Societal Cost-Benefit Analysis of Small-Scale *JUJU DHAU* Dairy in Bhaktapur Municipality

Padma Kumar Adhikari[1], Kul Prasad Lamichhane[2], Ram Prasad Gajurel*[3]

1. Associate Professor of Economics at Ratna Rajyalaxmi Campus, TU.
   adhikaripadam26@gmail.com
2. Associate Professor of Economics at Ratna Rajyalaxmi Campus, TU.
   kul.lamchhane@rrlc.tu.edu.np
3. Lecturer of Economics at Ratna Rajyalaxmi Campus, TU.
   Corresponding author
   ram.gajurel@mahmc.tu.edu.np, gajurelrp@gmail.com
   https://orcid.org/0000-0001-5693-1953

Received: September 23, 2024
Revised: December 7, 2024
Accepted: December 13, 2024

How to Cite: Adhikari, P. K., Lamichhane, K. P., & Gajurel, R. P. (2024). Societal cost-benefit analysis of small-scale JUJU DHAU dairy in Bhaktapur Municipality. *Economic Review of Nepal, 7*(1-2), 1–15. https://doi.org/10.3126/ern.v7i1-2.72760

© Adhikari, Lamichhane, & Gajurel; Economic Review of Nepal, Department of Economics, Ratna Rajyalaxmi Campus, Tribhuvan University. This paper is distributed under the terms of the Creative Commons CC BY-NC 4.0 DEED (https://creativecommons.org/licenses/by-nc/4.0/), which permits copying and redistributing the material in any medium or format for non-commercial uses with proper attribution to the creator.

Abstract

This study, entitled *Societal Cost-Benefit Analysis of Small-Scale JUJU DHAU Dairy in Bhaktapur Municipality*, was designed to evaluate the economic viability and social impact of *JUJU DHAU* production on the Newar community, using data from 50 producers collected between December 2022 and January 2023 under funding provided by UGC Nepal (SRDIG-78/79- H&S-02) program and applying cost-benefit analysis to assess costs, revenues, and effectiveness in a societal context. The findings of this study revealed that producers spent Rs. 31280, earned an average monthly income of Rs. 53,600, and saved Rs. 22,320. The benefit-to-cost ratio (1.295) and the internal rate of return (2.72) demonstrated the strong economic potential of JUJU DHAU trades. This study recommends supporting these local industries, improving market access, reducing production costs, and expanding JUJU DHAU production beyond Bhaktapur by using modern marketing strategies. The implications thereof are that these initiatives could create a niche in the JUJU DHAU market and boost economic opportunities by preserving cultural heritage on the one hand and striking a proper balance between traditional practices and socioeconomic sustainability in a globalized context on the other.

***Keywords*:** JUJU DHAU trade, benefit-cost, societal value, livelihood, socioeconomic activities

JEL classification: D61, F14

Introduction

Small-scale dairy farms are vital to economic development, particularly in developing countries like Nepal (Smith et al., 2020). Dairy farming provides a steady income source for millions of rural households, contributing to poverty alleviation and the improvement in living standards (Kumar et al., 2014). There is high demand for dairy products, such as milk, yogurt, and butter both for domestic consumption and regional trade (Choudhury et al., 2018; Devkota et al., 2018). Among these products, JUJU DHAU, a traditional yogurt, seem to support local livelihoods and boost Baktapur's economic stability (Gautam & Bhattarai, 2021; Gosai, 2023; Tachomo, 2024).

The availability of locally produced dairy items has reduced reliance on imports and ensured affordable, high-quality food for communities (Food and Agriculture Organization [FAO], 2019). This subject is particularly relevant in Nepal, where traditional dairy products hold immense cultural and economic significance (Thapa & Joshi, 2019). JUJU DHAU

production has been a deep-rooted, cultural practice of the Newar community, with yogurt-making methods passed down through generations (Gautam & Bhattarai, 2021); this industry has since provided ample opportunities of employment and made a significant contribution to the local economy (Khadka & Lama, 2020).

Despite the economic significance of JUJU DHAU's production, it has been a symbol of the Newar community's cultural identity. Dairy products like GHEE and DAHI have been essential in Nepal's religious ceremonies, festivals, and rituals, fostering social cohesion and pride (Thapa & Joshi, 2019). Similarly, JUJU DHAU has been making connections among cultural events and symbolizing heritage and regional identity (Choudhury et al., 2018). Its production has relied on traditional methods that have been preserved over centuries, thereby highlighting the need to safeguard cultural practices within modernization (Sharma, 2019).

Amidst many challenges for sustainability, the JUJU DHAU production has united the community through the collective participation of families and artisans, promoted societal harmony, ensured the intergenerational transfer of knowledge, and sustained the trade to date (Gautam & Bhattarai, 2021). The issues, such as the lack of standardized quality control and inconsistent production methods, seem to have acted as an impediment to market expansion, affected consumer trust, and made it difficult for JUJU DHAU to compete with industrial dairy products that benefit hugely from aggressive marketing and large-scale productions (Gautam & Rijal, 2021).

Moreover, other obstacles for producers—such as accessing raw materials such as milk, irregular supplies, and price fluctuations (Adhikari & Gajurel, 2024)—have increased production costs and reduced profit, negatively affecting local artisans' livelihoods (Sharma & Neupane, 2016); likewise, rising input and transportation costs further have exacerbated the problems of JUJU DHAU producers (Karki, 2020).

Given the economic and cultural significance of JUJU DHAU production, a societal cost-benefit analysis has been conducted to assess its impact. A prior study has emphasized the role of traditional dairy products in preserving cultural heritage and promoting social cohesion (Paudel et al., 2020).

The prior studies seem to have suffered from one important gap: Those studies were found falling short of addressing the societal cost-benefit analysis (CBA) of small-scale dairy of JUJU DHAU production in Bhaktapur, Nepal, and analyzing monetary and non-monetary benefits to social perspective. This study therefore attempts to fill the gaps from geographical, variable, and methodological perspectives by conducting a thorough societal cost-benefit analysis of JUJU DHAU production and examining how trade activities contribute to economic and social value within the community. To serve the purpose, this study employed a quantitative method, a detailed analysis of fixed and variable costs, and the benefits derived from production for twelve months.

Research Objectives

This current study therefore was designed to fill the gap in the previous studies by evaluating the economic viability and social impact of JUJU DHAU production of the Newar community in Bhaktapur Municipality. To assess economic viability, this study also conducted benefit-cost analysis (CBA) by using net present value (NPV) and internal rate of return (IRR) criteria. By examining fixed and variable costs, revenue generation, and the impact on the

community, this study aims to assess the roles of JUJU DHAU—and to identify this industry's challenges—in making economic sustainability and preserving valuable cultures, especially in the age of unfettered globalization.

Literature Review

The literature on small-scale dairy holdings, particularly JUJU DHAU production, highlights its dual significance as an economic and cultural activity. Previous studies have showed small-scale dairies contributing to poverty alleviation and community development (Chagwiza et al., 2016; Kumar et al., 2020). Thapa and Joshi (2019) and Gautam and Bhattarai (2021) emphasized JUJU DHAU's cultural importance within the Newar community, where traditional yogurt-making fosters social cohesion and identity. Khadka and Lama (2020) adopted an integrated approach, combining economic and cultural perspectives to underscore the sustainability of JUJU DHAU production.

Regarding the small-scale dairies that play a vital role in developing economies, a study analyzed the financial feasibility of small-scale dairy farms in East Africa. They exhibited that low investments can yield high returns despite challenges such as fluctuating milk prices and high feed costs (Bachke, 2019). These findings are in consonance with JUJU DHAU production in Bhaktapur, where uninterrupted supply of milk and stable input costs are essential for quality and productivity (Gautam & Rijal, 2021). Another study found dairy cooperatives raising income and credit access, thereby boosting productivity in Ethiopia. This cooperative model was found suggesting the structures similar to those of Bhaktapur JUJU DHAU Byabasai Sangh (BJDBS), which could help local producers address challenges in milk tracking and marketing (Chagwiza et al., 2016).

In South Asia, Kumar et al. (2020) used a CBA framework to assess the profitability of small-scale dairies in India, demonstrating a strong sensitivity of profitability to input costs such as feed and veterinary care and emphasizing cost management and innovation for sustaining small-scale dairies. This insight is particularly relevant for JUJU DHAU producers who must carefully manage production costs to sustain traditional quality while maintaining economic viability. In Nepal, Sharma and Neupane (2018) claimed that the dairy sector can contribute significantly to rural livelihoods. Thapa and Pokharel (2018) investigated JUJU DHAU production in Bhaktapur, emphasizing its substantial role in generating income and employment. Their study recommended integrating traditional methods with modern techniques to improve productivity and efficiency.

Documenting major challenges facing Nepal's dairy sector, such as inadequate access to quality feed, veterinary services, and market information, Sharma and Neupane (2016) also identified some barriers to the growth of JUJU DHAU production, adding that their cost-benefit analysis (CBA) revealed that small-scale dairies could achieve profitability—for all these challenges—if these issues were addressed. Similarly, Bhandari and Thapa (2017) explored the market dynamics of traditional dairy products, emphasizing the strong consumer demand for JUJU DHAU. They argued for preserving traditional practices and focusing on innovation for meeting consumer expectations and ensuring long-term profitability.

Khadka and Lama (2020) examined the fermentation process of traditional foods like JUJU DHAU, emphasizing their nutritional and economic importance. Their findings underscored the role of dairy products in supporting local economies and livelihoods, reinforcing JUJU DHAU's cultural value in Bhaktapur. In this regard, Paudel et al. (2020) explored the broader societal implications of JUJU DHAU production, including its role in preserving cultural heritage and promoting tourism. However, they warned of the potential risks that stand in the way of product quality and industry sustainability.

Some previous studies were found underling the need for raising economic productivity, addressing the societal and cultural dimensions of JUJU DHAU production for the sustainability of JUJU DHAU, and modernizing the production process without making any compromise in traditional practices—the finding that highlighted cultural and economic significance of JUJU DHAU trades in fostering community cohesion, preserving traditional knowledge, and reinforcing the cultural identity of the Newar community (Pokharel, 2018; Sharma & Neupane, 2016; Thapa & Joshi, 2019).

A study in Ethiopia revealed that cooperative models and collective efforts could have the potential to enhance productivity and address common challenges effectively (Chagwiza et al., 2016). Likewise, JUJU DHAU producers were also observed facing similar challenges—such as fluctuating input prices and limited resource access—that can be mitigated through cooperative frameworks, improved input supply, and strategic marketing initiatives (Gautam & Rijal, 2021; Karki, 2020).

Materials and Method

Following the above research objectives, this study was grounded in the study of Broadman et al.'s (2018) cost-benefit analysis and Scott and Motamed's (2024) analysis practically applied later in the agriculture sector in the USA. Therefore, this study employed a quantitative research design to conduct a societal cost-benefit analysis (CBA), particularly of JUJU DHAU dairy production in Bhaktapur Municipality. Primary data were collected from December 2022 to January 2023, using random sampling, especially focusing on 50 JUJU DHAU producers—the grant provided by UGC-Nepal (SRDIG-78/79- H&S-02). Structured interviews and questionnaires were utilized to collect data on the socio-economic status of the producers, production costs, revenues, and the overall impact of JUJU DHAU production on local livelihoods. The data collection process involved two main components: a structured questionnaire, and key-informant interviews to gain deeper insights into the challenges and opportunities posed by producers. Descriptive statistical techniques were employed to analyse the characteristics of respondents and the CBA used to calculate net present value (NPV) and internal rate of return (IRR) criteria and to assess the economic viability of JUJU DHAU production (Broadman et al., 2018). The costs were categorized into fixed and variable components: Fixed costs included investments in equipment and infrastructure, and variable costs included monthly expenses, such as milk, utilities, and labour. Both costs were included for 12 months. The benefits were calculated in monetary value, based on monthly revenues generated from JUJU DHAU sales. The analysis used shadow pricing to provide a more accurate representation of costs and benefits to ensure that the findings reflect the true economic and social value of JUJU DHAU production in the local context.

1. The calculation of NPV was based on two criteria as given below:
   i. The Benefit-Over-Cost Criteria (BOC): $\sum_{i=1}^{n} B_i - \sum_{i=1}^{n} C_i > 0$ indicates the business is profitable in 12 months.
   ii. The Benefit-to-Cost Ratio Criteria (BCR): $\frac{\sum_{i=1}^{n} B_i}{\sum_{i=1}^{n} C_i}$ >1 indicates the business is successfully sustainable during twelve months.
2. Internal Rate of Return Criteria (IRR): The IRR was calculated through the growth rate of BOC criteria during twelve months. The positive growth rate of the BOC indicates that the business is viable for future operation for more than the next twelve months.

Results

Societal Status of JUJU DHAU Traders

The study surveyed 50 JUJU DHAU-producing firms in Bhaktapur Municipality and revealed that 81.6% were registered, while 18.4% operated without formal registration. These enterprises, distributed across various wards, demonstrated a homogenous self-employment structure, although income levels varied significantly among producers. The JUJU DHAU industry, deeply rooted in the Newar community, has evolved into an oligopolistic market characterized by substantial barriers to entry and exit, primarily due to the traditional transmission of skills within the community.

Both males and females actively participated in this labour-intensive occupation, typically working between 8 to 12 hours daily. Most producers operated their businesses from home, with 56% of respondents indicating they worked from their residences. The average monthly income for these families was Rs 53,600, with expenditures averaging Rs 31,280, resulting in an average monthly saving of Rs 22,320. The Gini coefficient of 25.75% indicated minimal income disparity among producers, suggesting a relatively stable economic environment.

The findings highlight that the JUJU DHAU occupation has provided economic benefits and fostered social cohesion and cultural identity within the Newar community. This study suggests that traditional practices should continue by integrating with modern market strategies sustaining the livelihoods of JUJU DHAU traders and preserving their cultural heritage in the face of modernization.

Cost Analysis of the JUJU DHAU

The cost analysis of JUJU DHAU production was conducted, using shadow prices rather than market prices, providing a nuanced understanding of the economic viability of this traditional dairy product. The analysis revealed that the initial setup costs averaged Rs. 573,484 across the 50 surveyed families, while the monthly production costs averaged Rs. 192,760. This comprehensive breakdown of costs is essential for understanding the financial dynamics of JUJU DHAU production.

Analysis of Fixed Cost

The fixed costs associated with JUJU DHAU production included various expenditures for establishing and maintaining the production process. Table 1 includes the average setup costs.

Table 1

The Fixed Cost

Fixed cost particulars	*n*	Min	Max	*M*	*SD*
Rent	50	60000	216000	111024.00	44492.40
Salary	20	7500	60000	16550.00	15140.48
Utensils	50	10000	200000	34800.00	39782.06
Fat checking machine	42	2500	25000	7857.14	5883.30
Blanket or quilt	50	2000	20000	7220.00	4886.63
Ply	50	2000	20000	5220.00	3922.93
Fridge	50	75000	2000000	402000.00	395892.17
Average set-up cost for Fixed assets	50	185500	2444000	573484.00	455887.35

Note. *n* = Sample Size; Min = Minimum; Max = Maximum; *M* = Mean; *SD* = Standard Deviation, the data collected from December 2022 to January 2023.

Table 1 interprets the findings in detail in this way:

Utensils. These types of equipment were essential for fermentation and storage, highlighting the need for quality equipment to maintain product standards. Producers invested an average of Rs. 34,800 in utensils, ranging from Rs. 10,000 to Rs. 200,000.

Salary. This indicates that many producers relied on family labour, which could reduce operational costs and limit production capacity. Only 20 respondents reported paying salaries, averaging Rs. 16,550 per month.

Fat Checking Machine. This equipment has been crucial for ensuring the milk quality that is used in JUJU DHAU production. The average investment in lactometers was Rs. 7,857.14.

Other Equipment. These costs reflected the need for proper storage and fermentation conditions to produce high-quality yoghurt. Additional investments included blankets for fermentation (Rs. 7,220 annually), plywood (Rs. 5,520), and fridges (Rs. 402,000 over their lifetime).

The total average setup cost for fixed assets was calculated at Rs. 573,484, indicating a substantial initial investment required to establish a JUJU DHAU production operation. This investment is critical for ensuring the sustainability and quality of the product over a lifetime.

Analysis of Production Cost

The production costs were calculated, based on monthly expenses incurred during the production of JUJU DHAU. Table 2 presents the average monthly production cost figures, including the mean, maximum, minimum, and standard deviation.

Table 2 displays the detailed description of the production cost per month:

Milk. The cost of milk was found to be the most significant expense, reflecting the reliance on local dairy farmers for quality milk supply averaging Rs.155976.

Electricity. This cost was diverse based on the production scale and the efficiency of the equipment to be used averaging Rs. 2860.

Wood and Gas. These fuels worth Rs. 9584 on average were essential for heating during the yogurt-making process.

Rice Husk. Rice husk worth Rs. 1466.67 on average has been frequently used as a basement for clay pots, reflecting local agricultural products.

Table 2

The Production Costs

Production cost particulars in month	*n*	Min	Max	*M*	*SD*
Milk	50	58200	436500	155976.00	95026.87
Electricity	50	1200	10000	2860.00	1717.38
Wood and gas	50	3200	20000	9584.00	4353.62
Rice husk	48	400	3000	1466.67	575.87
Clay pot	50	4400	22500	10992.00	4470.67
Transportation	37	0	30000	9027.03	6893.98
Sugar	50	2000	7000	3420.00	1175.26
Others	44	1000	4000	2090.91	935.56
Average production cost	50	92650	530500	192760.00	109811.56

Note. *n* = Sample Size; Min = Minimum; Max = Maximum; *M* = Mean; *SD* = Standard Deviation, the data collected from December 2022 to January 2023.

Clay Pots. Clay pots, traditionally used for fermentation and contributing to the unique taste and texture of JUJU DHAU, costed Rs. 10,992 on average.

Transportation. Efficient transportation, with an average cost of Rs. 9,027.03, has been essential for maintaining product freshness and quality. These costs varied significantly depending on distance and logistical factors.

Sugar and Other Ingredients. These costs reflected the additional ingredients necessary for flavouring and enhancing the product worth Rs. 3420 and Rs. 2090.91 on average, respectively.

The average monthly production cost stood at Rs. 192760, with a maximum of Rs. 530,500 and a minimum of Rs. 92,650. This monthly production cost indicated that producers faced stable operational expenses, which was realized as essential for planning and financial forecasting.

The findings further indicate that the costs appeared to be substantial, the potential for revenue generation from JUJU DHAU tended to be fluctuating over the year, and remains high, particularly during peak seasons and cultural events. This cost analysis provides a critical foundation of the CBA for the economic viability of JUJU DHAU production and reflects its role in supporting local livelihoods in Bhaktapur Municipality.

Revenue (Benefit) Analysis

The revenue generated by JUJU DHAU producers was analysed over twelve months, revealing significant variations in income across different months. The average monthly revenue for the surveyed producers amounted to Rs. 253260, with a standard deviation of Rs. 153370.30, indicating a notable disparity in earnings among the producers. Table 3 breaks down the monthly revenue-generating figures for each month over a year.

Table 3 indicates that December consistently yielded the highest average revenue, likely due to rising demand during the festive season, while September recorded the lowest average revenue. The monthly revenue fluctuations can be attributed to several factors, including seasonal demand, cultural events, and the number of participating family members in production.

Table 3

The Revenue Every Month

Monthly revenue	Min	Max	*M*	*SD*
May	80000	600000	212400	124122.39
June	80000	605000	206600	124815.95
July	90000	900000	260600	179263.35
August	90000	650000	233800	135881.70
September	80000	500000	210600	110350.28
October	85000	800000	289200	195514.39
November	80000	700000	251400	147824.50
December	90000	1200000	392000	260830.70
January	100000	600000	224200	125451.67
February	105000	900000	298000	203407.20
March	100000	800000	233200	155864.15
April	100000	700000	227120	154487.52
Total revenue	1140000	8505000	3039120	1840443.65
Average revenue	95000	708750	253260	153370.30

Note. Min = Minimum, Max = Maximum, M = Mean, and S*D* = Standard Deviation, the data collected from December 2022 to January 2023.

This revenue analysis highlights the economic potential of JUJU DHAU production, emphasizing its role as a significant source of income for local producers in Bhaktapur. The findings suggest that producers can enhance their revenue streams and contribute to the sustainability of this traditional industry with effective management and marketing strategies.

Testing Benefit (Revenue)-Over-Cost Criteria

The analysis of the benefit-over-cost (BOC) for JUJU DHAU production was conducted to assess the economic profitability of the trade across twelve months. This evaluation aimed to determine whether the benefits derived from JUJU DHAU production outweighed the associated costs, thereby indicating the sustainability of the JUJU DHAU business model.

The data from the monthly benefit-over-cost analysis revealed positive differences for each month, confirming the profitability of JUJU DHAU production. The average monthly benefit stood at Rs. 60500, with a standard deviation of Rs. 45049.64, indicating variability in profitability across different months. Similarly, Table 4 gives a detailed picture of the breakdown of the benefit-over-cost analysis for each month.

Table 4 shows in detail the benefit-over-cost analysis for each month in figures of mean, maximum, minimum, and standard deviations. This analysis indicates that the average benefit-over-cost was consistently positive across all months, suggesting that producers could continue their operations profitably. The highest average benefit-over-cost was observed in December, likely due to increased demand during the festive season, while the lowest was in June.

Figure 1 further showed the trends of benefit-over-costs fluctuating every month. Figure 1 shows that the differences between benefits-over-costs were irregular each month. The differences were found to be the highest in December and lowest in June.

Table 4

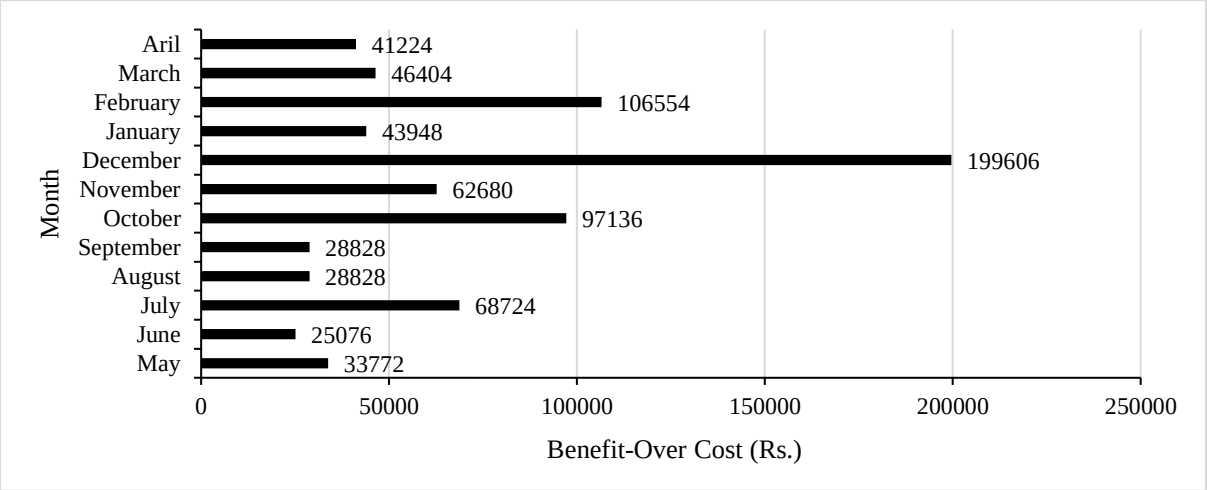
Benefit Over Cost of Each Month

Benefit Over Cost by Month	Min	Max	*M*	*SD*
May	500	126100	33772	32017.80
June	400	106100	25076	24927.22
July	2600	369500	68724	78889.46
August	500	196150	28828	32205.19
September	500	196150	28828	32205.19
October	4600	382500	97136	100354.89
November	4600	224600	62680	60011.58
December	2650	683500	199606	156628.73
January	3850	118000	43948	34861.80
February	3850	383500	106554	97840.61
March	3850	269500	46404	52501.83
Aril	400	183500	41224	46445.08
Average Revenue Over Cost	1300	192250	60500	45049.64

Note. Min = Minimum; Max = Maximum; *M* = Mean; *SD* = Standard Deviation. The data collected from December 2022 to January 2023.

Figure 1

Benefit-Over Cost of Monthly Basis



Note. The figure was based on the total amount of revenue over twelve months the data from December 2022 to January 2023.

These findings confirm that JUJU DHAU production may be economically viable, with producers experiencing positive financial outcomes throughout the year. The consistent positive differences between benefits and costs indicate a strong potential for sustaining JUJU DHAU production as a viable livelihood option for local producers in Bhaktapur Municipality. This analysis not only underscores the profitability of the trade but also highlights the importance of seasonal demand fluctuations in influencing economic outcomes for producers.

Testing Revenue-to-Cost Ratio Criteria

Vital for assessing the economic sustainability of JUJU DHAU production, the revenue-to-cost ratios (an average ratio of 1.295) were calculated for the 50 surveyed producers over twelve months, indicating that producers earned Rs. 1.295, on average, for every rupee spent,

confirming the profitability of the JUJU DHAU trade. Table 5 summarises the monthly revenue-to-cost ratio in mean, maximum, minimum, and standard deviation for each month.

Table 5

The Revenue-to-Cost Ratio of Each Month

B/C month basis	Min	Max	*M*	*SD*
May	0.82	1.73	1.096	0.225
June	0.82	1.61	1.056	0.174
July	0.96	2.21	1.309	0.292
August	0.96	1.62	1.202	0.179
September	0.71	2.27	1.108	0.228
October	0.91	2.37	1.436	0.368
November	0.85	2.28	1.321	0.385
December	0.97	2.62	1.979	0.453
January	0.58	1.78	1.198	0.288
February	0.88	2.09	1.495	0.294
March	0.84	1.57	1.188	0.190
April	0.84	1.57	1.152	0.189
Average B/C of year	1.01	1.46	1.295	0.8862

Note. Min = Minimum; Max = Maximum; M = Mean; *SD* = Standard Deviation. The data collected from December 2022 to January 2023.

The findings from Table 5 indicate that the revenue-to-cost ratios were consistently above one for all months, confirming that JUJU DHAU production seemed to be economically sustainable. The highest ratio was observed in December, likely due to increased demand during the festive season, while the lowest was in June. They secured profit constantly as visualized in Figure 2.

Figure 2

Trends of the Benefit-Cost Ratio by Twelve Months

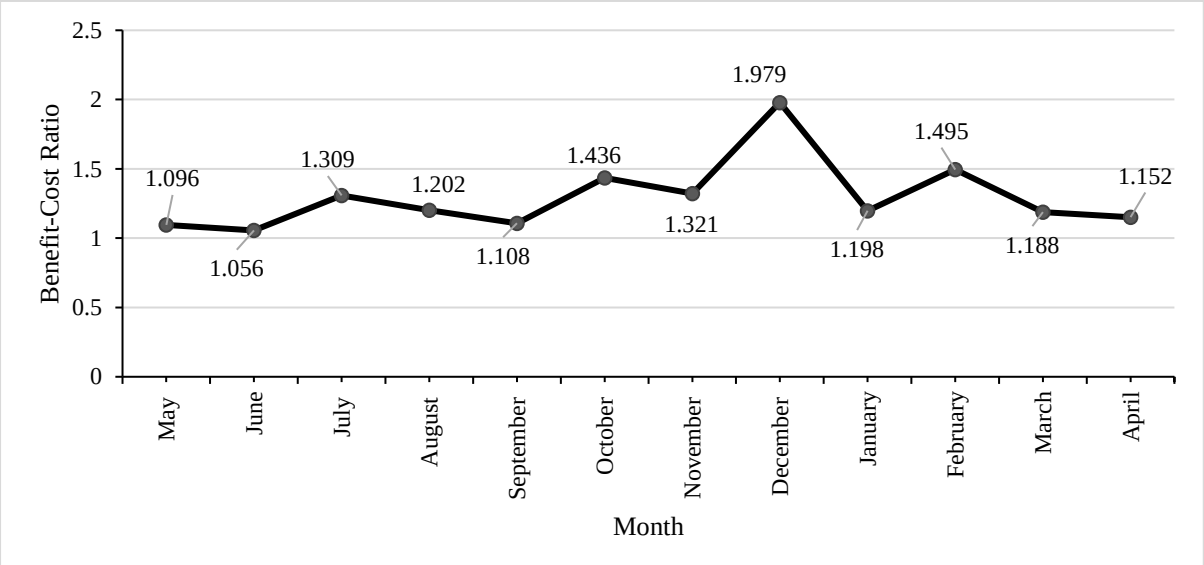


Figure 2 shows that the revenue-cost ratios were distributed constantly over twelve months, indicating almost a similar pattern of trades over the seasons, albeit fluctuating. These results highlight the sustainability of the JUJU DHAU trade over the twelve months, suggesting that producers can continue their operations with a positive outlook on financial returns. The

consistent revenue-to-cost ratios further emphasize the potential for growth and long-term sustainability within this traditional industry.

Testing Internal Rate of Return Criteria

The internal rate of return (IRR) is a crucial measure for evaluating the profitability and financial viability of JUJU DHAU production. This study calculated the IRR over twelve months, revealing an average IRR of 2.72, informing a 272% annual profit. This high rate of return indicated that the JUJU DHAU trade was profitable and offered substantial financial benefits to producers in the forthcoming days. Table 6 gives a detailed picture of the monthly IRR assessed for each month.

Table 6

The Internal Rate of Return of Months

Internal rate of return on twelve-month	Min	Max	*M*	*SD*
May	-1.00	10.83	1.10	2.98
June	-1.00	42.50	2.34	8.50
July	-1.00	25.83	1.77	4.76
August	-1.00	49.29	3.79	9.33
September	-1.00	49.29	3.79	9.33
October	-1.00	7.61	0.75	2.22
November	-1.00	12.81	0.95	2.85
December	-1.00	176.53	6.73	27.74
January	-1.00	22.83	1.82	6.02
February	-1.00	98.61	2.82	14.08
March	-1.00	20.69	1.65	4.74
April	-1.00	80.50	5.12	17.77
Average internal rate of return on the year	-1.00	30.29	2.72	5.20

Note. Min = Minimum; Max = Maximum; M = Mean; *SD* = Standard Deviation. The data collected from December 2022 to January 2023.

Table 6 shows that average rate returns were highest (*M* = 6.73) in December and lowest (*M* = 0.75) in October. Figure 3 illustrates the IRR for the average figures over twelve months.

Figure 3

Monthly Rate of Returns of Revenue

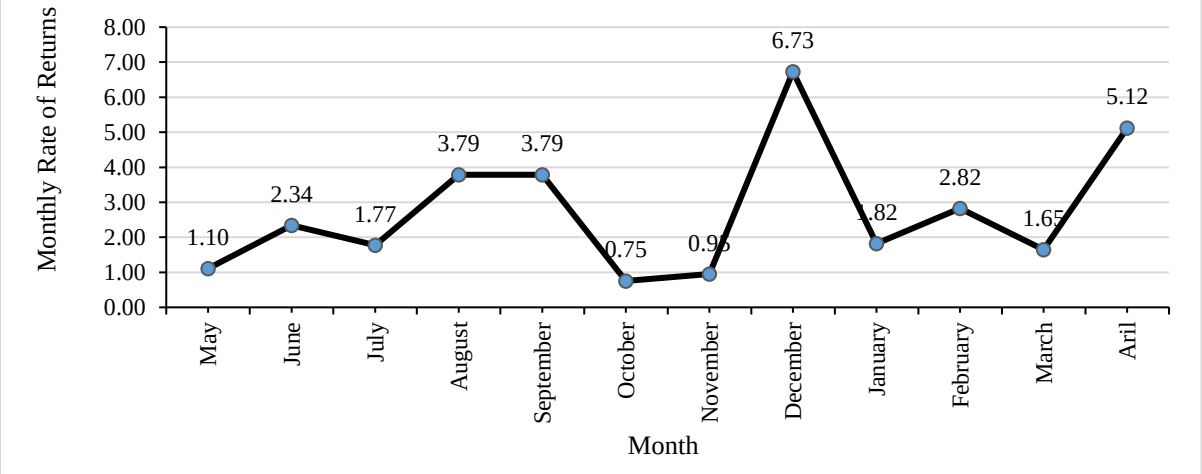


Figure 3 shows that the IRR trend was observed to be positive over the twelve months, fluctuating significantly across the months, with December showing the highest potential for

returns. The overall average IRR of 2.72 suggests that JUJU DHAU production is a highly lucrative venture, reinforcing the economic sustainability of this traditional industry. The robust rates of return underscore the potential for continued growth and profitability, making JUJU DHAU production a viable livelihood option for local producers in Bhaktapur Municipality in the upcoming days.

Discussion

Building on the existing literature regarding small-scale dairy farming in Nepal, this study presents the societal cost-benefit analysis of JUJU DHAU production in Bhaktapur Municipality. The findings indicate that JUJU DHAU serves as a source of income and plays a crucial role in preserving cultural heritage within the Newar community. The average monthly income of Rs. 53,600 and savings of Rs. 22,320 per family highlight the economic stability that this traditional trade provides. This finding is in line with the previous studies that emphasize the role of dairy farming in poverty alleviation and improved living standards (Choudhury et al., 2018; Devkota et al., 2018).

The NPV of BCA, the testing benefit-over-cost criteria revealed an average profit of Rs. 60,500 per month, with a benefit-to-cost ratio of 1.295, confirming the profitability and sustainability of JUJU DHAU production. This finding is consistent with previous studies that highlights the economic potential of traditional dairy products, particularly during peak seasons and cultural events (Karki, 2020; Sharma, 2019). In addition, this current study adds a new dimension by demonstrating that the revenue-to-cost ratio consistently exceeded one across all months, indicating a stable economic environment for producers throughout the year.

Moreover, the internal rate of return (IRR = 2.72), translating to a 272% annual profit, underscores the financial viability of this trade in the days ahead. This high IRR is congruent with findings from the previous studies that emphasize the importance of effective management and resource allocation in maximizing profitability (Bhandari & Thapa, 2017; Thapa & Pokharel, 2018). However, this current study highlights the need for producers to navigate challenges, such as fluctuating input prices and competition from substitute products, which could impact long-term sustainability.

The cultural significance of JUJU DHAU within the Newar community is another critical aspect of this study. The production process is deeply intertwined with local traditions, fostering social cohesion and community pride. This cultural dimension adds value beyond mere economic metrics, emphasizing the importance of preserving traditional practices in the face of globalization (Paudel et al., 2020). The findings of this study suggest that integrating traditional methods with modern market strategies is essential for sustaining the livelihoods of producers and preserving their cultural identity.

In a nutshell, this study contributes to the growing body of literature on small-scale dairy farming in Nepal by providing a comprehensive analysis of the economic and social value generated through JUJU DHAU production. The findings of this study underscore the need for continued support and development within this sector, highlighting the potential for JUJU DHAU to serve as a model for other traditional industries seeking to balance economic viability with cultural preservation.

Conclusion

The study's societal cost-benefit analysis of JUJU DHAU production in Bhaktapur Municipality is most likely to highlight the significant economic and cultural contributions. The findings from this study indicate that JUJU DHAU can serves as a vital source of income for local producers, with an average monthly income of Rs. 53,600 and savings of Rs. 22,320, demonstrating the economic stability of families involved in this trade.

The analysis of this study reveals a benefit-over-cost ratio of 1.295, confirming the profitability of JUJU DHAU production. Additionally, the internal rate of return of 2.72, amounting to 272% annual profit, underscores the financial viability of this industry. These measures suggest that JUJU DHAU preserving traditions are economically sustainable and would offer economic benefits to the local community of Bhaktapur Municipality.

Despite the positive economic indicators, challenges—such as fluctuating input prices and competition from alternative products—highlight the factors that could affect the long-term sustainability of the JUJU DHAU industry. Therefore, local stakeholders should implement strategies to enhance market access, stabilize production costs, and promote the unique cultural heritage associated with JUJU DHAU.

Moreover, the cultural significance of JUJU DHAU within the Newar community cannot be overlooked. The production process is deeply entwined with local traditions, thereby fostering social cohesion and a community sense of pride. This cultural aspect adds value beyond mere economic metrics, emphasizing the importance of preserving traditional practices in tandem with modernization.

The findings of this study are likely to nudge stakeholders into making policy decisions for sustainably preserving JUJU DHAU production and ensuring artisans' livelihoods of those engaged in this unique industry in Bhaktapur. The findings from this study could contribute to understanding how JUJU DHAU supports local livelihoods and preserves cultural practices, besides benefiting policy decisions and community development efforts.

A strategic approach is required to preserve the cultural and economic significance of JUJU DHAU trade, to address existing challenges, and to promote sustainable growth. Strengthening their market position requires enhancing quality control, standardizing production methods, and ensuring a stable supply of raw materials. Moreover, modern marketing strategies can extend JUJU DHAU's reach beyond Bhaktapur, creating new economic opportunities while preserving its rich cultural heritage.

References

Adhikari, P. K. & Gajurel, R. P. (2024). *Trade and employment process of small-scale dairy holdings: A case study of JUJU DHDU producing industries in Bhaktapur* [An unpublished report]. University Grant Commission (UGC) Nepal, under the Grant (SRDIG – 78/79- H&S-02) 2021/2022.

Bachke, M. E. (2019). Financial feasibility of small-scale dairy farms in East Africa. *Journal of Development Economics, 137*(1), 141-150. https://doi.org/10.1016/j.jdeveco.2019.01.002

Bhandari, K., & Thapa, R. (2017). Market dynamics of traditional dairy products in Nepal: A Focus on Juju Dhau. *Journal of Agricultural Economics, 5*(3), 233-245.

https://doi.org/10.5958/0974-0279.2020.00003.8

Boardman, A. E., Greenberg, D. H., Vining, A.R., and Weimer, D.L. (2018). *Cost-benefit analysis* (5th ed). Cambridge University Press. https://www.doi.org/10.1017/9781108235594

Chagwiza, C., Muradian, R., & Ruben, R. (2016). Cooperative membership and dairy enterprise performance in Ethiopia. *Food Policy*, *59*, 165-176. https://doi.org/10.1016/j.foodpol.2016.01.008

Choudhury, V., Kumar, A., & Pathak, H. (2018). Traditional dairy products of India: A review. *Journal of Dairy Science and Technology*, *53*(2), 79-90. https://doi.org/10.1016/j.jdairy.2017.12.014

Devkota, N., Pant, K. P., & Banskota, A. (2018). Economic analysis of small-scale dairy farming in Nepal. *Nepalese Journal of Agricultural Economics*, *23*(1), 59-72. https://doi.org/10.3126/njae.v23i1.20475

Food and Agriculture Organization. (2019). *Dairy development in South Asia: A regional overview*. Food and Agriculture Organization of the United Nations. https://doi.org/10.4060/ca6017en

Gautam, R., & Bhattarai, P. (2021). Economic challenges and opportunities in the traditional dairy sector: A focus on Juju Dhau production in Bhaktapur. *Journal of Dairy Science and Technology*, *45*(2), 123-135. https://doi.org/10.1016/j.jdairy.2020.11.014

Gautam, R., & Rijal, S. (2021). Modern adaptations in the production of Juju Dhau in Bhaktapur. *Journal of Dairy Science and Technology*, *46*(1), 115-128. https://doi.org/10.1016/j.jdairy.2020.12.010

Gosain, S. (2023). *An economic analysis of JUJU DHAUtrades in Bhaktapur municipality* [Unpublished master's thesis]. Tribhuvan University.

Karki, M. (2020). Economic implications of small-scale dairy farming: The case of Juju Dhau in Bhaktapur, Nepal. *Economic Journal of Nepal*, *44*(2), 145-160. https://doi.org/10.3126/ejn.v44i2.35612

Khadka, D. B., & Lama, J. P. (2020). Traditional fermented food of Nepal and their nutritional and nutraceutical potential. In *Nutritional and Health Aspects of Food in South Asian Countries* (Issue March). https://doi.org/10.1016/b978-0-12-820011-7.00022-8

Kumar, A., Joshi, P. K., & Pal, S. (2014). Impact of supply chain integration on smallholder dairy farmers in India. *Agricultural Economics Research Review*, *27*(2), 171-180. https://doi.org/10.5958/0974-0279.2014.00019.1

Kumar, A., Singh, P., Joshi, A., & Kumar, S. (2020). Economic impact of small-scale dairy farms in India: A Cost-Benefit Analysis. *Agricultural Economics Research Review*, *33*(1), 45-58. https://doi.org/10.5958/0974-0279.2020.00003.8

Paudel, P., Bhattarai, K., & Shrestha, S. (2020). Role of traditional dairy products in cultural preservation and tourism promotion in Bhaktapur. *Nepal Tourism Review*, *11*(1), 23-35. https://doi.org/10.3126/ntr.v11i1.25753

Poudel, D., & Tiwari, S. R. (2020). Entrepreneurship for sustainable livelihood through traditional crafts : A case of Bhaktapur. *Entrepreneurship for Sustainable Livelihood*

through Traditional Crafts: A Case of Bhaktapur, *8*, 294–302.

Sharma, B. (2019). Traditional methods of Juju Dhau production in Bhaktapur. *Journal of Food Science and Technology Nepal*, 37(2), 134-143. https://doi.org/10.1007/s13197-019-03902-9

Sharma, R., & Neupane, S. (2016). Challenges faced by small-scale dairy farmers in Nepal. *Journal of Agricultural Extension and Rural Development*, *8*(6), 75-82. https://doi.org/10.5897/JAERD2016.0775

Smith, J., Brown, R., & Taylor, P. (2020). The role of small-scale dairy farms in developing economies: Challenges and opportunities. *Journal of Agricultural Economics and Development, 12*(3), 123–135. https://doi.org/10.xxxx/jaed.2020.123456

Szott, A., & Motamed, M. (2024). Agriculture sector cost-benefit analysis guidance. USA: Millennium Challenge Corporation.

Tachamo, R. (2024). *Cost and benefit analysis in trade and employment process of JUJU DHAUin Bhaktapur: A case study of Bhaktapur Municipality* [Unpublished master's thesis]. Tribhuvan University.

Thapa, R., & Pokharel, D. (2018). Economic impact of Juju Dhau production in Bhaktapur, Nepal. *Journal of Development Economics and Research*, *19*(4), 102-114. https://doi.org/10.1016/j.jdeveco.2018.04.011

Thapa, S. (2018). Informal employment in traditional food sectors: A study of Juju Dhau production in Bhaktapur. *Nepalese Journal of Employment Studies*, *5*(2), 101-115. https://doi.org/10.3126/njes.v5i2.29853

Thapa, S., & Joshi, G. R. (2019). Cultural significance of dairy products in Nepal: The case of Juju Dhau in Bhaktapur. *Asian Journal of Agriculture and Development*, *16*(1), 123-136. https://doi.org/10.22004/ag.econ.288372