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Optimizing Dairy Revenue: Strategic Insights from Farm and Product Profiles

Rajbir Singh[1], Jaimin Trivedi[2], A. Udaya Shankar[3], Jyoti Prasad Kalita[4], Mehul Mistry[5]

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ABSTRACT

Background: Understanding the dynamics of dairy product sales in relation to farm characteristics is crucial for optimizing agricultural practices and market performance.

Methods: This study examines these relationships using a comprehensive dataset of 4,325 data points sourced from Kaggle. A random sampling technique was employed to create a representative subset, resulting in a final sample size of 499. The analysis employed multiple statistical methods, including descriptive statistics and chi-square tests, to explore associations between categorical variables such as farm size and sales channel. The Kruskal-wallis test was used to compare medians across groups, such as different farm sizes and locations. Regression analysis was used to assess how independent variables influenced total revenue.

Result: The findings offered valuable insights into the factors affecting dairy product sales, enhancing our understanding of dairy farm operations and contributing to more informed decision-making in the agricultural sector.

Key words: Dairy products, Farm characteristics, Farm management, Non-parametric analysis, Sales performance.

INTRODUCTION

In the competitive world of dairy production, understanding what drives revenue trends is crucial for both producers and brands aiming to optimize their market presence. The revenue performance of dairy brands is influenced by a myriad of factors, from the characteristics of the farms producing the milk to the attributes of the products themselves (Kalra and Singh, 2023). Analyzing these factors can provide valuable insights into how different farm sizes, distribution channels and product features impact sales performance.

Farm characteristics, such as size, location and production capacity, play a significant role in shaping the economic outcomes of dairy operations. Larger farms may benefit from economies of scale, while smaller farms might focus on niche markets or premium products (Stringer *et al*., 2020; Diao *et al*., 2023). Additionally, the specific attributes of dairy products-ranging from shelf life and packaging to quality and brand positioning-can significantly affect consumer preferences and purchasing decisions (Bahety *et al*., 2022).

This analysis investigates the revenue trends across dairy brands, examining how different farm and product characteristics influence financial performance. By exploring these relationships, we aim to uncover patterns that can help dairy producers and brands make informed decisions about production, marketing and sales strategies. Understanding these dynamics not only aids in enhancing profitability but also helps in meeting the evolving demands of consumers in a competitive marketplace.

In the following sections, we will explore how factors such as farm size, geographic location, product pricing and storage conditions impact revenue trends for dairy brands. This comprehensive analysis will provide a clearer picture of the drivers behind successful dairy sales and offer actionable insights for stakeholders in the dairy industry.

Background and rationale

Despite the importance of the dairy industry, there is limited research on the specific farm characteristics that affect

[1]Department of Animal Husbandry, IIMT University, Meerut-250 002, Uttar Pradesh, India.
[2]Indukaka Ipcowala Institute of Management, Charotar University of Science and Technology, Anand-388 001, Gujarat, India.
[3]Koneru Lakshmaiah Business School, Koneru Lakshmaiah Education Foundation, A Deemed to be University, Guntur-522 002, Andhra Pradesh, India.
[4]Assam down town University, Guwahati-781 001, Assam, India.
[5]Sardar Patel College of Commerce, Sardar Patel University, Vallabh Vidyanagar, Anand-388 001, Gujarat, India.

Corresponding Author: Jaimin Trivedi, Indukaka Ipcowala Institute of Management, Charotar University of Science and Technology, Anand-388 001, Gujarat, India.
Email: jaimintrivedi.mba@charusat.ac.in
ORCIDs: https://orcid.org/0009-0004-1418-0580, https://orcid.org/0009-0004-0850-2707, https://orcid.org/0009-0006-3368-9440, https://orcid.org/0009-0001-6874-129X

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sales performance. Previous studies have primarily focused on production efficiency and animal health, with less emphasis on sales outcomes. This study fills this gap by examining a range of farm characteristics and their impact on sales performance.

Objectives

1. To identify the farm characteristics that significantly influence dairy product sales performance.
2. To analyze the relationship between farm size, location, production methods and sales outcomes.
3. To provide recommendations for farmers and policy makers to enhance sales performance.

Literature review

The dairy industry is vital to the global food system, providing essential nutrients and economic benefits. Understanding revenue trends for dairy brands involves examining various factors, including farm sizes, product characteristics and market dynamics. This review synthesizes key studies to provide insights into these trends.

Farm size and revenue

Farm size plays a crucial role in determining dairy brands' economic viability and revenue generation. Larger farms often benefit from economies of scale, leading to lower production costs and higher profitability. For instance, a study by Fiorillo and Amico (2024) highlighted that larger farms can implement more efficient production practices and achieve better financial performance. Conversely, small farms may face higher per-unit costs but can capitalize on niche markets by offering artisanal or locally sourced products. A study by Sarica *et al*. (2022) analyzed the cost and profitability of dairy farms of various sizes in Isparta, Turkey. The study found that larger farms had lower production costs per animal unit and higher net profits compared to smaller farms. Feed costs were the highest portion of total production costs and milk sales income was the largest contributor to farm income. The study concluded that policies favoring an increase in cattle population on farms could positively impact profitability. Ramsbottom *et al*. (2021) explored the relationship between the frequency of financial benchmarking and farm performance. The study used data from 5,945 dairy farms over nine years and found that frequent users of financial benchmarking tools had greater increases in intensification, productivity and financial performance. Larger farms were more likely to use these tools and showed significant improvements in net profit and technical efficiency.

Product characteristics

The characteristics of dairy products, such as quality, variety and branding, significantly influence revenue trends. High-quality products with desirable attributes like higher fat and protein content tend to command premium prices (Koike *et al*., 2023). A systematic review by Fiorillo and Amico (2024) emphasizes the importance of milk quality indicators, such as fat and protein percentages, in driving economic sustainability. Additionally, consumer preferences for organic, non-GMO and sustainably produced dairy products are shaping market demand and influencing revenue streams. In addition, the shelf-life of dairy products is a critical factor influencing food safety, quality, consumer satisfaction and ultimately, the revenue generation and sales performance of dairy brands (AlZubi, 2023; Cho, 2024). A study by the Boston Consulting Group (BCG) highlighted that extending the shelf-life of dairy products can significantly enhance market reach and sales performance. For instance, a company that offered milk with a three-week shelf-life instead of the industry norm of two weeks gained a competitive advantage and increased market share (Gilbert *et al*., 2016). This extended shelf-life allowed the company to distribute its products to more distant markets, reducing waste and improving profitability. This review synthesized key studies to provide insights into how the shelf-life of various dairy products impacts their market success. Aryana and Olson (2017) discussed the continuous development in the science and technology of yoghurt and other cultured products, highlighting the role of probiotics and starter cultures in enhancing shelf-life. An extended shelf-life can lead to increased sales performance by providing consumers with more reliable and longer-lasting products. Research published by White (1993) discussed how consumer preferences for fresh products make shelf-life a critical competitive feature. Products with longer shelf life are perceived as more convenient and reliable, leading to higher consumer satisfaction and repeat purchases. This can be directly translated to increased sales and revenue for dairy brands. Also, he emphasized the importance of quality assurance in predicting the shelf-life of dairy products. Ensuring that products last as long as they are supposed to can prevent losses due to spoilage and returns, thereby enhancing revenue generation. Brands that invest in rapid methods for estimating and predicting shelf-life can maintain higher product quality and consistency, which boosts consumer trust and sales performance. A survey on microbiological spoilage of dairy products by Ledenbach and Marshall (2009) found that extending the shelf-life by improving quality control measures can reduce spoilage rates and economic losses. This study highlighted that even a small increase in shelf-life can have a significant positive impact on the revenue of dairy brands by reducing waste and ensuring product availability.

Regional variations and market dynamics

Revenue trends for dairy brands also vary across regions due to differences in agricultural practices, market conditions and consumer preferences. A review by Bojovic and McGregor (2023) identified geographical shifts in dairy production and consumption, with increasing demand in the Global South. However, this shift was accompanied by challenges related to intensification, standardization and ecological impacts. Understanding these regional dynamics

can be crucial for dairy brands to tailor their strategies and optimize revenue.

In addition to these factors, technological advancements in dairy farming, such as automation, precision agriculture and genetic improvements, can have a significant impact on revenue trends. These innovations enhance productivity, reduce costs and improve product quality. The adoption of advanced technologies is more feasible for larger farms, further accentuating the revenue disparity between large and small farms (AlZubi, 2023; Zhao *et al*., 2024). Also. sustainability practices are increasingly influencing revenue trends in the dairy industry (Cantele and Signori, 2023). Consumers are becoming more conscious of the environmental and social impacts of their purchases, driving demand for sustainably produced dairy products (Ghuriani *et al*., 2023). A study on sustainability indicators in the dairy industry highlighted the need for comprehensive performance measurement systems that encompass environmental, social and economic dimensions (Feil *et al*., 2020). Brands that effectively integrate sustainability into their operations can enhance their market appeal and revenue potential.

The literature on revenue trends for dairy brands underscores the multifaceted nature of the industry. Farm size, product characteristics, regional variations, technological advancements and sustainability practices all play pivotal roles in shaping revenue outcomes. By understanding these factors, dairy brands can develop strategies to optimize their operations, meet market demands and achieve sustainable growth.

MATERIALS AND METHODS

Dataset description

The dataset used in this study was obtained from Kaggle and contains detailed information on dairy product sales and farm characteristics, comprising a total of 4,325 data points. The data included various attributes such as location, total land area, number of cows, farm size, date, product details (ID, name, brand), quantity, price per unit, total value, shelf life, storage conditions, production and expiration dates, quantity sold, sales channel and stock levels, among others. These attributes provided a comprehensive overview of the operations and sales performance of dairy products across different regions in India.

Sample selection

To manage the extensive dataset, a random sampling technique was employed. The RAND() function in Excel was used to generate a random sample of the data, resulting in a subset that is representative of the larger dataset while being manageable for detailed analysis. This subset maintained the diversity of variables present in the original dataset, ensuring the integrity of subsequent statistical analyses.

Statistical analyses

The selected sample was subjected to various statistical analyses to explore the relationships and distributions of the variables. The analyses performed included.

Descriptive analysis

This was conducted to summarize the basic features of the dataset, providing simple summaries about the sample and the measures. Descriptive statistics such as mean, median, standard deviation and range were calculated for quantitative variables such as approximate total revenue, total land area, number of cows, shelf life and total Value.

Chi-square test

The chi-square test was employed to examine the association between categorical variables, such as farm size, product type and sales channel. This test helped in identifying any statistically significant relationships between these variables.

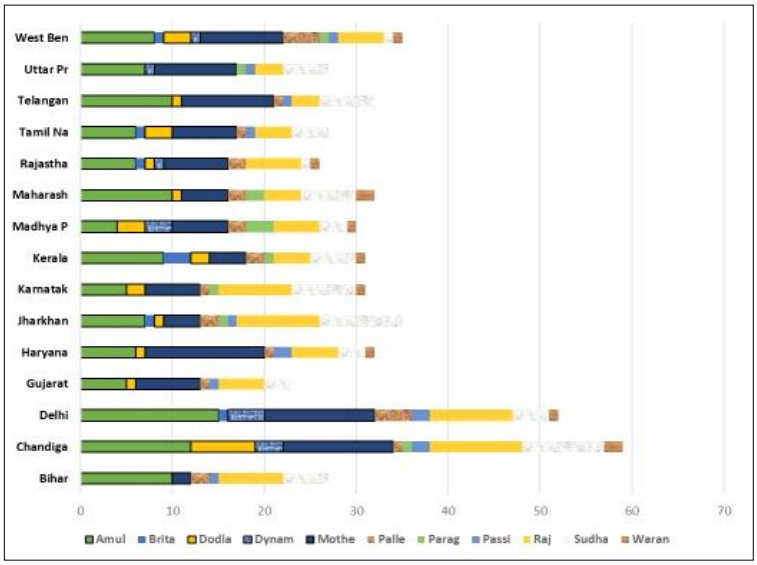

Fig 1: Distribution of Brands across different states.

Kruskal-wallis test

Given that some of the data did not meet the assumptions required for parametric tests, the Kruskal-Wallis test, a non-parametric method, was applied. This test was used to compare the medians of more than two groups, such as the distribution of sales across different farm sizes and locations.

Regression analysis

To further investigate the relationships between the variables, regression analysis was performed. This allowed for the assessment of the impact of independent variables (Total land area, number of cows, shelf life and total value) on dependent variables such as Approximate Total Revenue.

RESULTS AND DISCUSSION

Fig 1 illustrates the market penetration of various dairy brands across different Indian states. Each bar represents a state, segmented by brand contributions. It was observed that Amul exhibited a strong presence across multiple states, particularly in Bihar, Chandigarh, Delhi, Maharashtra and Telangana, underscoring its dominance in the Indian dairy market. Mother Dairy also shows significant market penetration, especially in northern states like Haryana, Chandigarh and Delhi.

The regional variations in brand presence highlight the importance of localized strategies for market penetration. Brands with lower presence scores may need to focus on targeted marketing and distribution strategies to enhance their market share.

Uttar Pradesh, Maharashtra and Gujarat. Mother Dairy dominates in states like Delhi and Haryana, indicating a significant market share in these regions. Rajhans Group was dominant in Rajasthan and Madhya Pradesh and Sudha Dairy Products had a substantial presence in Bihar and Jharkhand. These findings suggest that different brands have varying levels of market penetration across states, highlighting the importance of region-specific marketing strategies to optimize sales performance.

Total revenue generated by different brands

Fig 2a shows the average total revenue and Fig 2b illustrates the standard deviation of the average total revenue for different milk brand companies. Amul had the highest average total revenue but also a high standard deviation, suggesting significant fluctuations in revenue. This could indicate varying market conditions or inconsistent sales performance.

With substantial average total revenue and a moderate standard deviation, Mother Dairy demonstrated strong and relatively stable financial performance. Brita and Raj have lower average total revenues and lower standard deviations, indicating stable but lower revenue streams. This stability might be due to a consistent customer base or steady market conditions. Dynamic Dairy and Parag

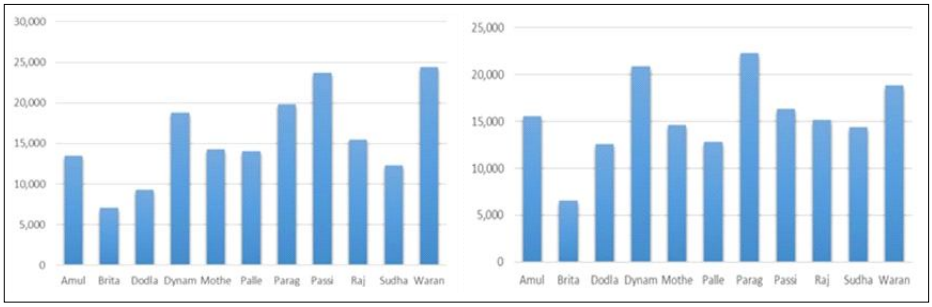

Fig 2: (a) Mean total revenue and (b) standard deviation of mean total revenue for different milk brand companies.

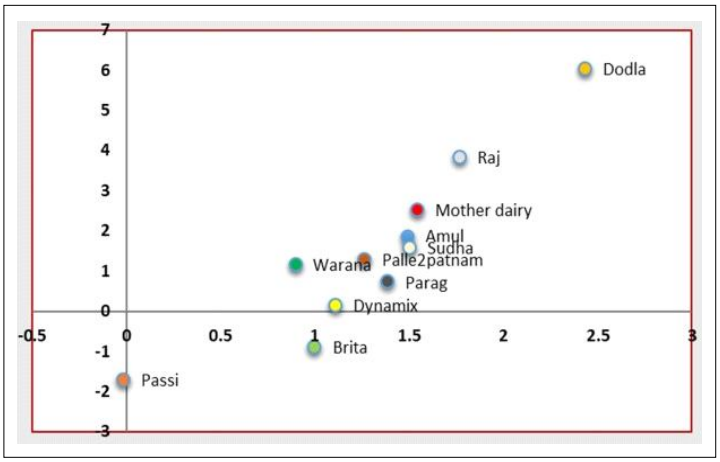

Fig 3: Distribution of skewness and kurtosis.

displayed high average total revenues with moderate to high standard deviations, suggesting potential for high earnings but also indicating variability in revenue.

Fig 3 presents the scatter plot graph illustrating the relationship between skewness and kurtosis for the total revenue of different milk brand companies providing significant insights into their revenue distributions. Positive skewness suggests occasional high revenue values, which could be due to seasonal spikes, promotions, or other factors. Predicting revenue trends in this case might involve identifying and leveraging these high-revenue periods. Conversely, negative skewness: indicates a longer tail on the left side, suggesting occasional low revenue values. This could be due to off-seasons, market downturns, or other negative factors. High kurtosis indicates a distribution with heavy tails and a sharp peak suggesting more extreme values (both high and low) than in a normal distribution. On the other hand, low kurtosis has a flatter distribution with lighter tails. This suggests fewer extreme values and a more stable revenue stream. In the present dataset, Brands such as Amul and Mother Dairy exhibited positive skewness and high kurtosis, indicating occasional high revenue spikes and heavy-tailed distributions. This can occur as a result of occasional high revenue spikes during holiday seasons. In contrast, Passi showed negative skewness and low kurtosis, suggesting a more consistent but lower revenue stream. Fig 2 presents the comparative analysis of farm sizes owned by different brand companies. It was observed that there were substantial differences in their operational scales. Amul demonstrated a diverse range of farm sizes, reflecting a broad operational strategy. In contrast, Mother Dairy showed a concentration in larger farm sizes, suggesting a preference for large-scale farming operations. Raj focuses on smaller farm sizes, indicating a strategy centered around smaller-scale farming. These findings highlight the varying operational approaches of different milk brand companies, which could inform strategic decisions in the dairy industry. However, in terms total revenue enerated there were no statistically significant differences found between different brands according to the farm sizes they owned (Indicated by Kruskal-Wallis test where all the p-values were greater than 0.05).

Fig 4 shows the distribution of farms based on their sizes for different brands. It was observed that Brita, owned the highest number of large farms compared to any other brands. Medium sized farms were most frequent for all the brands. Hence, it is evidenced that farm sizes can vary significantly within a country due to factors like soil fertility, climate and local agricultural practices. In India, farm sizes are generally smaller in densely populated states like Uttar Pradesh compared to states with more available land like

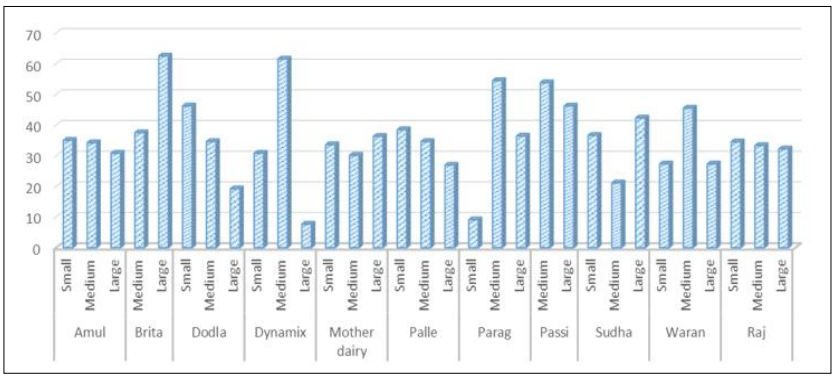

Fig 4: Distribution of brands according to the farm size.

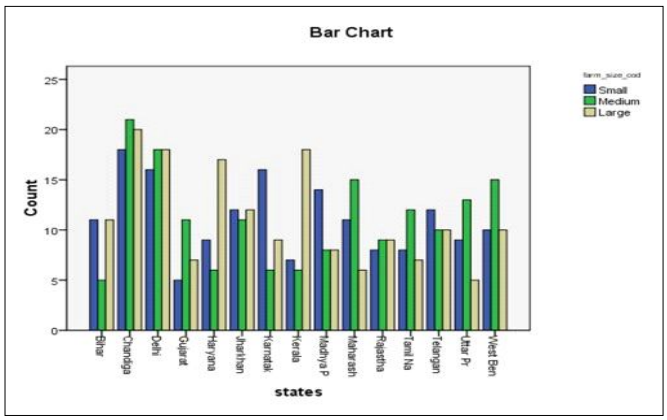

Fig 5: Distribution of different farm sizes according to States.

Punjab (Fig 5). The global trends shows that farms are being consolidated by merging smaller farms into larger ones. This is driven by economic pressures and the need for more efficient production. Government policies, subsidies and economic conditions also play a significant role in determining farm sizes. For instance, regions with strong agricultural support policies may see larger, more productive farms. However, this dataset the total revenue of all the brands did not show any statistically significant differences between different farm sizes.

Fig 6 shows the sales channels utilized by different brands. It was observed that Amul dominated the retail and wholesale sales channels. Mother Dairy had the highest presence in online sales followed by Amul, Raj and Sudha. There was a statistically significant association between the brand and the sales channel as indicated by Chi-square test (P<0.05).

Table 1 shows the analysis of total revenue across different sales channels of different brands. A distinct performance pattern among brands was revealed. The average total revenue generated through online sales channels was highest for Passi (21,800), with significant variability (SD =12,832) and a broad CI (4,470.25-39,200.00). This suggests strong online performance with substantial fluctuation. The highest average total revenue generated through the retail sales channel was achieved by Parag followed by Warang whereas through wholesale channel it was highest for Warang followed by Parag. Hence, though Amul dominated in retail and wholesale but the revenue generated was lower than Parag and Warang. However, the Kruskal-Wallis test revealed that these differences in revenue distribution across brands for different sales channels were not statistically significant (Chi-square = 12.062, df = 10, p = 0.281). This suggests that while some brands performed exceptionally well in specific channels, the overall distribution of revenue across channels is consistent as no significant differences in sales performance across the online, retail and wholesale channels for most brands were observed. This indicates that the choice of sales channel may not have a substantial impact on total revenue for these brands. However, the high variability in sales performance across channels for some brands, such as Dodla and Dynam, suggests that other factors, such as market conditions, brand strength and customer preferences, may have played a more significant role. Though not reflected in this study's findings, other studies have supported the idea that effective sales channel management is crucial for optimizing sales performance. For example, the integration of online and offline channels can enhance market reach and customer engagement, leading to improved sales performance (Angeloni, 2022). Additionally, the alignment of sales channel strategies with the overall company vision and goals is essential for achieving success (Jokinen, 2012).

Table 1: Total revenue of all brands (Mean± Standard deviation, 95% Confidence Interval (CI) of Mean) along with Kruskal-Wallis test to total revenue across sales channel (Column) and Across brands (Row).

Brand	Online (Mean ± SD)	95% CI	Retail (Mean ± SD)	95% CI	Wholesale (Mean ± SD)	95% CI	Kruskal-wallis test (Chi-square, df, p-value)
Amul	12,100±16,770	5,587.47-18,600.00	14,400±15,990	9,451.96-19,300.00	13,600±14,690	9,395.93-17,800.00	(0.365, 2, 0.833)
Brita	8,986.95±9,823	-79,300.00-97,300.00	7,993.39±7,451	-3,863.44-19,930.00	3,330.84±318.93	465.40-6,196.27	(0.000. 2, 1.000)
Dodla	7316± 6930.7	42.55-14589	14822.7±15196.3	-1124.9-30770.2	7754.2±13300.7	74.6-15434.0	
Dynam	19,400±25,440	-7,252.87-46,100.00	8,384.23±7,443.03	-58,500-75,300	22,300±20,485	-3,113.25-47,700.00	(0.360, 2, 0.835)
Mothe	15,700±16,364	10,700.00-20,700.00	12,500±21,331	8,195.17-16,800.00	14,700±12,492	9,639.80-19,800.00	(0.822, 2, 0.666)
Palle	11,400±10,132	4,333.91-18,400.00	16,900±15,025	5,322.94-28,500.00	16,200±12,399	-3,512.85-35,900.00	(2.029. 2, 0.363)
Parag	10,000±10,610	-3,126.77-23,200.00	32,300±15,420	13,379.00-62,857.00	23,700±18,720	-56,800.00-104,000.00	(2.861, 2, 0.239)
Passi	21,800±12,832	4,470.25-39,200.00	28,700±20,167	-2,330.24-59,700.00	20,800±14,135	-20,600.00-62,200.00	(0.099, 2, 0.952)
Raj	15,600±14,346	8,492.31-22,800.00	19,700±13,993	12,700.00-26,600.00	12,200±11,902	8,308.50-16,000.00	(3.532, 2, 0.171)
Sudha	14,500±15,770	7,725.47-21,400.00	14,000±15,509	6,641.00-21,300.00	9,309.33±12,597.92	4,672.36-13,900.00	(2.337, 2, 0.311)
Waran	11,000±9,960	-78,400.00-101,000.00	33,100±1,950	15,600.00-50,600.00	25,700±22,085	5,260.00-46,100.00	(0.365, 2, 0.833)
Kruskal-wallis Test (Chi-square, df, p-value)	(12.062, 10, 0.281)		(15.775, 100.106)		(6.268, 100.792)		

Table 2 shows the mean and standard deviation for approximate total revenue, total land area, number of cows, total value and shelf life. The table revealed a significant difference in Approximate Total Revenue, with Passi showing the highest mean revenue and statistical significance (Chi-square = 20.576, p = 0.024*). In contrast, Total land area and number of cows showed no significant variation among brands (Chi-square = 11.997, p = 0.285; Chi-square = 5.462, p = 0.858). Total Value did not exhibit significant differences either (Chi-square = 14.767, p = 0.141). However, Shelf Life varied significantly across brands, with Brita having the longest shelf life and this variation was statistically significant (Chi-square = 107.385, p<0.001**).

Kruskal-wallis test results

To assess the differences in key farm and product characteristics among various dairy brands, a Kruskal-Wallis test for the following variables: approximate total revenue, total land area, number of cows, total value and shelf life. The results are summarized in Table 3.

The Kruskal-Wallis test indicated a statistically significant difference in the median approximate total revenue among the dairy brands (χ^2 = 20.576, df = 10, p = .024). This suggests that the revenue distribution varies significantly across the brands. There were no statistically significant difference in the median of total land area, number of cows, total value and total land area. A highly significant difference was observed in the median shelf life of products across the brands (χ^2 = 107.385, df = 10, p<.001). This indicates considerable variation in the shelf life of dairy products between the brands.

Regression analysis

Tables 4 and 5 present the results of stepwise regression analysis (Forward).

Model 1

The regression model including only total value as a predictor explained a significant portion of the variance in approximate total revenue (F = 817.309, p = 0.000). The model is statistically significant.

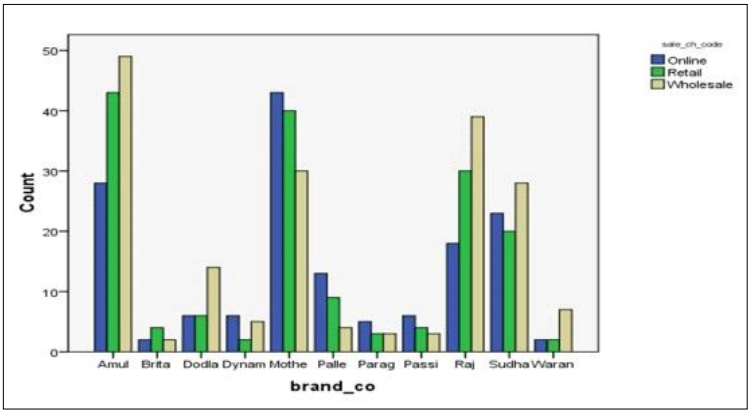

Fig 6: Brand distribution as per sales channel (χ^2= 32.93, p=0.034, α= 0.05).

Table 2: Descriptive statistics and Kruskal-wallis test results for key variables by brand.

Brand	Approximate total revenue: Mean±SD	Total land area: Mean±SD	Number of cows: Mean±SD	Total value: Mean± SD	Shelf life: Mean± SD
Amul	13500.00±15550.89	522.76±287.64	52.04±26.24	26600.00±22907.28	27.82±25.67
Brita	7076.14±6567.03	642.58±217.75	56.25±17.40	23300.00±23895.68	60.75±14.79
Dodla	9284.31±12545.45	460.59±278.80	56.81±29.64	18000.00±15067.07	25.69±2.94
Dynam	18800.00±20917.77	453.46±328.51	45.54±28.74	38200.00±26785.32	50.69±21.38
Mothe	14300.00±14625.51	480.78±313.59	55.81±25.46	28200.00±22386.62	21.43±22.96
Palle	14000.00±12802.20	503.98±331.15	59.77±27.28	25300.00±19099.87	26.35±2.59
Parag	19800.00±22292.07	400.57±288.12	53.45±35.32	27500.00±25116.43	33.55±6.39
Passi	23700.00±16353.36	680.94±321.84	57.00±23.64	36000.00±18994.03	52.38±15.53
Raj	15500.00±15198.14	494.10±273.10	54.21±27.11	29900.00±21608.58	27.15±37.25
Sudha	12300.00±14362.07	491.78±287.29	57.97±25.59	26400.00±22254.05	30.17±40.91
Waran	24400.00±18836.52	623.72±279.41	53.64±30.39	37000.00±20818.19	36.18±2.48
Kruskal-wallis test (Chi-square, df, p-value)	(0.576, 10, 0.024*)	(11.997, 10, 0.285)	(5.462, 10, 0.858)	(14.767,10,0.141)	(107.385, 10, 0.000**)

*Significance level=0.05, **Significance level=0.001.

Model 2

Adding shelf life to the model improved its explanatory power (F = 413.304, p = 0.000), indicating that shelf life contributes significantly to the prediction of approximate total revenue.

Total value

The coefficient remains significant (B = 0.552, Standard Error = 0.019, Beta = 0.795, t = 28.725, p = 0.000), indicating a positive relationship with approximate total revenue.

Shelf life

The coefficient for shelf life is -29.891 (Standard Error = 14.693), with a standardized Beta of -0.056. This coefficient is statistically significant (t = -2.034, p = 0.042), suggesting a small but significant negative effect on approximate total revenue. Collinearity statistics indicate that there were no issues with multicollinearity among the predictors, as all Variance Inflation Factors (VIFs) are close to 1.

The results of the stepwise regression analysis revealed that both total value and shelf life significantly contributed to the prediction of total revenue, albeit in different ways. Total value as a predictor: The regression model including only total value (Model 1) explained a significant portion of the variance in approximate total revenue (F = 817.309, p = 0.000). The coefficient for total value (B = 0.547, Standard Error = 0.019, Beta = 0.789) was highly significant (t = 28.589, p = 0.000), indicating a strong positive relationship with approximate total revenue. This finding aligns with previous studies that have highlighted the importance of total value in driving sales performance. For instance, a study by Angeloni (2022) emphasized that higher total value often correlates with increased customer satisfaction and repeat purchases, thereby boosting overall revenue. Adding shelf life to the model (Model 2) improved its explanatory power indicating that shelf life contributed significantly to the prediction of approximate total revenue. The coefficient for shelf life was -29.891 (Standard error = 14.693), with a standardized Beta of -0.056 and was statistically significant (t = -2.034, p = 0.042). This suggests a small but significant negative effect of shelf life on total revenue. This result is consistent with findings from other studies, such as the work by Jokinen (2012), which found that products with shorter shelf lives often face higher turnover rates and increased waste, negatively impacting revenue.

The findings of this study are in line with the broader literature on sales performance and revenue prediction. For example, Guillet and Mohammed (2015) conducted a meta-analysis on hotel revenue management and found that factors such as total value and shelf life significantly influence revenue outcomes. Their study highlighted that while higher total value generally leads to increased revenue, shorter shelf life can pose challenges in inventory management and sales optimization.

Implications for practice

The results of this study have important implications for businesses aiming to optimize their sales performance.

Table 3: Kruskal-wallis test statistics for farm and product characteristics across dairy brands.

Variable	Chi-square	df	Asymp. Sig. (p-value)
Approximate total revenue	20.576	10	.024
Total land area	11.997	10	.285
Number of cows	5.462	10	.858
Total value	14.767	10	.141
Shelf life	107.385	10	.000

Table 4: Stepwise regression analysis (Anova).

Model		Sum of squares	Df	Mean square	F	Sig.
1	Regression	7.261E10	1	7.261E10	817.309	.000[a]
	Residual	4.415E10	497	8.884E7		
	Total	1.168E11	498			
2	Regression	7.297E10	2	3.649E10	413.304	.000[b]
	Residual	4.379E10	496	8.828E7		
	Total	1.168E11	498			

a. Predictors: (Constant), total_valueb. Predictors: (Constant), total_value, Shelf_lifec. Dependent Variable: approx_tot_rev.

Table 5: Regression Coefficients.

Model		Unstandardized coefficients		Standardized coefficients	T	Sig.	Collinearity statistics	
		B	Std. error	Beta			Tolerance	VIF
1	(Constant)	-823.131	678.205		-1.214	.225		
	total_value	.547	.019	.789	28.589	.000	1.000	1.000
2	(Constant)	-94.001	765.204		-.123	.902		
	total_value	.552	.019	.795	28.725	.000	.987	1.013
	Shelf_life	-29.891	14.693	-.056	-2.034	.042	.987	1.013

a. Dependent variable: approx_tot_rev.

The strong positive relationship between total value and revenue underscores the need for businesses to focus on enhancing the perceived value of their products. Strategies such as improving product quality, offering competitive pricing and providing excellent customer service can help achieve this goal.

On the other hand, the negative impact of shelf life on revenue suggests that businesses need to carefully manage their inventory and product turnover. Implementing effective inventory management systems and adopting just-in-time production techniques can help mitigate the adverse effects of shorter shelf lives.

CONCLUSION

This study sheds light on the dynamics between farm characteristics and dairy product sales using a dataset from Kaggle. Through descriptive analysis, chi-square tests, Kruskal-Wallis tests and regression analysis, we identified key patterns and associations. Findings revealed how factors like farm size and sales channel impact revenue and highlight regional sales variability. The regression analysis revealed that Total Land Area and Number of Cows significantly impact Approximate Total Revenue, with a positive correlation to revenue increases. Chi-square tests indicated significant associations between farm size and product type and between sales channel and total sales. These findings offer valuable insights for optimizing farm operations and sales strategies, contributing to enhanced farm efficiency and market performance.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Research implications

Businesses can use these measures to inform strategic decisions. For instance, if a company sees a negative skewness, it might invest in marketing campaigns during low-revenue periods to boost sales.

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Authors' contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

Data availability

The data analysed/generated in the present study will be made available from corresponding authors upon reasonable request.

Availability of data and materials

Not applicable.

Use of artificial intelligence

Not applicable.

Declarations

Authors declare that all works are original and this manuscript has not been published in any other journal.

Conflict of interest

Authors declare that they have no conflict of interest.

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