RESEARCH ARTICLE

ECONOMICS OF PRODUCTION AND MARKETING OF MANDARIN IN GULMI, NEPAL

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ARTICLE DETAILS	ABSTRACT

Questionnaire based field survey was conducted with the purpose to access the production and market situation of mandarin orange among 120 farmers in Gulmi district. For the ease of the study, the sampled farmers were categorized according to their orchard land holding into small holders and commercial producers respectively. The average production of mandarin for smallholders and commercial producers were 0.987 tons and 3.645tons with productivity of 7.45 t/ha and 9.66 t/ha respectively. The average variable cost of production for small holder growers was found higher with NRs. 385581.16/ha. However, gross margin and B: C ratio was found higher in commercial producers which were NRs. 388040.43/ha and 2.59 respectively. Cobb-Douglas production function was used for the analysis of factor of production which showed human labor, irrigation cost, manure cost and transport cost was significant contributor in the return of mandarin. Pre-harvest contract was the most common marketing pattern with 60% of the producers following producer to contractor channel. The major production and marketing problems were lack of irrigation, lack of quality sapling, fruit drop. Low price offered to farmers, lack of processing activities and technical constraints in the study area.

1. INTRODUCTION

Citrus is the important cash crop for the hill farmers of Nepal (Budathoki, 2004). The citrus in Nepal is cultivated in small as well as in commercial scale at an altitude of 650 to 1400 m above sea level. The Eastern and western and mid-hills are the major citrus producing area of Nepal with altitude ranging from 1000-2000, mean annual temperature being 17-20^{0}C and annual rainfall ranging from 1000-2800 mm (Srivastava et al., 2002). Within the citrus fruit species, mandarin (*Citrus reticulate* Blanco) comes under first position followed by sweet orange (*Citrus sinensis*) and lime (*Citrus aurantifolia*) in terms of area and production. The productive area of citrus is estimated to be 24854.3 ha and the fresh fruit production is 21844.2 mt with the productivity of 8.82 mt/ha (MoAD, 2017).

Citrus, particularly the mandarin orange is the most important and highly commercial fruit crop in the hills of Nepal (Bhattarai et al., 2013). Mandarin alone covers 67% of the total productive area and 64% of the total production (NCRP, 2016/17). Mandarin contributes to augmenting food availability, improvements in nutrition, generation of employment and income and also helps in maintaining the environment (Shrestha and Dinesh, 2015).

Though Gumi is one of the potential mid hill district of mandarin production, the annual production has failed to meet the anticipated requirement. Inadequate information on production cost, pricing mechanism and poor knowledge on linkages has caused farmers to face the lower pricing share from this profitable business. Therefore, this study is designed for the analysis of production and marketing aspect of mandarin orange in the selected areas of Gulmi district.

2. MATERIALS AND METHODS

2.1 Study area

This study was conducted in three rural municipalities and one municipality of Gulmi district: Dhurkot, Chhatrakot, Gulmidurbar and Resunga during April 2019 in Nepal. The selected VDCs are the prime citrus production area of Gulmi. All the citrus growers in the selected VDCs were listed with the help of key-informant, PM-AMP (Citrus Zone) and Agriculture Knowledge Centre. All together 120 respondents, 20 from each of three RMLs and municipality were selected randomly from the list. A semi-structured questionnaire focus group discussion and orchard visits were used in the study. The data was analyzed using Microsoft Excel and Statistical Package for Social Sciences (SPSS).

2.2 Selection of Mandarin producers

All together 120 mandarin producers were selected, 20 from each of three RMLs and a municipality through simple random technique. Mandarin growers were divided into two categories i.e. farmers cultivating in area less than 0.25 ha were small growers and the farmers cultivating above 0.25 ha were commercial producers. The counts of small growers were67 and commercial producers were 53. Farmers themselves were the key informants to understand the market, marketing structure and channel in the study area.

2.3 Survey design and data collection

2.3.1 Interview schedule design

For the collection of primary data single interview schedule was prepared

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to collect the information from farmers regarding production and marketing of mandarin. Different variables were identified and interview schedules were prepared accordingly.

2.3.2 Field survey

The field survey was conducted in April 2019. The respondents were interviewed using face to face method by visiting their homes. Regular checking and validation of the information were done after filling the interview schedule to avoid haphazard data.

2.4 Methods and techniques of data analysis

Both the primary and secondary information collected from the field survey and other means were coded, tabulated and analyzed by using Microsoft Excel and Statistical Package for Social Sciences (SPSS). Cost of production mainly the cost of land preparation, manure, fertilizer, plant protection, labor, planting materials etc. was focused on determining cost of production while excluding land rent, since all of those farmers were cultivation on their own land.

2.5 Benefit cost analysis

For benefit cost analysis, total cost of production of mandarin and total gross return from produce were used. For calculating gross return, income from produce sale was accounted. So the B/C ratio was calculated using the following formula:

B/C ratio = Gross Return/Total Cost

2.6 Profit analysis

The profit is the difference between total revenue and total cost incurred. Thus, net profit for any farm business can be written as:

$\Pi = TR - TC$

Where, Π = net profit, TR = total revenue, TC = total cost

2.7 Factors affecting mandarin production

The Cobb-Douglas production function model was used to estimate the coefficients for factors affecting the gross income from mandarin production. The model for mandarin production was specified as following to estimate the degree of influence of various explanatory variables.

Dependent variable= Gross return of mandarin

Explanatory variables= seedling cost, manure cost, labor cost, transportation cost, Bordeaux paste cost and irrigation cost

$Y = a X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} e^u$

Where,

Y= gross income from mandarin production (NRs.)
a= constant
X_1= Seedling cost
X_2= Labor cost
X_3= Transport cost
X_4= Bordeaux paste cost
X_5= Irrigation cost
U= Error term

$b_1, b_2, b_3, b_4,$ and b_5 are the coefficients for seedling cost, manure cost, labor cost, transportation cost; Bordeaux paste cost and irrigation cost.

2.8 Indexing / Scaling

For finding the importance of different production and marketing problems five point scale was used based on the farmer's perception about them. It comprises very high importance, high importance, normal importance, less importance and the least importance to the different problemsusing numeric value 1, 2, 3, 4 and 5 respectively. The index of importance was conducted by using the following formula;

Iimp= ∑ (Si fi)/N

Where,

Iimp= Index of importance

Si = Scale value

fi= Frequency of importance given by the respondents

N = Total number of respondents

3. RESULT AND DISCUSSION

3.1 Plant distribution

The average plant distribution among different growers is presented in the figure below. The total number of plants in the orchard is distributed according to the age group and their average count is shown.
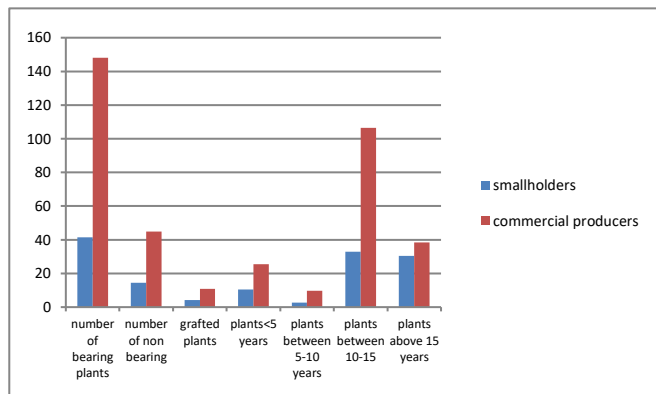

Figure 1: Distribution of mandarin plants in the study area

Production of the mandarin depends on the type of sapling used (seedling origin or grafted). The figure clearly shows that a thrift amount of grafted plants are used in the study area with commercial growers holding higher number than the smallholder mandarin growers. Similarly, the age wise distribution of plants with most bearing age group also seems to be higher among the commercial growers.

3.2 Production situation of mandarin

Table 1: Production situation of mandarin among different growers

Particulars	Overall average	Small holders	Commercial producers
Production (tones)	2.163	0.987	3.645
Productivity (mt/ha)	8.36	7.45	9.66

In 120 sampled household, there were average production of 0.99 tones in smallholder growers and 3.65 tones in commercial producers. The mean difference in the production of mandarin between different growers is statistically significant at 1% level. Similarly, productivity is 7.45 t/ha and 9.66 t/ha among smallholder growers and commercial producers respectively and the difference is significant at 5% level. The productivity of mandarin in Gulmi district is 8.46 in the year 2016/17 (DADO, 2017).

3.3 Cost incurred in mandarin production

Table 2: Total variable cost incurred in mandarin production (per ha)

Particulars	Overall average	Smallholders	Commercial producers
Seedling	2120.13	2264.83	1937.01
Manure	14551.35	13021.80	16484.91
Irrigation	197331.75	231297.54	154389.98
Labor	89584.13	113516.64	59329.95
Transportation	6380.85	10147.51	1619.00
Bordeaux paste	9616.01	11380.58	7385.67
Pesticide	845.77	611.23	1142.25
Micronutrients	368.42	205.25	574.66
Vermicompost	2688.51	3868.30	1196.90
Total variable cost	323406.95	385581.16	244064.94

The cost of mandarin production per ha per year was presented in the table above. Here fixed costs were excluded and only the variable costs incurred in a year was tabulated. The total variable cost of mandarin production for smallholder growers was NRs 385581.16 and that of commercial producers was NRs 244064.94. The variable cost included the cost of seedling, manure, irrigation, labor, transportation, Bordeaux paste, and pesticides, micronutrients and vermicompost. Here the cost of irrigation, labor, transportation, Bordeaux paste and vermicompost were found highly significant at 1% level while the cost of micronutrients was found to be significant at 5% level.

3.4 Benefit cost Analysis

Table 3: Economic indicators showing productivity and profitability of mandarin farming			
Particulars	Overall	Small holders	Commercial producers
Total variable cost (NRs/ha)	323078.29	385581.16	244064.94
Average price	66.23	70.19	61.22
Gross revenue(NRs/ha)	614907.59	601303.26	632105.37
Gross margin (NRs/ha)	291829.30	215722.10	388040.43
Benefit cost	1.90	1.56	2.59

The average total cost/ha was found to be NRs 323078.29/ ha and return was NRs 614907.59/ha. The average BC was found to be 1.90. Similarly, the gross margin was found to be 291829.30/ha. The total variable cost, gross revenue, gross margin and BC for commercial producers and smallholder growers was found to be NRs 244064.94/ha, NRs 632105.37/ha, NRs 388040.43/ha, 2.59 and NRs 385581.16/ha, NRs 601303.26/ha, NRs 215722.10/ha, 1.56 respectively. This result was also supported found the average BC ratio of coorg mandarin as 1.96 on his study on production and marketing of coorg mandarin in coorg district among different scales of mandarin growers (Linkin, 2015). Similarly, this result was also case study in two different VDCs of Lumjung district where the average B:C for Chitti VDC was 2.6 while that of Udipur VDC was 2.0.

3.5 Production function analysis

Table 4: Regression estimates for factors affecting gross income of mandarin growers				
Variables	Coefficients	Std. Error	T- value	F –value
Constant	3.563	0.579	6.51	0.000
Seedling cost	-0.038	0.360	-1.08	0.283
Manure cost	0.223***	0.061	3.65	0.000
Labor cost	0.134*	0.074	1.81	0.073
Transportation Cost	-0.027**	0.013	-2.11	0.037
Bordeaux cost	-0.055	0.082	-0.67	0.505
Irrigation cost	0.520***	0.077	6.68	0.000
R^2	0.56			
Adjusted R^2	0.54			
F ratio	24.41			

A Cobb-Douglas production model was run to find out the effect of different factors on gross return of mandarin production in the study area. The explanatory variables included in this model were cost on seedling, manure, labor, transportation, Bordeaux paste and irrigation. The regression model obtained for mandarin production is presented in the table above.

The explanatory power of the estimated model for mandarin production was 0.56. F ratio being highly significant, the model was a good fit. All the explanatory variables had positive coefficients except seedling, transportation and Bordeaux cost. Coefficient for cost of manure was found to be positive and significant at 1% level of significance indicating that100% increase in the use of manure, keeping other factors constant would increase the gross return by 22.3%. Irrigation cost seemed to be significant at 1% level indicating 100% increase in the use of irrigation would increase return by 52.0% keeping other things constant.

Similarly, labor cost also showed significance at 1% level of significance on gross returns from mandarin production. Keeping all other factors

constant, 100% increase in the labor cost will increase the return by 13.4%. Likewise, the transportation cost was also found significant at 5% level of significance with negative coefficient, indicating larger the marketing channel, more is the transportation cost resulting lesser return to the producers while the case becomes just opposite for shorter market channel and lesser transportation cost.

3.6 Marketing channel

Marketing channel is the sequence of intermediaries or middlemen, and markets through which produce pass from producers to find consumers. The marketing channels are important aspects of agribusiness which affects the prices paid by consumers and the corresponding share received by the producers.

Figure 2: Marketing scenario of the study area

Mainly two systems of practices for selling of the produce prevail in the study area. The first is the contract selling and the second one is non-contract selling. 56.66% of the total producers had contract selling practice while 43.33% of the producer prefer non contract selling of their produce. The contract selling had the direct channel of producer-contractor while non-contract selling of had two channels viz. producer-wholesaler- consumer and producer-wholesaler-retailer and consumer.

The pre-harvest contract is the most commonly preferred system of selling. Farmers prefer pre-harvest contract due to the low risk associated as well as easy way of getting money without harvesting and transportation burden (Gurung, 2000). Here those marketing channel on the farmers perspective through which the producer pass their produce to the consumers were recorded. The marketing channels are presented as follows:

- ✓ Producers →Contractors
- ✓ Producers → Wholesalers→ Consumers
- ✓ Producers→ Wholesalers→ Retailers→ Consumers

3.7 Problems in production of mandarin

The details of intensity of production problems and their index value are presented in the table.

Table 5: Production problems of mandarin growers in the study area									
Problems	Intensity of problems					Sum	Weight	Index	Rank
	1	0.8	0.6	0.4	0.2				
Lack of irrigation	52	47	21	0	0	120	102.2	0.85	I
Lack of quality sapling	32	20	8	60	0	120	76.8	0.64	II
Fruit drop	11	38	10	31	30	120	65.8	0.55	III
Lack of storage facility	10	9	52	19	30	120	62	0.52	IV
Technical constraints	16	4	30	10	60	120	53.2	0.44	V

The result showed that lack of irrigation was the most severe problem perceived by the producers. The second major problem as indicated by sampled farmers was lack of quality sapling which has resulted into the complaint of citrus decline and greening in some part of the study area. These problems were followed by fruit drop, lack of any types of storage facilities and technical constraints which includes absence of technical assistance and support, mechanization in mandarin cultivation. High incidence of pest and disease, inadequate technical guidance, inadequate

supply of inputs, high cost of labor, non-availability of planting materials were found the major constraints of production of mandarin (Linkin, 2015). Weak farm management, lack of irrigation facility, low availability of hired labor were perceived as the major production constraints by mandarin growers (Roy et al., 2018).

3.8 Problems of marketing

Marketing plays a crucial role for easy disposal of product from producer ultimately to consumer. Until and unless marketing systems are improved, no incentives to increase the production will benefit the growers.

Table 6: Marketing problems of mandarin growers in the study site

Problems	Intensity of problems				Sum	Weight	Index	Rank
	1	0.75	0.5	0.25				
Low price offered to farmers	42	47	31	0	120	92.75	0.77	I
Lack of processing activities	35	20	32	33	120	74.25	0.62	II
Lack of post-harvest handling practices	20	39	23	38	120	70.25	0.59	III
Lack of market information	17	26	28	49	120	62.75	0.52	IV

Marketing is equally important as farming practice for good return to farmers. A good market leads to commercialization of agriculture sector. Many respondents were dissatisfied with the price of mandarin. Mandarin was directly sold to the contractors. Contract farming system is widely prevalent in the study area. Thus, four major marketing problems were ranked by the respondents. Low price offered to the producers was top ranked with index value 0.77. An average of the selling price is only NRs 66.23/ kg. Similarly second major problem was lack of processing activities. Value addition activities were not prevalent in any of the study area. There rely immense possibilities of value addition of mandarin but this is yet to be explored for which the producers had ranked an index value of 0.62 and mentioned it the second major marketing constraints. Mandarin growers had perceived that existence of middleman was the major constraint followed by lack of proper market and no preservation industry in the study area among the storage and marketing constraints (Roy et al., 2018).

4. CONCLUSION

Gulmi district is one of the prominent areas for mandarin production which is located at $28^o 4' N\ 83^o 15' E$ with a total area of 1149 km². The climatic condition and the edaphic factor of the mid hill region is suitable for the production of citrus in the district. It has a total area of 1286 ha of citrus cultivation which majorly includes mandarin, sweet orange and lime, a productive area of 339 ha with production of 3860 mt and yield of 11.38 mt/ha among which mandarin occupies a total area of 1081 ha, with productive area of 346 ha, production of 2927 mt and productivity of 8.46 mt/ha respectively. Altogether 120 respondents were sampled from four different places, 30 from each Dhurkot RML, Chhatrakot RML, Gulmidurbar RML and Resunga municipality through cluster sampling. Of 120 respondents 67 small holder growers and 53 commercial producers were selected. Primary data were collected through field survey from farmers, FGD and KII. The secondary data were collected from different secondary sources of information.

In 120 sampled household, there were average production of 0.987 tones in smallholder growers and 3.645 tones in commercial producers. Similarly, productivity is 7.45 t/ha and 9.66 t/ha among smallholder growers and commercial producers respectively. Fixed costs were excluded and only the variable costs incurred in a year was tabulated. The total variable cost of mandarin production for smallholder growers was

NRs 385581.16/ha and that of commercial producers was NRs 244064.94/ha. The average total cost/ha was found to be NRs 323078.29 and return was NRs 614907.59. The average BC was found to be 1.90. Similarly the gross margin was found to be NRs 291829.30. The total variable cost, gross revenue, gross margin and BC for commercial producers and smallholder growers was found to be NRs 244064.94, NRs 632105.37, NRs 388040.43, 2.59 and NRs 385581.16 , NRs 601303.26, NRs 215722.10, 1.56 respectively.

The existing marketing channels were producer to contractor, producer to wholesaler to consumer and producer to wholesaler to retailer and consumer. Cobb-Douglas production model was run to find out the effect of different factors on gross return of mandarin production in the study area. All the explanatory variables had positive coefficients except seedling, transportation and Bordeaux cost. Production function analysis revealed that one percent increase in the expenditure on manure, irrigation and labor would increase the gross income of mandarin by 0.22, 0.52 and 0.13 respectively.

Lack of irrigation was the most severe problem perceived by the producers. The second major problem as indicated by sampled farmers was lack of quality sapling which has resulted into the complaint of citrus decline and greening in some part of the study area. Among the different marketing constraints, low price offered to the producers was top ranked with index value 0.77. Similarly, second major problem was lack of processing activities.

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