

Assessing the producer's share in the consumer rupee: An analytical study of Rajbanshi dairy farmers

B. Barman^{1*}, A. Mohammad², S. A. Munshi³, U. Kisku² and C. E. Girish²

¹Division of Agricultural Extension, ICAR- India Agricultural Research Institute, New Delhi- 110 012, India; ²Dairy Extension Section, ICAR- National Dairy Research Institute, Eastern Regional Station, Kalyani, Nadia- 741 235, West Bengal, India; ³Division of Agricultural Economics, ICAR- Indian Agricultural Research Institute, New Delhi- 110 012, India

Abstract

This study examines the producer's share in the consumer rupee (PSCR) among Rajbanshi dairy farmers in the Coochbehar district of West Bengal, focusing on the influence of socio-economic variables. Data were collected from 200 dairy farmers to determine the relationship between PSCR and factors such as age, educational status, milk production, extension contact and mass media exposure. The results indicate that the average selling price of milk by producers is ₹ 37.45, while the consumer price is ₹ 40.88, leading to a PSCR of 91.61%. Correlation analysis reveals significant associations between PSCR and key variables. Negative correlations were observed with market type, milk production and crossbreed ownership, while positive correlations were found with age and mass media exposure. The study suggests that socio-economic conditions and farm characteristics significantly influence PSCR, with more experienced farmers and those with better media access tending to secure a higher share. Additionally, the type of market and milk production levels play a crucial role in determining the share received by producers. The findings underscore the importance of improving market linkages, enhancing farmers' awareness and strengthening extension services to boost the earnings of smallholder dairy farmers.

Keywords: Dairy Farming, Marketing, Price, Producer's share in consumer rupee (PSCR), Rajbanshi

Highlights

- The study examines PSCR among Rajbanshi dairy farmers in Coochbehar, West Bengal.
- Socio-economic factors like education, milk production, and extension contact influence PSCR.
- A negative correlation between milk production and PSCR shows challenges for low-producers.

INTRODUCTION

In the dynamic landscape of agriculture and agribusiness, the relationship between producers and consumers remains a pivotal area of investigation (Lyson and Green, 1999; Opitz *et al.*, 2019). The producer's share in the consumer rupee (PSCR) is a crucial metric that elucidates the portion of the consumer's expenditure on a product that is captured by the producer (Kumar and Babu, 2021). This measure is particularly significant in understanding the economic dynamics within agricultural supply chains and ensuring fair compensation for farmers. In the context of dairy farming, where producers often operate under significant market pressures, examining the PSCR provides valuable insights into income distribution and market efficiency. The PSCR serves as an essential indicator of the economic health of agricultural sectors by highlighting the income retained by producers from consumer spending

(Krueger *et al.*, 2019). It reflects the proportion of the retail price of agricultural products that reaches the farmers, thereby shedding light on the efficiency and fairness of the agricultural supply chain. A higher PSCR signifies that a larger share of the consumer's spending is benefiting the producers, while a lower PSCR indicates intermediaries, such as processors, distributors, and retailers are absorbing a more significant portion of the consumer's money (Vidhyashree *et al.*, 2024). Understanding the PSCR is critical for formulating policies that aim to improve the welfare of farmers and enhance the overall efficiency of the agricultural market. It provides insights into the distribution of economic value within the supply chain and helps identify areas where market interventions or policy adjustments might be necessary. This metric is especially relevant in developing countries where smallholder farmers often face challenges related to market access, pricing, and

*Corresponding Author, E-mail: bikram.agriext@outlook.com

bargaining power. Dairy farming is a cornerstone of India's agricultural sector, contributing significantly to the livelihood of millions of farmers and the country's economy. India is the largest producer and consumer of milk globally, with a diverse range of dairy products contributing to both domestic consumption and export markets.

Despite its prominence, the dairy sector is characterized by a complex and fragmented supply chain that involves multiple stakeholders, including producers, cooperatives, processors, and retailers. Rajbanshi dairy farmers, who are predominantly located in the north eastern regions of West Bengal, represent a significant segment of this sector. These farmers often face unique challenges, including limited access to modern technology, fluctuating market prices, and inadequate infrastructure. Understanding the PSCR for Rajbanshi dairy farmers is crucial for assessing the economic viability of their operations and identifying potential areas for policy support and market improvement. Research on dairy sectors in other regions has highlighted the impact of market intermediaries on the PSCR and the role of cooperatives and producer organizations in enhancing farmers' share (Vandeplas, 2011; Vandeplas *et al.*, 2013).

For instance, studies conducted in different states of India have revealed significant variations in the PSCR, influenced by regional market conditions, pricing mechanisms, and the level of organization among dairy farmers. These studies underscore the importance of localized research to understand the specific dynamics affecting the PSCR in different contexts.

There are no studies that specifically examine the PSCR for dairy farmers in the area, especially those who are Rajbanshi. This study focuses on Rajbanshi dairy farmers in the north eastern region of West Bengal, aiming to assess the PSCR and provide a comprehensive analysis of the economic dynamics affecting these producers. By examining the average selling price of milk and the consumer's buying price, this study calculates the PSCR for Rajbanshi dairy farmers and explores the factors influencing this metric. The choice of Rajbanshi dairy farmers for this study is driven by the need to address the

specific challenges faced by farmers in this region. Despite their significant contribution to the dairy sector, Rajbanshi farmers often encounter barriers related to market access, pricing volatility, and infrastructural constraints. This study aims to provide empirical evidence on the PSCR for this group and offer insights into potential policy measures and interventions to enhance their economic welfare. This study hypothesises that PSCR varies across blocks in Coochbehar due to market dynamics and access differences. It further posits that socio-economic factors and market type significantly impact PSCR.

MATERIALS AND METHODS

Study area: The study was conducted in Coochbehar district, West Bengal. Coochbehar district is located between 25°57'47" and 26°36'20" North latitude; between 88°47'44" and 89°54'35" East longitude. It focuses on four randomly selected blocks: Dinhata I, Dinhata II, Coochbehar I, and Coochbehar II (Fig. 1).

Sample size estimation and study design: A sample of 200 Rajbanshi dairy farmers, each deriving more than 50% of their income from dairy farming, was selected using a stratified random sampling technique to ensure proportional representation. Data were collected in 2022 through structured questionnaires administered in face-to-face interviews with trained

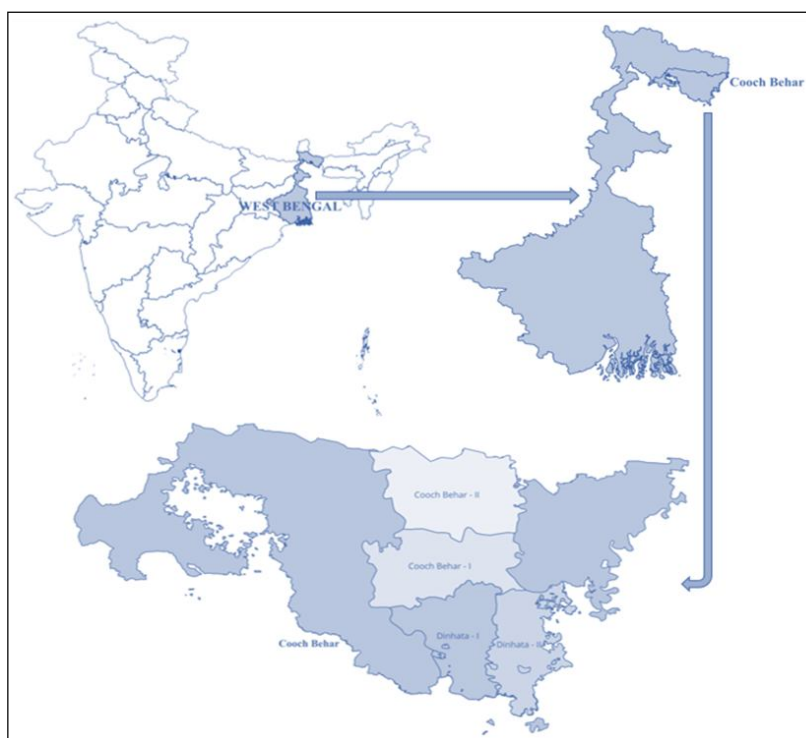


Fig. 1. The locale of the study (Created using QGIS)

enumerators, covering aspects such as income sources, milk selling prices, and consumer prices. Enumerators received extensive training on data collection protocols and ethics, and the interview schedule underwent a pilot test with a small subset of Rajbanshi dairy farmers to refine questions and validate relevance.

Data collection: Primary data was collected through a structured interview schedule administered to the selected farmers. The schedule captured information on socio-economic variables such as age, educational status, family type, milk production, extension contact, and mass media exposure. Additionally, data on milk prices received by farmers and the market prices paid by consumers were recorded to calculate the PSCR.

Statistical analysis of data: Data were analyzed using descriptive statistics, correlation analysis, and graphical representations. PSCR was calculated as the percentage of the selling price received by producers out of the consumer's buying price. Correlation analysis was conducted to assess the relationships between PSCR and the selected socio-economic variables. The study employed SPSS for statistical analysis and utilized Python, specifically the Matplotlib library, for data visualization.

The PSCR was calculated using the formula (Deepa and Murthy, 2018; Satashia and Pundir, 2021):

$$\text{PSCR} = \frac{\text{Average selling price of milk}}{\text{Consumer buying price of milk}} \times 100$$

Descriptive statistics and correlation analysis assessed the relationship between the producer's share and factors such as market access, production scale,

and reliance on intermediaries. The study also looked at differences in producer shares across different marketing channels.

RESULTS

Marketing management practices

Table 1 shows that most farm families (72.50%) sold milk in village or local markets, while 15.50% sold to vendors or middlemen, 10.00% sold in municipality markets, and 2.00% sold through home delivery. The high proportion of sales in local markets likely stems from limited transportation and dairy processing facilities, which restrict farmers' access to broader markets. The average selling price of milk was ₹ 37.45 per litre, compared to the consumer's buying price of ₹ 40.88 per litre, resulting in a PSCR of 91.83%. This high PSCR indicates that a substantial portion of the consumer's spending on milk is retained by the producers, reflecting favourable conditions for farmers despite the challenges in market access (Scholten, 2007; Tripathy *et al.*, 2022).

Producer's share in consumer rupee (PSCR)

The analysis of the PSCR for Rajbanshi dairy farmers shows that the average selling price of milk was ₹ 37.45 per litre, whereas the consumer's buying price was ₹ 40.88 per litre. The calculated PSCR of 91.61% indicates that Rajbanshi dairy farmers receive a significant share (91.61%) of the final consumer price paid for milk. This high PSCR suggests that Rajbanshi dairy farmers capture a large portion of the retail price, which reflects favourably on their market position relative to other stakeholders in the supply chain, such as processors, distributors, and retailers. A PSCR of 91.61% implies that most of the consumer's expenditure on milk is passed on to the producers, with relatively low margins going to intermediaries. This could be due to effective local market practices, minimal transaction costs, or a relatively short supply chain in this region. This finding is in line with the findings of Berti and Mulligan (2016) and Nakandala and Lau (2019).

The block-wise PSCR analysis provides insights into the variations in the PSCR across four key blocks in Coochbehar district (Table 2, Fig. 2). Dinhata I has the highest PSCR (94.75%) among the four, indicating that dairy farmers in Dinhata I retain the largest share of the consumer's rupee spent on milk. This relatively high PSCR suggests that farmers in this block benefit more from their milk sales compared

Table 1. Distribution of dairy farm families according to different marketing management aspects

Sl. No.	Marketing practices and types	Frequency	Percentage
1.	Selling of raw milk		
	a. Village/Local market	145	72.5
	b. Home delivery	4	2
	c. Municipality market	20	10
	d. Vendor/Middleman	31	15.5
	e. Dairy cooperatives	0	0
2.	Selling price of milk (in rupees)	Average price (₹) 37.45	
3.	Market price of milk (Consumer's buying price) in rupees	Average price (₹) 40.88	
4.	Producer's share in consumer rupee (PSCR)	91.61%	

to other blocks, possibly due to lower transaction costs, efficient supply chains, or better market conditions. PSCR in Dinhata II is slightly lower (92.61%) than in Dinhata I but still relatively high. This suggests that dairy farmers in Dinhata II also retain a significant portion of the consumer's spending, though there might be slightly higher costs or other factors

affecting their share compared to Dinhata I. With a PSCR (93.63%) close to that of Dinhata I, Coochbehar I shows that dairy farmers here also retain a substantial portion of the consumer's money. The close PSCR values indicate that the conditions in Coochbehar I are similar to those in Dinhata I, with effective market practices and lower costs. Coochbehar II has the lowest PSCR (87.38%) among the four. A lower PSCR suggests that farmers in Coochbehar II receive a smaller share of the consumer's expenditure, which could be

Table 2. Block-wise analysis of producer's share in the consumer rupee (Unit-%)

Block	Mean	N	Std. Deviation
Dinhata I	94.75	50	7.91
Dinhata II	91.58	50	10.06
Coochbehar I	93.63	50	7.32
Coochbehar II	87.38	50	4.94
Total	91.84	200	8.21

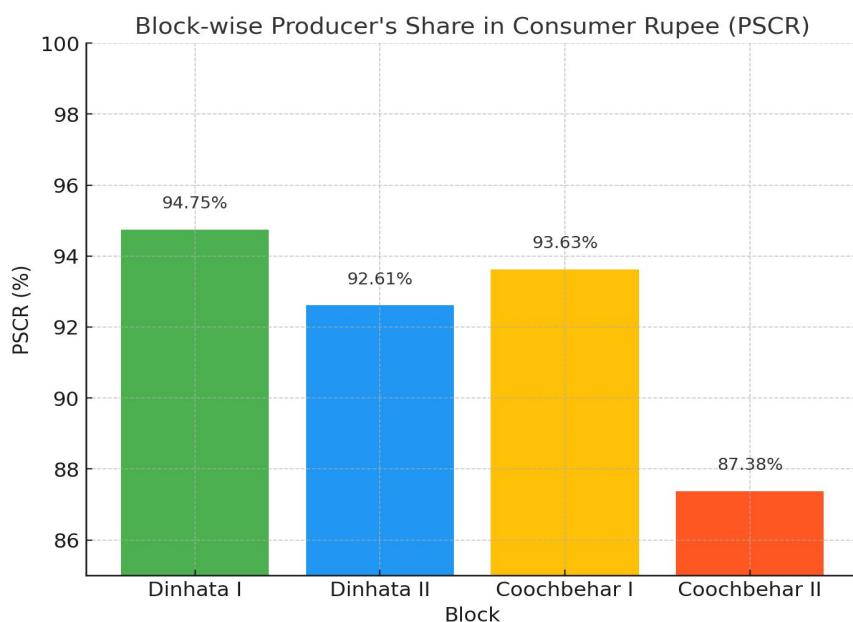


Fig. 2. Block-wise producer's share in consumer rupee

Table 3. ANOVA table for comparing PSCR across different blocks

Source	Sum of Squares	df	Mean Square	F	p-value
Between groups (Combined)	1580.166	3	526.722	8.714	0.000
Linearity	1005.245	1	1005.245	16.631	0.000
Deviation from linearity	574.921	2	287.461	4.756	0.010
Within groups	11847.308	196	60.445		
Total	13427.474	199			

Table 4. Correlation analysis of variables affecting PSCR

Variable	Pearson Correlation (r)	p-value
Market type	-0.476	0.000
Age	-0.153	0.031
Educational status	0.044	0.536
Crossbreed cattle	-0.338	0.000
Milk production	-0.427	0.000

due to higher transaction costs, more intermediaries in the supply chain, or less favourable market conditions compared to the other blocks.

The ANOVA results (Table 3) reveal significant differences in the PSCR among the four blocks, with an overall F-value of 8.714 and a p-value of 0.000, indicating that the mean PSCR varies significantly between blocks. The linearity term, with an F-value of 16.631 and a p-value of 0.000, supports that the PSCR differences follow a linear trend across the blocks.

However, the significant deviation from linearity (F-value of 4.756, p-value of 0.010) suggests that while the linear model is appropriate, some non-linear effects or interactions are influencing PSCR. Overall, these findings indicate that the economic conditions or market structures in different blocks affect PSCR, and further analysis may be needed to understand the nuances of these regional differences.

The correlation analysis examines the relationship between the PSCR and various socio-economic factors among Rajbanshi dairy farmers. Detailed interpretations of the findings are presented in Table 4 and Fig. 3

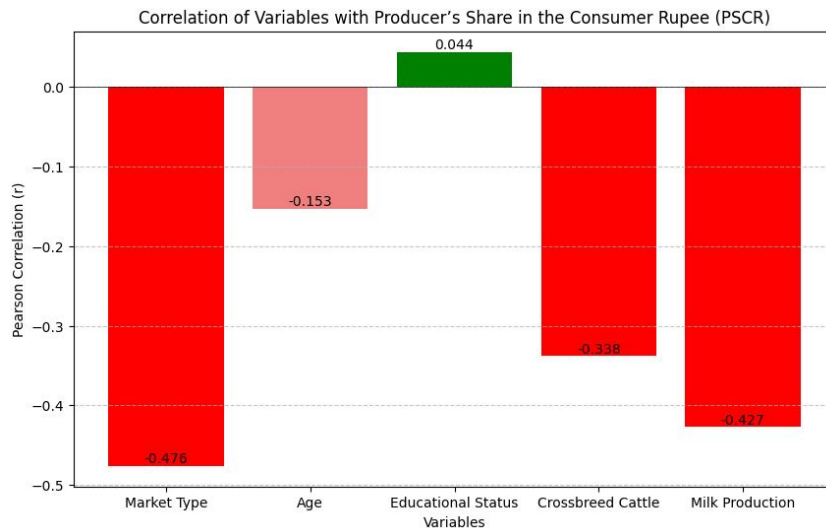


Fig. 3. Correlation analysis of variables affecting PSCR

Market type: The analysis reveals a significant negative correlation ($r = -0.476$, $p = 0.000$) between the market type and the PSCR. This suggests that the producer's share tends to decrease as the market type shifts from direct sales channels like village/local markets or home delivery to more complex structures involving vendors or middlemen. In local or home delivery markets, dairy farmers benefit from fewer intermediaries, thus retaining a larger portion of the consumer's expenditure. In contrast, markets involving multiple intermediaries or vendors often result in a lower PSCR, as additional costs and markups reduce the share of the consumer's rupee that goes to the producers. This highlights the significant impact of market structure on the economic returns to dairy farmers.

Age: There is a weak ($r = -0.153$, $p = 0.031$) but significant negative relationship between the age of the respondents and PSCR. Older farmers might have lower PSCR, potentially due to their limited access to modern markets, lower bargaining power, or reliance on traditional sales channels.

Educational status: The correlation between education level and PSCR ($r = 0.044$, $p = 0.536$) is positive, but not statistically significant. This suggests that educational status has a minimal impact on PSCR. Although education might improve knowledge and decision-making, it does not directly translate into higher producer earnings in this context.

Crossbreed cattle: A significant negative correlation exists between owning crossbreed cattle and PSCR

($r = -0.338$, $p = 0.000$). Although crossbreeds have higher milk yields, associated costs (like feed and veterinary care) may reduce the net earnings per litre, decreasing PSCR.

Milk production: There is a strong negative relationship between milk production and PSCR ($r = -0.427$, $p = 0.000$). High milk producers may face challenges such as dependency on bulk buyers or intermediaries, leading to a reduced share in the consumer rupee. Additionally, increased production might involve higher costs that diminish the overall share for producers.

Extension contact: There is a significant negative correlation between extension contact and PSCR ($r = -0.230$, $p = 0.001$). Although extension services aim to improve practices, if the advice emphasizes bulk selling or emphasizes productivity without considering market strategies, it could lower PSCR.

Mass media exposure: Mass media exposure has a slightly positive but non-significant correlation with PSCR ($r = 0.075$, $p = 0.294$). While media can inform farmers about market trends and better practices, its limited reach or relevance in this region might explain why it does not strongly influence PSCR.

DISCUSSION

The PSCR is a critical indicator of the economic returns received by farmers in a supply chain (Tripathy *et al.*, 2022; Vidhyashree *et al.*, 2024). In this study, PSCR was analysed for Rajbanshi dairy farmers in Coochbehar district, West Bengal, and examined how various socio-economic factors such as age, educational status, milk production, extension contact, mass media exposure, and market type influence PSCR.

Producer's Share in Consumer Rupee (PSCR): The study found that the average PSCR among Rajbanshi dairy farmers was 91.61%, indicating that producers retain a substantial portion of the consumer price. However, there were significant variations among different blocks, with Dinhata I having the highest PSCR (94.75%) and Coochbehar II the lowest (87.38%). These differences highlight the impact of local market dynamics, transportation costs, and the bargaining power of producers on the overall share they retain.

The high PSCR in most areas suggests that producers are actively engaged in direct selling, bypassing intermediaries who typically capture a significant share of the consumer price. Direct selling can include selling milk directly to consumers, cooperative societies, or local vendors (Staal *et al.*, 2006). The ability to minimize the involvement of middlemen directly impacts the PSCR positively. However, challenges such as limited access to larger markets and insufficient knowledge about advanced marketing practices could still hinder further improvements in PSCR.

Impact of socio-economic factors on PSCR: This study explored how key socio-economic variables influence the PSCR. The correlation analysis provides insight into these relationships, with some factors being more significant than others in determining the producer's share. The study found a weak positive correlation between educational status and PSCR. This suggests that better-educated farmers tend to have a slightly higher share of the consumer rupee. Education plays a vital role in enhancing the marketing and negotiation skills of farmers, allowing them to explore better marketing channels and make informed decisions. Educated farmers may also have better access to information on government schemes, subsidies, and cooperative memberships that can help them reduce input costs and increase their net returns. The results show a significant negative correlation between milk production and PSCR. Farmers with higher milk production generally face a lower PSCR. This counterintuitive finding might be due to the reliance of high-producing farmers on bulk buyers, who often pay lower prices than direct consumers. Bulk buyers, such as large dairies and processing units, have greater bargaining power and can dictate prices that reduce the producers' share (Shokoohi *et al.*, 2019). Additionally, farmers with larger production volumes might prioritize volume sales over price per unit, accepting lower prices to ensure their entire output is sold. Extension contact is positively correlated with PSCR, though the correlation is moderate. Farmers with higher extension contact tend to secure better returns because they are more likely to be exposed to updated knowledge on best practices, efficient management, and marketing strategies (Anderson and Feder, 2007; Poulton, 2010). Extension services can also facilitate connections to cooperatives, value chains, and government programs that enhance the profitability of dairy farming. However, the study found that most respondents had limited extension contact, indicating a need for stronger outreach and better engagement

with these services. While the goal of extension services is to improve farming practices, advice that emphasises productivity above all else may unintentionally encourage bulk selling, which could lower PSCR by increasing reliance on lower-priced intermediaries or bulk buyers. Why more extension contact is associated with a lower PSCR may be explained by insights into the specifics of extension advice, such as whether it is focused solely on productivity gains or also incorporates market-focused tactics. The study revealed a weak positive correlation between mass media exposure and PSCR. Farmers who engage more with agricultural programs, news, and other media are likely better informed about market prices, consumer preferences, and modern farming techniques (Liu *et al.*, 2018). Although the correlation is not strong, it highlights the role of information access in decision-making and market participation. However, limited access to targeted content on farming practices and market information could explain the relatively low impact of mass media exposure on PSCR. Age was negatively correlated with PSCR, though the correlation was weak. Younger farmers, especially those in their twenties, tend to have a higher share than older ones. This can be attributed to the younger generation's openness to adopting new technologies, exploring alternative markets, and engaging in more entrepreneurial approaches. Older farmers may prefer traditional marketing methods and be more reliant on intermediaries, leading to a lower share. Additionally, younger farmers may be more willing to engage in collective action, such as forming or joining cooperatives, which can enhance their bargaining power. Market type plays a crucial role in determining PSCR. The study shows that farmers who participate in organized markets (like cooperatives or government-supported markets) tend to achieve a higher PSCR than those selling in unorganized or local markets. Organized markets often offer better prices, assured payments, and the opportunity to engage in collective bargaining. On the other hand, unorganized markets, despite providing quicker sales, often involve multiple intermediaries, leading to a significant reduction in the producer's share.

The variations observed across different blocks suggest that accessibility to organized markets is uneven. In areas like Coochbehar II, where the PSCR was lower, limited access to organized markets might force farmers to rely on local buyers who offer lower prices. Transportation and infrastructure challenges could also make it difficult for producers to access better markets, compelling them to accept suboptimal

prices. Policymakers need to prioritize interventions that enhance farmers' access to profitable markets and reduce their dependency on exploitative intermediaries. The study's limitations include a relatively small sample size and a focus on Rajbanshi dairy farmers in Coochbehar which could limit generalisability. Furthermore, its cross-sectional design ignores non-economic factors and restricts insights into changes in PSCR over time. Encouraging the formation of producer groups, supporting cooperative movements, and introducing digital platforms for direct sales can contribute significantly to improving PSCR. Additionally, expanding the coverage of extension services and integrating modern communication tools, like mobile-based advisory services, can bridge the gap between farmers and market information. The findings also suggest that policies targeting youth engagement in agriculture should focus on providing them with the skills and resources to capitalize on emerging market opportunities. Incorporating technologies such as mobile apps, online marketplaces, and social media marketing can significantly enhance market participation and improve financial returns for younger farmers. Given the positive association between youth participation and higher PSCR, creating an enabling environment for young farmers could lead to overall improvements in the sector's profitability. The PSCR may be impacted by regional variations, which are briefly acknowledged. However,

comparative studies in areas with comparable socio-economic characteristics or market structures may be the main focus of future research. The effects of consumer preferences, market accessibility, and local agricultural policies on PSCR may be investigated in such studies, along with the contribution of supply chain dynamics and cooperative movements to the improvement of farmer returns in various settings.

Conflict of interest: The authors declare no conflict of interest in this study.

Author's contribution: BB: Conceptualised, designed, collected data, and prepared the manuscript; AM: Supervised the entire study process; SAM, CEG, UK: Contributed to writing and editing. All authors read and approved the final manuscript to be held accountable for the work.

Data availability statement: All the data supporting the research findings have been presented in this paper. The corresponding author is willing to provide the raw data upon reasonable request.

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