

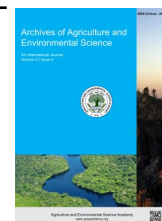


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ORIGINAL RESEARCH ARTICLE



Analysis of economic, production, and marketing aspects of potato farming in Changunarayan Municipality of Bhaktapur, Nepal

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ABSTRACT

A comprehensive study was undertaken in the Changunarayan Municipality of Bhaktapur District to conduct a thorough cost-benefit analysis, analyze production functions, and evaluate the various marketing channels and associated challenges of potato cultivation. A total of 100 farmers were surveyed, and gathered data were analyzed using Excel and SPSS software. Despite an average cost per hectare of potato cultivation reaching NRs 370,662.58, which is comparatively higher than in other regions, the productivity was notably greater at 22.021 Mt/ha, surpassing the national average of 16.73 Mt/ha. With a benefit-cost ratio of 1.68, potato production was found economically viable in the region. The production function analysis, conducted using the Cobb-Douglas Model, revealed noteworthy insights among the six variables examined. Fertilizers, machinery, plant protection measures, and micronutrients were identified as underutilized inputs, as indicated by a RUE value surpassing unity. Conversely, labor cost and various other factors exhibited negative associations with average returns. The study also revealed that potato production in the area exhibited an increasing Return to Scale (RTS) value of 1.619, indicating that a 1% increase in input expenditure would lead to a 1.619% increase in returns. Farmers primarily choose a marketing channel with three intermediaries, which results in a larger market margin but a smaller share for the producers. Among the five key marketing challenges reported by farmers, the influence of intermediaries stands out as the most significant issue. In conclusion, this study highlights the pressing need for efficient marketing channels and fair pricing systems to support potato farmers in the region.

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INTRODUCTION

The potato (*Solanum tuberosum*) is an annual plant belonging to the nightshade family (Solanaceae), grown for its starchy edible tubers. Originating from the Peruvian-Bolivian Andes, Potatoes are now cultivated worldwide in various climates (Singh *et al.*, 2020). It ranks fifth in terms of production after paddy, maize, wheat, and sugarcane with China and India being the primary producers (FOASTAT, 2022). Potatoes are among the highly

cultivated and consumed food crops because they provide a high protein and calorie yield per unit of land (Singh, 2020). In Nepal, potatoes are the second highest in total production and the sixth in terms of area cultivated, following paddy, maize, wheat, oilseed, and lentils (MOALD, 2023). Potatoes are rich in carbohydrates, essential amino acids like lysine, vitamins (C, thiamine, niacin, peroxide, B6), and minerals (calcium, potassium, phosphorus) (Singh *et al.*, 2023). They serve various culinary purposes, especially as chips and fries in recent times, and also

find applications in non-food industries, with their starch used in biodegradable polymers (Grommers and van der Krogt, 2009; Kirkman, 2007).

Potatoes are grown in almost all regions of Nepal, from the terai where they are primarily cultivated in the winter months, along hilly regions to the Himalayas where cultivation occurs mainly in the summer months (AITC, 2023). The moderate climate of the hilly region makes potatoes a suitable and popular crop among rural farmers (Gairhe et al., 2017). The farmers of Bhaktapur district have been cultivating potatoes for many years, and it has become an integral part of their agriculture system. The productivity of potatoes within this region is also markedly greater than the average national productivity (21.83 Mt/ha compared to 16.73 Mt/ha) (Appendix 1). Potatoes are becoming increasingly popular in the Bhaktapur area, thanks to rising demand, the availability of quality inputs, versatile usage, and higher production. Bhaktapur's convenient access to inputs and favorable climate make it an ideal place for growing potatoes. The potato productivity here surpasses that of the rest of Nepal, and overall production is steadily rising both nationally and within Bhaktapur. As a result, the PMAMP recognizes this region as a promising potato growth zone. In particular, potato cultivation thrives in areas like Nagarkot, Bageshwori, Sudal, Tathali, Nangkhel, Sipadol, Gundu, Dadhikot, Madhyapur Thimi, Jhaukhel, and Changunarayan, making a significant contribution to the local economy.

In a world marked by a growing population and escalating concerns about food security, potatoes emerge as a pivotal player in dietary considerations (Haverkort and Struik, 2015). Moreover, these versatile tubers hold a crucial place in helping farmers meet their financial needs. China, recognizing this potential, has been focusing on bolstering its potato production in recent years, leading to notable increases in both production and consumption (The Wall Street Journal, 2015). In our own country, potato farming holds immense promise, and with strategic measures, there exists significant room for amplifying potato production's profitability. Potatoes constitute a substantial portion of the Nepalese diet and play a fundamental role in the socio-economic fabric of our society (Bajracharya and Sapkota, 2017). Despite the challenges faced, such as a fragile marketing

system that impacts farmer profits, potatoes remain an economically viable choice due to their superior productivity compared to other vegetables (Sapkota and Bajracharya, 2018). Off-season production, however, presents additional hurdles, including elevated labor cost, pest-related issues, and limited access to modern farming practices and technology. Furthermore, the absence of adequate irrigation facilities further impedes growth.

With proper policy-level adjustments, increased access to essential inputs, and other targeted measures, the profitability of potato cultivation could be further enhanced. This, in turn, has the potential to alleviate the country's agricultural trade deficit. Taking all these aspects into account, this study aims to comprehensively assess the current scenario, techniques, inputs, productivity, and profitability of potato production in the region. It also seeks to provide valuable insights for farmers, policymakers, and stakeholders involved in potato cultivation in the area. To achieve this, the research delves into the socio-economic status of potato producers, analyzes production cost and marketing strategies, and identifies the challenges confronting both potato production and marketing. Several studies, such as those conducted by Dahal and Rijal (2019), Timsina et al. (2011), Subedi et al. (2019), Joshi et al. (2022), and numerous others, have examined the economic aspects of potato production in different areas of Nepal. Our research, however, provides a unique focus on the profitability, economics, and marketing of potato cultivation, with a specific emphasis on the Changunarayan municipality of Bhaktapur district.

MATERIALS AND METHODS

Selection of the study area

Changunarayan Municipality of Bhaktapur District was chosen purposively as the study area, primarily due to its status as the principal hub of potato production in the Bhaktapur District. Additionally, it is worth noting that this locality falls under the command zone of the Prime Minister Agriculture Modernization Project (PMAMP), Project Implementation Unit, specifically designated as the Potato Zone in Bhaktapur (PIU, 2022).

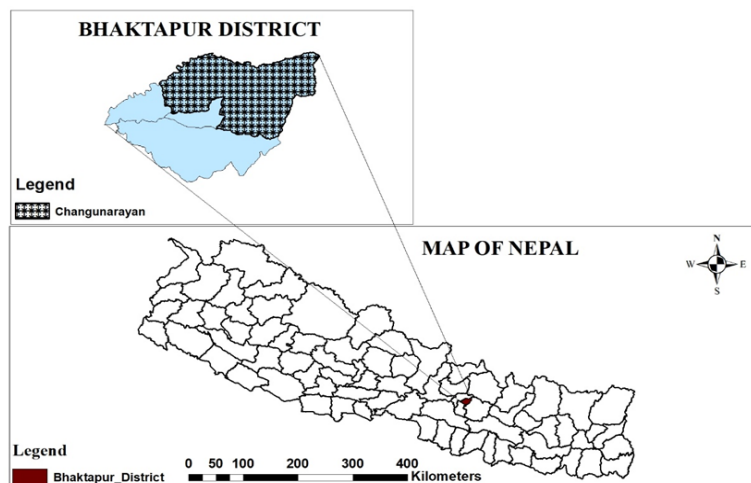


Figure 1. Map of Nepal showing Changunarayan Municipality within Bhaktapur District.

Sample size and sampling procedures

The list of small farmers, large farmers, and traders from PMAMP was used as a sampling frame. From the sampling frame, a sample size of 100 was strategically chosen, balancing the need for a representative sample with the constraints of time, budget, and manpower. This size ensures a diverse representation from each category, along with allowing for in-depth, high-quality data collection. Moreover, in-depth direct interviews were done using semi-structured questionnaires to retrieve information. Before the interview, all of the interviewees were informed that their private information would not be revealed. In addition, Focus Group Discussions (FGD), Key Informant surveys (KIS), and Field observations were also conducted to validate the information obtained from the household surveys. Apart from primary sources, Journal articles, and publications of various offices were also taken as a reference while gathering insights.

Methods and techniques of data analysis

Collected data was inserted into an Excel sheet and further data analysis was performed through SPSS software. In addition to descriptive analysis, economic analyses were also performed to appraise the financial status of potato cultivation in the area.

The economic appraisal was performed through the following analysis:

Cost of production

All production cost, including both fixed and variable expenses during potato production were recorded and subsequently totaled. Initially, data on production cost were collected from farmers under multiple categories, which were later grouped into fixed cost and six categories for variable cost.

Revenue from production

The total revenue (NRs) was calculated by multiplying the total production (Kg) with the average price per production (NRs).

Profit/loss analysis

The total cost incurred in potato production (Fixed+ variable) was subtracted from the total revenue to find out whether potato farming in the area was operating with Profit/Loss.

Benefit/cost analysis

Benefit/cost analysis was also undertaken to find out whether potato cultivation is financially feasible. The benefit-to-cost ratio provides insight into the economic strengths of any firm (Shively and Galopin, 2013). It was calculated as:

$$BCR = \text{Total revenue} / \text{Total cost of production}$$

Production function analysis

An analysis of the production function was conducted to evaluate the extent to which various inputs affect the income per unit of land. The Cobb-Douglas production function, a

widely accepted representation of the relationship between output and inputs, was employed due to its ability to closely approximate actual production outcomes (Mahaboob et al., 2019).

Furthermore, the regression model developed based on Cobb's Douglas function presents a well-grounded economic of studies pertaining to agricultural economic studies (Yang et al., 2020). Hence, this model was chosen to assess the efficiency of resource utilization in potato production.

The production function is expressed as follows:

$$Y = aX_1^{b_1}X_2^{b_2}X_3^{b_3}X_4^{b_4}X_5^{b_5}X_6^{b_6} + U$$

Where:

Y represents the income derived from potato production per hectare (in NRs).

X1 signifies the average cost of tubers per hectare.

X2 represents the average cost of fertilizer per hectare.

X3 denotes the cost of labor per hectare.

X4 accounts for the cost of plant protection measures and micronutrients per hectare.

X5 encompasses the cost related to other expenses per hectare.

U represents the error term.

b1 through b5 are the coefficients for each of the inputs and these coefficients give the estimate of the relationship of each of these independent variables to a dependent variable.

To simplify the analysis, the above equation was linearized using the natural logarithm function as follows:

$$\ln(y) = \ln(a) + b_1\ln(X_1) + b_2\ln(X_2) + b_3\ln(X_3) + b_4\ln(X_4) + b_5\ln(X_5) + u$$

Where:

ln represents the natural logarithm.

a is a constant.

u accounts for the random disturbance in the model.

This logarithmic transformation allows for a more straightforward assessment of the relationships between inputs and income in potato production.

Resource use efficiency

The assessment of allocative efficiency for all inputs involved a comprehensive evaluation based on resource use efficiency. Resource use efficiency for a specific input was determined using the following formula:

$$RUE(r) = MVP/MFC$$

Where:

MVP stands for Marginal Value Product.

MFC represents Marginal Factor Cost.

MVP was further estimated using the formula: $MVP = b_1 \cdot GM(X) / GM(Y)$

Also, b_i signifies the regression coefficient of the respective independent variable.

GM (Y_i) denotes the Geometric Mean of Gross Revenues

GM (X_i) represents the Geometric Mean of that particular input

Since all these variables are expressed in monetary terms, the value of MFC is consistently set at one. Consequently, the value of 'r' is equivalent to MVP.

Interpretation of the obtained value of RUE is as follows:

$r > 1$ signifies underutilization of the input.

$r < 1$ indicates overutilization of the input.

Gautam et al. (2022) and Pandey et al. (2020) also employed a similar kind of approach to estimate resource use efficiency in lentils and sugarcane respectively.

Marketing channels, market margin and producer's share

Farmers were surveyed to elicit the different market channels they had followed for the past year. The number of potatoes sold through each channel was then ascertained. Eventually, the number of potatoes sold through each channel was expressed in percentage. Additionally, data on the average farmgate price and retail price per kilogram of potatoes in each channel were collected and those data were used for the determination of market margin and producer's share.

Market margin is defined as the difference between the price paid by the customer and the price received by the producer for a unit of product. It is calculated as:

Market margin = Retail price - Farmgate price

Similarly, the producer's margin is defined as the amount received by the producer expressed as a percentage of the retail price, and it is calculated as:

$$\text{Producer's share} = (\text{Farmgate price} / \text{Retail price}) \times 100$$

This same approach was also deployed by Kharel et al. (2021) for determining market margin and producer's share in their study.

Scaling technique

Several problems related to the cultivation and marketing of potatoes were presented to farmers and they were made to

rank them on a scale from 0.2 to 1, with 1 being most severe, 0.8 being severe, 0.6 moderately severe, 0.4 less severe, and 0.2 least severe. The index value was calculated as:

$$\text{Index of problem (iop)} = \sum (f_p \times S_p) / N$$

f_p = Frequency of severity provided by the respondents

S_p = Scale value of severity

N = Total number of respondents

RESULTS AND DISCUSSION

Demographics of the population

In a survey of 100 respondents, males prominently led at 81%, mirroring traditional gender roles in household leadership. Age-wise, most respondents fell within the 51-75 group, followed by the 26-50 group. Hinduism was the predominant religion, encompassing 66% of participants. Educationally, the group had a commendable literacy rate of 87%, which exceeded the national average of 76.2%. Agriculturally, nearly half (46%) cited farming as their primary occupation and likewise, 77% were part of agricultural cooperatives. Moreover, 74% had previously participated in agricultural training programs. When it came to potato cultivation preferences, both Janak Dev and Khumal Seto varieties were chosen by 41% of the farmers, presumably due to their superior yield potential compared to others like Kufri Jyoti. For transporting their produce, a significant majority (86%) opted for modern sacks, suggesting a progressive shift from traditional methods like dokos used by 14%.

Cost and benefit analysis

The study showed that, among the five categories of variable cost, the largest share of the total cost was allocated to tuber expenses, followed by machinery cost, fertilizer cost, and labor cost (Table 1). Collective cost for pesticides, insecticides, and micronutrients accounted for the fourth-highest share of variable cost, with other associated variable expenses representing the least costly component among all other variable cost. Turning to fixed cost, minor expenses like interest on working capital, depreciation of machinery, and miscellaneous cost were grouped under the heading of other fixed cost. Additionally, cost related to land rent and taxes were categorized separately.

Table 1. Cost of different items of potato production per hectare in the study area for a single year.

Variables	Cost \pm SE (NRs/Ha)
A Fixed cost	
Land rent including tax	186846.2 \pm 913.90
Other fixed cost (interest on working capital and depreciation of machinery)	16168.2 \pm 398.061
Total fixed cost	203014.4
B Variable cost	
Tuber cost	52845.14 \pm 356.34
Labor cost for different agricultural operations	25591.67 \pm 257.61
Fertilizer cost(Both organic and inorganic)	26319.1 \pm 289.48
Machinery cost	32555.63 \pm 506.34
Pesticides, Fungicides, and Micronutrients cost	21355.56 \pm 472.79
Other variable cost	8981.08 \pm 181.12
Total variable cost	167648.2
The total cost of production	370662.58

Table 2. Gross Margin and profit analysis of potato production in the study area for a single year.

Particulars	Value \pm SE (NRs/Ha)
The total cost of production (NRs. /ha)	370662.58
Average price of potato (NRs. /kg) i.e., farmgate price	28.29 \pm 0.43
Total production per hectare (kg/ ha)	22021.34 \pm 551.3
Gross return (NRs. /ha)	622983.7
Gross margin	455335.53
Net profit	252321.13
B/C ratio	1.68

Source: Field Survey, 2022.

Table 3. Gross margin and profit analysis of potato production in the study area.

Variables	Coefficient	Standard error	T stat	P-value	Resource use efficiency(r)
Ln(Tuber)	0.138	0.474	0.291	0.772	1.54
Ln(Fertilizers)	0.654	0.279	2.343**	0.021	14.92
Ln(labor)	-0.011	0.344	-0.033	0.974	-0.25
Ln(machinery)	0.639	0.206	3.100**	0.003	12.04
Ln(Plant protection measures + Micronutrients)	0.340	0.135	2.518**	0.013	9.79
Ln(other variable cost)	-0.141	0.154	-0.918	0.361	-9.54
Constant	1.606	5.799	-0.277	0.782	
R square	0.235				
Adjusted R square	0.186				
F value	4.773***				
Return to scale	1.619				

* = significant at 5% level of significance ** = significant at 1% level, *** = significant at 0.1%.

Cost covering Land rent and taxes, amounted to NRs 186,846.2 per ha, while other associated fixed cost amounted to NRs 16,168.2 per ha. When considering the entirety of fixed cost and variable cost, they aggregated to NRs 203,014.4 and NRs 167,648.2 per ha respectively. Consequently, the average cost of NRs 370,662.58 was incurred for potato cultivation in a hectare. In our study, we observed that the total cost per hectare of potato production is higher compared to several other studies conducted in various locations across Nepal (Joshi et al., 2022; Subedi et al., 2019; Timsina et al., 2011). This elevated cost per hectare can be attributed to the substantial expenses related to land rent. This observation aligns with the findings of Nandwani et al. (2021), who also noted the comparatively higher land rent in the Kathmandu Valley, which includes Kathmandu, Lalitpur, and Bhaktapur District.

On average, the study area had a potato production of 22.021 MT/ha (Table 2), a figure closely matching the overall productivity of the entire Bhaktapur district (21.83 metric tons per metric tons per hectare (MOALD, 2023). When the average production per hectare was multiplied by the average price of NRs 28.29 per kg, it resulted in a gross return of NRs 622,983.7. Calculating the gross margin for potato production involved deducting the total variable cost from the gross return, resulting in a value of NRs 455,335.53. Furthermore, by subtracting the total cost from the gross return, a net profit of NRs 252,321.1286 was determined. Furthermore, upon dividing the gross return by the total cost, we obtained a benefit-cost (BC) ratio of 1.68 (Table 2). Since this ratio exceeds one, it suggests that potato production in the area is economically viable (Wilts et al., 2020). The BC ratio offers an estimate of the enterprise's capacity to recover production cost through profits, indicating a favorable outlook

for this agricultural endeavor. It's worth noting that the Benefit-Cost (BC) ratio obtained in our study is somewhat in line with the ratio reported by Dahal and Rijal (2019) in the Bidur Municipality of Nuwakot district (1.66) and surpasses the ratios presented by Bajracharya and Sapkota (2017) in the Bobang (1.53) and Tara (1.45) regions of Baglung District. However, our BC ratio is lower than the one reported for potato cultivation in the Taplejung district (2.9) and also falls short of the BC ratios for potato cultivation in various regions in the Terai region of Nepal (Subedi et al., 2019; Timsina et al., 2011).

Production function analysis

The Cobb-Douglas function was used to evaluate the relationship between various independent variables and income from potatoes. Notably, variables such as Tuber, Fertilizers, Machinery, and Plant Protection Chemicals + Micronutrients displayed positive coefficients, indicating their positive impact on potato production. Conversely, other associated variable cost and labor cost exhibited negative coefficients, suggesting a negative influence on output (Table 3). The influence of the cost of fertilizers, machinery, and plant protection measures plus micronutrients on potato income was found to be statistically significant. Specifically, the cost of fertilizers was significant at a 5% level of significance, and a 1% increase in fertilizer cost resulted in a 0.654% increase in income. In their study on resource use efficiency in potatoes, Sapkota and Bajracharya (2018) also discovered a positive regression coefficient for FYM. When considering the cost of machinery, it was determined to have a notable and statistically significant positive influence on income at a 5% significance level. Specifically, a 1% increase in machinery cost corresponds to a 0.539% increase in income.

Conversely, Giang and Huong (2023) reported a significant negative relationship between machinery cost and production income per unit area in their study across two different regions of Russia and Vietnam. Furthermore, our study revealed that the cost of plant protection measures and micronutrients have a statistically significant positive impact on income at a 5% significance level, mirroring the results of Dahal and Rijal (2019) who demonstrated a significant positive relationship between pesticide cost and average production income. This demonstrates that farmers, when provided with access to plant protection measures can achieve significant increments in yield. Besides, although non-significant, the cost of tubers displayed a positive relationship with income, with a 1% increase in tuber cost associated with a 0.138% income increase. Similarly, Bajracharya and Sapkota (2017) also found a positive regression coefficient for tuber cost and average production income, but their study reported a significant relationship between these variables. In contrast, both the cost of labor and other expenses exhibited a negative relationship with income. A 1% increase in labor cost resulted in a 0.011% income decrease, and a similar 1% increase in other associated variable expenses led to a 0.141% decrease in total income. This contradicts the findings of Bajracharya and Sapkota (2017), who reported a positive but non-significant regression coefficient for labor cost. The F-value of 4.773 was significant at a 1% level of significance, indicating that all the explanatory variables collectively contributed to changes in output. Furthermore, the R-squared value of 0.235 indicated that 23.5% of the variation in income from potatoes could be attributed to the explanatory independent variables. Upon estimation of the RUE values, it becomes evident that certain inputs, such as Tuber, Fertilizer, Machinery, and Plant protection measures plus Micronutrients, have been underutilized, whereas Labor and other associated inputs are shown to be over-utilized (Table 3). These findings are consistent with the observations made by Sapkota and Bajracharya (2018) in their study, where they similarly identified tubers as an underutilized input and emphasized the over-utilization of human labor. However, it is noteworthy that our results diverge from their study, as they reported the overuse of Organic fertilizer, Draft power, and cost related to intercultural operations. The contrast between the underutilization of machinery in our study and the opposite trend for labor suggests that the mechanization of potato farming could offer an effective solution for optimizing the utilization of farm inputs. Consequentially, this shift toward mechanization has the potential to enhance the overall profitability of potato farming. Greater value of Resource use efficiency (r) for other inputs such as Tuber, Fertilizers, and Plant protection measures + Micronutrients, implies that investing more resources in these specific inputs can result in higher yields and, consequently, greater returns on the potato farming operation. Furthermore, when all the constants were totaled, the Return to Scale (RTS) value was computed to be 1.606, signifying an increasing scale of return in this production function. In practical terms, this implies that there would be a 1.606% increase in income when all independent variables were augmented by 1%.

In contrast, Dahal and Rijal (2019) reported an RTS value of 0.3239, signifying that income increases with a smaller proportion than the proportionate increment of input cost. This comparatively greater value of RTS suggests that, given the current level of resources and inputs, further scaling up potato production could lead to increased yields and potentially greater profitability

Marketing channels

Our study identified four distinct marketing channels that facilitate the movement of potatoes from farmers to consumers, which are mentioned below:

Producers → Consumers

Producers → Retailers → Consumers

Producers → Wholesalers → Retailers → Consumers

Producers → Collectors/Commission agents → Wholesalers → Retailers → Consumers

When analyzing the participation of farmers in each channel, we observed that the longest channel, which involves intermediaries like collectors, wholesalers, retailers, and finally consumers, was the most prevalent, with 46% of individuals choosing this route. The second channel, which includes only two intermediaries (wholesalers and retailers) between producers and consumers, was followed by 38% of farmers. Furthermore, 12% of farmers preferred selling their products to local retailers, while 4% opted to sell directly to consumers. In line with our findings, Rai et al. (2019) also reported that the majority of vegetable farmers in the Kathmandu Valley sell their products to collection centers or intermediaries. They noted that only around one-third of the farmers sell their products directly to customers or local retailers. Table 4 provides additional insights into the relationship between the number of intermediaries and market dynamics. As the number of intermediaries increased, both the market margin and the producer's share increased. In the first channel, where there were no intermediaries between producers and consumers, the producer's share was 100%, and the market margin was zero. Channel 2 had a producer share of 89.45% and a market margin of 4.8, while channel 3 had a producer share of 72.82% and a market margin of 10.6. The last channel (channel number 4) had the highest market margin at 32.8% but the lowest percentage of producer share at 65.94%. This information underscores the importance of understanding the dynamics of marketing channels and their impact on both producer income and overall market structure. Shrestha et al. (2022), in their study in Tokha, Kathmandu, also found that as the number of intermediaries in the supply chain increases, the market margin increases while the producer's share decreases. Hence, in order to maximize returns for farmers, it is crucial to emphasize the development of marketing channels with fewer intermediaries.

Marketing problems

In the assessment of major constraints in potato marketing, a

Table 4. Market margin and Producer's share in different marketing channels.

Channel	Farm gate price	Retail Price	Market margin	Producers share (%)
1	39	39	0	100
2	34.2	39	4.8	89.45
3	28.4	39	10.6	72.82
4	25.72	39	13.28	65.94

Table 5. Severity of different marketing problems as perceived by farmers.

Marketing Problems	Index	Rank (1 = severe, 5 = least severe)
Predominance of intermediaries	0.862	1
Price Fluctuations	0.776	2
Storage Problems	0.584	3
Lack of marketing knowledge	0.454	4
Poor standardization and grading mechanisms	0.332	5

problem-ranking tool was utilized, resulting in the ranking of five key issues based on their index values (Table 5). Among these problems, the most severe issue, as perceived by the farmers, was the predominance of intermediaries. Following this, price fluctuations were ranked second, storage problems were third, and a lack of marketing knowledge was fourth. In contrast, poor standardization and grading mechanisms received the least index value and were thus considered less severe problems by the farmers. These findings provide valuable insights into the challenges faced by potato farmers in the marketing of their produce. In contrast to our findings, Joshi *et al.* (2022) in their study in Darchula, identified demand fluctuations and the influence of imported products as two significant challenges in potato marketing. In summary, it is of utmost importance for stakeholders to address the region's most critical issues. Particularly in the context of Bhaktapur, stakeholders should take proactive steps to reduce the number of intermediaries and establish a dependable pricing mechanism. Furthermore, it remains equally essential for stakeholders to concentrate their efforts on resolving the various challenges confronting local farmers.

Conclusion

The study found that potato production in the Changunarayan Municipality of Bhaktapur was economically viable, with a production cost of NRs. 370662.58 per hectare and a benefit-cost ratio of 1.68. However, the profitability of potato production depended on the choice of inputs and the marketing channel. The study revealed that labor and miscellaneous expenses had a negative impact on the average income, while other expenses had a positive impact. Additionally, this study underscores the significance of farmers increasing their investment in tubers, fertilizers, machinery, plant protection measures, and micronutrients. These inputs were identified as being underutilized, falling below their optimal levels. Conversely, labor cost and other associated expenses should be reduced down, as they have exceeded the level of their optimal utilization. The study also estimated the return to scale to be 1.606, indicating that increasing the input use would result in a higher proportionate increase in income. Concerning the marketing channel, the study revealed that a significant portion of potato sales involved intermediaries like collectors, wholesalers, and retailers, who

claimed a substantial portion of the market margin, thereby diminishing the share of the producers. Farmers identified the prevalence of intermediaries and price fluctuations as the primary challenges in marketing. Consequently, the study recommended that policymakers take action to establish a more equitable and efficient marketing system and implement effective pricing mechanisms for potato production in Changunarayan, Bhaktapur.

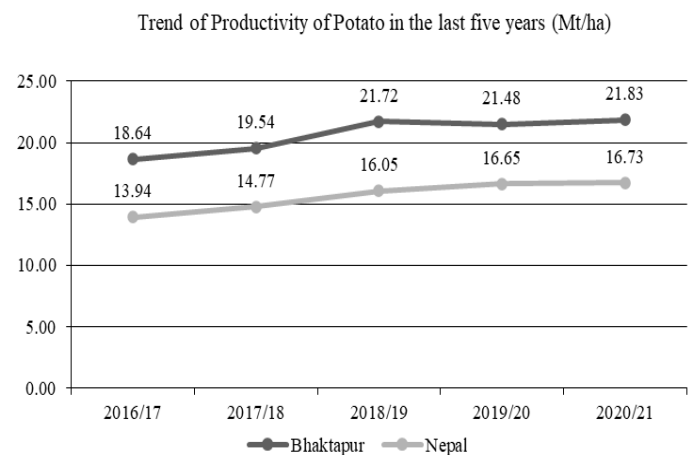
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Conflict of interest

We wish to emphasize that this article is entirely original, and we can affirm that there are no conflicts of interest to disclose

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**Appendix 1.** Graph comparing the productivity of potatoes in Nepal versus in Bhaktapur district over the last 5 years. Source: (MOALD, 2022).

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