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Analysis of Mango Marketing Channels in Siraha, Nepal

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Abstract

The Siraha district of Nepal experiences surplus mango production during the season that ends up being wasted or sold at throw-away prices due to imperfect marketing. Thus, this survey research was conducted to investigate the market channels of mango, post-harvest mechanisms, constraints, marketing margins, market shares, consumer purchasing behaviors, and patterns of purchasing in Siraha. The research survey was done with thirty producers, five wholesalers, thirty-two retailers, and twenty-five consumers within the Golbazaar and Dhangadimai municipalities through a semi-structured questionnaire. Mango trading was dominated by males. It was revealed that the market demand for mango in Siraha was produced in Siraha itself (91.49%). The wholesalers supplied 30.66% of their mango to retailers, and 14.73% to consumers. Gulab Khas and Banaganapalli were the most imported varieties from India. Each variety of mango provided an almost equal margin, although Bombay was slightly higher than others. The market share was dominated by the Maldah variety as most of the farmers cultivated this variety. It was found that in addition to the varieties and arrival time, the distance to markets and farming practices were significant factors influencing the profitability of mango marketing. There is great potential to industrialize and substitute the Indian mango in the market through commercial production of mango, efficient storage, and post-harvest management, and in increasing the efficiency of the mango marketing system through subsidies and aids to the mango growing farmers from concerned stakeholders. A collaborative approach is required among all stakeholders for sustainable mango marketing and establishing it as an economic profession.

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Keywords

Economy, fruit, marketing channel, post-harvest practices, price

Introduction

The tropical and subtropical fruit mango (*Mangifera indica*)

belongs to the Anacardiaceae family and is popular in fresh and processed forms. Mango is believed to be native to south Asia (Kayier Guien chay, 2019). It is thought to have originated in the foothills of the Himalayas in India and Burma, and has been grown there for at least 4,000 years as an important fruit for the Ayurvedic and indigenous medical systems. Different parts of a mango consist of a variety of nutritional and medicinal properties (Shah *et al*., 2010). Mangoes are now grown in over 100 countries, with more than 65 of them producing more than 1,000 MT per year.

Figure 1 represents the increasing trend of mango production worldwide. Mangoes have a total global production of about 55 MMT and have played an important role in the lives of many people (Statista 2020). Mango has an attractive appearance and pleasant taste, and is the most important summer fruit, known as the 'king of all fruit' (Griesbach, 2003). Mango covers around 75% of the total fresh tropical fruit and is the dominant tropical fruit worldwide (FAO, 2010). Mango can be used in various forms, and for various purposes and markets, *e.g.*, juice, chutney, jam/jelly, fresh, canned, and many more. It is a source of income and foreign exchange, and is also an important source of energy in combating nutritional disorders (Litz, 2009).

Nepal is one of the major tropical fruit growing areas. Nepal is expected to have a fantastic production opportunity and marketplace as well because of its geographical comparative advantages, (Yadav *et al*., 2021). Mango is cultivated there in an area of 40,110 hectares and the production area is 32,228 hectares. Its production is 328,883 MT and its productivity is 10.21 MT/ha (Devkota, 2015). A large number of functionaries are involved in mango production and marketing. The functionaries, in this case, include production, collection, wholesale, and retail as the main activities in the market channel. Perishability and seasonality are the major constraints in agricultural marketing (Pokhrel, 2021). There has been a terrific situation in current years concerning the performance of production and marketing of mango. According to the Project for Agricultural Commercialization and Trade (2014), the major production problems are infestations of disease, a lack of quality inputs, a lack of technical knowledge and marketing problems related to price fixation, the low bargaining power of farmers, middlemen (vendors), a lack of infrastructure, and a lack of market information, which causes mango growers to sell their produce at low prices. The fluctuation of the arrival time of mango in the market directly affects the market price and causes great losses to the farmers. Other constraints include a lack of post-harvest management and a low level of extension service provision (Honja, 2016). Storage is one of the major problems, and due to this, even when the area, production, and productivity are high, the availability of mango in markets is only for a short duration of time, hardly four months. The lack of coordination between supply chain actors causes the variation in mango prices. The country experiences surplus mango production during the season that ends up being wasted or sold at throw-away prices due to imperfect marketing. Mango marketing is an integral part of the production distribution system. The Siraha district of Nepal is one of the largest mango production and mango consumption markets of Nepal. There are no organized databases or studies of the marketing system of mango in Siraha. There is increasing urban population demand for a diversified diet (away from agriculture food), so there is a concomitant need for increasingly specialized marketing services such as physical distribution, storage, grading, market information gathering, and so on.

In the year 2018, the production of mango in Siraha was 23,265 metric tons from the cultivated area 5,170 hectares with a productivity rate of 4.5 metric tons per hectare, and in the year 2019, its productivity decreased to 1.5 metric tons per hectare as it was affected by wind and hailstorm damage during the flowering season (RSS, 2019; Dhungana, 2019) (**Table 1**).

In Nepal, the notable local cultivars of mango are Sinduriya, Kali, Supare, and Lohare from the lower hills, and Chinia, Sipiya, Chausa,

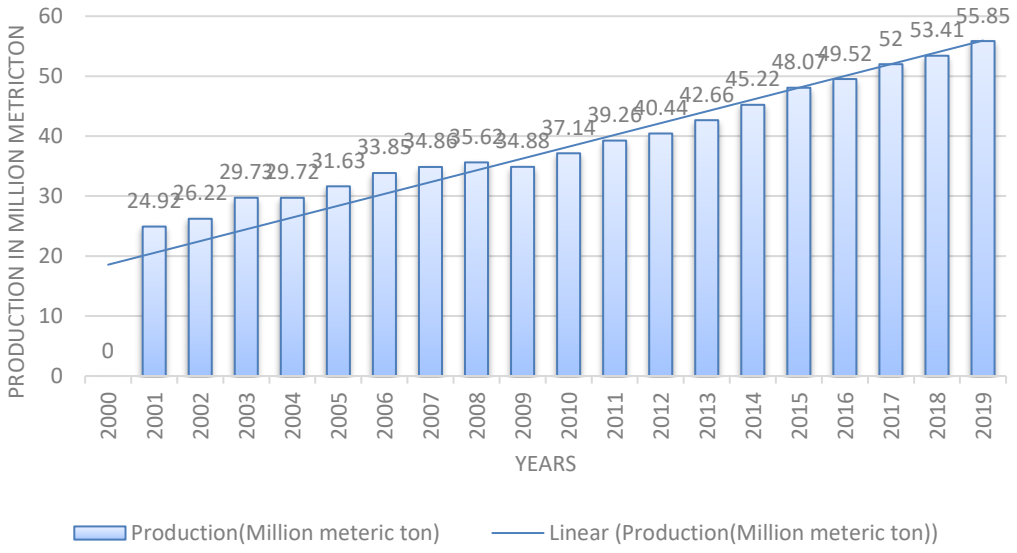

Figure 1. Status of mango production worldwide

Source: Statista (2020)

Table 1. Area, productive area, production, and productivity of mango in Siraha

Year	Area (ha)	Productive area (ha)	Production (Mt)	Productivity (Mt/ha)
2011/12	5,400	4,750	92,625	9.50
2012/13	5,570	5,000	35,000	7.00
2013/14	5,570	5,000	35,000	7.00
2014/15	5,650	4,950	32,214	6.51
2015/16	5,650	4,950	32,214	6.51
2016/17	5,855	5,170	29,680	6.00

Source: MoAD (2011-18)

and Safeda from the Terai and hills region (Nepal Agriculture Research Council, 2003). Some of the famous cultivars of mango cultivated in Nepal are Alphonso, Bombay Yellow, Maldaha, and Dussehri (Pradhan, 2010). The major cultivars of mango found in the Siraha district are Maldah, Bambai, Amarpali, Kalkatia, Sipia, Dashari, Krishnabhog, , and Sindure as shown in **Table 2** and their market availability time.

Horticultural marketing is one of the most important branches of agricultural marketing, focusing on the promotion of horticultural commodities such as fruits and vegetables. An efficient marketing system ensures there are enough farm products by stimulating production and accelerating the pace of economic development while ensuring a higher level of the producer's share, reducing the number of middlemen, and limiting market charges (NoorMmemon, *et al*., 2015). The traditional agricultural wholesale markets in developing countries are dominated by wholesale agents. The contract marketing system (agreements between farmers and processing and/or marketing firms for the production of agriculture products under forwarding agreements, frequently at predetermined prices) is popular because of the perishability and seasonality of foods, as in the case of mango (Gopalakrishnan, 2013). The fruits of a nation cannot compete in the world market if there is a lack of infrastructure like good quality packing materials, refrigerated transport facilities, and certificates for health and the environment (Khalid *et al.*, 2007). The marketing channel is

Table 2. Seasonal availability of mango in Siraha

Species	Months
Bambai	4th week of May-4th week of June
Krishnabhog	June
Maldah	2nd week of June-2nd week of July
Amarpali	3rd week of June-3rd week of July
Dashari	4th week of June-4th week of July
Kalkatya	July

Source: DADO (2016)

the path that products take from the producers to the final consumers. The agricultural product undergoes changes in time, place, form, and ownership during the marketing process, which adds to its value. These chains that various products pass through between producers and consumers constitute their marketing channel (Bhandari, 1993).

Stern *et al*. (1998) have conceptualized marketing channels as a vertical tier of markets as a product moves from the point of production to the hands of the ultimate consumers. The marketing system encompasses a wide range of activities and mechanisms for moving goods from one hand to another. An effective marketing system reduces costs while benefiting all segments of society (Acharya & Agrawal, 1999). Producers, traders, transporters, and consumers are the main contributors involved in various activities in the marketing system (MDD, 1999). Transport costs and contractor-level marketing are the major elements that reveal the deconstruction of market margins. For the survival of producers, the attention of policymakers is required so that farmers fetch the appropriate prices for their products. About one-third of the shares in a consumer's rupee is held by producers and the rest of the shares are held by traders (contractors 39%, commission agents 7%, wholesalers 9%, and retailers 19%) (Khushk & Smith, 1996; Dunne & Johnson, 2010). Marketing should be done to minimum costs and losses while aiming to be more competitive, increase economic growth, and maximize benefits to the farmers (Aujla *et al*., 2007). The relationship among farmers, wholesalers, and retailers plays an important role in marketing, and the development of trust and dependency among them are necessary (Batt, 2004). The market linkage may be to the rural market, retailers, semi-wholesale, or wholesalers. Some cities have many small hawkers acting as retailers, operating with bicycles or small carts, who take small amounts from wholesalers and supply foods directly to consumers. For example, in Kathmandu, hawkers account for more than 25% of product outflow from the wholesale market (Tharanathan *et al.*, 2006). Keeping those needs in mind, this study aimed to investigate the mango marketing system, constraints, and possible solutions in Siraha.

Materials and Methods

Data collection

Siraha district is located in the south-eastern part of the Madhesh Province of Nepal. The district has a tropical climate with hot summers and cold winters. It lies in an area with an altitude ranging from 73 meters to 885 meters above sea level. The sites of the study were Dhangadimai and Golbazzar municipalities of Siraha district situated in the northern part of the district as shown in **Figure 2**, and the area was purposively selected as it was in the internship coverage area of the Prime Minister's Agriculture Modernization Project (PMAMP), Project Implementation Unit (PIU), Mango Zone Siraha working area.

Ward numbers 9, 10, 11, 12, and 13 from the Dhangadhimai municipality, and ward numbers 1, 2, 3, and 10 from the Golbazar municipality were the coverage areas. These wards were

Figure 2. Map of Nepal showing the study area

purposely selected and mango-growing farmers from each ward of the zone coverage were selected by simple random sampling as it was not possible to take data from the entire population. The total number of samples was 92, *i.e.*, 30 farmers, 5 wholesales, 32 retailers, and 25 consumers. A questionnaire survey was carried out among the sample population. A field and market survey was conducted to gather information about mango production and marketing in 2020. Data were gathered through informal and formal surveys, as well as from key informants. A pilot field inspection was conducted to gather preliminary data about farming statuses and the marketing structure. The traders, producers, and consumers were asked open- and close-ended questions to collect useful data about the social dynamics, economic conditions, production, marketing structure, and price in the area.

Qualitative data were taken into account to prepare the index. On the basis of the respondent frequencies, weighted indexes were calculated for the analysis of the farmers' perceptions of the extent of marketing problems (Rangaswamy, 2009). The farmers' perceptions of the different marketing problems were ranked by using a five-point scale. The five-point scale representing the farmers' perceptions of marketing problems

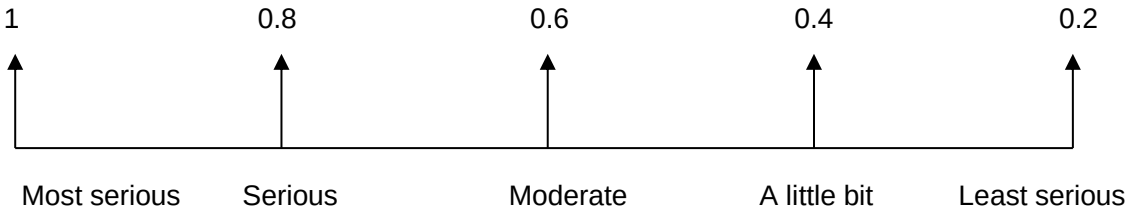

Figure 3. Scale value for intensity of marketing problems

included the options of most serious, serious, moderate, a little bit, and least serious. The scale values of 1, 0.8, 0.6, 0.4, and 0.2 were used for the most serious, moderate, a little bit, and least serious problems, respectively (Figure 3). Then, the priority index was calculated by the weightage average to mean in order to draw valid conclusions. The index of importance was computed by using the formula:

$$I_{imp} = \sum \frac{Sifi}{N}$$

where, Iimp = index of importance, Σ = summation, $S_i = i^{th}$ scale value, f_i = frequency of i^{th} importance given by the respondents, and N = total number of respondents.

Data analysis

Collected data were coded, compiled, and entered into SPSS (Statistical Package for Social Sciences) Version 25 and Microsoft Excel. In the statistical analyses, mean, frequency, percentage, and standard deviation were calculated. As per necessity, pictures, graphs, diagrams, narrative analysis, and other inferential statements were used sufficiently to extrapolate the prevailing status of the marketing of mango, market constraints, and market shares of imported and domestic mango. The marketing margin, which is a function of the difference between retail and farm prices, was used to calculate the cost of marketing services. The margin is primarily influenced by changes in retail demand, farm supply, and marketing input prices. However, it is also influenced by other factors such as supply and demand time lags, market power, risk, technical change, quality, and spatial considerations (Wohlgenant, 2001). The marketing margin was calculated using the formula:

Marketing margin = f (retail price - farm price).

Result and Discussion

Socio-economic characteristics of the respondents

Gender of respondents

From the study, it was found that the mango trade business was dominated by males. The majority of the respondents (68.48%) were male and only (31.52%) were female (**Table 3**). But in the case of retailers, females dominated (53.13%) over the males (46.87%), and in the case of wholesalers, 100% of the respondents were male. Rural women are rarely consulted in development projects, and even though they have heavy workloads, they are under-recognized and under-valued. Female farmers have no access to marketing and decision-making, though most farm production is carried out by them, and their labor plays a significant role in the mango industry (Sekar *et al*., 2014). The study findings suggest that readdressing the gender gap in marketing and decision making, and improving the management skills of women through training would reduce post-harvest losses, and increase farm productivity, income, and household food security. Policymakers should raise gender awareness by encouraging more women to work in mango farming.

Ages of respondents

According to the survey, almost all the respondents were more than 42 years old. The average ages of producers, wholesalers, retailers, and consumers involved in the survey were 51

Table 3. Gender of mango traders by trading category in Siraha

Category of trader	Gender		Total
	Male (%)	Female (%)	
Producer	24 (80)	6 (20)	30
Wholesaler	5 (100)	0 (0)	5
Retailer	15 (46.87)	17 (53.13)	32
Consumer	19 (76)	6 (24)	25
Total	63 (68.48)	29 (31.52)	92

Note: Figures in the parentheses indicate percentage.

Table 4. Ages of the respondents by trading category in Siraha

Category of trader	Age of respondent (mean ± SD)
Producer	51.67 ± 12.044
Wholesaler	42.60 ± 8.473
Retailer	48.13 ± 12.808
Consumer	42.56 ± 12.952

years, 42 years, 48 years, and 42 years of age, respectively (**Table 4**). According to the study, it was found that producers tended to be older and consumers tended to be younger. The active participation of adults seems to be a positive interest of traders in marketing and can be turned to economic benefits, which is supported by the study of Saripalle (2019), who found that age is a significant factor influencing the profitability of mango cultivators.

Family sizes of respondents

Generally, sizes of families in the study area determine the availability of manpower for mango production and marketing. Therefore, the average family size of households was calculated. The overall average family size in the study area was 6.42, which was higher than that of the national average family size (4.88) in 2011 (CBS, 2011a). The details of the family sizes of households are presented in **Table 5**.

Education statuses of respondents

The educational status of the traders was assessed in five categories, namely, the illiterate, primary, secondary, higher secondary, and university education levels. The study showed that the highest percentage (33.33%) of mango producers had a secondary education, 23.33% had a primary education, 20% were illiterate, and 16.67% had attained a higher secondary education level (**Table 6**). Eighty percent of wholesalers had attained a primary education level and 20% had attained a higher secondary level. Most of the retailers had attained a primary education level (50%), 28.12% were illiterate, and 21.88% had attained a secondary level of study. The education status of the consumers varied from illiterate to a university education level, with the highest percentage being the university level (32%). An additional 19.57% of respondents were illiterate and the remaining were literate. Overall, they had a good education status, which indicates that dissemination of

Table 5. Family sizes of the respondents

Parameters	Family size
Average	6.48
Minimum	2
Maximum	14

Table 6. Education statuses of the respondents

Trading category	Education level					Total
	Illiterate (%)	Primary (%)	Secondary (%)	Higher secondary (%)	University (%)	
Producer	6 (20)	7 (23.33)	10 (33.33)	5 (16.67)	2 (6.67)	30
Wholesaler	0 (0.00)	4 (80)	0 (0.00)	1 (20)	0 (0.00)	5
Retailer	9 (28.12)	16 (50)	7 (21.88)	0 (0.00)	0 (0.00)	32
Consumer	3 (12)	2 (8)	8 (32)	4 (16)	8 (32)	25
Total	18 (19.57)	29 (31.52)	25 (27.17)	10 (10.87)	10 (10.87)	92

Note: Figures in the parentheses indicate percentage.

training and programs to the traders and consumers will be easier.

Analysis of the marketing channel of mango in Siraha district

Marketing channel of mango

The study revealed that producers supply 54.61% of their produce to wholesalers, 30.66% to retailers, and the remaining 14.73% directly to consumers (**Figure 4**). Wholesalers sold 40.66% of their mangoes to retailers and the remaining 13.95% to consumers. These chains through which various products pass through between producers and consumers constitute their marketing channel (Bhandari, 1993). An effective marketing system reduces costs while benefiting all segments of society (Acharya & Agrawal, 1999). The country experiences surplus mango production during the season that ends up being wasted or sold at throw-away prices due to imperfect marketing. About a one-third share in a consumer's rupee is held by producers and the rest of the share is by traders (contractors 39%, commission agent 7%, wholesalers 9%, and retailers 19%) (Khushk & Smith, 1996; Dunne & Johnson, 2010). Marketing should be done with minimum costs and losses to be more competitive, increase economic growth, and maximizing benefits to the farmers (Aujla *et al*., 2007).

Cost and margin analysis

Mango is a highly perishable fruit crop. The price of mango may vary due to a variety of factors such as season and time of ripening, location of sale, size and species of mango, and the inflow of mango from India. The study showed that Indian mango fetches a higher price than Nepalese mango due to its early arrival and transportation costs (**Table 7**). Mangoes are generally packed in plastic crates. A survey study showed that the most imported varieties of mango from India were Gulab Khas and Banaganapalli. Gulab Khas was slightly more expensive than the Banganapalli (cost per kg Rs. 170 and Rs. 150, respectively). This shows that there is an opportunity for growing early ripening varieties to meet demand and get a higher price. Moreover, markets near where mangoes are grown can get earlier access to fruits since there are fewer transport costs so it is better to seek alternative varieties for production.

The cost of Nepalese mango varies according to its ripening time. The Nepalese mango that fetches the highest price is Bambai (Rs. 70 per kg) and the lowest is Kalkatiya (Rs. 40 per kg) at the peak period in Siraha (**Figure 5**). The producers tend to sell their products at a minimum price to the wholesalers as the wholesalers purchase the products from the farms of the producers and in a large quantity all at once. The retailers then purchase the fruit at a slightly higher price than the wholesalers, and this is due to the farmers having to transport their product to the retailers. The producers sell their product at the maximum price to the consumer as it requires time and transportation to move products to the market. Similarly, the wholesalers sell the fruit at a greater price to the consumers and at lower price to the retailers. In regards to the marketing of mango, there was only one channel of marketing (producer-

consumer). Thus, the producers' share in the consumer's rupee was observed to be 93.59 percent. This channel needs to be promoted to make farmer cultivation more economic (Datarkar, *et al*., 2014).

From the study, it was found that the market margin of Gulab Khas mango (Rs. 30 per kg) was greater than that of Banaganapalli mango (Rs. 25 per kg). Bambai possessed the highest margin among the Nepalese mango. But the mango market margin varied according to the time of ripening, and on average, almost every species of mango possessed a nearly equal margin in a year. The market margins in different channels of Nepalese mango are tabulated in **Table 8**.

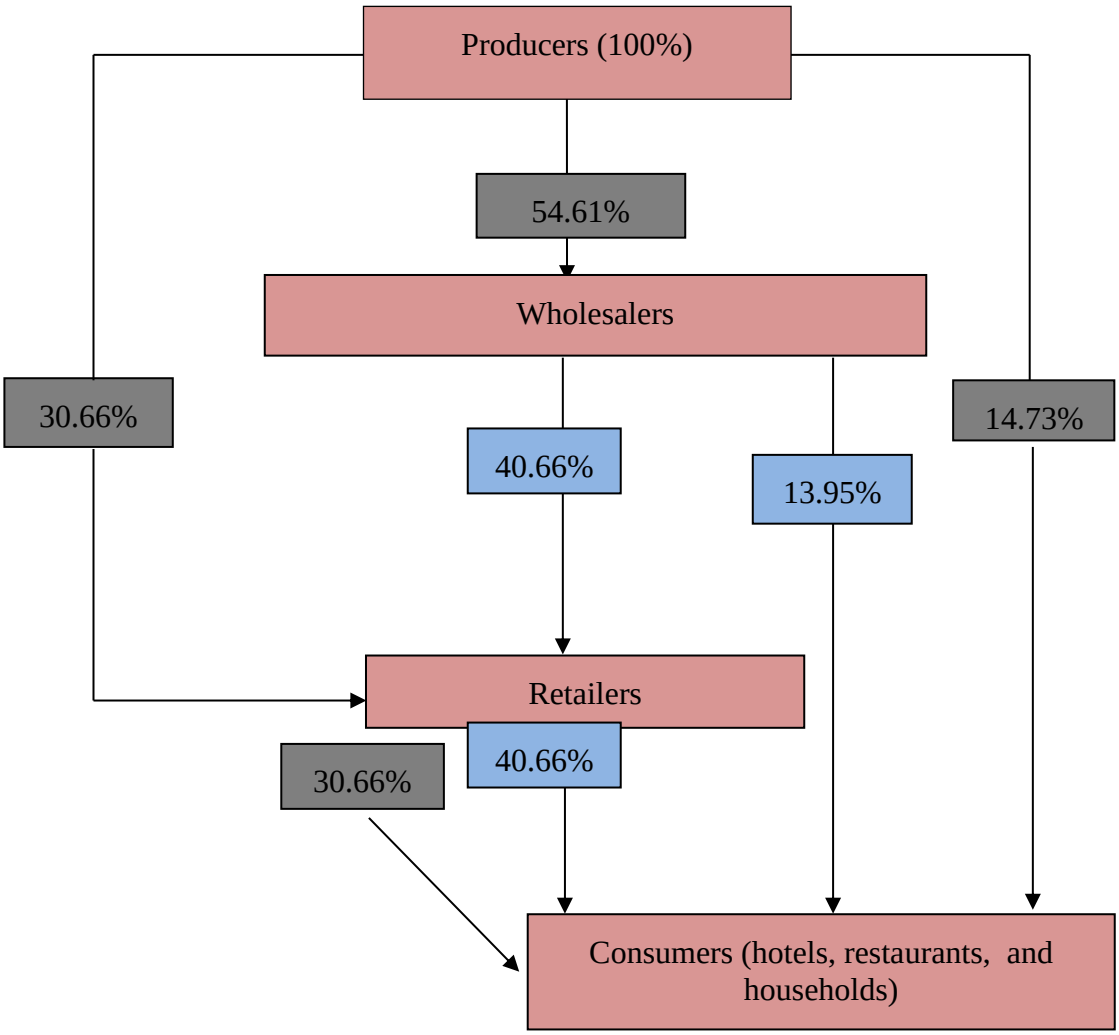

Figure 4. Marketing chain of mango in Siraha

Source: FGD (2020)

Table 7. Market prices of Indian mango in Siraha at peak time

Mango species	Wholesaler average price (Rs./kg)	Retailer average price (Rs./kg)
Gulab khas	140	170
Banaganapalli	125	150

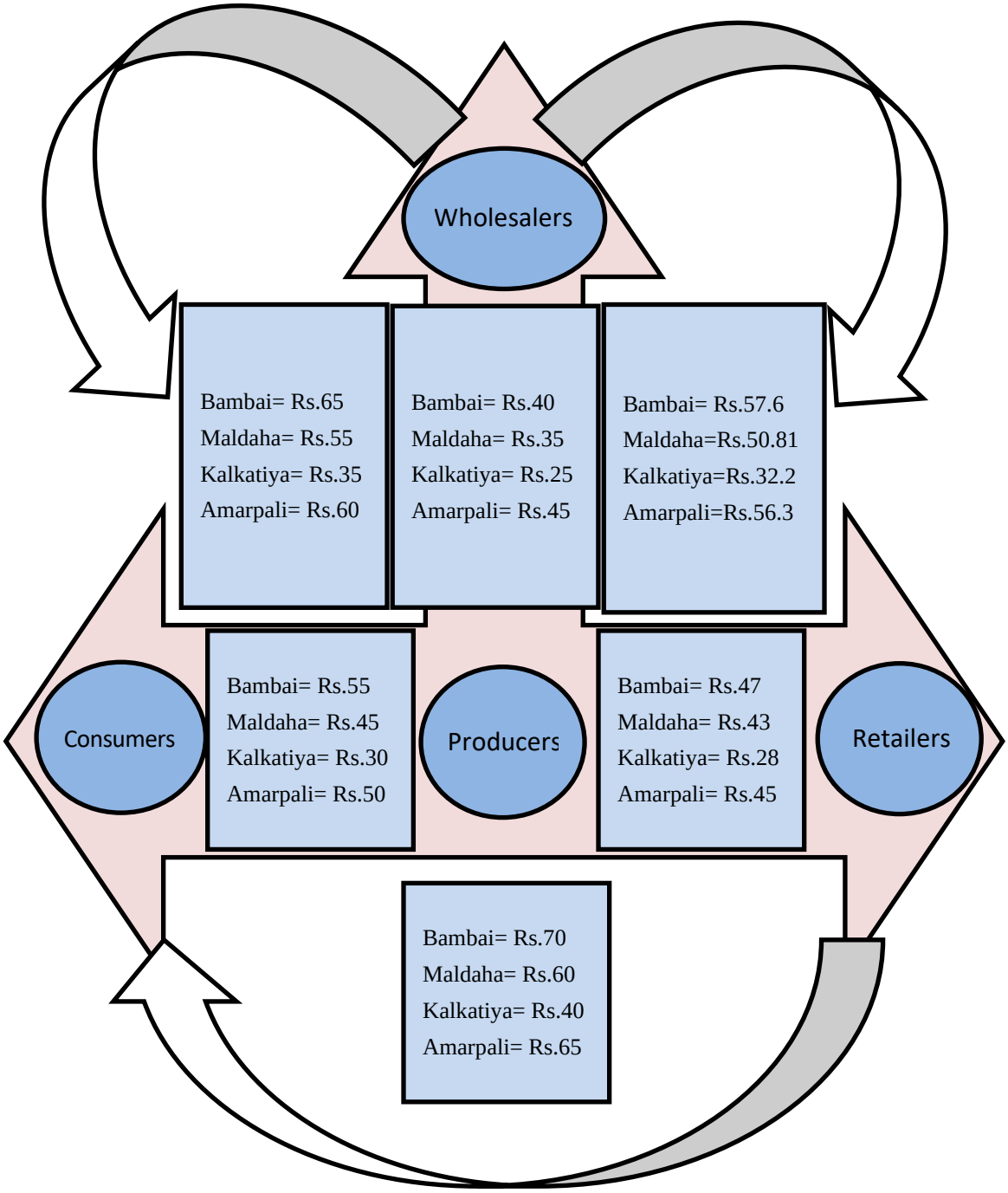

Figure 5. Market prices of mango

Some of the famous cultivars of mango cultivated in Nepal are Alphonso, Bombay Yellow, Maldaha, and Dussehri (Pradhan, 2010). Various species of mango are marketed in Siraha. The major species produced in Siraha are Bambai, Maldah, Kalkatiya, Amarpali, Dashari, and many more. The major mango varieties imported from India were Gulab Khas and Banaganpalli. Among the Nepalese mango, Maldah held the highest market share in Siraha (34.85%), which was followed by Kalkatiya 19.97%) (**Table 9**). Amarpali held the smallest market share (6.34%) but its cultivation area is increasing. Bambai held a 12.46% market share,

Table 8. Marketing margin of Nepalese mango in Siraha

a. Marketing margin from producer to retailer channel

Species of mango	Producer average price (Rs./kg)	Retailer average price (Rs./kg)	Marketing margin (Rs./kg)
Bambai	40	70	30
Maldah	35	60	25
Kalkatiya	27	40	13
Amarpali	25	65	40

b. Marketing margin from producer to wholesaler channel

Species of mango	Producer average price (Rs./kg)	Wholesaler average price (Rs./kg)	Marketing margin (Rs./kg)
Bambai	40	65	10
Maldah	35	55	10
Kalkatiya	37	35	5
Amarpali	25	60	10

c. Marketing margin from producer to wholesaler to retailer channel

Species of mango	Producer average price (Rs./kg)	Whole seller average price (Rs./kg)	Retailer average price (Rs./kg)	Marketing margin in Wholesaler (Rs./kg)	Marketing margin in Retailer (Rs./kg)	Marketing margin overall (Rs./kg)
Bambai	40	57.6	70	17.6	12.4	30
Maldah	35	50.81	60	15.81	9.19	25
Amarpali	27	32.2	40	5.2	7.8	13
Kalkatiya	25	56.3	65	31.3	8.7	40

although it fetches the highest margin due to its earliness and lack of storage mechanisms. All other varieties of mango together held a 17.87% share in the market of Siraha. A large volume of mango was produced in Siraha (91.49%) and only 8.51% of mango was imported from India because the Indian variety arrived earlier than the earliest variety of Nepal, and a lack of storage in Siraha prevented long-term storage of the Indian mango. The early arrival of the preferred variety fetched a good economic return in the market. The marketing demand of Maldah was highest over the other cultivars.

The mango imported from India was more consistent and smaller in weight with an average weight of 200g and a range from 100g to 300g, whereas the mango produced in Nepal was slightly larger and varied from the Indian mango; the average weight was 400g and the fruit had a range of 150g to 600g (**Table 10**). Kalkatiya was the largest mango in size. The demand and consumers' preferences were medium weight mangoes with a good look.

Issues in mango marketing channels in Siraha district

The study revealed that there is a lack of storage mechanisms for mango (**Figure 6**). There was no cold storage for the conservation of mango. All the respondent wholesalers stored mango in a structure like an airtight room. Fifty percent of retailers stored mango in the market under the open sky by wrapping them with plastic. Only 18.75% of retailers stored fruits in a refrigerator and the remaining stored them in other types of storage. National data on storage loss of mango fruits is estimated to be between 20% to 60% (Boateng, 2016). Thus, it is high time to search for different possible methods from the locally available resources, which will directly upgrade the marketing channel and make the profession more economic.

Table 9. Market share of Nepalese and Indian mango in Siraha

Variety of mango	Amount (%)
Nepalese mango	
Bambai	1,682.1 (12.46)
Maldah	4,704.75 (34.85)
Amarpali	855.9 (6.34)
Kalkatiya	2,695.95 (19.97)
Others	2,412.45 (17.87)
Total Nepalese mango	12,351.15 (91.49)
Indian mango	
Gulab khas	432 (3.20)
Banaganapalli	716.85 (5.31)
Total Indian mango	1,148.85 (8.51)
Total mango (Nepalese+Indian)	13,500 (100)

Note: Figures in the parentheses indicate percentage.

Table 10. Marketing weight of Nepalese and Indian mango in Siraha

Parameter	Source of mango	
	Nepal	India
Max. Wt of mango (g)	600	300
Min. Wt of mango (g)	150	100
Mean Wt of mango (g)	400	200

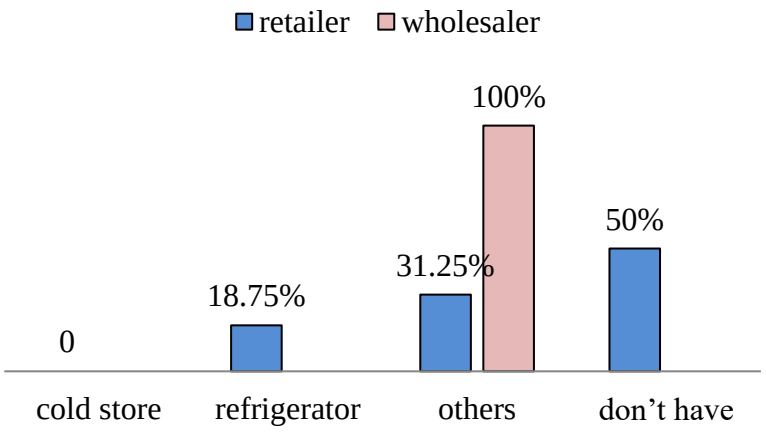

Figure 6. Storage mechanisms by traders in Siraha

From the survey, it was found that the majority of producers (46.67%) used pickups, followed by cycles (30%), motorcycles (16.66%), and automobiles (6.67%) to transport mango (**Table 11**). Only trucks and pickups were used by the wholesalers as they needed to transport large quantities of mango. Forty percent of wholesalers used trucks for transportation and the remaining 60% used pickups. The majority of the retailers used pickups (37.5%), cycles (28.12%), motorcycles (21.88%), and automobiles (12.5%). The most used means of transportation was a pickup and the least used was a truck. Different

transportation with sophisticated facilities should be provided in order to decrease the transportation loss and maintain the quality of the mango for the consumer.

The study revealed that 42% of the mango fruits produced and imported in Siraha were traded inside the district and were consumed in Siraha. Outside the district, the highest percentage of mango was supplied to Kathmandu (21%), followed by 16% to Pokhara, 14% to Dharan, and 7% to other districts (**Figure 7**). There is a need for the promotion of exporting mango to other preferred markets nearby and distant. As there is great demand, some collaborative approach is necessary among the producers and traders to promote exporting. From the survey research, it was found that most producers packed their mango in plastic crates (46.66%), and fewer packed in cartoons or bamboo baskets. One-hundred percent of wholesalers packed in plastic crates. Generally, retailers packed in plastic crates (71.87%) and only a few packed in sacks (7.46%). Thus, most of the mango in the Siraha district was packed in plastic crates (62.69%), followed by bamboo baskets (14.93%), and then in cartoons, sacks, or without packing, each with a percentage of 7.46%. The details of packaging are illustrated in **Table 12**.

The post-harvest losses were highest due to the lack of storage and the high perishable nature of mango (Honja, 2016). National data on post-harvest loss of mango fruits is estimated to

Table 11. Transportation used by traders in Siraha

Traders category	Transportation medium					Total
	Truck (%)	Pickup (%)	Auto (%)	Motorcycle (%)	Cycle (%)	
Producer	0 (0.00)	14 (46.67)	2 (6.67)	5 (16.66)	9 (30)	30
Wholesaler	2 (40)	3 (60)	0 (0.00)	0 (0.00)	0 (0.00)	5
Retailer	0 (0.00)	12 (37.5)	4 (12.5)	7 (21.88)	9 (28.12)	32
Total	2 (2.99)	29 (43.28)	6 (8.95)	12 (17.91)	18 (26.87)	67

Note: Figures in parentheses indicate percentage.

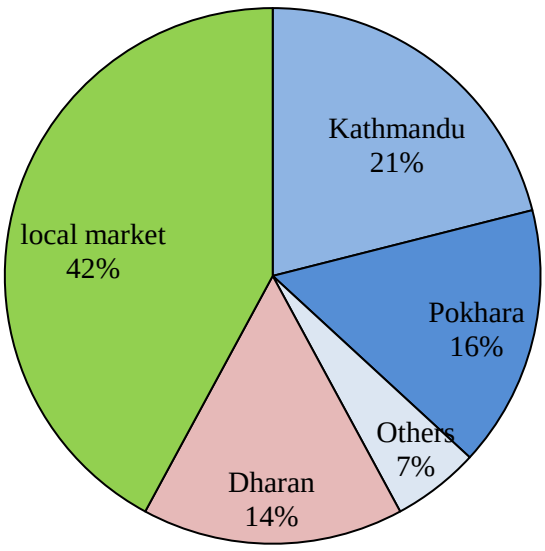

Figure 7. Supply of mango

Table 12. Use of packaging containers by traders

Traders category	Packaging					
	Bamboo basket (%)	Plastic crates (%)	Cartoons (%)	Sack (%)	No packing (%)	Total
Producer	3 (10)	14 (46.66)	3 (10)	5 (16.67)	5 (16.67)	30
Wholesaler	0 (0.00)	5 (100)	0 (0.00)	0 (0.00)	0 (0.00)	5
Retailer	7 (21.88)	23 (71.87)	2 (6.25)	0 (0.00)	0 (0.00)	32
Total	10 (14.93)	42 (62.69)	5 (7.46)	5 (7.46)	5 (7.46)	67

Note: Figures in the parentheses indicate percentage.

be between 20% to 60% (Boateng, 2016). Post-harvest life poses more economic losses so there is a need for more investments in post-storage equipment for all producers, wholesalers, and retailers. According to the study, post-harvest losses were high in the Siraha district. Losses for wholesalers were higher than for the retailers. The details are tabulated in **Table 13**.

The study revealed that the problem score for storage was the highest. Thus, mango traders in Siraha are mostly facing the problem of storage. The mango growing farmers of Siraha had various problems regarding mango production and its marketing. Some major problems faced by mango traders as well as mango consumers in the Siraha market included, (1) Lack of storage: There was no proper storage of the harvested product. Due to the lack of storage, there were problems in trading at the beginning and end of the season when the price was high, and in the peak time when the price was too low. Thus, the price of the commodity fluctuated highly; (2) Market facilities: There was a lack of market facilities for the trading of mango. There were no installations or separate places for the trading of mango. Most retailers left their fruits under the open sky under plastic only to prevent animals like cows from eating the fruits at night. There was not a proper lining of the traders for marketing activities; (3) Government policies: The government has made many policies and laws regarding horticulture and marketing but they have not been properly implemented. The government has not conducted a mango production and marketing program or encouraged farmers to practice mango cultivation; and (4) Lockdown: The COVID-19 pandemic was also one of the major problems. Due to the pandemic, there has not been proper marketing or studies about marketing and production as there has been a lack of interactions with the traders, farmers, and consumers. These major problems are also supported by the study of the Project for Agricultural Commercialization and Trade (2014), which found major marketing problems related to price fixation, the low bargaining power of farmers, middlemen (vendors), a lack of infrastructure, and a lack of market information causing mango growers to sell their produce at low prices.

The study showed the score of a separate market was the smallest. Hence, it was ranked as the least concerning problem among all the problems. In Siraha, there were no separate markets for the mango trade, although traders ranked it as the least among others. For making mango marketing more profitable there is a need of addressing all these problems. The pie chart in **Figure 8** represents the order of problems, in which the percentage was calculated from the score value obtained from the weighted means.

A lot of factors can influence a consumer's decision in purchasing or buying a mango from the market. The major factors were the price, quality of freshness, and size of a mango. **Table 14** shows that most of the consumers were concerned about freshness during the purchasing of mango. The survey research showed that 48% of consumers preferred freshness, 32% of consumers were considered about price, and 20% were considered about the size of the mango during purchasing. There is a necessity to maintain the freshness of mango to increase the consumers' preference. As price contributes to 32% of preference, it is necessary to maintain a

Table 13. Wastage of mango in Siraha

Category of traders	Loss % (Mean ± SD)
Wholesalers	27.00 ± 9.083
Retailers	26.88 ± 7.156

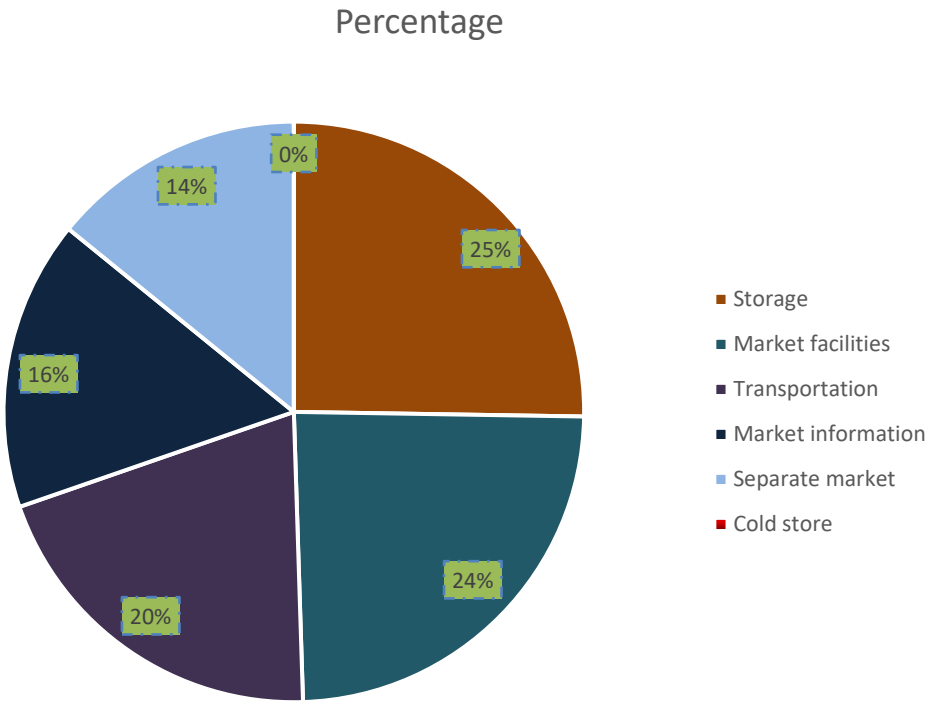

Figure 8. Problems of marketing mango in Siraha
Source: FGD (2020)

Table 14. Factors influencing consumers during purchasing mango in Siraha

Factors	Frequency (%)
Price	8 (32)
Freshness	12 (48)
Size	5 (20)
Total	25 (100)

Note: Figures in the parentheses indicate percentage.

short market chain to lower the market price.

The purchasing time or pattern refers to how many times a consumer buys the product. During the research study period, the consumers' purchasing patterns were classified as once, twice, thrice, and more. **Figure 9** shows that 36% of consumers purchased mangoes thrice, 32% of consumers purchased mangoes more than thrice, 20% of consumers purchased mangoes twice, and only 12% of consumers purchased mangoes once in a season. As many consumers preferred to buy more than one time, there were no problems regarding decreases in consumer marginal preferences, rather, it would be good to provide the preferred cultivars for increasing profitability.

During the survey, consumers were asked about the prices of mango in the markets of

Siraha. Among the 25 consumers, 60% said that the price of mango was moderate and 12% said it was expensive, whereas 28% said it was cheap (**Table 15**).

The study showed that of most of the consumers (57%) said that the mango marketing of Siraha is considered as average, 26% of consumers said that the mango marketing in Siraha needs to improve, and 17% of consumers said that the mango marketing of Siraha is good (**Figure 10**).

From the study, it was revealed that the majority of consumers (40%) preferred Maldah, 32% of consumers preferred Bombai, 24% of consumers preferred Amarpali, and only 4% of consumers preferred Kalkatiya (**Table 16**). Maldah and Bombai were the most preferred. Maldah is also known as the queen of the mango. Kalkatiya was the least preferred variety of mango as its sweetness is relatively less than the others. More consumers preferred the local variety due to freshness, so there is a need for a collaborative approach among all concerned authorities.

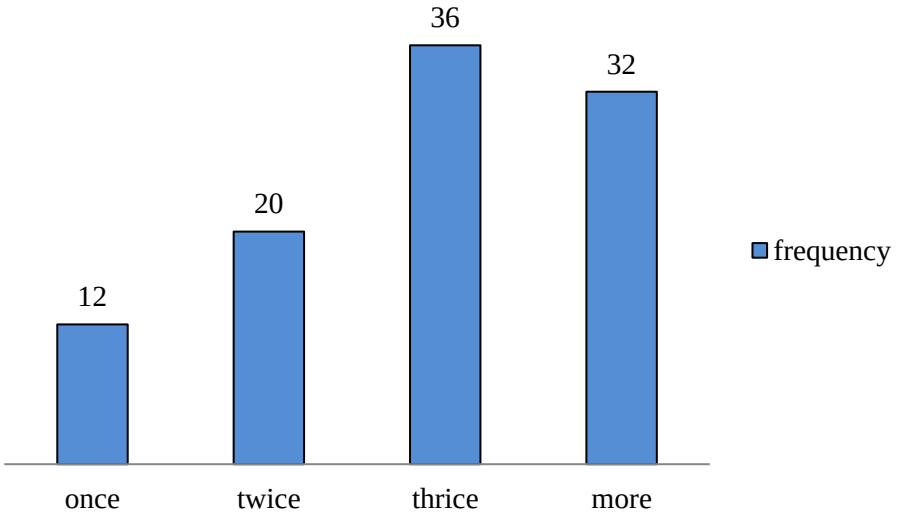

Figure 9. Consumer purchasing frequency

Table 15. Consumer opinions on the cost of mango in Siraha

Factor	Frequency (%)
Expensive	3 (12)
Moderate	15 (60)
Cheap	7 (28)
Total	25 (100)

Note: Figures in the parentheses indicate percentage.

Table 16. Consumer preference for the different varieties of mango in Siraha

Mango variety	Number of respondents (%)
Bombai	8 (32)
Maldah	10 (40)
Kalkatiya	1 (4)
Amarpali	6 (24)

Note: Figures in the parentheses indicate percentage.

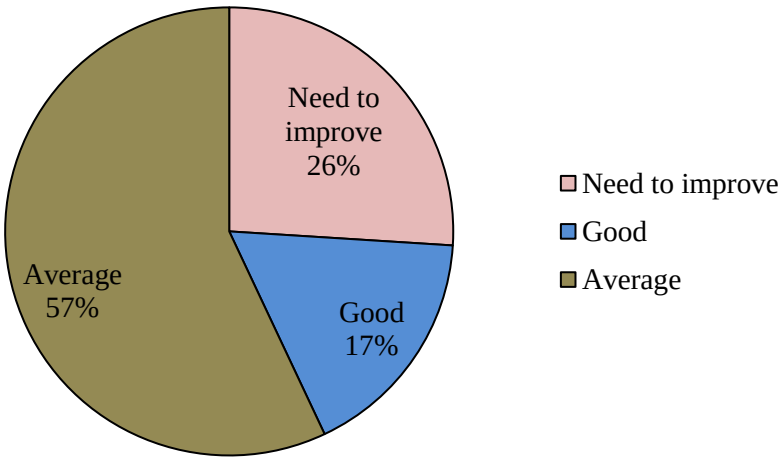

Figure 10. Consumer opinions about the marketing of mango in Siraha

Conclusions

Siraha district is the second-largest mango production and consumption market of Nepal. There are no organized databases or studies of the marketing system of mango in Siraha. This study showed that mango from Siraha was supplied to different districts of Nepal. The major mango varieties cultivated and consumed in Siraha were Bambai, Maldaha, Amarpali, Dashari, Kalkatiya, Malika, Neelam, and many more. It was observed that storage and market facilities were the major problems for marketing. Bombai, the earliest variety, fetched a high margin at the beginning of the season. Most of the consumers preferred to consume the Maldah variety. The findings of this study can help to formulate policies about the major factors for stabilizing the market prices of mango. Marketing research and intelligence can help to reduce the level of uncertainty with which the farmers and marketing managers must cope. Understanding the perceptions of consumers on different species and sources of mango is helpful to the farmers in formulating farming strategies and also to the traders in improving the marketing system. It also helps policymakers, interested and related I/NGOs, and individual personnel collaborate to solve the problems and make investments in this area. There is great potential to industrialize and commercialize the production, efficient storage, and post-harvest management of mango, and in increasing the efficiency of the mango marketing system through subsidies and aids to the mango growing farmers from concerned stakeholders. A collaborative approach is required among the various organizations and all stakeholders. Policies supporting the formation of mango marketing groups should be strengthened in order to promote knowledge dissemination, improve farmers' bargaining power, reduce transaction costs, and increase farmers' income.

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