final sample of farmers. Initially, a roster of vegetable cultivators was compiled in collaboration with

the Department of Agriculture. Subsequently, 30 farmers were randomly selected from each of the six blocks—Theog, Rampur, Kullu, Pooh, Kaza, and Keylong. Consequently, a total of 180 respondents were randomly chosen for the study.

Selection of Market Intermediaries

The study determined the sample size of market functionaries based on the data acquired from the agricultural produce market committee (APMC) office. Accordingly, two primary markets, Shimla (Dhalli) and Kullu (Bhuntar), were selected. Furthermore, to investigate the various aspects of potato marketing, a total sample size of 40 traders was established by randomly selecting five local traders, five commission agents, five wholesalers, and five retailers from each market.

Analytical Framework for Market Performance and Supply Chain Management

Marketing Costs

The marketing expenses were determined by aggregating the expenditures of each marketing entity involved in the supply chain process of potato produce. The intermediaries' marketing costs comprised costs for packaging materials, fees for loading and unloading, transportation costs, commission charges and taxes (Acharya and Agarwal, 2016). The process of calculating involved assessing the total expenses associated with marketing activities in the following manner:

$$TC_m = C_g + \sum_{i=1}^{H} MC_i$$

Where,

 TC_m = Total cost of marketing, C_g = Cost paid by the grower in the marketing of his produce MC_i = Marketing costs incurred by i-th middleman.

Marketing Margin

Marketing margin analysis entails the comparison of prices across various stages of the marketing chain within a given time frame. It evaluates the proportion of the ultimate selling price that a particular agent in the marketing chain retains, typically presented as a percentage of the final price or the price paid by the end consumer (Thakur et al., 2023a,b; Divyanshu et al., 2022). The marketing margin represents the difference between the price paid to the initial seller, often called the farm-gate price, and the price paid by the final buyer, commonly known as the retail price (Abankwah et al., 2010). To calculate the percentage of marketing margins earned by each intermediary engaged in the marketing of potato produce, the formula provided by Acharya and Agarwal (2016) was utilised:

$$A_{\rm mi} = P_{\rm Ri} - (P_{\rm pi} + C_{\rm mi})$$

Where,

 A_{mi} = Absolute margin of middlemen

 P_{Ri} = Total value of receipts per unit (sale price)

 $Pp_i = Purchase value of goods per unit$

 $C_{mi} = Cost$ incurred on marketing per unit

$$GMM = \frac{Consumers' Price - Producers' Price}{Construction} \times 1$$

$$A = \frac{\text{Consumer's Price}}{\text{Consumer's Price}} \times 100$$

Where, TGMM is the total gross marketing margin. It is useful to introduce the idea of producers' gross margin (GMM_P), which is the portion of the price paid by the consumer that goes to the producer. The producers' margin is calculated as:

$$Producer's share = \frac{Consumer Price - Gross marketing margin}{Consumers'Price} \times 100$$

Where, GMMp = the producer's share in consumer price.

The net marketing margin (NMM) is the percentage of the final price earned by the intermediaries as their net income after their marketing costs are deducted.

The percentage of net income that can be classified as pure profit (i.e., return on capital), depends on the extension to such factors as the intermediaries' own (working capital) costs. The equation tells us that a higher marketing margin diminishes the producer's share and vice versa. It also provides an indication of welfare distribution among production and marketing agents.

$$NMM = \frac{Gross margin - Marketing Cost}{Consumers'Price} \times 100$$

Where, NMM is the net marketing margin

Higher NMM or profit of the marketing intermediaries reflects reduced downward and unfair income distribution, which depresses the market participation of smallholders.

NMM = Net Market Margins.

Price Spread

Price spread refers to the difference between the price paid by the consumer and the price received by the producer. The calculation of the price spread was conducted using the formula endorsed by Acharya (1988).

Producer's Share in Consumer's Rupee

It represents the producer's revenue as a percentage of the retail price (i.e., the price paid by the consumer) (Singh et al., 2020). The calculation of the producer's share in the consumer's rupee has been determined as follows:

$$PS = \frac{PF}{RP} \times 100$$

Where,

PS = Producer's share in consumer's rupee

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PF = Price received by the farmer per unit of output RP = Retail price per unit of output

Marketing Efficiency of the Marketing Channels

In the case of marketing channels, marketing efficiency is concerned with the movement of goods from producer to consumer at the lowest possible cost consistent with the provision of services desired by the consumers. The marketing efficiency of various channels in the study area has been computed by using Acharya's method (Acharya and Agarwal, 2001) as follows:

$$ME = \frac{RP}{MC + MM} - 1$$

Where,

ME = Marketing efficiency RP = Retailer's price MC = Total marketing costs. MM = Total marketing margins

Analytical Framework for Factors Influencing Choice

Factors Influencing Farmers' Choice

The Random Utility Model provides a framework for examining the marketing channels that impact farmers' decisions regarding selling their agricultural produce. Numerous studies, including those conducted by Mtimet and Albisu (2006), Geoffrey et al. (2015), Ma and Abdulai (2016), and Espinosa-Goded et al. (2021), have employed this model in their respective research. The model assumes that farmers select their marketing channels by considering the anticipated value and engaging in a particular channel to maximise a utility function (Greene, 2003; Train, 2009). Essentially, farmers assess the anticipated benefits, expenses, and benefits of each channel and opt for the one offering the greatest overall utility. This utility, denoted as U_{ij} , represents the benefit of selling through a specific channel.

$$U_{i(j=k)} = \beta_{j=k} X_{ij} + e_{ij} \forall j \in \mathbb{N}$$
.... (1)

The farmer's decision regarding which output channel to use is based on utility, representing the difference between the benefits and costs of each channel. While utility cannot be directly observed, the farmer's decision indicates which marketing channel offers the most utility (Greene, 2012). If the expected utility from selling agricultural produce through a particular marketing channel exceeds all other options, the farmer will choose that channel. The probability of selecting a specific option depends on the likelihood that its utility will be higher or at least equal to the utilities of every other alternative in the decision set (Mariel et al., 2022). The farmer will select the j = k market channel for agricultural output if the utility of that channel is greater than the utility of all other channels, as expressed in equation (2).

$$U_{i(j=k)} > U_{i(j\neq k)} \forall k \neq j \forall k \neq j \qquad \dots (2)$$

The random utility associated with the market channel j = k is denoted as U_{ij} , while the index function $\beta_{(j=k)} X_{ij}$ represents the average utility of the producer associated with this choice. The term e_{ij} represents a random error specific to the producer's utility choice, as discussed by Louviere et al. (2000) and Tafesse et al. (2020). Furthermore, based on empirical evidence in the theoretical background section, Figure 1 illustrates the conceptual framework of the dependent variables that influence farmers' choices regarding the channels they select for marketing their potato produces. The determinants of choice fall into four categories: household factors (such as education, farm income and farm experience), sales factors (such as distance to the market, advance payment, financial urgency, delay in sale and storage facility), and source of market information factors (like government sources, and relative friends).



Figure 1: Conceptual Framework for Choice of Marketing Channels

Multinomial Logit Regression Model

The multinomial logistic regression uses maximum likelihood estimation to evaluate the probability of categorical membership.

The Multinomial logit regression model is commonly utilised when there are several alternatives for the variable being explored (Bardhan et al., 2012; Martey et al., 2012; Delong et al., 2019; Asante and Weible, 2020; Goncalves et al., 2022). This technique is suitable for analysing responses that are not ordered and involve more than two options (Chung et al., 2011; Mgale and Yunxian, 2020; Olutumise, 2022).

Formula of MNL

$$P_{ij} = \frac{exp(\beta_j x_i)}{1 + \sum_{j=1}^{4} exp(\beta_j x_i)}$$
 for j = 1,2,3,4

Where, x_i is a different characteristic of the i-th farmer

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 β_j is a vector of regression parameter estimates associated with alternative j, and 4 is the number of the output market channel in the choice set.

The probabilities of the i-th farmer being in the other three categories (j = 2 or 3 or 4) can be estimated as:

$$P_i (j = m \operatorname{I} x_i) = \frac{\exp(\beta_j x_i)}{1 + \sum_{j=2}^4 \exp(\beta_j x_i)} \quad \text{for } m > 1$$

The marginal effects of the individual characteristics on the probabilities can be estimated as follows:

$$\frac{\partial P_j}{\partial x_i} = P_j \left[\beta_j - \sum_{j=0}^4 P_j \beta_j \right] = P_j \left[\beta_j - \bar{\beta} \right]$$

 P_i is the probability of the farmer choosing market channel j, and

 β_i is a vector of regression parameter estimates associated with alternative j

The empirical MNL for factors affecting the farmers choice of output marketing channels is specified as follows:

 $P_{ij} = \ln (P_i/P_1) = \beta_0 \dots \beta_{11}$ are the parameters to be estimated P_{ij} is the probability of output marketing channel j being chosen by farmer i.

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RESULTS AND DISCUSSION

Profile of Potato Growers

Table 1 profiles potato growers categorized as marginal, small, and medium farmers, with an overall for all 180 sample farmers. Marginal farmers, with an average landholding of 0.77 hectares, cultivate 0.14 hectares of potatoes, producing 6.58 quintals per farm and a marketable surplus of 4.46 quintals. On average, small farmers, holding 1.43 hectares, dedicate 0.2 hectares to potatoes, yielding 10.67 quintals per farm and a surplus of 7.54 quintals. Medium farmers, with 2.24 hectares on average, cultivate 0.27 hectares, producing 14.34 quintals and a surplus of 9.89 quintals per farm. The average landholding is 1.35 hectares, with 0.17 hectares under potato cultivation, yielding 9.87 quintals and a marketable surplus of 6.85 quintals per farm. The potato varieties grown include Kufri Jyoti, Kufri Chandermukhi, and Santana potato across all categories.

TABLE 1. PROFILE OF POTATO GROWERS

Particulars	Marginal	Small	Medium	Overall
(1)	(2)	(3)	(4)	(5)
Number of sampled farmers	70	71	39	180
Average number of land holdings (ha)	0.77	1.43	2.24	1.35
Average area under potato	0.14	0.20	0.27	0.17
Average Production (Quintals/farm)	6.58	10.67	14.34	9.87
Marketable surplus (Quintals/farm)	4.46	7.54	9.89	6.85
	Kufri Ivoti	Kufri	Kufri	Kufri
Detate variation cultivated	Kulli Jyou,	Chandermukhi,	Chandermukhi,	Chandermukhi,
Polato varieties cultivated	Santana potato	Kufri Jyoti,	Kufri Jyoti,	Kufri Jyoti,
		Santana potato	Santana potato	Santana potato

Marketing Channels of Potato

Based on the research survey, some farmers face difficulty selling their entire potato harvest through a single channel. Analysis of the data in Table 2 indicates that farmers in the study area utilized five distinct marketing channels for their potato crops (Figure 2). Marginal, Small and medium farm categories farmers sold their high quantity through channel-II (Producer \rightarrow Wholesaler \rightarrow Retailer \rightarrow Consumer) 1.63, 2.42 and 3.60 quintals, respectively. Selling through wholesalers and retailers can mitigate market fluctuations, transportation logistics, and storage risks, as these intermediaries often handle this aspect. These results show that wholesalers are key intermediaries in these specific marketing channels. Mgale and Yunxian (2020) and Thakur et al., 2024) observed similar results. Overall, the lowest quantity sold through channel-I (Producer \rightarrow Consumer) because direct sales involve significant time and effort in setting up stands or markets, handling transactions, and addressing consumer inquiries, which can be impractical for farmers focused on production.

TABLE 2. FARM CATEGORY-WISE QUANTITY OF POTATO SOLD THROUGH VARIOUS MARKETING CHANNELS

				(quantity in qtls)
Marketing channels	Marginal	Small	Medium	Overall
(1)	(2)	(3)	(4)	(5)
	0.19	0.51	0.83	0.46
Channel-I	(4.35)	(6.87)	(8.56)	(6.76)
	1.63	2.42	3.60	2.37
Channel-II	(36.96)	(32.26)	(36.98)	(34.94)
	1.25	1.74	1.94	1.59
Channel-III	(28.24)	(23.27)	(19.87)	(23.48)
	0.81	1.99	2.26	1.59
Channel-IV	(18.23)	(26.60)	(23.17)	(23.42)
	0.54	0.82	1.11	0.78
Channel-V	(12.22)	(11.00)	(11.42)	(11.45)
Total	4.42	7.49	9.74	6.78

Note: Figures in parentheses are percentages of the total.



Figure 2: Marketing Channels of Potato in the Study Area

Marketing Costs and Margin of Different Functionaries

Table 3 outlines the marketing costs and margins of diverse market participants involved in different marketing channels for potato produce within the study area. In Channel-I, where producers directly sold potato produce to consumers, the total marketing cost for producers was Rs. 66 per quintal. Nevertheless, these findings indicate that farmers incur lower marketing costs when selling directly from farmer to consumer than utilising other marketing channels. This disparity stems from the reduced involvement of intermediaries in direct sales, leading to lower expenses related to transportation, loading/unloading, and commission charges. Moreover, direct sales often require less transportation, reducing costs compared to sales to other market functionaries.

In addition to the producer, retailers were the primary market participants selling produce directly to consumers. Their substantial marketing costs included commission fees, transportation expenses, loading and unloading charges, and Mandi taxes. It has been established that retailers in Channels II, III, IV, and V incurred total costs of Rs. 165.09, Rs. 195.77, Rs. 218.18, and Rs. 147.16 per quintal, respectively. Moreover, the retailer margin per quintal in Channel II was Rs. 170; in Channel III, it was Rs. 180; in Channel IV, it was Rs. 165; and in Channel V, it was Rs. 190. This indicates that the retailer can command a higher price per quintal of potato crop than other intermediaries, implying that the retailer possesses more market power and can derive more value from the transaction. Consequently, they wield greater bargaining power and can demand higher prices for the produce. Additionally, retailers frequently enhance the value of the product by offering services such as product display, marketing, and customer service.

The local trader was identified as a crucial market participant. The main elements influencing marketing expenditures include commission fees, transportation expenses, loading and unloading charges, and Mandi taxes. Commission charges refer to fees paid to the local trader for their services facilitating the sale of goods. Loading/unloading costs are transporting goods to and from the market. Mandi tax is a tax imposed on the sale of goods in specific markets in India. The local trader incurred a total marketing cost of Rs. 136.63, with a market margin of Rs. 70 per quintal. Moreover, the local trader sold the produce to the wholesaler. Nevertheless, the study found no indications of local traders selling directly to consumers. The findings indicate that farmers primarily sell their potato produce to local traders, who connect farmers with other market players like wholesalers and retailers. These local traders provide services such as transportation, storage, and market information to farmers, thereby assisting them in selling their produce more efficiently.

Wholesalers were identified as essential market participants in Marketing Channels II, III and IV. The key components of wholesalers' marketing costs, including commission fees, Mandi tax, and transportation, were determined to be Rs. 192.12, Rs.

TABLE 3. MARKETING COSTS AND MARGINS OF DIFFERENT FUNCTIONARIES IN THE MARKETING CHANNELS OF POTATO CROP

S.No.	Particulars	Ι	II	III	IV	V	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	
I.	Marketing costs incurred by producers						
1	Net price received by the farmer	1212.43	888.45	902.36	1109.76	1018.50	
2	Transportation cost	20.00	40.00	45.00	30.00	25.00	
3	Packing material cost	38.00	38.00	38.00	38.00	38.00	
4	Loading/unloading	8.00	10.00	10.00	8.00	8.00	
5	Commission charge	-	-	-	-	-	
6	Mandi Tax	-	-	-	-	-	
	Total	66.00	88.00	93.00	76.00	71.00	
	Farmer's selling price	1278.43	976.45	995.36	1185.76	1089.50	
II.	Marketing cost incurred by Local trader/commission agent						
А	Gross price paid by a trader			995.36			
1	Loading/unloading			12.00			
2	Transportation cost			45.00			
3	Mandi Tax			19.91			
4	Commission charge			59.72			
В	Total			136.63			
С	Trader's margin			70			
D	Trader's selling price			1201.99			
III	Marketing cost incurred by the Co-operative						
	society				1105 56		
A	Gross price paid by Co-operative society				1185.76		
в	Cost components of co-operatives				1100		
1	Loading/unloading				14.00		
2	Transportation cost				40.00		
3	Room rent				50.00		
4	Mandi Tax				23.72		
2 3	Commission charge				/1.15		
C	lotal				198.86		
D	Co-operative Society's Margin				130.00		
E	Co-operative society selling price				1514.62		
1	Cross price prid by Wholeseler		076 45	1201.00	1514 62		
A D	Cost components of Wholesaler		970.45	1201.99	1314.02		
Б 1	Losding/Unloading		14	14.00	14.00		
2	Transportation cost		40	50.00	45.00		
2	Poom rent		40 60	50.00	45.00		
3	Mandi Tay		19.53	24.04	30.29		
5	Commission charge		58 59	72 12	90.88		
Ċ	Total		192.12	220.16	240.17		
D	Wholessler Margin		1/2.12	150.00	160.00		
F	Wholesaler selling price		1313 57	1572.15	1914 79		
L V)	Marketing cost incurred by Retailer		1515.57	1372.15	1714.77		
A A	Gross price paid by Retailer		1313 57	1572 15	1914 79	1089 50	
B	Cost Components of Retailer		1010.07	1572.15	1711.77	1009.50	
- 1	Loading/unloading		15	15	15	20	
2	Transportation cost		45	55	50	40	
3	Mandi Tax		26.27	31 44	38 30	21 79	
4	Commission charge		78 81	94 33	114 89	65.37	
C .	Total		165.09	195.77	218.18	147.16	
D	Retailer Margin		170	180	165	190	
Е	Retailer Selling price		1648.65	1947.92	2297.97	1426.66	
VI	Consumer' Purchase Price	1278.43	1648.65	1947.92	2297.97	1426.66	

220.16 and Rs. 240.17 per quintal, respectively. Wholesalers directly purchase from farmers, while in Channel-II, potato produce is acquired through local traders (Channel-III) and bought from farmer cooperatives in Channel-IV. Wholesalers are pivotal in marketing potatoes, bridging farmers with various market entities, ensuring availability across the marketing chain and facilitating distribution to retailers and other businesses.

Price Spread and Marketing Efficiency

An analysis of Table 4 reveals varying producer prices for the potato crop across different output marketing channels in the study area. Channel-II had the lowest producer's price at Rs. 888.45, followed by Channel-III at Rs. 902.36, Channel-V at Rs. 1018.50, Channel-IV at Rs. 1109.76, and the highest price was observed in Channel-I at Rs. 1212.43. The producer's share of the consumer's rupee was most significant in Channel-I (94.84 per cent) when the producer directly acted as a retailer. This was followed by Channels-V (71.39 per cent), Channel-II (53.89 per cent), Channel-IV (48.29 per cent), and Channel-III, with the lowest percentage at 46.32 per cent. The marketing margins varied across the channels, with Channel-I having a zero margin, followed by Channel-V (13.32 per cent), Channel-II (19.11 per cent), Channel-IV (19.80 per cent), and Channel-III (20.53 per cent). The cost of marketing differed as well, with Channel-I having the lowest percentage at 5.16 per cent, followed by Channel-II (33.14 per cent).

Particulars	Marketing channels					
	Ι	II	III	IV	V	
(1)	(2)	(3)	(4)	(5)	(6)	
Producer price (Rs.)	1212.43	888.45	902.36	1109.76	1018.50	
Consumer's price (Rs.)	1278.43	1648.65	1947.92	2297.97	1426.66	
Gross marketing margin (GMM) (Rs)	66.00	760.20	1045.56	1188.21	408.16	
Net marketing cost (Rs.)	66.00	445.20	645.56	733.21	218.16	
Net market margin (Rs.)	-	362.12	400.00	455.00	190.00	
Total gross marketing margin (per cent)	5.16	46.11	53.68	51.71	28.61	
marketing cost (per cent)	5.16	27.00	33.14	31.91	15.29	
Marketing margin (per cent)	-	19.11	20.53	19.80	13.32	
Producer's shares (per cent)	94.84	53.89	46.32	48.29	71.39	
Marketing efficiency	18.37	1.10	0.86	0.93	2.50	

TABLE 4. PRICE SPREAD AND MARKET EFFICIENCY OF POTATO CROP

From Table 4, it's evident that Channel-I (18.37 per cent) was the most efficient channel, followed by Channel-V (2.50 per cent), Channel-II (1.10 per cent), Channel-IV (0.93 per cent), and Channel-III (0.86 per cent). Thus, Channel-I emerged as the most efficient among the five marketing channels. However, despite its efficiency, Channel-I was not prominent due to its lower sales volume of potato produce compared to other channels. This could be explained by the fact that direct sales from farmers to consumers can be cost-effective but may not always be practical for larger quantities

of produce. Such direct sales often involve smaller volumes and may require farmers to invest more in marketing, such as setting up roadside stands or participating in the farmers' markets. While this approach can work well for small-scale or speciality producers, it may not be viable for larger quantities of produce. In the end, selecting a marketing channel hinges on numerous factors, such as production scale, market demand, and the accessibility of distribution networks. Employing a blend of diverse marketing channels could prove to be the optimal strategy for enhancing sales and profitability among farmers.

Factors Affecting Farmer's Choice of Marketing in Potato Crop

Table 5 provides an overview of the variables affecting farmers' decisions regarding marketing channels for potato crop, along with their descriptive statistics and definitions. These variables were employed in the multinomial logit regression analysis. Independent variables encompassed factors such as household characteristics (e.g., education, farm income and farm experience), sales-related aspects (e.g., distance to the market, advance payment, financial urgency, delay in sale and storage facilities) and sources of market information (e.g., relative friends, government departments, media). The coefficients of variation (CV) indicated higher variation in the farm income (167.63) and storage facility variable (109.46), whereas the education variable (38.54), utilised in the model, exhibited comparatively lower variability.

Variables	Variable description/ measurement	Mean	SD	CV (per cent)
(1)	(2)	(3)	(4)	(5)
Household factors				
Education level	Discrete variable (Education status of sampled farmers)	3.14	1.21	38.54
Farm income	Continuous variable (Annual farm income of farmers per household in rupees)	350376.41	587342.00	167.63
Farm experience	Continuous variable (Farming experience in years)	15.41	7.23	46.92
Sales factors				
Distance to the market	Continuous variable (Distance to the agricultural market in KM)	19.87	11.65	58.63
Advance payment	Payment received by farmers in advance Dummy variable $no = 0$, yes $= 1$	0.52	0.50	96.15
Financial urgency	Farmers financial urgency Dummy variable $no = 0$, yes =1	0.39	0.34	86.42
Delay in sale	Delay in payment after sale of vegetable Dummy variable $0 = no, 1 = yes$	0.51	0.39	77.55
Storage facility	Storage facility for harvested produce Dummy variable $0 = no$, $1 = yes$	0.46	0.50	109.46
Source of market info	ormation			
Govt.Dept/ TV/Radio/social media	Farmers received market information through Dummy variable $0 = no, 1 = yes$	0.52	0.39	74.34
Relatives/ friends	Farmers received market information through relative friends Dummy variable $0 = No$, $1 = yes$	0.43	0.28	65.69

TABLE 5. DESCRIPTIVE STATISTICS OF THE VARIABLES USED IN THE MULTINOMIAL REGRESSION MODEL

Maximum Likelihood Estimates

Table 6 displays the factors influencing the choice of marketing channels among potato farmers in Himachal Pradesh. An analysis using multinomial logistic regression was conducted to investigate these factors.

Particulars	Channe	1 -II	Channe	l-III	Channe	el-IV	Chann	el-V
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Testerner	22.68*	0.09	33.63**	0.02	25.19	0.13	38.58**	0.02
Intercept	$\begin{array}{c c c c c c c c c c c c c c c c c c c $							
Household factors								
Education level	0.16*	0.10	0.24**	0.02	0.22*	0.07	0.16	0.16
Education level	(0.10)	$\begin{array}{c c c c c c c c c c c c c c c c c c c $						
Form in como	0.00007	0.26	-0.0001	0.18	-0.00006	0.42	0.0002**	0.02
Farm income	(0.0001)		(0.0001)		(0.0001)		(0.00008)	
F	0.13**	0.05	-0.09	0.18	0.04	0.64	-0.10	0.15
Farm experience	(0.07)		(0.07)		(0.08)		(0.07)	
Sales factors								
Distance to the	0.06	0.45	0.06	0.45	0.03	0.77	0.09	0.24
market	(0.07)		(0.07)		(0.10)		(0.08)	
A	0.03	0.98	0.03	0.98	0.60	0.66	-0.43*	0.10
(1) Intercept Household factors Education level Farm income Farm experience Sales factors Distance to the market Advance payment Financial urgency Delay in sale Storage facility Source of market inform Govt. Dept/TV/Radio/soci al media Relatives/friends N LR chi-square Prob > chi-square Prob > chi-square Pseudo R square	(1.18)		(1.18)		(1.38)		(1.35)	
E	0.31	0.83	0.31	0.83	-0.55	0.77	2.86**	0.06
Financial urgency	(1.46)		(1.46)		(1.84)		(1.53)	
Dalary in sola	1.86	0.13	1.86	0.13	1.98	0.18	0.63	0.65
Delay in sale	(1.22)		(1.22)		(1.47)		(1.38)	
C	0.97	0.43	0.97	0.43	-1.41	0.40	0.81	0.92
Storage facility	(1.22)		(1.22)		(1.68)		(1.33)	
Source of market infor	mation							
Govt.	1.27	0.42	-1.52	0.42	1.27	0.42	-0.28	0.84
Dept/TV/Radio/soci								
al media	(1.58)		(1.25)		(1.58)		(1.32)	
Deletives/friende	1.37	0.41	1.37	0.41	1.37	0.41	-1.16	0.40
Relatives/Intends	(1.64)		(1.64)		(1.64)		(1.38)	
Ν	60							
LR chi-square	67.98							
Prob > chi-square	0.04							
Pseudo R square	0.32							
Log Likelihood	-73.22							

TABLE 6. MULTINOMIAL LOGISTIC REGRESSION ESTIMATES FOR FACTORS AFFECTING THE CHOICE OF MARKETING CHANNEL FOR POTATO CROP

Note: Channel-I used as a base category, ***, **and * denotes significance at 1%, 5% and 10% level, respectively. The figure in parentheses is standard error.

We designated Channel-I as the base category to assess the probability of opting for one market channel over another. The log-likelihood ratio test suggests that the overall model is statistically significant. The chi-squared test statistic, significant at the one per cent level, indicates that the estimated multinomial logit model offers a satisfactory regression, explaining the variation in the dependent variable adequately through the independent variables. Education significantly influenced the decision to join Channel-II, III and IV. Farm income influenced participation in Channel-V. Factors like farming experience impacted choices in Channel-II. Payment methods such as advance payment were negatively significant in Channel-V, while financial urgency in Channel-V.

Marginal Effects Estimates

The marginal effects (ME) indicate how a one-unit increase in an independent variable affects the probability of choosing an alternative marketing channel, either increasing or decreasing it. Table 7 displays the estimated marginal effects derived from the multinomial logit model, highlighting the factors influencing the selection of agricultural output marketing channels for potatos in the study area. Education is pivotal in minimizing the expenses and time involved in information search and its efficient processing (Thakur et al., 2023a,b; Cheng et al., 2016). According to the findings in Table 7, education was determined to be statistically significant at the 5 per cent level, influencing farmers' decisions to market potato produce through the marketing channel producer-wholesaler-retailer-consumer (Channel-II). The education factor was associated with a 9.2 per cent increase in the probability of choosing marketing Channel-II (Mariano et al., 2012). Farm income exhibited a significant positive impact on marketing Channel-III at the 10 per cent significance level. Farming experience is directly linked to farmers' bargaining power and marketing network.

TABLE 7. MARGINAL EFFECT (POTATO) ESTIMATES FOR FACTORS AFFECTING FARMERS CHOICE OF MARKETING CHANNEL

Particulars	Channe	el -II	Channel	-III	Channe	Channel-IV		el-V
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(10)
Household factors								
Education level	0.092**	0.04	0.04	0.37	0.097	1.68	0.002	0.86
	(0.046)		(0.004)		(0.076)		(0.011)	
Farm income	0.00	0.95	0.00004*	0.08	0.00	0.14	0.00	0.75
	(0.00)		(0.000023)		(0.00)		(0.00)	
Farm experience	0.01**	0.05	0.004	0.24	0.003	0.49	0.004	0.53
	(0.006)		(0.004)		(0.005)		(0.006)	
Sales factors								
Distance to market	0.004	0.56	0.02**	0.02	0.005***	0.00	0.01	0.32
Distance to market	(0.007)		(0.01)		(0.001)		(0.01)	
Advance payment	-0.04	0.42	0.15*	0.08	0.09	0.16	0.16	0.19
	(0.05)		(0.08)		(0.06)		(0.13)	
Financial urgency	0.05	0.61	0.00	0.98	0.33***	0.01	0.26*	0.06
	(0.10)		(0.05)		(0.13)		(0.14)	
Delay in sale	-0.20	0.99	-0.15	0.99	-0.04**	0.05	-0.12	0.67
	(0.43)		(0.23)		(0.02)		(0.56)	
Storage facility	-0.04	0.68	-0.07**	0.03	-0.08**	0.02	0.10	0.46
	(0.09)		(0.03)		(0.03)		(0.13)	
Source of market inf	formation							
Govt Dept/TV/	0.03***	0.00	0.18*	0.10	-0.07	0.40	-0.14	0.37
Radio/social media	(0.01)		(0.11)		(0.08)		(0.13)	
Relatives/ friends	0.09*	0.08	0.15	0.99	0.08	0.99	0.23*	0.07
	(0.05)		(0.13)		(0.06)		(0.12)	

Note: ***, **and * denotes significance at 1, 5 and 10 per cent level, respectively. The figure in parentheses is standard error.

The long-standing relationships developed over the years between farmers and market intermediaries may contribute to farmers favouring Channel-II marketing (Barrett et al., 2012; Hisali et al., 2011). The distance to the market showed significant positive effects at the 1 per cent level in Channel-III and IV. According to the marginal effects, compared to the base category, the probability of selecting marketing Channel-III and IV increased by 2 and 0.5 per cent, respectively. Mmbando et al. (2015) showed similar findings, indicating that farmers prioritise selling their produce in the market, especially when they have larger quantities, even if it involves travelling to a distant market. The negative significance of the storage facility in marketing channels III and IV indicates that farmers do not have enough storage facilities, forcing them to sell their produce instantly to intermediaries. Table 7 indicates that the source of market information is a crucial variable influencing farmers' choices regarding marketing channels. Access to market information through govt. department/tv/radio showed significant positive effects at the 1 and 10 per cent level, influencing farmers' decisions to opt for marketing Channel-II and III. Access to marketing information plays a crucial role in encouraging farmers to explore innovations (Zhang et al., 2017).

IV

CONCLUSION

This study investigates the marketing dynamics and factors influencing farmers' selection of marketing channels for potato crops. The findings reveal that the Producer-Wholesaler-Retailer-Consumer (Channel-II) has the highest preference for potato produce, offering streamlined distribution processes that allow producers to concentrate on cultivation. At the same time, intermediaries manage marketing, ensuring a consistent potato supply for retailers and consumers. However, Channel-IV may lead to higher consumer prices due to higher marketing margins. Conversely, direct producer-to-consumer channels incur the lowest marketing costs for farmers, reducing transportation, loading/unloading, and commission charges. Although the producer-to-consumer channel is the most efficient, its limited use stems from lower sales quantities compared to other channels. Encouraging local produce demand through marketing campaigns and government procurement policies can address this issue, supporting collective marketing initiatives like co-operatives and enabling smallholder farmers to access larger markets efficiently. The study findings reveal that farm income, farming experience, storage facilities, payment methods, and market information sources influence farmers' selection of agricultural output marketing channels. Higher-income farmers may transport produce to distant markets for better prices or invest in storage for favourable market conditions. Government and media disseminated market information aids informed decision-making, guiding farmers towards suitable channels aligning with their goals. The producer-to-consumer channel is recognised as the most efficient, although farmers opt for other channels because of lower sales. Awareness initiatives can emphasise the advantages such as increased prices and decreased costs. Governments can provide subsidies and improve infrastructure to bolster this channel, ensuring equitable benefits distribution throughout the supply chain. Awareness initiatives can emphasize advantages such as increased prices and decreased costs. Governments can provide subsidies and improve infrastructure to bolster this channel, ensuring equitable benefits distribution throughout the supply chain.

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REFERENCES

- Abankwah, V., Aidoo, R., and Tweneboah-Koduah, B. (2010). Margins and economic viability of fresh coconut marketing in the Kumasi metropolis of Ghana, *Journal of Developmental Agriculture and Economics*, 2, 432– 440.
- Acharya, S. S. (1988). Agricultural production, marketing and price policy in India. Mittal Publications, Delhi.
- Acharya, S. S. and Agarwal, N. L. (2016). Agricultural marketing in India, Oxford and IBH Publishing Corporation Private Limited, New Delhi.
- Acharya, S. S. and Agrawal, N. L. (2001). Agricultural marketing in India (2nd ed.), Oxford & IBH Publishing Company.
- Asante, A. C. and Weible, D. (2020). Is there hope for domestically produced poultry meat? A choice experiment of consumers in Ghana. Agribusiness, 36, 281–298. doi: 10.1002/agr.21626.
- Bardhan, D., Sharma, M. L. and Saxena, R. (2012). Market participation behaviour of smallholder dairy farmers in Uttarakhand: A disaggregated analysis, *Agricultural Economics Research Review*, 25, 243–254.
- Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H. C., Narayanan, S. and Walker, T. F. (2012). Smallholder participation in contract farming: Comparative evidence from five countries, *World Development*, 40, 715– 730. doi: 10.1016/j.worlddev.2011.09.006.
- Bendroth, E., Larsen, R. and Svensson, J. (2020). Factors influencing choice of marketing channels in agriculture: A literature review. *Journal of Agricultural Economics*, 10 (3), 45-58.
- Cheng, L., Jiang, S., Zhang, S., You, H., Zhang, J. and Zhou, Z. (2016). Consumers' behaviors and concerns on fresh vegetable purchase and safety in Beijing urban areas, China. *Food Control*, 63, 101–109. doi: 10.1016/j.foodcont.2015.11.024.
- Chung, C., Boyer, T. and Han, S. (2011). How many choice sets and alternatives are optimal? Consistency in choice experiments. *Agribusiness*, 27,114–125. doi: 10.1002/agr.20252.
- Delong, K. L., Jensen, K. L., Griffith, A. P. and McLeod, E. (2019). Beef cattle farmer's marketing preferences for selling local beef. Agribusiness, 35, 343–357. doi: 10.1002/agr.21579.
- Divyanshu, Vaidya, M., Guleria, C., Singh, P. and Vashishat, R. (2022). Marketing efficiency of pomegranate and its supply chain management in Himachal Pradesh, Agro Economist - An International Journal, 9(1), 55-60.
- Espinosa-Goded, M., Rodriguez-Entrena, M. and Salazar-Ordóñez, M. (2021). A straight forward diagnostic tool to identify attribute non-attendance in discrete choice experiments. *Economic Analysis and Policy*, 71, 211–226. doi: 10.1016/j.eap.2021.04.012.
- Geoffrey, S. K., Hillary, B. K., Jonah, K. K. and Timothy, O. O. (2015). Factors influencing the choice of marketing outlets among small-scale pineapple farmers in Kericho county, Kenya. *International Journal of Regional Development*, 2, 1–11. doi: 10.5296/ijrd.v2i2.6237.
- Goncalves, T., Lourenço-Gomes, L. and Pinto, L. M. C. (2022). The role of attribute non-attendance on consumer decision-making: Theoretical insights and empirical evidence. *Economic Analysis and Policy*, 76,788-805. doi: 10.1016/j.eap.2022.09.017.
- Greene, W. H. (2003). Econometric analysis (5th ed.), Upper Saddle River, NJ: Prentice Hall.
- Hisali, E., Birungi, P. and Buyinza, F. (2011). Adaptation to climate change in Uganda: Evidence from micro level data. *Global Environmental Change*, 21, 1245–1261. doi: 10.1016/j.gloenvcha.2011.07.005.
- Indiastat (2023). Area, production and productivity of total vegetables in Himachal Pradesh. Retrieved from https://www.indiastat.com/data/agriculture/total-vegetables.
- JICA. (2021). The preparatory survey of Himachal Pradesh crop diversification promotion project phase-II (HPCDP-II) in Republic of India, Washington, D.C.: Japan International Cooperation Agency.
- Kumar, V., Singh, M. and Verma, P. (2019). Marketing strategies for potatoes in India: Challenges and opportunities. International Journal of Marketing and Management Research, 9(3), 45-58.

- Louviere, J. J., Hensher, D. A. and Swait, J. (2000). Stated choice methods: Analysis and application (1–30). Cambridge University Press, Cambridge.
- Ma, W. and Abdulai, A. (2016). Linking farmers to markets: Determinants and impacts of marketing contracts in China. China Agricultural Economic Review, 8 (1–21). doi: 10.1108/CAER-04-2015-0035.
- Manjunath, V. and Girish, M. R. (2016). An analysis of private vegetable market vis-à-vis public vegetable market in Karnataka-A study in Kolar district of Karnataka state, *Agricultural Update*, 11, 173–177. doi: 10.15740/HAS/AU/11.2/173-177.
- Mariano, M. J., Villano, R. and Fleming, E. (2012). Factors influencing farmer's adoption of modern rice technologies and good management practices in the Philippines, *Agricultural Systems*, 110, 41–53. doi: 10.1016/j.agsy.2012.03.010.
- Martey, E. K., Annin, Wiredu, A. N. and Attoh, C. (2012). Does access to market information determine the choice of marketing channel among smallholder yam farmers in the Brong Ahafo region of Ghana? A Multinomial logit regression analysis, *Journal of Economics and Sustainable Development*, 3, 18–28.
- Mgale, Y. J. and Yunxian., Y. (2020). Marketing efficiency and determinants of marketing channel choice by rice farmersin rural Tanzania: Evidence from Mbeya region, Tanzania, *Australian Journal of Agricultural and Resource Economics*, 64, 1239–59.
- Mmbando, F. E., Wale, E. Z. and Baiyegunhi, L. J. (2015). Determinants of smallholder farmer's participation in maize and pigeon potato markets in Tanzania. Agrekon, Vol. 54, pp. 96–119. doi: 10.1080/03031853.2014.974630.
- Mtimet, N. and Albisu, L. M. (2006). Spanish wine consumer behavior: A choice experiment approach. *Agribusiness*, 22, 343–362. doi: 10.1002/agr.20090.
- Olutumise, A. I. (2022). Determinants of market participation and preference for production of pepper (Capsicum spp.) among farmers in southwest Nigeria, Heliyon, 8, e10585. https://doi.org/10.1016/j.heliyon.2022.e10585.
- Rana, S., Verma, P. and Thakur, R. (2019). Role of potato cultivation in enhancing livelihood security of farmers in Himachal Pradesh. *International Journal of Agricultural Sciences*, 15(3), 215-224.
- Sharma, V., Kumar, A. and Singh, R. (2018). Economic impact of potato cultivation on farmer's livelihood in Himachal Pradesh, Indian Journal of Agricultural Economics, 73(3), 372-384.
- Singh, A., Kumar, R. and Sharma, S. (2020). Potato production and productivity in Himachal Pradesh, Journal of Agricultural Sciences, 10(2), 1-9.
- Singh, P., Vaidya, M. K. and Divyanshu. (2020). Marketing efficiency and problems of potato crop in Himachal Pradesh of northwestern Himalayan region, *International Journal of Farm Sciences*, 10(3), 22-30.
- Singh, N., Sharma, R. and Kayastha, R. (2020). Economic analysis of potato (Pisum sativum) in Himachal Pradesh. *Economic Affairs*, 65, 191–195. doi: 10.46852/0424-2513.2.2020.9.
- Tafesse, A., Megerssa, G. R. and Gebeyehu, B. (2020). Determinants of agricultural commercialization in Offa district, Ethiopia, Cogent Food & Agriculture, 6, 1–4. doi: 10.1080/23311932.2020.1816253.
- Thakur, P., Mehta, P., Devi, C., Sharma, P., Singh, K. K., Yadav, S., Lal, P., Raghav, Y. S., Kapoor, P. and Mishra, P. (2023). Marketing performance and factors influencing farmers' choice for agricultural output marketing channels: The case of garden potato (Pisum sativum) in India, *Frontiers in Sustainable Food Systems*, 7, 1270121. doi: 10.3389/fsufs.2023.1270121.
- Thakur, P., Mehta, P., Guleria, A., Divyanshu, S. P. and Sharma, P. (2023). Study on marketing performance and constraints of potato (*Pisum sativum*) output in high hills wet temperate zone of Himachal Pradesh, India. *Indian Journal of Ecology*, 50, 129–135.
- Train, K. E. (2009). Discrete choice methods with simulation (2nd ed.). Cambridge University Press, Cambridge.
- Zhang, B., Fu, Z., Wang, J., Tang, X., Zhao, Y. and Zhang, L. (2017). Effect of householder characteristics, production, sales and safety awareness on farmer's choice of vegetable marketing channels in Beijing, China. *British Food Journal*, 119, 1216–1231. doi: 10.1108/BFJ-08-2016-0378.