Economics of Production and Marketing for French Bean in Kalikot District (Tilagupha Municipality), Nepal

Susma Adhikari [1] ✉, Arati Chapai [2] ✉, Shova Shrestha [1], Nisha Bhandari [1,2], Prativa Acharya [1], Kiran Thapa [1], Shasi Kumar Keshari [1]

1 College of Natural Resource Management, Bardibas, Mahottrai, Nepal

2 Agriculture and Forestry University, Rampur, Chitwan, Nepal

✉ Co-corresponding authors: adksushma01@gmail.com; chapaiarati100@gmail.com

Abstract The research, conducted from February to July 2023 in Tilagupha municipality, Kalikot, Nepal, focused on French bean production and marketing. Sixty participants were surveyed using a stratified sampling technique. Primary data, gathered through household surveys, interviews, and field visits revealed insights into the agricultural landscape. Bean cultivation occurs once a year on small farms averaging 17.16 ropani, with 30.33% of land dedicated to beans. The average yield was 658.2 kg/ha, below the reported ADO Kalikot figure (1477 kg/ha). Production cost was Rs. 21,054.7 per ropani, with a return of Rs. 75,240 and a benefit-cost ratio of 1.20. Most producers (61.3%) were satisfied with bean prices. Challenges included diseases, pests, lack of irrigation, and limited marketing information, obtained mostly from neighbors (94.8%). The average retail price was Rs. 250 per kg, with a marketing margin of Rs. 78.34 per kg. Lack of market information was a significant issue in bean marketing.

Keywords Production; Beans; Economics; Marketing; Sampling; Significant; Market

Introduction

Kalikot, a part of Karnali province one of the seventy seven districts of Nepal with land topography of mountains, hills, and valleys. It lies at an altitude ranging from about 730 m to 4,790 m above sea level. It lies at latitude 295'N and longitude 82'02'E covering an area of 1,641 km^2 including 4 municipalities and 5 rural municipalities (Jumla/Kalikot, 2078). The climatic zone of Kalikot ranges from Upper Tropical to Alpine with drizzling rainfall from March to Oct and receives snow from Nov-Jan (DADO, 2020). It is known as the organic district of Nepal producing apples, walnuts, peaches, pears, beans, lime, etc. An important cereal includes paddy, maize, wheat, millet, and barley. Vegetables include cabbage, cauliflower, tomato, leafy vegetables, etc both seasonal and off seasonal. Kalikot, besides apple and potato, is also well known for Beans (*Phaseolus vulgaris*). The total production of beans in Kalikot district is 981 mt in a 3,926 ha area under production (MoALD, 2020). Bean (*Phaseolus vulgaris*) is the most important leguminous crop widely grown from Terai to the high hills of Nepal. The bean of Jumla/ Kalikot, also known as 'Jumli simi', is an indigenous crop of the Karnali region which is highly diversified (Bhujel et al., 2013). In Nepal, it is cultivated in 32,262 ha. of land with production of 39,320 mt. and productivity of 1,218 kg/ha. It is grown as a sole crop, intercrop with maize, or in apple orchards too (MoALD, 2020).

Bean of Karnali is preferred by consumers over other beans because of its taste and nutritive value. 100 grams of dried beans contains 16.54-25.23 g of protein and 0.33-1.33 g of fat (Cominelli et al., 2022). Similarly, 63 g of carbohydrate is found in 100 g of bean. Dry bean is consumed as soup. It is easy to cultivate, store and transport, has high nutritive value, and fetch good market price, so farmers of Tilagufa rural municipality and other areas cultivate beans in a large area. It has the potential to be cash crop and exported out of Kalikot. But the vast difference in national and regional production is a result of use of poor quality seed, lack of irrigation, fertilizers and inappropriate land management. Also the bean cultivation is centered in marginal upland only with no provision of irrigation facilities and poor crop management practices afterwards. There is no specific management practices for different insects-pest and diseases. Bean crop suffers severe drought especially during flowering period which is water critical stage of bean. This has resulted in low production. Lack of quality seeds and organic

fertilizer, well decomposed FYM, no provision of irrigation especially during critical period, lack of intercrop operation etc. are some other problems related to bean production in Kalikot. But this scenario has been noticed to be changing. Previously, bean was cultivated for home consumption and less for market sell, but after realizing the nutritive value and market value of beans, availability of superior genotypes, farmers have started to cultivate beans in low lands as well within reach of irrigation facilities after wheat for commercial purpose.

1 Materials and Methods

1.1 Site selection and sub-sector

The study was carried out in Kalikot district which lies in karnali province. It covers an area of about 1,641 km^2 with a land topography of mountains, hills and valleys. It lies at an altitude ranging from 730 m to 4,790 masl. Beans were cultivated under 96 ha area in various wards. Area under French bean Zone includes Tilagufa Municipality and the wards are Bhigma, Foyi, Ratada and Bajedi.

1.2 Study area

The study was conducted in four villages of Tilagufa municipality namely Bhigma, Foyi, Ratada and Bajedi of Kalikot district, Karnali province. It is located at approximately 29° 5' 12" north latitude and 81° 35' 23"east longitude. It encompasses elevations ranging from 738 meters to 4,790 meters above sea level.

1.3 Sampling size and sampling technique

Bean producer of the selected area were the target population for the research. There were 7 farmer groups, 2 cooperatives and 2 private firms in bean zone. 30% of farmers from total member of farmer group were selected for research. Simple random sampling method was used. 60 farmers, 20 members from each wards were selected for data collection. The proportion of male and female farmers in sample was correspond to the population of male and female in farmer group.

1.4 Data collection

Primary data was gathered directly from farmers using semi-structured questionnaires, field visits, focus group discussions, key informant interviews, and personal communication. Secondary data was sourced from annual reports of ADO-Kalikot and PMAMP, DADO and NARC reports, MOALD publications, reports from various governmental and non-governmental organizations, as well as proceedings and journals.

1.5 Research instruments

Various research instruments were utilized to collect reliable data, including household surveys, focus group discussions, key informant interviews, rapid market appraisals, case studies, and field observations. The household survey was involved structured interviews with 60 samples. Focus group discussions were conducted in each village with diverse participants. Key informant interviews were involved progressive farmers, farmer leaders, and local extension workers. Rapid market appraisals were engaged French bean stakeholders at village and district levels. Case studies of individual farm households offered in-depth insights. Field observations was provided a brief overview of farm conditions through frequent visits.

1.6 Data analysis techniques

Both primary and secondary data collected from the field and other means were first coded, tabulated, and then analyzed with the help of computer software packages like the Statistical Package for Social Science (SPSS version 23) and Microsoft Excel. Simple descriptive statistics such as average, standard deviation, frequency, minimum, maximum, and percentage were used for the analysis of demographic and socio-economic characteristics of respondents like age, gender, ethnicity, education, primary occupation, landholding status, etc. In addition, the livestock holding status was also determined with the help of Livestock Standard Unit (LSU). The ranking of problems of beans in the study area was done by indexing method.

1.7 Analysis of socio-economic data

The collected socio-economic survey data underwent coding, tabulation, and analysis using SPSS and MS Excel. Simple descriptive statistics, including averages and percentages, were employed for variables like landholding and farming experience. Results were visually represented through graphical means such as bar diagrams and pie charts.

1.8 Cost of production and gross revenue

The sum of all expenditure involved in the production process is the cost of production. Total cost (TC) is the sum total of total fixed cost (TFC) and total variable cost (TVC).

TC = TFC+TVC

The product of the quantity sold and unit price of the produce (bean) is the gross revenue (Total revenue).

Gross revenue = Unit price* Total quantity sold

1.9 Benefit-cost analysis

The benefit-cost (B/C) ratio was calculated as follows:

B/C ratio: Gross return/Total cost

1.10 Gross margin

The gross margin was calculated as follows:

Gross margin = Gross return - Total cost

1.11 Marketing margin and Producer's share

Marketing margin (MM) is the difference between the farm gate price and the retailer's price, which was calculated as follows:

MM = Retailer Price-Farm gate Price

Producer's share (PS) is the price received by the farmer expressed as percentage of the retail price, that is, the price paid by the consumers. It was calculated by the following formula:

PS = (Pf/Pr)*100

Where, Pf = Producer's price (farm gate price); Pr = Retailer's price; PS = Producer's share

1.12 Index of production and marketing problems

The index was prepared mainly taking into account the qualitative data. Farmer's perception to the different production and marketing problems was ranked by using five-point scale of problems compromising most serious, serious, moderate, a little bit and the least serious by giving weightage on the basis of priority i.e., 5 for first priority, 4 for second, 3 for third, 2 for fourth and 1 for fifth priority. Then the priority index for each variable was calculated by weightage average mean in order to draw valid conclusion and making reasonable decision. The index of importance was computed by using the formula:

Iimp = Σ (Sifi/N)

Where, Iimp = Index of importance; Σ = Summation; Si = Scale value; fi = Frequency of respondents; N = Total number of respondent

2 Results and Analysis

2.1 Household and farm characteristics

The household and farm characteristics include gender of respondent, family size, economically active population, education level of the respondents, land holding and land utilization pattern.

2.1.1 Gender of respondents

Gender of respondent gives us the information about the active person/decision maker regarding the agricultural works. Majority of respondents (60%) were male (Table 1).

Table 1 Population distribution of respondents by gender

Gender	Frequency	Percent (%)
Male	36	60
Female	24	40
Total	60	100

Source: Field Survey (2023)

2.1.2 Ethnicity

Ethnicity is one of the important factors governing the occupation in Nepalese society. Majority of the respondents (53.3%) in the study were Chhettri (Figure 1).
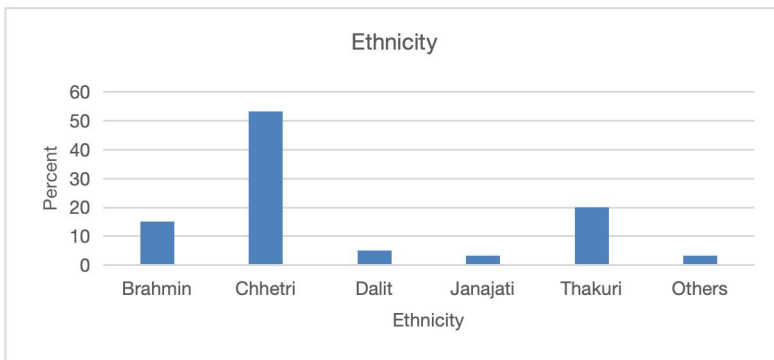

Figure 1 Ethnicity of the respondents (Source: Field Survey (2023))

2.1.3 Family size and economically active population

The size of family and economically active population provides information regarding the availability of labour for farming (Figure 2; Figure 3). Average family size was found to be 7.72, which is more than national family size average (5.4).
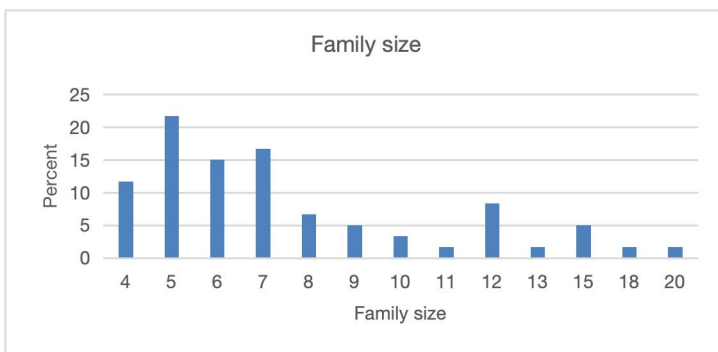
Figure 2 Family size of the respondents (Source: Field Survey (2023))

Population belonging to the age group of 15-59 years that have productive capacity are considered as economically active population by the government of Nepal. Average economically population was found to be 5.31. It indicated that 55.5% of population was economically active.

2.1.4 Education level of respondents

In the study area, 11 respondents (18.3%) were illiterate, while 49 (81.7%) were literate. Among the literate group, 19 individuals (31.7%) could only read and write basic things (Table 2).

Figure 3 Economically active population in respondent's family (Source: Field Survey (2023))
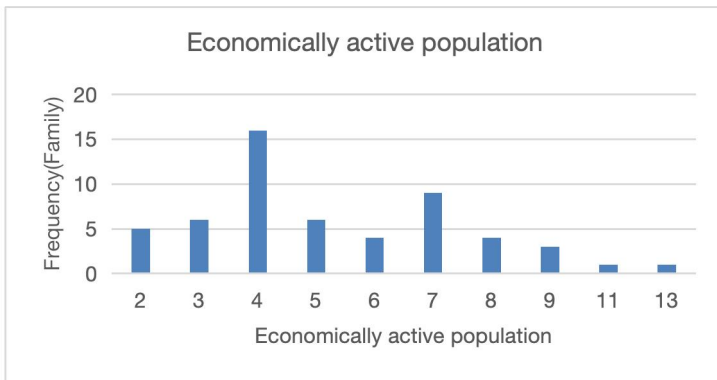
Table 2 Educational status of respondents

Education status	N	Percent (%)
Illiterate	11	18.30
literate	49	81.70

Source: Field Survey (2023)

2.1.5 Occupation of the respondents

Agriculture was the major source of occupation. All of the respondents were involved in agriculture (bean production) of varying scale. Besides agriculture, many of them were involved in business and government jobs (Table 3).

Table 3 Occupation status of respondents

Occupation	N	Percent (%)
Agriculture	28	46.7
Business	21	35
Government job	9	15
Others	2	3.3

2.2 Land holding

Land is one of the most important components of any farming system. According to the High Level of Commission on Scientific Land Reform (2010), farmers with less than 0.1 ha of land are considered as landless. Similarly, farmers having 0.1 to 0.3 ha of land are considered as marginalized farmers, farmers having 0.3 to 0.5 ha of land are considered as small farmers, farmers having 0.5 to 3 ha of land as considered as medium farmers and farmers having more than 3 ha of land are considered as large farmers (Table 4).

Average land holding of farmers was found to be 0.87 ha (17.16 ropani), which indicated that majority of the farmers were medium farmers (Figure 4). Average land area used for bean cultivation was found to be 0.264 ha (5.20 ropani) (Figure 5).

Table 4 Land holding size and land used for bean cultivation in ropani by respondent

	Total land (in ropani)	Land with bean cultivation
Mean	17.1668	5.2052
Minimum	2	1
Maximum	113	20

2.3 Cropping pattern

Farmers used most of their land for bean cultivation in bean's season (Jestha to Asoj) followed by wheat. Four type of cropping pattern was found in the study area (Table 5).

2.3.1 Economics of bean production

This part deals with the production situation, cost, return, gross margin, profit, benefit cost ratio of bean production and the contribution of bean in household income.
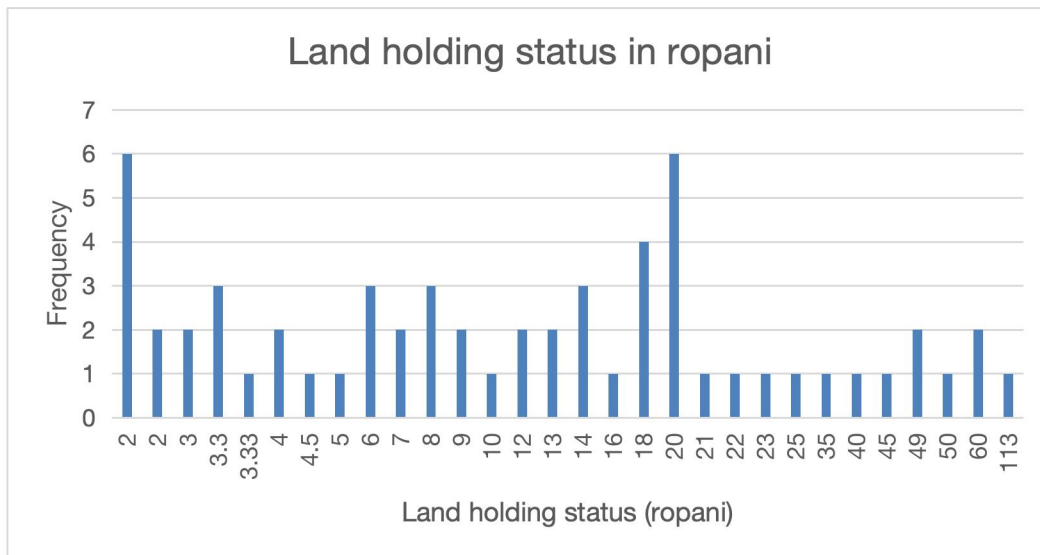

Figure 4 Land holding status of respondent's family (Source: Field Survey (2023))
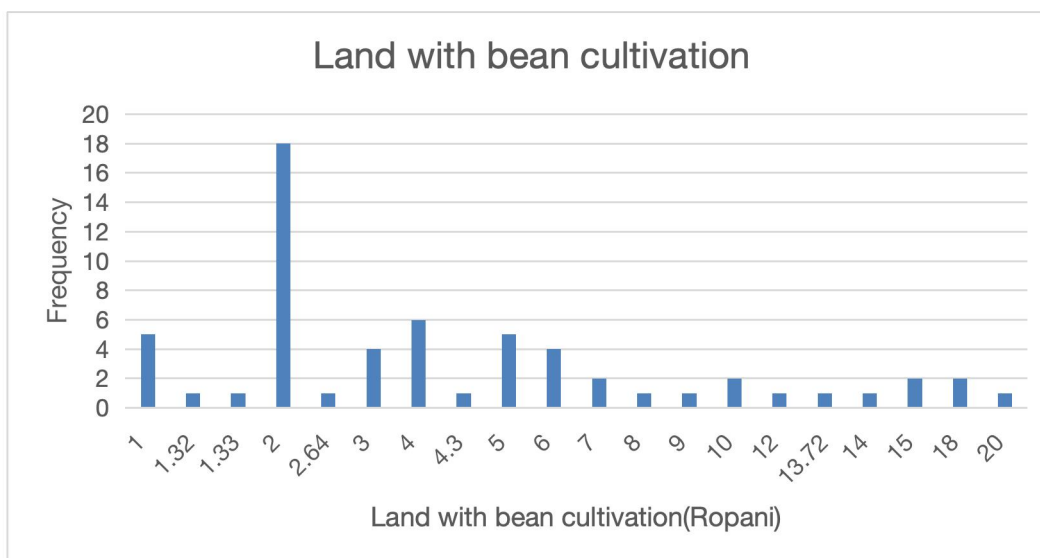
Figure 5 Land used for bean cultivation by respondent's family

Table 5 Cropping pattern of the study area

Land	Pattern
Upland	Bean (Baisakh to Bhadra) – Fallow
Lowland (irrigated)	Paddy (Jestha to Kartik) – Barley (Kartik/Mangsir to Jestha)
Lowland (non-irrigated)	Bean (Asadh to Asoj/Kartik) – Wheat (Kartik/Manfsir to Asadh)
Lowland/upland	Fingermillet (Baisakh/Asadh to Bhadra/Asoj) – Barley/Wheat (Kartik/Mangsir to Jestha/Asadh)

2.3.2 Total production of bean

Bean was cultivated in 15.88 ha (312.31 ropani) land of the respondent and with production of 37,650 kg and productivity of 658.2 kg per hectare. The productivity obtained from the study is below the national productivity which is 1,477 kg per hectare. In average, each household produced and sold 627 kg.

2.3.3 Cost of production, return and benefit-cost analysis

The sum of all expenditure involved in the production process is the cost of production. It includes fixed cost like land tax and machinery cost and variable cost like labour cost, seed and other input cost, packaging cost and so on.

The study showed (Table 6) that average cost of production and return per ropani was Rs. 21054.7 and Rs. 25387.07. In average, each household earns Rs. 75,240 benefit per year from selling bean.

Average cost of production and return per kg of bean was Rs. 120 and Rs. 215, respectively. Benefit-cost ratio of the study area was found to be 1.20. Benefit cost ratio greater than 1 indicated that bean production was running in profit.

Table 6 Different cost involved in production of bean per ropani

Particulars	Unit	Quantity	Price (Rs)	Value (Rs)
Variable cost				
Seed	kg	19.07	210	4004.7
FYM	Doko	35	100	3500
Land preparation	Labor-days	2 labor, 1pair ox, food	600 per person, 1000 per pair ox,100 per food	2400
Seed sowing	Labor-days	2	600	1200
Intercultural operations (weeding, FYM application, training)	Labor-days	8	600	4800
Harvesting	Labor-days	5	600	3000
Transportation and Marketing	Local vehicles, Auto	1	500	500
Sub-total				**19404.7**
Fixed cost				
Tools and equipment			1500	1500
Depreciation and tax			150 per ropani	150
Sub-total	**Rs**			**1650**
Total cost	**Rs**			**21,054.7**
Income				
Gross income	**Rs**			**25387.1**
Net income	**Rs**			**4332.37**
BC ratio				**1.2**

Source: Field Survey (2023)

2.4 Gross margin
The study showed that average gross margin was Rs. 85131.07 per hectare (Rs. 4332.37 per ropani).

2.4.1 Price satisfaction

The study showed (Table 7) that majority of the respondents/producers, i.e., 39 (65%) were satisfied with market price of bean. 4 respondents were neither satisfied nor dissatisfied and 9 respondents were dissatisfied with price. 8 producers didn't respond because they didn't sell bean.

2.4.2 Pricing time and price decider

Pricing of beans between producer and trader was done after harvesting of beans. Contract farming was not in practice.

The study showed (Table 8) that the buyer was the major factor in deciding the price. The majority of the respondents (75%) reported that the buyer decided the price of the bean.

Table 7 Price satisfaction among producers

Satisfaction level	Frequency
Very satisfied	0
Satisfied	39 (65%)
Nor satisfied nor dissatisfied	4 (6.66%)
Dissatisfied	9 (15%)
Very dissatisfied	0

Table 8 Price decider

Decider	Frequency
Producers	12 (20%)
Buyers	45 (75%)
Negotiation	3 (5%)

2.5 Economics of bean marketing

2.5.1 Marketing channel

The beans were collected from farm gate in road accessible farms while in inaccessible farms the farmers poached their beans to the road accessible areas. The collection peak period was Ashoj and Kartik which stretched to late Kartik to early Mangsir. Usually, the beans were collected at farm gate at 150-200 NRs/kg. The marketing channel of bean in Kalikot was found to be of 3 major types. The major stakeholders of bean marketing in Kalikot were producers, collectors, wholesalers and retailers. Beans from producers reaches to consumers indirectly. It involves disposing beans to collector to wholesalers to retailers and finally to consumers. In other two channels, middleman is absent where wholesaler and cooperatives get bean directly from producer and disposed bean to retailer and finally to consumers. Most farmers use beans for their household consumption use then trade the remaining ones to approachable buyers (Table 9).

Table 9 Marketing channels of French bean in kalikot

Channels	N	Percent (%)
Producer-village level collector-district traders-consumer	9	15
Producer-village level collector-consumer	29	48.30
Producer-consumer	20	33.30
Producer-district trader-retailers-consumer	2	3.30

2.5.2 Marketed price

According to last year's marketed price of beans by respondents, the average marketed price from farmers (Farm gate price) was found to be Rs. 151.66 (Table 10). The highest price marketed was recorded up to Rs. 180 whereas the lowest price was found to be Rs. 120.

Table 10 Marketed price of bean

	N	Minimum	Maximum	Mean
Marketed price of bean last year	60	120	300	217.1667

Source: Field Survey (2023)

2.5.3 Marketing margin and producers' share

The average farm gate price of bean was found to be Rs. 151.66 per kg. The average retail price paid by the consumers was Rs. 230 per kg. Marketing margin and producers' share was found to be Rs.78.34 per kg and 60.664%, respectively (Table 11).

2.5.4 Marketing information and marketing help

Market information includes information on price, product demand and supply, buyers and sellers. It appears that 47 out of 60 producers (78.3%) were not communicated about market price whereas 13 (21.7%) were getting communication facility about price of beans (Table 12). The major source of information about market were neighbours and friends. None of the farmers were using newspapers as a source of market information.

For collectors, telephone call was the most reliable, easy and most frequently used source of price information, while retailers use different sources such as telephone call, neighbours and friends and radio and television broadcast for price information. None of the farmers get help from organizations about market conditions.

Table 11 Retail price of different varieties of bean

Variety	Rate in average (Rs)
Black bean	250
Red bean	180
Mixed bean	220

Table 12 Communication facility about market price

	Frequency	Percent (%)
Yes	13	21.7
No	47	78.3
Total	60	100

2.6 Analysis of marketing practices
2.6.1 Grading
Bean sorting and grading was done on the basis of colour. All wholesalers and retailers had used grading before selling.

2.6.2 Packaging
Almost all the producers in the study area were found to use plastic and jute bags for packaging during transportation. Retailers used small plastic bags for packaging.

2.7 Constraints in the bean sector
2.7.1 Constraints in production
The primary challenges facing bean production include diseases and pests, which are the most significant problems. Another critical issue is the insufficient irrigation facilities. Additionally, producers face difficulties due to the unavailability of necessary inputs and a lack of technical knowledge. Labor shortages also pose a significant barrier to efficient bean production (Table 13).

Table 13 Constraints in bean production

Problem	Index value	Rank
Diseases and insects	0.908	1
Lack of Irrigation	0.8003	2
Unavailability of inputs	0.5633	3
Lack of technical knowledge	0.42	4
Labor problem	0.2367	5

Note: Respondents were asked to rank the problems ranging from most serious problem to the least serious problem by assigning 5 to 1 scale

2.7.2 Constraints in marketing
Marketing information was the major problem in marketing of beans (Table 14). Beside this, no other problems related to marketing of bean were reported in the study area.

Table 14 Constraints in bean marketing

Problem	Index value	Rank
Middleman	0.84	1
Lack of market information	0.35	2
Lack of storage	0.335	3
Lack of transportation	0.23	4

3 Conclusion

Bean is produced in Kalikot in small scale in traditional manner. Inputs like quality seeds, irrigation, chemical fertilizers, pesticides and herbicides was available in very low quantity or not at all. Due to these reasons, production cost involved was high. Diseases and pests was the major problem in the production of the bean. Marketing channel of the bean was not very long, therefore producer's share was high. In marketing side of the produced bean, lack of marketing information and marketing help was the major problem. Bean collectors, wholesalers and cooperatives brought bean from the farmer's field. So, no other significant problems were reported in marketing of the bean.

Authors' contributions

SA: Contribution to design and implementation of the survey, data collection, interpretation and analysis of the results, writing the manuscript. AC: Data collection, analysis of data, interpretation of the results, writing the manuscript. SS, NB, PA, SKK, KT: data collection and manuscript preparation. All authors read and approved the final manuscript.

References

Bhujel R.B., Rana C.B., Mahat P.M., Subedi S., and Shrestha L.L., 2013, Evaluation of bean (*Phaseolous vulgaris*) as an Important pulse and cash crop in Jumla and similar high hill region of Nepal, In Proceedings of the 27th National Summer Crops Workshop, 22-27.

Cominelli E., Sparvoli F., Lisciani S., Forti C., Camilli E., Ferrari M., Le Donne C., Marconi S., Juan Vorster B., Botha A.M., Marais D., Losa A., Sala T., Reboul E., Alvarado-Ramos K., Waswa B., Ekesa B., Aragão F., and Kunert K., 2022, Antinutritional factors, nutritional improvement, and future food use of common beans: A perspective. Frontiers in Plant Science, 13: 992169.
https://doi.org/10.3389/fpls.2022.992169

DADO, 2020, District Agriculture Profile Book.

Jumla/Kalikot P., 2078, Annual programme and progress book.

MOALD., 2020, Statistical information on Nepalese agriculture.