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ECONOMICS OF PRODUCTION AND VALUE CHAIN OF KIWI IN DOLAKHA DISTRICT OF NEPAL

Hari Bahadur Lamtange
HICAST, Kathmandu
Corresponding Author: lamtangehari@gmail.com

ABSTRACT

This research was conducted to analyze the economics of production and value chain of Kiwi in Dolakha district of Nepal. A pre tested questionnaire was administrated to survey 165 randomly selected respondents from two municipalities and four rural municipalities by using simple random sampling for collecting primary data relevant for the study. Focus group discussion, various value chain actors and key informants' interview was also done during November to December, 2021 A.D. Total cost of production and gross return was found NRs.480128.40. and NRs. 902222.22 per hectare respectively. Similarly gross profit margin was found 60.7 percentages. On an average benefit cost ratio was found 1.84. The study reveals that on an average B:C ratio of Kiwi per hectare was found 1.84. Kiwi production is higher from 6th year onward to 20th year which has an average B/C ration found 2.47. The marketing margin, producer's (farmer's) share and marketing efficiency of Kiwi was found NRs 213.67 per kg and 19.67 percent and 0.34 respectively. Similarly, Price spread was found 80.33 percent in the Kiwi value chain. Total cost involved in Kiwi production by the farmers was found as NRs. 53 per kg which is 17.99 percent of total cost of actors in the value chain of Kiwi in the study area. Processing and packaging, actors took the average profit of NRs. 96.67 per kg which was 45.24 percent of total profit for the whole chain. In total 42 percent margin was found. The entire channels of Kiwi value chain the total average cost incurred were NRs. 294.67/kg and which came to 58 percent of total cost. While profit margin NRs/kg was 213.67 which was equals to 42 percent as a whole in value chain process. Major production constraint faced by the farmers was no availability of saplings on time and having huge gap between farm gate and retail price.

Key Words: *Kiwi, B:C ratio, Value chain, Producer's share, Marketing margin*

INTRODUCTION

Kiwi is a spreading type of fruit plant (shrub) which bears egg-shaped fruit. This fruit is considered to be the native to China but massive cultivated in New Zealand having a thin brown skin and tart green flesh. Fruits are covered with light and thin fur like hairs. Once it planted it can grow and thrive for 30-40 years and gives continue fruiting. Kiwi *(Actinidia deliciosa)* farming is gaining popular among Nepalese farmers in recent years. High value cash crop farming is the only option to increase the income through agriculture-oriented livelihood system. It is an emerging perennial fruit crop becoming popular across the mid hills and high hills of Nepal. It has gained a worldwide popularity in recent few years because of its unique taste, wide climatic adaptability along with its high nutritive and medicinal values. It can be grown well at an altitude of 1200 m. to 2400 m. in the hills of Nepal. Hayward, Alison and Montie are the major cultivated varieties. The fruits range in weight from 40 to 90 g. Kiwi can be consumed as a fresh fruit, juice, jam, wine, biscuit, ice-cream etc. The fruit has a good source of vitamin C, exceeding that of orange, pear and apples. Thus, it is described as "King of fruit" due to its high vitamin C content. Kiwi generally ripens from October to December, which is the lean period for other fruits in the market, so the price for kiwi fruit is always high. The fruits can be stored for longer period of time which makes it possible to supply for extended period. ICIMOD knowledge park Godavari Lalitpur (1998) plays very important role for the extension of kiwifruit in the country. International Centre for Integrated Mountain Development (ICIMOD) is said to be the first doing research work on kiwi fruits in Nepal. Government farms such as Dolakha, Kirtipur, Solukhumbu and Daman started to produce saplings and training for the extension of kiwifruit in the hill areas of the country. Commercial kiwifruit growing started since 2009 AD in Nepal.

MATERIALS AND METHODS

Selection of the study area

The present study was conducted in four Rural Municipalities (Kalinchowk, Bigu, Gaurishankar and Sailung) and two Municipalities (Bhimeshwor and Jiri) of Dolakha District. These areas were highly potential for Kiwi production because of PMAMP PIU program has given focused and working in these areas as a zone program.

Selection of respondents

Actors of Kiwi producer and value chain were of eight categories, namely; Input

suppliers, Kiwi producer, Collector, wholesalers, Processor/ conditioner/ packagers, retailer, consumer. Service provider and KII were the major enablers. Therefore, the selection of input suppliers, key chain actors, service provider, enablers and Kiwi consumer were done by following techniques. Out of 995 farmers, 95 farmers (10 percent of the total population) and 25 value chain actors were selected as sample for the study. Altogether 165 samples were selected for the study. List of farmers and major value chain actors were obtained from PMAMP PIU Dolakha and Agriculture section of Bhimeshwor Municipality.

Sources of data collection

Primary data were obtained from Kiwi producing farmers, wholesalers, processors, traders and retailers. The entire information was collected through a household survey using interview schedule. Focus Group Discussion (FGD), in depth interview was held with various value chain actors and Key Informant Interview (KII) was used to triangulate the data. The secondary information were obtained through reviewing different publication mainly produced by GOs, NGOs, market studies of study areas, research articles from national and international journals along with the previous studies in the study areas.

Methods and techniques of data analysis

Both statistical and none statistical tools were used for analyzing the collected data after editing for missing and incomplete. The information collected from the field were first coded and entered into the computer. Data entry and analysis was done by Microsoft Excel. Data were analyzed by computing descriptive statistics to determine frequencies, percentages and means. For the objective of mapping Kiwi value chain were used to determine cost flow and involvement of different actors and enables to the final consumers. Similarly, problem ranking formula was used to determine major factors influencing production and marketing of Kiwi in the study area.

Cost of production

For analyzing the cost of production, the variable cost items and fixed cost items were considered. The variable cost includes expenditure on saplings, field preparation, labor, fertilizers, irrigation, plant protection chemicals, micronutrients, harvesting, packaging, transportation, etc. Total cost of production was calculated by using following formula.

Total cost =Total variable cost+ Total fixed cost

Gross margin analysis

Gross margin analysis was used as to determine profitability and as a means of selecting farm plan. The gross margin depends on the service provided, market structure, market price, perish ability of the product and distance between producers and consumers. Gross margin was calculated using following formula:

$$GM = \Sigma P_i Q_i - \Sigma C_j X_j$$

Where,

GM=Gross Margin

P_i=Unit price of production

Q_i=Quantity produced of product iC_j = per unit variable cost of input jQ_j=quantity of input used

$\Sigma P_i Q_i$=Gross Return

$\Sigma C_j X_j$=Variable cost

Benefit cost analysis (B/C ratio)

Benefit cost ratio was analyzed by two methods. First total gross return was compared with total variable cost and second, total gross return was compared with total cost.

$$\text{B/C } (Overtotalvariblecost) = \frac{\text{Gross return}}{\text{Total variable cost}}$$

$$\text{B/C } (Overtotalcost) = \frac{\text{Gross return}}{\text{Total cost}}$$

Marketing margin, producer's share and return on investment (ROI)

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

Marketing margin (MM) was calculated by subtracting farm –gate from Mill gate price.MM= Retailer price (PR) – Farm gate price (PF)

Producer's share is the price received by the producer's (farmers) expressed as a percentage of the retailer price, that is, price paid by the consumers. It was calculated by using following formula:

$Ps = (pf/pr) \times 100$

Where,

Ps = producer share

Pr = Retail price

Pf = producer's price (farm- gate price)

Return on investment on per kg of seed/ sapling per piece was calculated to understand the strength of the value chain to attract investment indifferent value streams.

$$\text{ROI (\%)} = \frac{\text{Total revenue-Total cost/Total cost}}{\text{Where ROI = Return on investment \%}} \times 100$$

Price spread

Price-spread is the difference between the actual price received by the producers, the price paid by the consumers, costs incurred and margins earned by the various market intermediaries in the process of marketing of Kiwi. The net price received by the producers, total marketing costs and margins were analyzed separately for Kiwi producer in order to evaluate the marketing efficiency of different marketing channels.

Price spread (%) = (PF-PC)/PC*100

Where, PF=Price received by the farmers PC=Price paid by the consumer

Marketing efficiency

Marketing efficiency is the ratio of net price received by farmers to the sum of marketing cost and marketing margin. For each production system, marketing efficiency was estimated by following formula. (Acharya and Agrawal, 2001)

ME= NPF/ΣMC+ΣMM
Where,
ME =Marketing Efficiency
NPF= Net price received by the farmers
ΣMC=Sum of marketing cost

ΣMM=Sum of marketing margin of the intermediaries

Problems on production and marketing

For identifying major problems of production and marketing, index was prepared based on response frequencies. Production and marketing problems were ranked by using five-point level of influence comprising most serious, serious, moderate, low and very low or no problem at all using scores of 1.00, 0.80, 0.60, 0.40 and

0.20 respectively. The formula given below was used to find the index for intensity of production and marketing problems faced by Kiwi growers. The priority index for each variable was calculated by weighted average mean in order to draw valid conclusion and making responsible decision.

Index of influence is calculated by using following formula:

$$I_{inf} = \sum \frac{s_i f_i}{}$$

Where,

I_{inf}=index of influence

Σ= summations_i=scale value

f_i=frequency of influence given by respondentsN=total number of respondents

RESULTS AND DISCUSSION

Cost of production of Kiwi (Quintal per hectare)

Variable cost and Fixed cost

The study showed that total average cost of production per hectare of Kiwi was NRs.480128.40. Total variable cost was obtained higher (NRs. 354628.40) followed by the total fixed cost (NRs. 125500.00).

Table 1. Average cost of production of Kiwi per hectare

	Particular	1st 5 Years	2nd 5 Years	3rd 5 Years	4th 5 Years	5th 5 years	Average Total
A	Variables Cost	456460.69	581974.012	577860	97998	59119	354682.34
B	Fixed Cost	125500	125500	125500	125500	125500	125500
C	Total cost (A+B)	581960.69	707474.012	703360	223498	184619	480182.34

Cost of production over various cost concepts

The table showed the cost of production with various cost concepts. In total 235 Kiwi plant were planted in average land 43.09 ha. Individuals had an average landholding size was 7.18. Similarly, Average production per plant Yield (Kg) was found 38.9 with production was 90222 kg/ha. Average cost of production of 1 kg of Kiwi was found NRs 53 at the rate of NRs 100 per kg.

Table 2. Cost of production over various cost concepts

Productive number of Kiwi plant (Ha)	235
Total area (Ha)	43.09
Area of individual farms (Ha.)	7.18
Average production per plant Yield (Kg)	38.9
Average production per hector Yield (Kg)	90222
Average cost of production of 1 kg Kiwi	53
Sales price per kg of Kiwi at farm (NRs)	100

Cost and Return from Kiwi

The study revealed that the total gross return from the Kiwi production was NRs. 902222.22/-.ha. The study reveals that on an average B/C ratio of Kiwi per hectare was found 1.84. This indicates that Kiwi farming is somewhat worthy business. In other word the Kiwi farming returns **1.84** times till the 25 years of farming which is two times greater than investment on it. Kiwi production is higher from 6^{th} year onward to 20^{th} year which has an average B/C ration found **2.47**. Thus it can be concluded that Kiwi farming across the study areas was profitable business. The study revealed that the gross margin of Kiwi was NRs. 547593.82 per hectare or 60.7 percentages. This indicates that the variable cost for the production of Kiwi high at the study areas of Dolakha district.

Value addition analysis of Kiwi value chain

Total cost involved in Kiwi production by the farmers was found as NRs. 53 per kg which is 17.99 % of total cost of actors in the value chain of Kiwi in the study area. Total margin for the Kiwi producer was found as NRs. 47/kg which was 22 percent of the total profit in the chain. Kiwi producer usually sell randomly without grading or categorized and sold average price at NRs. 100/kg of Kiwi. After purchasing from the Kiwi producing farmers, collectors, processors and packages had performed sorting, grading, boxing, branding and storage in cold room and finally packaging of conditioned Kiwi. During those processes total average value-added cost incurred was NRs. 120/kg which is almost 40.27 % of total value addition cost. After the processing and packaging, they sold their product to the traders. In this node of processing and packaging, actors took the average profit of NRs. 96.67 which is almost 45.24 % of total profit for the whole chain.

Table 3. Cost and Return from Kiwi

A	Total Gross Income (NRs/ ha)	902222
B	Cost of production (NRs/ ha)	480128
C	Net Return (A+B)	422094
	BC Ratio	1.84
D	Variables Cost	354628
E	Gross Profit Margin	60.7 %

After the processing and packaging, activity to carryout was trading. Average cost of trading was NRs. 294.67/kg which is almost 71.83 % of total cost. In this node of value chain, total profit gained by traders was NRs.70 which is almost 32.76 %of the whole chain. In total 42 percent margin was found in Kiwi value chain with 58 percent value added cost of production. The marketing efficiency was found 0.34. There was higher price spread in the Kiwi value chain mainly due to the higher cost incurred in the process of processing, conditioning, packaging, branding, promotion and advertisement and trading. Kiwi producing farmers are getting only NRs.100/kg for selling whereas final consumers were paying average price of NRs. 508.33/kg, which resulted the total price, spread of 80.33% in the Kiwi value chain.

Flow of Cost and value in the Kiwi value chain in the study area

Kiwi producing farmers had the production cost of NRs. 53/kg and sold at an average price that was NRs 100/kg. Collectors and wholesalers buy from farm gate of farmers at an average price i. e. NRs. 100/kg. Then soon after sorting and grading was done at three different grade "A", grade "B" and grade "C". When accomplished the grading they moved for further processing and packaging process.

The major cost involving chain in kiwi value chain is processing, conditioning, boxing, branding and tagging. In which value chain they added an average cost NRs. 20/kg for each grade A, B and C and sold at NRs. 150/kg, NRs. 200/kg and NRs. 300/kg respectively. A study showed that these phases had incurred higher cost in as a whole value chain of Kiwi. They had received on an average 45 percent margin which was quite handsome margin. After that they added some additional cost on it, which was on communication and promotional activities cost and received around 24 percent of margin from that. The entire channels of Kiwi value chain the total average cost incurred was NRs. 294.67/kg and which came to 58 percent of total cost. While profit margin NRs/kg was 213.67 which was

equals to 42 percent on as a whole value chain process. Considering the amount of value addition and share of profit margin in each chain of Kiwi value chain, higher value in terms of price was added NRs/kg 180, 80 & 30 in grade A, B & C, respectively.

Table 4. Value addition analysis of Kiwi value chain in the study area

Actors	**Cost Involved on**	**Procurement cost**	**Value added cost NRs./Kg**	**Margin NRs./Kg**	**Selling NRs./Kg**	**Grade**
Kiwi producing farmers	Purchase agri inputs, production, interculture operation and harvesting and packaging (local materials)	0	53(53)	47 (47)	100	No
Collectors, processor and packagers (commercial farmers/collectors/wholesalers and PMAMP unit	Collection, sorting, grading. Boxing, branding and Storage in cold room.	100	20 (80)	30 (20)	150	**C**
		100	20 (60)	80 (40)	200	**B**
		100	20 (40)	180 (60)	300	**A**
Subtotal (A)		***100***	***20 (55)***	***96.67 (45)***	***216.67***	***Average***
Traders	Handling, losses, tagging, promotional activities, communication and Taxes	150	5	45 (23)	200	**C**
		200	5	75 (25)	275	**B**
		300	5	95 (24)	400	**A**
Subtotal (B)		***216.67***	***5 (48)***	***70 (24)***	***291.67***	***Average***
Total (A+B)		***216.67***	**78 (58)**	**213.67 (42)**	**508.33**	
Price Spread (%)					***80.33***	

Major constraint regarding production and value chain of Kiwi

Production related problems

The value obtained from the ranking scale revealed that no availability of sapling on time was the major problems related with Kiwi production with highest index value of 0.78. Similarly, farmers had faced serious problems of lack of storage facility farmers compelled to sell at lower price from farm gate in the study area, which ranked second most serious problem among the categorized problems with

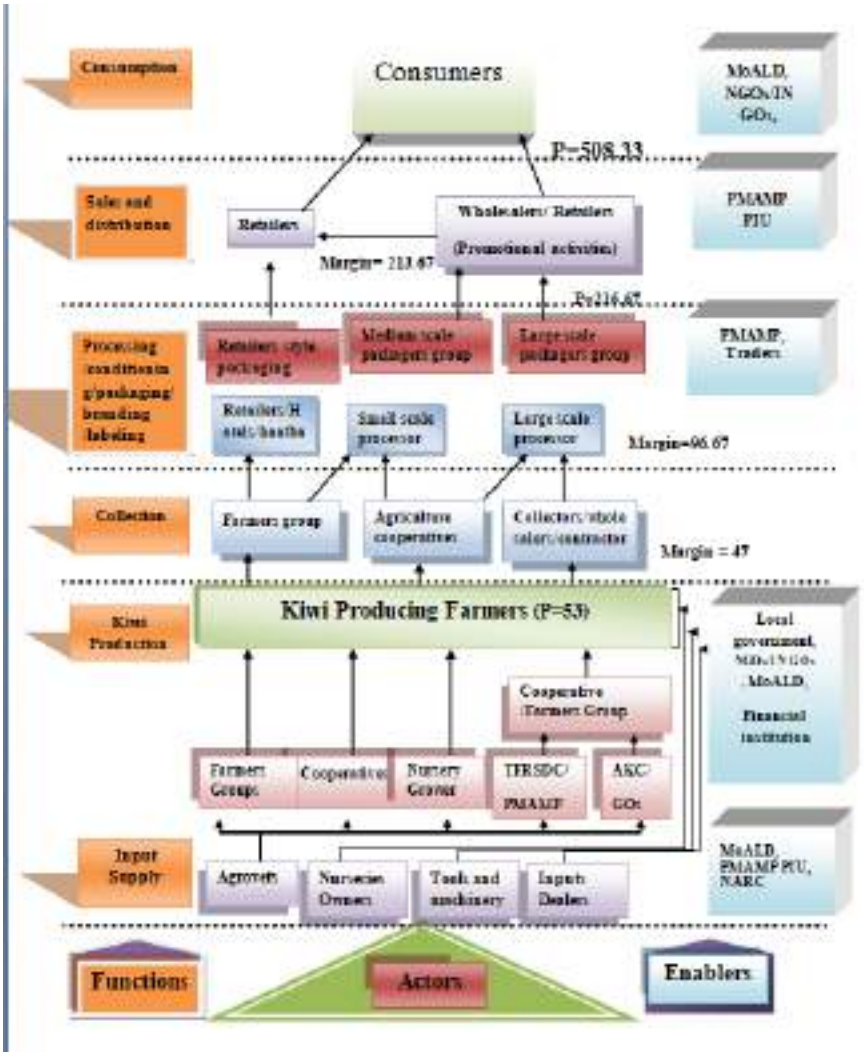
index value of 0.74. Likewise Lack of technical knowledge regarding training and pruning of Kiwi resulted in low quantity of production ranked third among the categorized problems with index value of 0.73 followed by lack of post-harvest technology like, stage of harvesting, grading and packaging resulted post-harvest losses and fetch lower price at market with index value of 0.68 and problem of Inadequate subsidies from government sectors with index value of 0.67 (Table 11). In the study area, thus all these problems were faced in the production stages of Kiwi by farmers.

Table 11. Various problems on Kiwi production in the study area

Problems	Major problem (1) to medium problem (0.2)					Weight	Index	Rank
	1	0.8	0.6	0.4	0.2			
No availability of saplings on time	57	22	19	14	8	93.2	0.78	I
Lack of storage facility farmers compelled to sell at lower price from farm gate	46	26	25	12	11	88.8	0.74	II
Lack of technical knowledge regarding training and pruning of Kiwi resulted in low quantity of production	42	29	23	17	9	87.6	0.73	III
Lack of post-harvest technology like, stage of harvesting, grading and packaging resulted post-harvest losses and fetch lower price at market	40	25	22	10	23	81.8	0.68	IV
Lack of subsidies from government sectors	35	28	15	25	17	79.8	0.67	V

Major problems on value chain of Kiwi

The value obtained from the ranking scale revealed that the major value chain problem of huge gap between farm gate and retail price had the highest index value of 0.76 and ranked as major marketing problem among categorized problems followed by fewer number of processor, packagers index value of 0.75,



Insufficient transportation facility to the market showing index value of 0.72, problem of market information system with index value of 0.71 and the last problem was sell bulk volume without grading in same price transportation and inaccessible market with index value of 0.70.

Table 12. Various value chain related problems of Kiwi producing farmers

Problems	Major problem (1) to medium problem (0.2)					Weight	Index	Rank
	1	0.8	0.6	0.4	0.2			
Huge gap between farm gate and retail price	52	25	19	14	10	91	0.76	I
Fewer number of processors, packagers	40	34	27	12	7	89.6	0.75	II
Lack of appropriate transportation facility to the market	43	27	21	18	11	86.6	0.72	III
Lack of market information system	38	28	27	16	11	85.2	0.71	IV
Sell bulk volume without grading in same price	45	22	18	23	12	85	0.70	V

CONCLUSION

Kiwi is the most promising and profitable high value medicinal cash crop having potential to significantly contribute to improve the rural livelihood through income generation and self-employment. Nepal has a special and unique topography and wide climatic adaptability for Kiwi production, kiwi having unique taste, high nutritive and medicinal values. The study reveals that on an average B/C ratio of Kiwi per hectare was found 1.84. This indicates that Kiwi farming is somewhat worthy business. Production is higher from 6th year onward to 20th year which has an average B/C ration found 2.47. Thus it can be concluded that Kiwi farming across the study areas was profitable business. Considering the amount of value addition and share of profit margin in each node of Kiwi value chain was found higher value. Higher price incurred during the process of processing and packaging may be due the less equipped structure and low level of technical advancement in processing and packaging equipment's. Also, there was a higher price spread. The main challenges include timely unavailability of saplings, Lack of storage facilities, inadequate scientific research on kiwi

production technology, insufficient investment, access of credit, Inconsistent quality of product (no grading) to meet buyers' demand, Lack of few processing industries and value addition activities, Lack of organized marketing and post-harvest infrastructure, unstable prices and high profit margins along with inappropriate market channels. Strengthen the farmers for group-marketing of kiwi fruits, increase farm gate price, increase farmer's share and operation efficiency in sale. Further research has to be done on Kiwi production and its value chain and supply chain approaches for more appropriate to all actors involved in marketing systems. To reduce the market margin and price spread in Kiwi value chain, shorten the marketing channels with possible one-way outdoor system. For that farmers should be engaged in cooperative base marketing system and use of new technology to reduce the production cost and make profit maximization.

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