VALUE CHAIN ANALYSIS OF KIWIFRUIT (*ACTINIDIA SPP.*) IN DOLAKHA DISTRICT, NEPAL

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ABSTRACT

Kiwifruit is one of the emerging, and high value fruit crops having tremendous nutritional and medicinal value that is being popular in Nepal. Under this context, research was done with the objective to carry out an in-depth value chain analysis of kiwifruit sub-sector in Dolakha district, Nepal. A total of 72 respondents, including 60 kiwifruit growers, 2 nursery owners, 2 wholesalers, 5 retailers and 3 consumers were selected for interview by using simple random sampling technique. Economic analysis revealed kiwifruit cultivation was running as a profitable agriculture enterprise in the district with the benefit-cost ratio value of 3.2. Additionally, kiwifruit production alone had 27.2% contribution in annual household income of growers. Five different marketing channels were observed, and majority of producers were found selling kiwifruit to consumers directly. On an average price spread was NRs. 87.4 per kg and producer’s share was 73.24% in existing marketing channels. Value addition activities such as grading, packaging, and processing were relatively poor in the study area. Furthermore, indexing identified inadequate technical knowledge and lack of storage facility as the major problems associated with production and marketing of kiwifruit, respectively. The findings of this research suggests that farmers are to be focused more on quality improvement practices and concerned authorities to prioritize their support in establishing proper marketing mechanism through provision of storage structures, processing units with least possible involvement of market intermediaries would be the best course of action to enhance future production and marketing of kiwifruit in the region.

KEYWORDS

Economic Analysis, Kiwifruit, Marketing Channel, Producer’s Share, Value Addition

1. INTRODUCTION

Kiwifruit or Chinese gooseberry is known as ‘China’s miracle fruit’ and ‘the horticultural wonder of New Zealand’. There are more than 70 species of kiwifruit (Ferguson, 1984). Among them *A. delicosa* and *A. chinensis* are two commercially cultivated species (Ferguson & Huang, 2007). Although kiwifruit is native to China, New Zealand was the first country to exploit its commercial production (Mani, Kundra, & Haque, 2018). In recent years, popularity of kiwifruit is increasing in many countries because of its delicacy, precocity, high economic return and health benefits (Paudyal, 2013).

Two species of kiwifruit, *Actinidia strigosa* and Callosa var. callosa which are found in wild form in Nepal were cataloged by Dr. Nathaniel Wallich in 1821 (Paudyal, 2013). However, cultivated varieties are new introduction in Nepal. During 1990s, International Center for Integrated Mountain Development (ICIMOD) introduced some varieties of kiwifruit from India and established a demonstration plot in Godavari, Lalitpur (Sherpa, 2013). Kiwifruit cultivation is highly suitable in Nepalese climatic condition. It can be well grown in the altitude above orange growing area and below apple growing area, where such high value crops are not grown presently in Nepal (Gotame et al., 2016). Therefore, kiwi-based farming system could be one of the possible options for commercialization of this region.

At present, kiwifruit cultivation is limited to only 1362 ha area with productivity 6.86 mt/ha in Nepal (MoALD, 2020). The productivity is too low compared to other kiwifruit producing countries in the world. The productivity of kiwifruit in China (largest producer) is 12.11 mt/ha (FAO, 2018). Lack of information and studies regarding economic benefits and profitability of kiwifruit enterprise has hindered poor and marginal farmers of Nepal from kiwifruit farming (Tiwari & Bhandari, 2020). Despite having immense potential for kiwifruit farming, it has not been developed to its full potential due to lack of appropriate production and marketing practices of kiwifruit in Nepal. So, to establish effective production and marketing mechanism, it is high time to make necessary interventions by studying value chain of kiwifruit as a high value commodity.

2. MATERIALS AND METHODS

2.1 Selection of The Study Area

Dolakha district was selected purposively for the study as it carries immense potential for kiwifruit cultivation in terms of area and production of the country. Similarly, survey was conducted within the command area of Prime Minister Agriculture Modernization Project (PMAMP), Project Implementation Unit (PIU), Dolakha, Nepal due to abundance of kiwifruit growers in these regions. The kiwifruit farm and nearby markets were the major sites of the study. It includes Bhimseshwor municipal, Jin municipal, Salung rural municipality, Kalinchowk rural municipality, Biju rural municipality and Gaurishankar rural municipality of Dolakha district.
2.2 Sample Size and Sampling Technique

The kiwifruit growers registered in Project Implementation Unit, Dolakha were taken as total population for the study, which was 135. A total of 60 kiwifruit growers were selected for interview by using simple random sampling technique. Additionally, 2 nursery owners, 2 wholesalers and 2 retailers from Kathmandu, 3 retailers from Dolakha and 3 consumers were interviewed for value chain mapping of kiwifruit. Pre-testing of questionnaire was also carried out among 10 respondents.

2.3 Data Types and Data Collection Techniques

Both primary and secondary data were considered for the study. The primary sources of the information were all the actors of the value chain such as input suppliers, producers, traders, consumers, service providers and key informant of related sectors. The primary data were collected from household survey, field observation and key informant interview. Secondary data were collected from the review of relevant literature based on availability.

2.4 Data Analysis Technique

After collection of necessary qualitative and quantitative data, it was coded and entered into the computer for analysis. Data entry and analysis were done by using Statistical Package for Social Science (SPSS) and Microsoft Excel.

2.5 Economic Analysis

2.5.1 Cost of Production of Kiwifruit

Total cost of production = Total fixed cost + Total variable cost

Variable cost was estimated by using following formula:

Variable cost = C (manure and fertilizer) + C(growth regulators) + C (manure and fertilizer)

Also, Total fixed cost = Rental value of land + Land tax + Depreciation in farm equipment, trellis and cost of sapling

Analysis of gross margin

Gross margin (GM) = Gross revenue - Total variable cost

Analysis of benefit-cost ratio

Benefit-cost ratio = Gross revenue/ Total cost

Marketing analysis

Price spread

Price spread = Price paid by consumer - Farm gate price (Acharya & Agrawal, 1999)

Producer’s share

PS = (PF/Pc) x 100 % (Singh & Meena, 2014)

Where, PS = Producer’s share

Pc = Price paid by consumer

PF = Farm gate price

3. RESULTS AND DISCUSSION

3.1 Economics of Kiwifruit Production

3.1.1 Cost of Kiwifruit Production

In the study area, the average cost of production of kiwifruit was found to be NRs. 12847.02 per ropani where the share of variable and fixed cost was 61.83% and 38.17% in total production cost, respectively (Table 1).

3.1.2 Gross Margin and Benefit-Cost Ratio

The gross margin and benefit-cost ratio of kiwifruit production in the study area was NRs. 33,296.32 per ropani and 3.21, respectively. The finding indicates that kiwifruit cultivation was running as a profitable agriculture enterprise in the study area and growers were earning NRs. 3.21 on each rupee invested in production process. Bhandari and Aryal (2015) estimated benefit-cost ratio ranging from 1.52 to 4.09 in Dolakha depending on age of orchard. Similarly, Tiwari and Bhandari (2020) found benefit cost ratio ranging from 0.32 to 5.29 with average value 1.47 in Ilam district of Nepal. The benefit cost ratio of kiwifruit production in the study area has not reached to the maximum possible value as most of the orchards in the study area were young or recently established and thus have not yet come into full production (Bhandari and Aryal, 2015; Tiwari and Bhandari, 2020).

3.1.3 Contribution of kiwifruit production in annual household income of growers

To examine the relative importance of kiwifruit farming in the economy of kiwifruit growers, sources of income were categorized and their contribution in annual household income was evaluated. The household members of economically active group of the respondent family were engaged in different kind of farm and off-farm activities to support their needs. The study revealed that the contribution of kiwifruit production in annual household income was 27.27%, which shows positive signs for its commercialization. Some kiwifruit growers of the study area were also found to be involved in sapling production. Contribution of kiwifruit sapling production was 9.96% in annual household income. Further details have been presented in Table (2) below.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Value (NRs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cost/ropani</td>
<td>12847.02</td>
</tr>
<tr>
<td>Fixed cost/ropani</td>
<td>4904.11</td>
</tr>
<tr>
<td>Variable cost/ropani</td>
<td>7942.91</td>
</tr>
<tr>
<td>Gross return/ropani</td>
<td>41239.23</td>
</tr>
<tr>
<td>Gross margin/ropani</td>
<td>33296.32</td>
</tr>
<tr>
<td>Benefit cost ratio</td>
<td>3.21</td>
</tr>
</tbody>
</table>

3.2 Contribution of kiwifruit production in sources of income

Table 2: Contribution of kiwifruit production in annual household income

<table>
<thead>
<tr>
<th>Sources of income</th>
<th>Average annual household income (NRs.)</th>
<th>Percentage contribution in annual household income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kiwifruit production</td>
<td>1444583.3</td>
<td>27.27</td>
</tr>
<tr>
<td>Kiwifruit sapling production</td>
<td>52766.67</td>
<td>9.96</td>
</tr>
<tr>
<td>Agricultural products other than kiwifruit</td>
<td>106400</td>
<td>20.09</td>
</tr>
<tr>
<td>Off-farm activities</td>
<td>2260666.67</td>
<td>42.68</td>
</tr>
<tr>
<td>Annual household income</td>
<td>529691.67</td>
<td>100</td>
</tr>
</tbody>
</table>

4. MARKETING ANALYSIS

4.1 Marketing Channels Observed in the Study Area

Five different marketing channels were observed in the study area (Figure 1). The most prevalent marketing channel was producers selling to the local consumers directly. In the study area individual producer was found producing kiwifruit in small quantity. Hence, they have sold kiwifruit to consumers directly.

4.2 Farm-gate price, price spread and producer’s share in existing marketing channels

The overall farm gate price for kiwifruit was NRs. 202.6 in the study area. Recent research stated kiwifruit is new crop for Nepal and has higher farm gate price per kg. Hence, overall farm gate price of kiwifruit in the study area was higher than that of other fruits in Nepal (AP & MDD, 2017).

The maximum price spread of worth NRs. 183.5 was observed in channel V, the longest marketing channel and channel I had no price spread since
there was no involvement of market intermediaries. The highest share of producer in consumer’s rupee was obtained when kiwifruit was directly sold to local consumer and lowest when sold to consumer through wholesaler and retailer. The overall price spread and producer’s share in consumer rupee was NRs. 87.4 and 73.24% in existing marketing channels, respectively. Further details have been presented in Table (3) below.

![Marketing channels of kiwifruit observed in the study area](image)

### Table 3: Price spread and producer’s share in existing marketing channels

<table>
<thead>
<tr>
<th>Marketing channels</th>
<th>Price paid by consumers (NRs.)</th>
<th>Farm gate price (NRs.)</th>
<th>Price spread (NRs.)</th>
<th>Producer’s share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channel I: Producer → Local consumer (Consumer within the district)</td>
<td>200</td>
<td>200</td>
<td>0</td>
<td>100%</td>
</tr>
<tr>
<td>Channel II: Producer → Distant consumer (Consumer outside the district)</td>
<td>300</td>
<td>280</td>
<td>20</td>
<td>93.33%</td>
</tr>
<tr>
<td>Channel III: Producer → Local retailer (Retailer within the district) → Consumer</td>
<td>250</td>
<td>180</td>
<td>70</td>
<td>72%</td>
</tr>
<tr>
<td>Channel IV: Producer → Distant retailer (Retailer outside the district) → Consumer</td>
<td>350</td>
<td>186.5</td>
<td>163.5</td>
<td>53.28%</td>
</tr>
<tr>
<td>Channel V: Producer → Distant wholesaler (Wholesaler outside the district) → Retailer → Consumer</td>
<td>350</td>
<td>166.5</td>
<td>183.5</td>
<td>47.57%</td>
</tr>
</tbody>
</table>

### 4.3 Value Chain Operators

#### 4.3.1 Input Suppliers

Input in the value chain of kiwifruit refers to the supply of saplings, fertilizer and manure, plant protection chemicals, pruning tools, tools and materials for trellis and irrigation management, anti-hail net, technical know-how, packaging materials. Temperate Fruit Rootstock Development Center and private nurseries in the district were major suppliers of saplings. Organic manure in the orchard was managed from the own farm by growers or farm of the fellow farmers. There were few farmers using chemical fertilizer. The chemical fertilizer and farm equipment were supplied by agro-vets within or outside the district. The source for materials of training structures/trellis and irrigation was Kathmandu and other major cities.

The major issues concerned with the supply of input were high cost of saplings and materials for trellis establishment, lack of tagging practice in saplings, poor quality of saplings. Due to lack of tagging practice in nurseries to differentiate male and female saplings and different varieties of kiwifruit, farmers have ended with inappropriate ratio of male female vines and undesired varieties in the orchard.

#### 4.3.2 Producers

The producers in the district do not have much experience in kiwifruit production. Most of the producers have just entered into fruiting stage and are producing small quantity of fruit and sold them directly to the consumers either from their own farm or through retailer at the district headquarter Charikot. Some of the farmers also sold the fruit directly to the consumers at Kathmandu and nearby districts such as Ramechhap, Karwe, Sindhi, Laltipur, Bhaktapur. The producers producing in large quantities were selling kiwifruit either to the wholesaler or retailer at Kathmandu. The producers were also involved in harvesting, sorting, grading, packing and transporting fruits to the destined market. But value addition activities such as grading, packaging were relatively poor in the study area, practiced by few producers only.

#### 4.3.3 Traders

Wholesaler and retailer were the major traders involved in the value chain of kiwifruit of Dolakha district. The wholesalers were the Kathmandu based traders who sold kiwifruit to the retailers or directly to the consumers sometime. The retailers were the value chain actors who bought kiwifruit either directly from the producer or wholesaler and sold them to the final consumers. The fruit shop, supermarket, department store were the major retailers prevalent in the market. Some retailers were selling the fruit by packaging in a small plastic box to upgrade the value of fruit, especially at supermarket.

#### 4.3.4 Processors

Till date processing of kiwifruit has not been practiced in commercial scale in the district. Some of the producers have prepared wine and squash in small quantity only for home consumption. Processing is the best alternative for adding value to the fruits that is not suited for marketing as fresh fruit (Guroo, et al., 2017). According to a studies, 1 kg of kiwi of worth Rs. 145 is processed into two bottles of jam of worth Rs. 275 each in Ilam, Nepal. But there is lack of processing unit in the district and knowledge on processing (Tiwari and Bhandari, 2020).

### 5. Consumers

Few people who are aware about the nutritional and medicinal value of the kiwifruit were its consumer. The consumers were not much aware about the variety of kiwifruit, but Hayward was the most preferred variety due to its large size and attractive shape. One of the major hindrances in marketing of kiwifruit is unawareness of people about this fruit. People are becoming health conscious and with the increase in knowledge regarding health benefits of kiwifruit, the consumption is expected to increase in future.

#### 5.1 Service Providers/Enablers

The main supporters in the value chain of kiwifruit in Dolakha district were Prime Minister Agriculture Modernization, Project Implementation Unit (Kiwi zone), Dolakha; Temperate Fruit Rootstock Development Center and private nurseries in the district were major suppliers of saplings. Some of the farmers also sold the fruit directly to the consumers at Kathmandu and nearby districts such as Ramechhap, Karwe, Sindhi, Laltipur, Bhaktapur. The producers producing in large quantities were selling kiwifruit either to the wholesaler or retailer at Kathmandu. The producers were also involved in harvesting, sorting, grading, packing and transporting fruits to the destined market. But value addition activities such as grading, packaging were relatively poor in the study area, practiced by few producers only.
Center; Agriculture Knowledge Center, Ramechhap; Rural Reconstruction Nepal (RRN) and Agri-section of local government. The Project Implementation Unit, Dolakha supported growers by providing subsidy for trellis establishment, irrigation management and farm equipment. It also conducted training for farmers, soil-test services and distributed cartoon box to few farmers for packing kiwifruit. The Temperate Fruit Rootstock Development Center was involved in providing saplings at subsidized price to farmers and conducting training program for agriculture technicians and farmers. Similarly, Agriculture Knowledge Center, Ramechhap and Local Government also provided subsidy for trellis establishment, irrigation management and technical knowhow. Different NGOs and financial institutions were also providing support to kiwifruit growers in the district.

5.2 Value Chain Map of Kiwifruit in Dolakha District

Figure (2) illustrates the value chain map of kiwifruit in Dolakha district. It shows various actors involved in the value chain and their relationship. On the left, the corresponding functions of the actors are mentioned and the enabling environment for the value chain operation is shown right to the figure. Similarly, price of kiwifruit in each step of value chain is also shown (Figure 2) which shows that the final price of product paid by consumer has increased with the involvement of market intermediaries in the chain.

6. Ranking of Production and Marketing Problems in the Study Area

6.1 Production Problems

Kiwifruit growers in the study area were facing several problems related to production and marketing of kiwifruit. Indexing/scaling technique was used as a tool for analysis of production and marketing problems faced by sampled household. The result showed that inadequate technical knowledge was the major production problem in the study area. Similarly, lack of proper trellis followed by lack of irrigation facility, problem of hailstones were the other problems faced by kiwi growers. Till date no significant damage has occurred due to insect and pest in kiwifruit but some farmers have complained about the attack by deer. The various production problems along with index value has been presented in the Table (4).

6.2 Marketing Problems

The major marketing problem faced by kiwifruit growers in the study area was lack of storage facility. Tiwari and Bhandari (2020) also reported lack of storage as the major production problem in the study area. Similarly, due to low quality of produce fruit do not meet market standards and creates difficulties in marketing. Other marketing problems faced by growers were market unavailability as consumers are unaware about kiwifruit and its nutritional importance followed by lack of processing and collection centers and transportation problem.

Table 4: Ranking of production problems in the study area

<table>
<thead>
<tr>
<th>Problems</th>
<th>Index</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of irrigation facility</td>
<td>0.59</td>
<td>III</td>
</tr>
<tr>
<td>Lack of proper trellis</td>
<td>0.61</td>
<td>II</td>
</tr>
<tr>
<td>Inadequate technical knowledge</td>
<td>0.83</td>
<td>I</td>
</tr>
<tr>
<td>Damage due to hailstone</td>
<td>0.57</td>
<td>IV</td>
</tr>
<tr>
<td>Disease/Insect/Pest damage</td>
<td>0.39</td>
<td>V</td>
</tr>
</tbody>
</table>

Table 5: Ranking of marketing problems in the study area

<table>
<thead>
<tr>
<th>Problems</th>
<th>Index</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of processing and collection centers</td>
<td>0.59</td>
<td>IV</td>
</tr>
<tr>
<td>Poor quality of produce</td>
<td>0.67</td>
<td>II</td>
</tr>
<tr>
<td>Market unavailability</td>
<td>0.60</td>
<td>III</td>
</tr>
<tr>
<td>Lack of storage facility</td>
<td>0.88</td>
<td>I</td>
</tr>
<tr>
<td>Transportation problem</td>
<td>0.26</td>
<td>V</td>
</tr>
</tbody>
</table>

7. Conclusion

Input supplier, producer, wholesaler, retailer, and consumer were the primary actors of value chain of kiwifruit in Dolakha district. Commercialization of kiwifruit farming seems economically feasible and profitable agriculture enterprise in Dolakha district with the current benefit-cost ratio value of 3.21. However, value addition activities such as...
grading, packaging, and processing were relatively poor, and the marketing aspect was in neglected condition which can become biggest hindrance for the management of future production.

Among the existing marketing channels, marketing channels having no involvement or minimum involvement of market intermediaries were efficient with high producer’s share and low-price spread. Hence, involvement of value addition activities at each step of chain and establishment of efficient marketing mechanisms through provision of processing and storage facilities with least possible involvement of market intermediaries would be the best course of action to enhance future production and marketing of kiwifruit in the region.

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DECLARATION OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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