

Economics of Production and Marketing of Ginger in Sunsari District, Nepal

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Abstract

Ginger is the main cash crop for small farmers across the country. A study was conducted to assess the economics of production and marketing of ginger in Sunsari district, Nepal. A total of 100 respondents were selected, 40 farmers each from Bishnupaduka and Panchakanya and 20 traders were selected by using proportionate random sampling. Primary data were obtained through questionnaire survey, Focus Group Discussion (FGD), Key Informant Interview (KII) and direct field observation. Secondary data were obtained by reviewing relevant publications. The average farm size was 33.67 kattha while average land under ginger cultivation was 3.67 kattha per household. The productivity of ginger of sampled households was 14.81 Mt/ha. The average cost of ginger production was NRs. 48.69/Kg. The B/C ratio was found 2.06. Marketing margin was found NRs. 27.77/Kg with 80.65% producer's share. Three types of marketing channels viz., farmers-wholesalers-retailers-consumers, farmers-commission agents-wholesalers-retailers and farmers-retailers-consumers were found in the study area. Cobb-Douglas production function analysis revealed that expenditure on fertilizer, seed and labor cum minitiller power use were significantly contributing factors for gross income from ginger production. Indexing technique identified high incidence of diseases and insects and high fluctuation in market price as the major problems associated with production and marketing of ginger by ginger growers respectively. Likewise, fluctuation in market price was the major problem faced by the ginger traders of Sunsari district. The study revealed that ginger production was a profitable and potential agriculture enterprise for the study area.

Keywords: Ginger; Productivity; Marketing; Cobb-Douglas Production Function and Problem

Introduction

Agriculture plays a vital role in the process of economic development of any country, particularly, in countries where per capita income is low. It accounts 33% of the nation's GDP and provides employment opportunities to 66% of the population in Nepal [1].

Ginger (*Zingiber officinale*) is a flowering plant, belonging to family Zingiberaceae. Its rhizome is widely used as spice as well as for various medicinal purposes [2]. Nepal ranks 4th in terms of ginger production in the world [3]. It can be cultivated in the marginal and sub marginal lands of mid hills ranging from 600-1600 masl [4]. In Nepal, it is commonly used as spice in its fresh or dried form [5]. It is used for the preparation of various products such as sutho¹, sauces, pickles, candy, squash, powder and beverages. Dried form of ginger (sutho) contains 15% of aromatic oil, 6% oleoresin while the fresh form of rhizome contains only 12.3%, 2.3% and 0.9% of carbohydrate, protein and fat respectively and some amount of vitamins and minerals [6]. Ginger also has medicinal properties and helps in preventing nausea, asthma, cancer, migraine, constipation, cold, blanching, cholesterol and blood pressure. It also has anti-bacterial and anti-inflammatory properties [7]. It grows in the

marginal and sub-marginal lands of mid-hills between the altitudes of 600-1600 masl [8].

In FY 2015/16, total production of ginger was 2,71,863 Mt, out of which more than half of the total production was, exported [9]. Of total exports, about 94% was exported to India [10]. The total area under ginger cultivation in Nepal was 21,869 ha with the productivity of 12.43 Mt/ha whereas in Sunsari district total area under ginger production was 450 ha producing 4235 Mt of ginger with productivity of 9.41 Mt/ha.

Though production of ginger is one of the important occupations in Sunsari district, little information is available on the economic viability and sustainability of this crop and its marketing aspect. Thus, this study was carried out to assess economics of production and marketing status of ginger in Sunsari district, Nepal.

Materials and Methods

Study area

Purposive selection of site was done based on area coverage of ginger production, number of ginger growing farmers, production of ginger and access to road facility. The study was conducted

¹Sutho: dried ginger

at Bishnupaduka (Dharan-20) and Panchakanya (Dharan-6) of Dharan Sub-Metropolitan City of Sunsari district which is assigned as Ginger/Turmeric Zone by PMAMP.

Selection of ginger producers and traders

Eighty ginger producers were selected from the list of the farmers, by applying simple random sampling techniques including 40 farmers each from Bishnupaduka and Panchakanya. To understand about market and marketing structure and channel of ginger in Sunsari, twenty traders were also selected.

Survey design and data collection

Interview schedule design

For the collection of primary data two sets of interview schedule were prepared, one set to collect the information from farmers regarding production and marketing of ginger and another set to collect the information from traders. Different variables were identified and interview schedule were prepared accordingly.

Field survey

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Methods and techniques of data analysis

Quantitative and qualitative data obtained from survey were coded, tabulated and analysed by using SPSS and Ms-Excel. The results were presented using frequency, percentage, bar diagram, line chart and pie chart.

Cost of production

For analyzing the cost of production, the variable cost items and fixed cost items were considered. The variable cost included the farm expenditure on seed, land preparation cost, fertilizers, manure, pesticides, planting, mulching, weeding, irrigation, harvesting, packaging, transportation, labor, bullock, minitiller cost, interest on variable cost etc. The fixed cost was calculated adding the depreciation cost, land rent etc. Total cost of production was calculated by adding all the expenditures on variable inputs and fixed cost:

Total cost = \sum of cost incurred in all the variable items + \sum of cost incurred in all the fixed items.

Benefit cost analysis

For benefit cost analysis, total costs of production of ginger 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 following formula:

B/C ratio = Gross return/Total cost

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:

Net profit = TR – TC

Where, TR= total revenue, TC= total cost

Marketing margin and producer's share

The difference between the farm-gate price i.e. price obtained by the producer and retailer's price i.e. price paid by the consumer is known as marketing margin. It is calculated as;

Marketing margin = Retailer's price (Pr) – Farm gate price (Pf)

Similarly, producer's share is the price received by the farmer i.e. farm gate price expressed as percentage of the retailer's price i.e. price paid by the consumers. It is calculated as;

Producer's Share (P_s) = $\frac{\text{farm gate price (Pf)}}{\text{retailer's price (Pr)}} \times 100$

Factors affecting ginger production

In order to determine factors affecting ginger production regression analysis techniques was used. The Cobb-Douglas production function model was used to estimate the coefficients for factors affecting the gross income from ginger production. It is important to analyze the contribution and magnitude of the effect of the several factors that affect ginger production. The model for ginger production was specified as following to estimate the degree of influence of various explanatory variables on dependent variable.

Dependent variable = Production of ginger (in value term).

Explanatory variable = Area under ginger cultivation in kattha, seed cost, fertilizer cost, organic manure cost, labor and minitiller power use cost, irrigation cost and pesticide cost.

$Y = a X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} X_6^{b_6} X_7^{b_7} e^u$

Above equation was linearized into logarithmic form, which is expressed as,

$\text{Log } Y = \text{Log } a + b_1 \text{Log } X_1 + b_2 \text{Log } X_2 + b_3 \text{Log } X_3 + b_4 \text{Log } X_4 + b_5 \text{Log } X_5 + b_6 \text{Log } X_6 + b_7 \text{Log } X_7 + u$

Where, Y= Gross income from ginger production (NRs.), a = Constant, X₁ = Seed cost (NRs.), X₂ = Fertilizer cost (inorganic fertilizer) (NRs.), X₃ = organic manure cost (NRs.), X₄ = Pesticide cost (NRs.), X₅ = Irrigation cost (NRs.), X₆ = Human labor cum minitiller power use cost (NRs.), X₇ = Area (Kattha), e = Base of natural logarithm (NRs.), u = Error term.

b₁, b₂, b₃, b₄, b₅, b₆ and b₇ are the coefficients for seed cost, fertilizer cost, organic manure cost, pesticide cost, irrigation cost, human labor cum minitiller power use cost and area respectively.

Gross income was the dependent variable in production function whereas area, seed cost, fertilizer cost, organic manure cost, pesticide cost, irrigation cost, human labor cum minitiller power use cost were the independent variables. Cost of labor was obtained by adding different costs incurred from cultivation to harvesting of ginger.

Indexing

Production and marketing problems were ranked using following formula:

$$I_{imp} = \sum \frac{S_{ift}}{N}$$

Where,

I_{imp} = index of importance

∑ = summation

S_i = Ith scale value

F_i = frequency of ith importance given by the respondents

N = total number of respondents

Analysis of index of importance was calculated by the above formula with different constraints. Those constraints with the higher index were ranked first, second, third and so on.

Results and Discussion

Land holding and utilization

The result showed that average land holding size of the overall sampled household was 33.67 kattha. The average area for ginger cultivation per household in the study area was 3.67 kattha. Most of the area was allocated for vegetable and other crops. Although ginger is high value crops, due to its high cost of production farmers failed to cultivate ginger in large areas as compared to other crops. The details of land use for ginger cultivation are presented in table 1.

Description	Mean	Standard deviation
Total area	33.67	22.82
Ginger cultivation area	3.67	2.46

Table 1: Land use (kattha) for ginger cultivation by sampled household in the study area.

Source: Household Survey, 2019.

Economics of ginger production

Cost of ginger production

The study revealed that total average variable cost for ginger production was NRs. 6, 54,226.9 for one hectare. Poudel, Regmi, Thapa, GC and KC reported that total cost of cultivation of ginger per hectare was NRs. 1, 81,933. Seed contributes the highest cost in average variable cost of production. Seed cost accounted 22.51% of average variable cost and then followed by weeding (14.20%), harvesting (10.95%), planting (10.41%), land preparation (9.19%), mulching (7.73%), manuring (7.23%), manure (6.52%), miscellaneous (4.55%), transport (2.24%), hired value of minitiller (2.12%), irrigation (0.95%), bullock (0.81%), Chemical fertilizer

(0.30%) and pesticides cost (0.29%). The details of average cost of ginger production per hectare in the study area are presented in table 2.

S.N.	Variables	Average variable cost (NRs.)	Standard Deviation	Contribution to total average variable cost (%)
1	Seed	1,47,234.4	32,444.17	22.51
2	Manure	42,682.5	15,701.69	6.52
3	Pesticides	1875	3,268.09	0.29
4	Chemical Fertilizers	1,991.25	4,685.66	0.30
5	Mini tillers (Hired value)	1, 3875	14,668.81	2.12
6	Bullock	5, 325	5, 869.95	0.81
7	Land preparation	60, 112.5	13, 197.62	9.19
8	Manuring	47, 287.5	16, 864.46	7.23
9	Planting	68, 137.5	15, 680.95	10.41
10	Mulching	50, 625	17, 689.57	7.73
11	Irrigation	6, 187.5	7, 430.85	0.95
12	Weeding	92, 887.5	22, 608.95	14.20
13	Harvesting	71, 625	15, 052.12	10.95
14	Transport cost	14, 625	1, 609.89	2.24
15	Miscellaneous	29, 756.25	808.89	4.55
Total average variable cost		6, 54, 226.9	86, 134.81	100
Total average fixed cost		66, 555	3, 256.79	
Total cost		7, 20, 781.9	85, 800.8	

Table 2: Cost of Production of ginger per hectare in the study area.

Source: Household Survey, 2019.

Production of ginger

The study revealed that on an average 11, 953.13 Kg of fresh gingers was produced per hectare ranging from 3000 to 19500 Kg whereas average mother rhizome production per hectare was 2851.88 Kg ranging from 1500 Kg to 3600 Kg. Average ginger production per hectare was found 11378 Kg [11]. The average cost of production per Kg was NRs. 48.685. The details of ginger production per hectare in the study area are presented in table 3.

Type of rhizome	Average production (Kg)	Standard deviation	Minimum	Maximum
Mother rhizome	2, 851.88	406.08	1, 500	3, 600
Fresh rhizome	11, 953.13	3, 602.02	3, 000	19, 500
Total	14, 805.01	3, 751.89	6, 000	22, 500
Cost of production per Kg: NRs.48.685				

Table 3: Production of ginger per hectare in the study area.

Source: Household Survey, 2019.

Gross Income from ginger farming

The study revealed that gross income from ginger cultivation per hectare was NRs. 14, 86, 406.13. Almost all of the gross income was from fresh rhizome which was NRs. 13, 89, 178 (93.45%) whereas mother rhizome contributed only NRs. 97, 228.13 (5.55%). The details of gross income from ginger production per hectare in the study area are presented in table 4.

Type of rhizome	Mean(NRs)	Standard deviation	Percent	Minimum	Maximum
Fresh rhizome	13, 89, 178	4, 42, 905.2	93.45	3, 60, 000	23, 40, 000
Mother rhizome	97, 228.13	24,138.81	5.55	45, 000	2, 40, 000
Total	14, 86, 406.13	44, 6804.2	100.00	4, 50,000	24, 45, 000

Table 4: Gross Income per hectare obtained by farmers in the study area.

Source: Household Survey, 2019.

Benefit-cost ratio analysis

Benefit cost ratio analysis gives an idea about the recovery of expenditure incurred during the production by return from the product. The benefit cost analysis of ginger produced in the study area is presented in table 5.

The benefit cost ratio analysis showed that the overall B/C ratio is greater than unity (2.06), which is lower than the B/C ratio of

Particulars	Amount
Total cost	NRs.7,20,781.9
Total income	NRs. 14,86,406.13
B/C ratio	2.06
Net profit	NRs. 7,65,624.23

Table 5: Calculation of benefit cost ratio of ginger production in the study area.

Source: Household Survey, 2019.

Marketing channel	Frequency
Farmers-Wholesalers-Retailers-Consumer(FWRC)	32(40.00)
Farmers-Commission agent-Wholesalers-Retailers-Consumer (FCaWRC)	4(5.00)
Farmers-Retailers-Consumers(FRC)	17(21.20)
Both FWRC and FCaWRC	14(17.50)
Both FWRC and FRC	13(16.20)
Total	80(100.00)

Table 6: Marketing channel of ginger in the study area.

Source: Household Survey, 2019.

Notes: Figures in the parenthesis () denote percentage.

Marketing system of ginger

Marketing system in the study area

Ginger producers, wholesalers and commission agents were the main person involved in the marketing. Marketing system is described as below;

Marketing Channel

The marketing channels are important aspects of agribusiness which affects the prices paid by consumers and the corresponding share received by the producer. Generally, the shorter the channel, lesser the marketing costs and cheaper the commodity to consumer [13]. Three types of marketing channel of ginger were recorded in the study area. Most common type of marketing channel was, Farmers-Wholesalers-Retailers-Consumer (FWRC) which was followed by 40% of the respondents. 21.20% respondents followed marketing channel of Farmers-Retailers-Consumers (FRC) whereas 17.50% respondents followed marketing channel of both FWRC and FCaWRC. 16.20% followed marketing channel of both FWRC and FRC whereas only 5% followed marketing channel of Farmers-Commission agents-Wholesalers-Retailers-Consumers (FCaWRC). The details of marketing channels in the study area are presented in table 6.

Market margin and producer’s share

Marketing margin is the difference between price paid by the consumer and price received by the farmers. Producer’s share is the proportion of the consumer’s payment received by the producers. Marketing margin and producer’s share are the indicators of

efficiency of existing marketing system. Lower marketing margin and higher producer’s share ensures efficiency of marketing system. Marketing margin of ginger was NRs.27.77 per Kg with 80.65% producer’s share

$$\text{Marketing margin (MM)} = \text{Retailers price (Pr)} - \text{Farm gate price (Pf)}$$

$$= \text{NRs. (143.58 - 115.81)}$$

$$= \text{NRs. 27.77/Kg}$$

$$\text{Producers' Share} = (\text{Pf/Pr}) \times 100\%$$

$$= (115.81/143.58) \times 100\%$$

$$= 80.65\%$$

Factors affecting ginger production

The Cobb Douglas production function model for ginger production in the study site was found to be best fit as the F-ratio was highly significant (P-value<0.001). The coefficient of multiple determinations (R²) of the estimated log linear form of Cobb-Douglas production function model was 0.735, which indicated that 73.50 percent of the variation in ginger production in value term could be explained by the variables included in the equation. All the explanatory variables had positive coefficients except organic manure, pesticides and irrigation cost. Coefficient for fertilizer cost was found to be positive and highly significant at 1% level of significance in-

dicating that 1% increase in expenditure on fertilizer, keeping all other factor constant, would increase the gross income by 0.192 percent. Seed cost and labor cum minitiller power use cost showed significant at 10% level of significance on gross income. Coefficient of area was found positive but not significant. Coefficient of pesticide and organic manure cost was negative and the result was not significant. Coefficient for irrigation cost was negative but significant at 5% level of significance.

The sum of regression coefficients obtained from Cobb Douglas production function was 0.866 which indicated the decreasing returns to scale. In this case if all the variables specified in production function were increased by 100 percent then the revenue would increase by 86.6percent. Regression coefficients of different inputs used in the production functions were estimated separately and result is presented in table 7.

Variables	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t-value	P-value
(Constant)	4.975	2.439		2.040	0.045**
Log seed cost	0.323	0.184	0.322	1.755	0.084*
Log organic manure cost	-0.002	0.088	-0.002	-0.021	0.983
Log fertilizer cost	0.041	0.014	0.192	2.829	0.006***
Log pesticide cost	-0.003	0.013	-0.014	-0.225	0.822
Log irrigation cost	-0.022	0.010	-0.133	-2.085	0.041**
Log Labor cum minitiller power use cost	0.329	0.195	0.260	1.688	0.096*
Log area	0.300	0.302	0.241	0.992	0.324

Table 7: Regression estimates for factors affecting gross income of ginger growers.

Source: Household Survey, 2019.

Dependent Variable: Log of gross income from ginger production

$R=0.867, R^2= 0.735, \text{Adjusted } R^2=0.709, F \text{ ratio}=28.459^{***},$

Returns to scale = 0.866

*** =1% level of significance, ** = 5% level of significance

and * = 10% level of significance.

Problems in ginger production and marketing Production problems

The value obtained from the rank scale showed that ‘Diseases and insects problem’ had index value (0.99) and ranked as a most serious problem whereas ‘High initial investment’ with index value (0.22) was ranked as a least serious problem. Relative seriousness of the problems faced by the ginger growers followed the sequence of high incidence of diseases and insects, scarcity of irrigation water, lack of quality inputs, input and labor shortage, lack of technical services and high initial investment. According to [14] rhizome rot was the major production problems whereas high incidence of

diseases and insects was found major production problems in Sunsari district. The details of production problems faced by ginger growers in the study area are presented in table 8.

Problems in Production	Weight	Index	Rank
Diseases and insects problem	79.67	0.99	I
Scarcity of irrigation water	54.33	0.68	II
Lack of quality inputs	47.33	0.59	III
High initial investment	16.17	0.20	VI
Input and labor shortage	42.45	0.53	IV
Lack of technical services	40.33	0.50	V

Table 8: Production problems faced by ginger growers in the study area.

Source: Household Survey, 2019

Marketing problems

Marketing problems of ginger faced by growers in the study area

The rank scale showed that ‘High fluctuation in market price’ had highest index value (0.88) and least was ‘Low market price of ginger’ with index value (0.23). Relative seriousness of the problems faced by growers followed the sequence of high fluctuation in market price, lack of processing facilities, lack of storage facilities, lack of proper transportation facilities, quality issues, unawareness of market price information, unorganized market and low market price of ginger. According to [14] fluctuation on market price was the major marketing problem which was similar to the finding of this study. The details of marketing problems faced by ginger growers in the study area are presented in table 9.

Marketing problems	Weight	Index	Rank
Lack of storage facilities	64.25	0.8	III
Lack of proper transportation facilities	51.00	0.64	IV
Quality issues	32.50	0.41	V
Unawareness of market price information	29.88	0.37	VI
Lack of processing facilities	68.00	0.85	II
High fluctuation in market price	70.38	0.88	I
Low market price of ginger	18.12	0.23	VIII
Unorganized market	25.50	0.32	VII

Table 9: Marketing problems faced by ginger growers in the study area.

Source: Household Survey, 2019

Marketing problems of ginger faced by traders in the study area

The value obtained from the rank scale showed that ‘High fluctuation in market price’ had highest index value (0.90) and least was ‘High transportation cost’ with index value (0.15). Relative seriousness of the problems faced by traders followed the sequence of high fluctuation in the market price, low quality, lack of proper

storage facility and high transportation cost. The details of marketing problems faced by ginger traders in the study area are presented in table 10.

Problems	Weight	Index	Rank
Low quality	16.25	0.81	II
Lack of proper storage facility	7.75	0.39	III
High fluctuation in market price	18.00	0.90	I
High transportation cost	3.00	0.15	IV

Table 10: Marketing problems faced by ginger traders in the study area.

Source: Household Survey, 2019.

Conclusion

Based on the findings of the study conducted on economics of production and marketing of ginger in Sunsari district of Nepal, it can be concluded that ginger cultivation was a profitable and lucrative enterprises in the study area with B/C ratio of 2.06. Seed cost was the major share incurred (22.51 percent) on total average variable cost of production. Therefore, the investment on ginger enterprise was found financially viable in the study area. Three types of marketing channels were found in the study area. Similarly production function analysis revealed that expenditure on fertilizer, seed and labor cum minitiller power use were significantly contributing factors for gross income from ginger production. Ginger growers were facing several productions and marketing problems due to which they were demoralized in further expansion of the scale of ginger production. Thus the study concluded that high incidence of rhizome rot, scarcity of irrigation water and lack of quality inputs were the major problems associated with the production whereas high fluctuation in market price, lack of processing facilities and storage facilities were the major problems associated with the marketing of ginger.

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