

Economics of production and marketing of mandarin in Parbat and Baglung districts of Nepal

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Abstract

This study was conducted in mandarin growing areas of Parbat and Baglung districts of Gandaki Province where total of 67 representative farmers and 20 traders were selected as sample, in which 36 farmers were from Parbat and 31 farmers were from Baglung district. The average cost of Mandarin production per ropani (19.66 ropani= 1 hectare) was NRs. 17220 highest contributor being labor cost with 43.82 percent of share. Average return and profit of Mandarin farming per ropani was NRs. 48,978 and NRs. 31,757 respectively with B:C ratio of 2.93. Average return, profit and B:C ratio was found to be significantly higher in Parbat than Baglung. The Cobb-Douglas production function of Mandarin farming shows, output of Mandarin farming is significantly and positively affected by expenditure on labor, land rent, and cost of nutrients with the increasing return to scale (1.097). Producer-Pre-harvest contractor-Wholesaler-Retailor-Consumer was most prominent marketing channel with 55 percent share of total sold volume. Inadequate irrigation facility was the most prominent production problem, while poor marketing facility and access to market information were the most prominent marketing problems faced by farmers. Difficulty in transportation was recognized as the most prominent marketing problems faced by mandarin traders. Average marketing margin and producers' share were NRs. 45.95 and 57.41 percent respectively both of which were highest in Parbat. In Parbat, harvesting is carried in January and February, which serves as off-season production in domestic markets, which ensures higher per unit price for respective district's output among two districts.

Keywords: Mandarin, Benefit cost ratio, Production function, Marketing channel, Producers' share

Introduction

Mandarin is the one of the highly grown perennial fruit crop in the country. It is well liked for its taste and rich vitamin C content and consumed mainly as fresh fruit (Shrestha, 1996). It contributes almost 17 percent to the total volume of fruit production and 0.97 to the AGDPs of Nepal (MOF, 2019). Mid-hills of Nepal possess immense opportunity and potentiality for mandarin production due to suitable climate and unique topography (Shrestha and Verma, 1998). Also, the economic return from mandarin production is far greater than

its contemporary crops i.e. cereal crops in case mid-hills of Nepal (NCRP, 2016). The market for mandarin is expanding and the demand is high (DOC, 2018). Mandarin farming is labor intensive enterprise which works out best because there is availability of cheap labor in the country. Understanding the factors that directly affect the cost and profitability and the economic advantages mandarin farming possess could attract more farmers towards it.

This could uplift the farmer from poverty and lead to sustainable and secure future ahead. Despite these possibilities

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there was no significant increase in production area in the last few years (AITC, 2019). Also the present productivity of mandarin production (9.43 Mt/ha) is far less than that of world’s mandarin productivity i.e.13.03 Mt/ha (FAO, 2017). Thus, with the aim of realizing its opportunity this study was carried out analyze the economics of production and marketing along with problems in Parbat and Baglung districts of Nepal.

Materials and Methods

Study area

This study was conducted in Jaljala rural municipality of Parbat and Kathekhola rural municipality of Baglung of Nepal. They lie in mid-hill region of Western Nepal, which falls under Gandaki province. The sites were selected on the basis of cultivation area and production status within their respective districts.

Sample Size, Sampling Procedure and Selection of Respondents

For the study, total of 67 respondents were randomly selected as sample out of which 36 were from Parbat and 31 were from Baglung. Due to economic and manpower limitation, limited number of respondents were selected for the study.

Source of information

For primary data pre-tested systematic semi-structured questionnaire was used for face to face interview and key informant interview. Secondary information was collected by reviewing various books, reports, article and publication from Government of Nepal and other concerned agencies.

Data Collection and Analysis

The field survey and key informant interview for the study was conducted in March, 2019. Information obtained from the interview was crosschecked through key informants (Shrestha et. al., 2018). Collected data were coded, tabulated, summarized and analyzed for determination and interpretation. Microsoft Excel and STATA12 were used for analysis purpose.

Cost of production

Only operating cost were incorporated in the study, price of orchard establishment was not included in the estimation of total cost of production.

Total Cost = Cost of (Land rent + Nutrients + Inter culture + Protection measures + Labor)

Benefit Cost Analysis

Benefit cost analysis is the simplest method to analyze economic performance of any enterprise. It measures the amount of return per unit of input cost (Shrestha, 2017), which was estimated using following formula;

$$B:C \text{ ratio} = \text{Total Return} / \text{Total Cost}$$

Profit analysis

Total cost of production is the sum of quantity of input multiplied by their respective prices, and total return is the multiplication of quantity of output and unit price of output. So the profit analysis can be done by subtracting total cost from total return (Debertin, 2012).

$$\Pi = TR - TC$$

$$\Pi = \sum P_y \times Y - \sum P_{xi} \times X$$

Where,

Π = net profit

TR = total return

TC = total cost

X_i = quantity of i^{th} input

P_{xi} = price of i^{th} input

Y = quantity of output

P_y = price of output

Marketing Margin and Producer’s Share

Marketing margin is the difference between the price paid by the consumer and price actually received by the farmers for their produce. Producers’ share is the percentage share of the producers on consumes’ rupees. Lower marketing margin and higher producers’ share is the indication of efficient and healthy marketing system (Shrestha et al., 2018). Marketing Margin (MM) = Retailer Price (P_r) – Farm Gate Price (P_f)

$$\text{Producer’s Share (Ps)} = \frac{\text{Farm gate price (Pf)}}{\text{Retailer price (Pr)}} \times 100$$

Factors Affecting Mandarin Production

In order to estimate the factors affecting Mandarin production general form of Cobb-Douglas type production function were applied. This form of production function were used by the likes of Islam et al. (2012) and Poudel et al. (2016) for resource use analysis of agricultural production. The estimating model for the coefficients of Mandarin production is, the following:

$$Y_g = a L^{b1} N^{b2} I^{b3} P^{b4} Lr^{b5} e^{u}$$

In log-log_form, the above model can be expressed as follows;

$$\ln Y_g = \ln a + b1 \ln L + b2 \ln N + b3 \ln I + b4 \ln P + b5 \ln Lr$$

Where, Y_g = Mandarin production (NRs),

L = Land rent (NRs)

N = Cost of nutrients (FYM + Chemical fertilizer)

I = Cost of inter-culture

P = Cost of protection measures

Lr = Cost of labor (included animal cost)

The intercept has been denoted by ‘a’ and ‘bi’ are the associated slope coefficient of the variable X_i , where $i = 1 \dots 5$.

Indexing / Scaling

Indexing technique was used to rank production and marketing problems faced by farmers. The index of importance of such problems was estimated by using the following formula (Shrestha, 2017);

$$I_{imp} = \sum (S_i f_i) / N \text{ Where,}$$

I_{imp} = Index of importance S_i = Scale value

f_i = Frequency of importance given by the respondents

N = Total number of respondents

Matrix Ranking

Matrix ranking is a tool or system used to analyze, compare and prioritize the problems, options or any related situation among them and establishes superiority of one above another. Matrix ranking was done by creating a matrix using sets of problems, which were identified using tools like literature review, key informant interview and focus group discussion, needed to compare and performing pair wise comparisons (Mahesh et al., 2017). Then, scoring and ranking of problem is done.

Results and Discussion

Average land holding and Mandarin cultivation area

The average land holding size of the overall sampled household was 17.99 ropani (0.92 ha) which is higher than

the national average of 0.65 ha (CBS, 2011). Such higher land holding is mainly due to the nature of farming area in such hilly district, as it comprises not only plain farming land, rather more sloped small hilly and forest area as well. The average number of mandarin plants per households is about 270 plants.

Cost of Mandarin production per ropani

Average operating cost of mandarin cultivation per ropani was estimated to be NRs. 17,220. Cost of labor was the highest contributor of the total cost with share of 43.82% which is similar to the findings of Bheel and Burak (2013) and Diliprao (2014). Details of cost of mandarin production per ropani along with their share of total cost are presented in Table 1.

Table 1. Cost of mandarin production in Parbat and Baglung districts of Nepal

Particulars	Cost	Percent Share
Land rent	4000	23.23
Machinery/animal	1180	6.85
Plant nutrient	4024	23.37
Plant protection	471	2.73
Labor cost	7545	43.82
Total	17220	100

Cost, Return and Profit of Mandarin Production

The average operating cost, return and profit of households was NRs. 17220, NRs. 48978 and NRs. 31757 respectively. Kafle (2007) found lower cost of cultivation which may be because the cost of labor, inputs and other cost have increased a lot since the time of that research. The return and profit from mandarin cultivation is significantly higher in Parbat than Baglung. In Parbat, harvesting is carried in January and February, which serves as off-season production in domestic markets, which ensures higher per unit price for respective district's output among two districts. Other details about average cost, return and profit among different district are presented in Table 2.

Benefit cost analysis of Mandarin cultivation

Average B:C ratio per ropani was estimated to be 2.93, which indicates highly profitable enterprise. That is double of what Bhat et al. (2011) reported in case Jammu, India, but similar result was reported in Lamjung by Pokhrel (2011).

Factors affecting mandarin production

Five explanatory variables namely human labor cost, intercultural cost, land rent, cost of nutrients and plant

protection cost were considered to show their effects on production of mandarin. Cost of nutrient was significant at 1% level of significance. Land rent were significant at 5 % level of significance while Labor cost was significant at 10% level of significance. Kafle (2007) reported that cost of labor and expenditure on nutrient had positive impact on output of Mandarin production. Similarly, Shrestha (2015) also reported that expenditure on nutrients had positive impact on output of Mandarin farming.

The sum of the coefficients of factors of production was 1.097, which indicates production function of mandarin is in increasing return to scale. The coefficient of multiple determinations (R^2) of the model was 0.72, which indicates 72% of the total variations in the output occurred due the explanatory variables. The value of adjusted R square was 0.69, which indicates after taking into account the degree of freedom (df) 69% of the variation in output explained by explanatory variables of the model. Other details of resource use efficiency or factors contribution on mandarin production or return are shown in Table 4.

Table 2. Average cost of production, return and profit of Mandarin cultivation (NRs.) per ropani.

Description	Parbat (n=36)	Baglung (n=31)	Overall (n=67)	Mean difference	t-value
Cost	18060±5572	16381±5735	17220±5669	1679	1.150ns
Return	58655±34124	39302±13946	48978±27626	19353	2.875***
Profit	40594±31568	22921±13931	31757±25780	17673	2.805***

*** and ns indicates 1 % level of significance and non-significant respectively

Table 3. Benefit cost analysis (B:C Ratio) of Mandarin cultivation in Parbat and Baglung districts

District	BC ratio		Mean Difference	t-value
	Mean	Standard Deviation		
Parbat (n=36)	3.29	1.44	0.711	2.171**
Baglung (n=31)	2.58	1.05		
Overall (n=67)	2.93	1.31		

** indicates significance at 5 % level

Table 4. Estimated values of coefficients and related statistics of Cobb-Douglas production function of Mandarin

Factors	Coefficient (bi)	Std. Error	t-value	P> t
Constant	1.311	1.4333	0.91	0.364
Human labor cost	0.3860	0.1964	1.97	0.054*
Intercultural cost	-0.01232	0.02242	-0.55	0.585
Land rent	0.33456	0.14925	2.24	0.029**
Cost of nutrients	0.38515	0.1231	3.31	0.003***
Cost of plant protection	0.00395	0.02218	0.18	0.859
F-value	31.75			0.001***
R square	0.72			
Adjusted R-square	0.69			
Return to scale	1.097			

Note: ***, ** and * indicates 1%, 5% and 10% level of significance respectively.

Production problems

Inadequate irrigation facility was recognized by farmers as the most important problems with the index score of 0.86. Pokhrel (2011) and Poorwal (2012) supports the findings of this research. Roy et al. (2018) also stated that lack of irrigation facility and lower productivity are the main production problems of Mandarin. But, Myat Oo (2013) suggested disease and insect infestation was the main production problem, while NHPC (2017) stated that poor quality planting material was the most important production problem of Mandarin.

Marketing problems faced by farmers

Poor market facility and information was recognized as

the most important marketing problems faced by farmers with the index score of 0.72. Kafle and Rana (2003) and Myat Oo (2013) also supported the findings of this research. But, Diliprao (2014) stated that fluctuation and lower price was the most critical problem that Mandarin growers of Amravati, India were facing.

Marketing Problems Faced by Traders

Difficulty in transportation was ranked the most important problem with the matric score of 4. Similar results were found by Kumar et al. (2017) and Porwal (2012). But, Pokhrel (2011) stated that small scale production by farmers was the main marketing problem of traders.

Table 5. Major production problems of Mandarin cultivation faced by farmers.

Description	Parbat (n=36)		Baglung (n=31)		Total (n=67)	
	Index score	Rank	Index score	Rank	Index score	Rank
Disease and Insect infestation	0.71	III	0.43	IV	0.58	III
Poor quality planting material	0.34	IV	0.27	V	0.31	V
Inadequate technical assistance	0.79	II	0.75	II	0.77	II
Inadequate irrigation facility	0.86	I	0.88	I	0.87	I
Unavailability of sufficient labor	0.31	V	0.67	III	0.47	IV

Table 6. Major marketing problems of mandarin faced by farmers.

Description	Parbat (n=36)		Baglung (n=31)		Total (n=67)	
	Index score	Rank	Index score	Rank	Index score	Rank
Lower price	0.52	IV	0.61	II	0.56	II
Poor market facility and information	0.66	III	0.79	I	0.72	I
Lack of storage and processing facility	0.82	I	0.20	v	0.44	III
Poor transportation facility	0.77	II	0.61	III	0.44	IV
High post - harvest loss	0.23	V	0.22	IV	0.22	V

Table 7. Marketing problems faced by Traders during marketing of Mandarin

	Seasonal supply	Lack of storage facility	High marketing cost	Difficulty in transportation	Lack of Collection center
Seasonal supply	*	Lack of storage facility	High marketing cost	Difficulty in transportation	Lack of Collection center
Lack of storage facility		*	Lack of storage facility	Difficulty in transportation	Lack of storage facility
High marketing cost			*	Difficulty in transportation	Lack of Collection center
Difficulty in transportation				*	Difficulty in transportation
Lack of Collection center					*
Score	0	3	1	4	2
Rank	V	II	IV	I	III

Marketing Channels of Mandarin

Among the four marketing channel of the study area, Channel II was found to be the most prominent with 55 percent share of total marketed volume of produces. Similar findings were found by Kumar et al. (2017) and Pokhrel (2011), but Bhatt et al. (2011) identified channel-IV as the main marketing channel and Porwal (2012) identified similar to channel-I as the main marketing channel of mandarin.

Those marketing channels are as follows;

Channel-I: Producer – Collector – Retailer – Consumer

Channel-II: Producer – Pre-harvest contractor -Wholesaler

– Retailer – Consumer

Channel-III: Producer – Retailer - Consumer

Channel-IV: Producer – Consumer

Marketing margin and Producers' share

Average marketing margin and producers' share was estimated to be NRs. 45.95 per Kg and 57.41 percent respectively. Kafle (2007) and Bhat et al. (2011) found somewhat similar results to the finding of this research. But, Shrestha (2015) reported lower producers' share i.e. 33.30 percent, which almost half of this finding.

Table 8. Share of Mandarin marketed by the sampled household through various channel

S.N.	Marketing channels	Parbat	Baglung	Overall
1	Channel-I	70	0	35
2	Channel-II	20	90	55
3	Channel-III	5	5	5
4	Channel-IV	5	5	5

Table 9. Marketing margin and producer share of Mandarin in the study area

Study Area	Farm gate price	Retail price	Market Margin	Producers' share
Parbat	88	140	52	59.09
Baglung	50.17	90	39.9	55.74
Total	69.08	115	45.95	57.41

Conclusion

All the above analysis and result shows us that mandarin farming is indeed very profitable business especially for the mid-hills of Nepal. However, there was no significant increase in production area in the last few years and the present productivity of mandarin is far less. There are various production and marketing problems that are acting as hindrance in the way to achieve economic stability through mandarin farming. Government intervention to support branding, export facilitation and market diversification of mandarin could lead to involvement of more and more farmers in mandarin farming

rather than opting for foreign employment. Better production and marketing system must be developed so that more and more farmers can be attracted toward mandarin farming and can be used as a means to fight against poverty.

Compliance with Ethical Standards

Conflict of interest

The authors declared that for this research article, they have no actual, potential or perceived conflict of interest.

Author contribution

The contribution of the authors to the present study is equal.



All the authors read and approved the final manuscript. All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

Ethical approval

Not applicable.

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