MARKETING AND PROCESSING OF FRUITS IN PUNJAB

Thesis

Submitted to the Punjab Agricultural University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE
in
AGRICULTURAL ECONOMICS
(Minor subject: Statistics)

By

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CERTIFICATE – I

This is to certify that the thesis entitled, **"Marketing and Processing of Fruits in Punjab"** submitted for the degree of Master of Science in the subject of **Agricultural Economics (Minor Subject: Statistics)** to the Punjab Agricultural University, Ludhiana, is a bonafide research work carried out by **Kamal Kishor Jalthariya (L-2018-BS-223-M)** under my supervision and that no part of this thesis has been submitted for any other degree.

The assistance and help received during the course of investigation have been fully acknowledged.

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CERTIFICATE II

This is to certify that this thesis entitled, **"Marketing and Processing of Fruits in Punjab"** submitted by **Mr. Kamal Kishor Jalthariya (L-2018-BS-223-M)** to the Punjab Agricultural University, Ludhiana, in the partial fulfilment of the requirements for the degree of **Master of Science** in the subject of **Agricultural Economics** (Minor subject: **Statistics**) has been approved by student's Advisory Committee along with Head of the Department and External Examiner after and oral examination on the same.

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ABSTRACT

The present study was conducted to investigate the various marketing and processing related aspects of fruits in Punjab. Personal interview method was employed to collect the primary data from the sample respondents comprising farmers, pre-harvest contractors, wholesalers, retailers and the processing units. The study revealed that marketed surplus of kinnow and malta, the major fruits of sample farmers constituted 98.20 per cent and 96.06 per cent total production of the respective fruits. As compared to channels in which producers themselves sold their produce in the market, in this channel (pre-harvest contract system) the observed price spread was the highest and the producer's share in the price paid by consumer for the average quality fruits was found to be the lowest. The producer's share in consumer rupee was the highest when they sold their produce directly to the retailers and this channel was observed to be the highly efficient. The location of majority of fruit processing units is away from the main fruit producing areas and these are found to be concentrated in the industrial hub of the state. The processing capacity utilized by processing units found to be very low and inversely related to the size of unit. Both, local as well as distant markets were the major sources of procurement of fruits by the processing units and relatively low quantities of fruits were sourced directly from the farmers. Problems of insect disease, inadequate irrigation facility, lack of processing unit in nearby area, and lack of local markets were the major constraints faced by the farmers. Inadequate supply of variety of fruits, low quality of fruits, lack of demand of processed food and lack of utilization of waste were the main constraints faced by the processing units. In order to bring the desired diversification of state agriculture, the problems faced by fruit growers and processing units need to be addressed on the priority basis through employing suitable technological interventions and policy tools.

Keywords: Fruits, channels, producer's share, marketing efficiency, capacity utilization, procurement, constraints.

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Signature of Major Advisor **Signature of the Student**

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ਮੁੱਖ ਸ਼ਬਦ: ਫ਼ਲ, ਮੰਡੀਕਰਨ ਚੈਨਲ, ਉਤਪਾਦਕ ਦਾ ਹਿੱਸਾ, ਮੰਡੀਕਰਨ ਕੁਸ਼ਲਤਾ, ਸਮਰੱਥਾ ਦੀ ਵਰਤੋਂ, ਰੁਕਾਵਟਾਂ

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CHAPTER-I

INTRODUCTION

Agriculture is backbone for the development of Indian economy. It is a source of livelihood for major proportion of the total population and thus has a significant impact on the overall economic development of country. In recent past, India have shown diversity in the production of agricultural crops due to immense agro climatic variations, fertile soil, enormous biodiversity, large cultivable land and all along rich crop husbandry. During 2019-20, agriculture added 18.40 per cent towards the GVA and offered employment to 45.60 per cent population of India. Horticultural sector occupies an important place in agricultural economy of country and adds more than 33 per cent to the agricultural sector. Horticulture sector includes fruits, vegetables, spices, and plantation crops, medicinal and aromatic crops. In past, significant progress has been made in area expansion and production of horticulture crops. Over the last decade, the area under horticulture grew by 2.6 per cent per annum and annual production increased by 4.8 per cent. During 2019-20, production of horticulture crops was 319.56 million tons from an area of 26.22 million hectares (Anonymous 2020).

The demand for horticulture products both in fresh and processed form have been increased overtime in the global market and after the implementation of NHM scheme the export of horticultural crops at all India level has picked up. Fruits occupy an important place from dietic, economic and medicinal value point of view and are considered under the category of protective foods. India with 6.70 million hectares of land under fruits and production of 100.44 million tons is the second largest producer of fruits in the world after China, and contributes nearly 10 per cent of total world fruit production. The average productivity of fruits in country is 14.98 tons per hectare (National Horticulture Board 2020). Presently India is leading the world in production of banana, mango, lime and lemon, papaya, okra, cashew and coconut (Anonymous 2020). The major fruit producing states of the country includes Andhra Pradesh, Maharashtra, Uttar Pradesh, Gujarat, Karnataka, and Tamil Nadu. Along with fruits, India rank second in vegetables, spices and few plantation crops such as coffee and tea creating more export value in the International market. India is exporting horticultural produce mainly to Netherlands, U.A.E., Nepal, U.K., Saudi Arabia, Kuwait and Bahrain. The number of commodities as well as the number of varieties produced and traded have increased manifold during the past 25 years.

In India, the food sector has appeared as a high-profit and high-growth sector because of its enormous potential for value addition, predominantly within the food processing industry. The government through the Ministry of Food Processing Industries (MoFPI) is making all efforts to encourage investments in the business. The Indian grocery and food market is the world's sixth largest with retail contributing 70 per cent of the sales. About 32 per cent of the country's total food market is accounted by Indian food processing industry as

one of the largest industries in India and is ranked fifth in terms of production, export, consumption and expected growth. It contributes around 8.39 and 8.80 per cent of Gross Value Added (GVA) in agriculture and manufacturing respectively. Food processing sector accounts for 13 per cent of India's exports and 6 per cent of total industrial investment. Though India has a good raw material base for food processing, its accounts only 1.7 per cent of world trade. 0nly about 2 per cent of fruits and vegetables is processed in country that is very low in comparison to countries like Malaysia (83%), Philippines (78%), USA (65%) and China (23%) (Majumdar 2016).

Fruits are highly perishable, but due to their nutritional value they are called as protective food. Varieties of fruits are important source of various minerals and vitamins supplied in freshen or preserved or processed form throughout the year for human consumption. After production, agricultural produce undergo series of post-harvest operations, handling stages and storage before they reach to the consumers. Each operation and handling stage results into some losses. Around 5.8-18.1 per cent fruits get spoiled in various stages during harvest, post-harvest operations, handling and storage in India (Jha *et al* 2015). In India due to favorable agro-climatic conditions there are plenty of raw materials available for fruit processing industries. The most important problem of rapid growing population with scarce capital resources need to create demand for protective and indispensable food among a wide range of Indian consumers. At present availability of fruits is not as per recommended level of 150 grams per day (ICMR 2020). For solving the problem of scarce availability, in addition to increase in production and productivity, following the proper post-harvest management practices and proper marketing practices may help in proper utilization of horticulture produce and make it available during off season. Processing enhances the self-life of predominately perishable commodities like fruits and vegetables. By creating ample opportunities for employment as well as foreign exchange, this sector may lead to economic growth and development of country.

The Punjab is at crossroad with respect to agriculture. Potential of agricultural growth based on wheat and rice has been fully exploited leading to stagnation in incomes from agriculture and environmental concerns particularly relating to high levels and imbalance in use of fertilizers, decline in the water table, loss of land to salinity and water logging. Thus, the sustainability of agriculture in state is under threat. In order to revitalize Punjab agriculture through exploring alternatives to the rice–wheat system, various expert committees and other groups (Government of Punjab 2002, 2005, 2006) have recommended the diversification of agriculture towards high-value commodities and a broader mix of traditional commodities and agro-processed products that augment farm income, promote exports, and conserve soil and water resources. Underlining the importance of horticultural crops, it has been observed that the Punjab state has large potential for cultivation of fruits.

Due to its profitability and good market value, fruit cultivation gained momentum and about 90 thousand hectares of land is under the fruit cultivation in state. Kinnow, guava, mango and pear are the major fruits grown in the state. Kinnow occupied the first position with 54243 hectare, followed by guava (9645 ha), mango (7012 ha), and pear (3501 ha) accounting for 59.96 per cent, 10.66 per cent, 7.75 per cent, and 3.87 per cent of the total area under fruit cultivation respectively (Anonymous 2020).

Though the area under fruits and production of fruits has shown rapid growth in recent decades, the existing marketing facilities are still inadequate. Under existing marketing practices, before the produce reaches to the ultimate consumer it passes through a long chain of intermediaries resulting into too wide price spread. Therefore, while the consumers have to pay higher prices for fruits, the producers are getting a small share in the price paid by them. The perishable nature of fruits, seasonality in production, and distribution of production far off from the consuming centers, inadequate cold storage and processing facilities, and lack of comprehensive marketing information are some of the important constraints hampering the efficiency of fruit marketing (Kaur and Singla 2016). Due to these factors, majority of fruit growers are compelled to sell their produce unprocessed at the harvesting time hence resulting into gluts in the market and thereby fall in prices and lower returns. To avoid marketing risk, many fruit producers lease out the orchards to the pre-harvest contractors which further lower their returns.

The exiting processing industry suffers on account of high fluctuations in market prices, varying quality and uncertainty in availability of raw material, high cost of energy and raw material-wise varying requirement of processing conditions. Besides, processing industry also faces under-capacity utilization and locational problems. Locations of existing processing industries are irrational as some fruit producing areas are completely neglected. There is dire need of adequate cold storage and processing facilities in the fruit producing areas. Emphasizing on these aspects will help in improving the economic condition of different stakeholders especially the fruit growers through enhancing returns at peak time of production, balancing in supply and demand in the fruit markets, increased employment opportunities and making fruit products available round the year. To meet the diversification need of Punjab agriculture, the cultivation of high value crops, particularly the fruits have to be made more remunerative through emphasizing on marketing and processing efficiencies. In light of above discussion, the present study has been designed to examine the various marketing and processing aspects of fruits. The specific objectives of the present study were:

1. To examine the price spreads for fruits through different marketing channels.
2. To study the sources of fruit procurement and capacity utilization of the processing units.
3. To study the problems faced by the fruit growers and the fruit processing units.

CHAPTER-II

REVIEW OF LITERATURE

An attempt has been made to review the available relevant research work having direct or indirect bearing on the present investigation. The literature cited on price spread for fruits through different marketing channels and other objectives has briefly been discussed under the following sub-headings:

2.1 Price spread for fruits through different marketing channels and problems in marketing of fruits

2.2 Sources of fruit procurement and capacity utilization of the processing units and problems faced by processing units

2.1 Price spread for fruits through different marketing channels and problems in marketing of fruits

Agarwal and Saini (1995) studied the marketing of vegetables in Jaipur market during 1992-93. The main channels observed were, Channel I: Producer – commission agent – retailer – consumer; and channel II: Producer – commission agent – mashakhores – retailer – consumer. The total marketing cost in the sale of cauliflower and cabbage through channel I was Rs 42.87 and Rs. 40.05, per quintal respectively. Charges for transport, commission, value of quantity lost and market fee were the main cost items, as these together accounted for 36 per cent of the total marketing cost in these crops. In channel II, the total marketing cost in sale of cauliflower and cabbage was Rs. 47.26 and Rs. 43.35, per quintal respectively. In this channel, transport, commission, value of quantity loss and market fee accounted for over 87 per cent of the total marketing costs. The producers' share in consumers' rupee was around 55 per cent and 52 per cent in channel I and II respectively. The farmers got a higher share in the sale of crops when channel I was adopted. The total margin of the intermediaries was higher in Channel II for both the vegetable crops.

Ladaniya *et al* (2003) analyzed the price spread of pomegranate in different marketing channels in Nasik, Solapur, and Ahmednagar districts of Maharastra. The study based on primary data collected from 30 farmers each from selected districts and 10 commission agent/ wholesalers, 10 retailers of Mumbai, Nagpur, Pune, Malegoan, Rahuri, and Ahmednagar markets. The study identified four main marketing channels viz: Producer - retailer - consumer (local) (channel-I), Producer - commission agent/trader/wholesaler - retailer – consumer (channel-II), Producer - commission agent/trader/wholesaler (distant) - trader/ wholesaler (distant) - retailer - consumer (channel-III), Producer — co-op. society - commission agent/wholesaler - retailer- consumer (distant) (channel-IV). The study identified the main mode of marketing, when producer opted for self-marketing through commission agent (86.66%) followed by through cooperative society only (10%) and through pre- harvest contractor (3.33%). The percentage share of producer was maximum in channel-I (51.65 %)

followed by channel-III (48.53%) and channel –II (44.50 %). About 90 per cent of the marketing costs were accounted by transportation, packaging and commission charges. Marketing efficiency was the maximum for marketing through co-operative society. Lack of marketing intelligence and lack of finance were the main constraints faced by farmers in the study area.

Bhagyalaxmi (2005) identified four main marketing channels of mango in Chittoor district of Andhra Pradesh viz: Producer- pre harvest contractor- local wholesaler- distant wholesaler- retailer- consumer (channel-I), Producer- pre harvest contractor- local wholesaler- retailer- consumer (channel-II), Producer- local wholesaler at regulated market yard- distant wholesaler- retailer- consumer (channel-III), and Producer-local wholesaler-retailer- consumer (channel-IV). The study is based on both primary and secondary data. Primary data were collected from 60 farmers and other market intermediaries with the help of pre tested schedule. The channel –III accounting for 8162 tonnes and 64 per cent of marketed fruits was predominant in study area followed by channel-I (20%), channel-II (15%) and channel-IV (less than 2 %). The study revealed that producer's share in consumer rupee was highest in channel-IV (44%) and lowest in channel-I (29%). Marketing efficiency was highest in channel-IV followed by channel- II, III and I with mean score 7, 8, 12, 13 based on Ramakumar approach.

Kamble *et al* (2007) conducted a study to identify various constraints in production and marketing of grapes in Sangli district of Maharashtra. Primary data were collected from 90 grape growers from 15 villages of district. Study revealed the major constraints of production as: lack of technical knowledge, non-availability of skilled labour at proper time, non-availability of bank loan, non-availability of pure variety grafts and high input cost. The major problems of marketing comprised high charges of commission by intermediaries (48%), high cost of packing material (10%), high cost of transportation (44%), low net returns to farmers, lack of cold storage and pre cooling facilities. Study suggested some measure like establishing of co-operative markets, provision of stall to the grower in urban markets and number of intermediaries should be reduced for reducing the high market cost.

Mathi and Pandey (2008) studied the marketing of Guava in Allahabad district of Uttar Pradesh. The study identified five marketing channels viz; Producer- pre harvest contractor - wholesaler/commission agent - Processor- Consumer (channel I). Producer- pre harvest contractor- processor- retailer- Consumer (channel II). Producer- pre harvest contractor- processor –commission agent- retailer (channel III). Producer – pre harvest contractor- wholesaler (local market for fresh fruits) - processor- wholesaler (distant market for processed product)-consumer (channel IV). Producer- pre harvest contractor-wholesaler (local market for fresh fruits)-processor- wholesaler (distant market for processed product) - retailer- consumer (channel V). Study also analyzed the efficiency of these marketing

channels for processors along with SWOT analysis and constraint faced by them. Marketing efficiency of channels for processors varied from 2.02 in the channel I to 0.36 in channel II. Lack of infrastructure facilities, maintaining required hygienic conditions, lack of forward and backward linkages, lack of capital inputs, high degree of competition were identified as the major constraints.

Sarode (2009) studied the economics of banana marketing in Jalgoan district of Maharashtra. Four different channels identified were : Channel I: Producers - cooperative marketing society - commission agent - wholesaler - retailer - consumer, Channel II: Producer - group sale agency -private trader - commission agent – wholesaler - retailer - consumer, Channel III: Producer - local traders - wholesaler - retailer - consumer and Channel IV: Producer – retailer – consumer. The study revealed that marketing cost was the highest in channel III (Rs 137.11/qtl) followed by channel II (Rs 132.57/qtl) and channel I (Rs 129.96/qtl). The producer's share accounted for 48.15, 46.78, 45.20 and 70.80 per cent of consumer rupee in channel I, II, III and IV respectively. The study suggested that in order to increase the farmer's income the number of market intermediaries should be reduced.

Sarma (2010) conducted a study on price spread and marketing efficiency of sweet potato in Kishoregonj district. The main marketing channels identified in the study area were: (I) Producer-retailer-consumer (II) Producer-wholesaler-retailer-consumer (III) Producer – arathdar - wholesaler-retailer-consumer. The data were collected from 100 farmers and 55 intermediaries using multistage stratified random sampling technique. Nearly 50 per cent of produce was marketed through channel-(II). The study revealed that producer's share in consumer's taka was maximum in channel -I (69.28%), followed by channel –II (57.94%) and channel -III (53.14%). The marketing efficiency was maximum in channel -I (2.25), followed by channel –II (1.37) and channel –III (1.13). Low yield, lack of cold storage, seasonal price variation, lack of cold storage and marketing facilities were identified as the main problems faced by growers in the study area.

Jaypatre *et al* (2011) conducted a study to examine the price spread, marketing efficiency and constraints in mango marketing in the Valsad district of Gujarat. The study was based on the data obtained from 70 growers with the survey method. The price spread, as percentage of consumer rupee in different marketing channels varied from 0.58 per cent to 62.35 per cent. The producer's share in consumer's rupee was maximum (99.42%), when produce was directly sold to the consumers. The marketing efficiency was relatively the highest in this channel (170.93), whereas it was observed to be the least in the marketing channel consisting of the highest number of intermediaries. Lack of sufficient cold storage facility, lack of market information and high cost of transportation were the main problems faced by the growers in the region.

Mavi *et al* (2012) examined the efficiency of various marketing models and problems

faced by kinnow growers in Punjab. For this, 120 farmers were selected from three local markets in the producing areas along with higher consuming market of Delhi and Ludhiana. The seasonal indices signified that kinnow prices show negative response to arrivals and positive response to lagged prices. The study revealed that growers selling their produce directly in market were getting more returns as compared to that from commonly followed channel of selling to the pre-harvest contractors. In the study area, kinnow growers faced various problems such as lack of market information, poor marketing infrastructure, inadequate processing and post-harvest facilities and frequent price fluctuations which affected the commercial cultivations of fruits in Punjab. Study emphasized on adoption of cooperative marketing along with need for sound market intelligence and establishment of processing facilities in the producing regions.

Meena (2012) conducted a study on economic analysis of production and marketing of kinnow in Sriganganagar district of Rajasthan. The study was based on primary data collected from 80 fruit growers and other market intermediaries through personal interview method. The study identified four marketing channels in district viz: Producer- retailer – consumer (channel-I), Producer- wholesaler- retailer- consumer(channel-II), Producer- pre harvest contractor- wholesaler- retailer- consumer (channel-III), and Producer- pre harvest contractor- retailer- consumer (channel-IV). The channel-I was predominant channel in the study area. Total marketing costs were Rs 100.90, Rs 247.85, Rs 280.11 and Rs 132.44 per quintal of kinnow in channel -I, II, III and IV respectively. The producer's share in consumer rupee were 71.86, 59.38, 56.58 and 66.23 per cent in channel -I, II, III and IV respectively. Lack of irrigation facilities, adverse weather conditions, labour shortage, lack of storage facilities, high marketing cost, no timely sale of product and fear of thieves and stray animal were the major constraints faced by farmers in the study area.

Grover *et al* (2013) conducted a study on economic analysis on emerging vis-a-vis traditional marketing channels of kinnow in Ferozepur district of Punjab. The study was based on primary data collected from 45 fruit growers and 15 market intermediaries. The main marketing channel from study area viz: Producer – pre-harvest contractor– commission agent – wholesaler – retailer – consumer was identified as traditional marketing channel (TMC) and direct marketing as the emerging marketing channel (EMC). The study found that when farmers sell their produce through EMC they get 20 per cent higher net price as compare to TMC. The farmer's per cent share in consumer rupee under TMC was only 33.70 per cent while the same in case of EMC was 55 per cent. The study suggested that in order to benefit both producer and consumer, there is need for expansion of such EMC for fruits in organized manner coupled with improved market structure.

Gunwant *et al* (2013) in their study on marketing of sweet orange have identified three marketing channels for marketing of sweet orange in India, namely; Producer- village

level commission/contractor – retailer - consumer (Channel-I), Producer- local retailer-consumer (Channel-II), Producer-cooperative retailer-consumer (Channel-III). The study revealed that the producer's share in consumer rupees was the highest at 70.29 per cent in channel-III followed by channel- II (54.93%) and channel-I (42.45%). Channel –III was the most efficient one with efficiency of 1.89 followed by channel-II with efficiency of 1.15, whereas the channel-I showed the least efficiency (0.69).

Datarkar *et al* (2014) analyzed the production and marketing of mango in Gadchiroli district of Maharashtra. The study identified the only major marketing channel as: Producer-consumer (NGO). The producer's share in consumer rupee was 93.59 per cent. In the total marketing cost (Rs 88.03/qtl) transportation and market fees accounted for 29.07 per cent and 16.40 per cent respectively. Very high fluctuations in mango price and high transportation cost were the main problems faced by the farmers in the study area.

Jagtap *et al* (2014) worked out the price spread of dry chilli in Amravati district of Maharashtra. Two major channels of distribution observed in the market were: Channel-I: Producer- commission agent- Wholesaler- Retailer- Consumer and Channel-II: Producer-Commission agent- Wholesaler- Processor- Consumer. In study area, 62 per cent produce routed through channel- I and 38 per cent produce routed through channel- II. Study revealed that producer's share in consumer rupee was 67.86 per cent and 43.37 per cent in channel-I and II respectively. Channel –I was relatively efficient with low market margin. Lack of Improved crop production technology (67.50%), high cost of manure and fertilizers (66.25%), difficulties in labour availability (63.75) were the main problems of production and price variation (73.75%), lack of storage facility (72.50%), lack of market intelligence(70%) were the main problems of marketing aspects.

Patel *et al* (2015) studied the price spread of ber in Mehsana district of north Gujarat. The study revealed that average yield per farmer and per hectare were 40.68 and 123.27 quintals, respectively. About 80 per cent of produce was sold through channel, Producer - contractor - wholesaler cum commission agents- retailer- consumer. The marketing cost and price spread was Rs 128.86 per quintal and Rs 1045.97 per quintal respectively. Study also showed that marketing efficiency of Mehsana market was 1.46 for ber marketing. Lack of storage facilities, high storage charges, lack of market information, lack of processing units and high transportation cost were the main problems in the marketing of ber in the district.

Tejaswini (2015) conducted a study on production and marketing of acid lime in Vijayapura district of Karnataka. The study identified mainly two channels of marketing of lime that are; Channel-I: Producer– commission agent-cum-wholesaler– distant trader– distant retailer– distant consumer and Channel-II: Producer– commission agent-cum-wholesaler– local retailer– local consumer. More than two third of produce was marketed through channel-II. Marketing cost (Rs 151.97/bag) was higher in Vijayapura market then

Indi market (Rs 119.55/bag). Price spread was higher under channel-I (Rs. 1,023.66 and 1,226.37 in Indi and Vijayapura, respectively) as compared to channel-II (Rs.715.04 and 792.37 per quintal in respective markets). Market price was high and market arrival was less from February to May as compared to other months. High commission charges, lack of irrigation facilities and price fluctuation were the main problems faced by farmers. Establishment of cold storage facilities, production of value added products and establishment of grower's cooperatives were the main recommendations of study.

Farheen *et al* (2017) analyzed the price spread of apple fruits in Baramulla district of J&K state. Five different kinds of marketing channels identified were: Channel I: Producer - whole seller/commission agent - retailer - consumer, Channel II: Producer - pre-harvest contractor - whole seller/commission agent - retailer - consumer, Channel III: Producer - commission agent - whole seller - retailer - consumer, Channel IV: Producer - pre-harvest contractor - commission agent - whole seller-retailer-consumer and Channel V: Producer - post-harvest contractor - commission agent - whole seller - retailer - consumer. Channel I was the major route for apple trade as more than 30 per cent of the farmers produce was marketed through this channel alone and this channel was also observed to be the most efficient one. On the other hand, channel-II was found to be the least efficient in apple marketing system of the study area. Thus, it was observed that producer will get more profit if they sell their product directly to the wholesaler. To enhance the profits of producers and overall efficiency of apple marketing, the study emphasized on the proper collection and dissemination of marketing information, skill development in market management and development of cooperative marketing.

Kaur (2017) studied the production and marketing of green chilli in Jalandhar district of Punjab. The different marketing channels for chilli marketing were identified as, channel – I: Producer -wholesaler- retailer- consumer, channel-II: Producer- retailer-consumer, Channel-III: Producer – consumer. Marketing channel-III was found more efficient because producer's share in consumer rupees was highest with less number of intermediaries. The proportion of consumer's rupee received by producer for channel-I, II, III was 61.96, 72.77 and 98.59 per cent respectively. High transportation cost (77%), non-remunerative prices (67%), high cost of packing material (60%), lack of packing material (46%) and non-availability of market information (27%), were the major problems identified in the marketing of green chilli in Jalandhar market.

Kumar (2017) conducted a study on economic appraisal of kinnow production and its marketing in Sirsa district of Haryana. The study was based on primary data collected from 60 farmers and other market intermediaries. The study identified 4 main marketing channels of kinnow marketing as: Producer- pre harvest contractor- commission agent-wholesaler-retailer- consumer (channel-I), Producer- pre harvest contractor- commission agent- retailer-

consumer(channel-II), Producer- commission agent-retailer- consumer(channel-III), and Producer- consumer(channel-IV). The study revealed that the average per quintal costs at farmer's level were Rs 1120, 1120, 1195.83 and 1215.30 for channel – I, II, III, and IV respectively. Similarly at wholesaler/ commission agent level average per quintal marketing cost was highest in channel –I (Rs. 660.58), followed by channel-II (Rs. 620.92), channel-III (Rs. 532.48) and channel- IV (Rs 252.39). The producer's share in consumer rupee was maximum for channel- IV (82.21 %) followed by channel-III (63.85%), channel-II (58.95) and channel-I (51.28%). The market efficiency values for channel –I, II, III, IV were 1.05, 1.44, 1.77 and 4.82 respectively. The study suggested that with less number of intermediaries the farmers get maximum benefit. The study found that adoption of scientific cultivation practices well developed storage facilities, establishment of processing units in production area would have led to higher returns to farmers.

Sateesh and Indumati (2018) studied marketing of sweet orange in Nalgonda district of Telangana state. The study was based on primary data collected from 90 framers and 40 intermediaries. The main channels for marketing in study area were: Channel-I: Producer-commission agent – wholesaler – retailer – consumer, Channel – II: Producer – wholesaler – commission agent – retailer – consumer, Channel – III: producer – Pre harvest contractor – wholesaler – commission agent – retailer – consumer and Channel – IV: Producer – pre harvest contractor – retailer – consumer. Among the sample farmers, 46.66 per cent farmers were using the channel-I. In this channel, producer's share of consumer rupees and marketing efficiency were highest at 27.19 per cent and 0.39 respectively. Price spread was found to be the maximum in channel-IV (Rs 9594.9/ qtl). High cost of commission agent, labour shortage during harvest, high transportation cost, price fluctuations and low price of produce were the main constraints identified in the study area.

Yadav *et al* (2018) conducted a study on economics of marketing of mango in Lucknow district of Uattar Pradesh. The study identified three main marketing channels in study area as: Producer — commission agent — wholesaler — retailer — consumer (channel-I), Pre-harvest contractor — commission agent — retailer — consumer (channel II) and Pre-harvest contractor – wholesaler – retailer – consumer (channel III). The study revealed that the marketing cost observed in channel I, II, III were Rs 773, Rs 753, and Rs 718 per quintal respectively. The producer's share in consumer rupee was maximum in channel III (78.71%) followed by channel II (78.50%) and channel I (76.77%). Incidence of pests and diseases, high velocity of wind during fruiting period, irregular bearing, lack of technical knowledge, monopoly of pre-harvest contractors, damage because of rotting and transportation related problems were the main constraints faced by the farmers in study area.

Sharma and Guleria (2020) conducted a study on economics of marketing of apple crop and the problems faced by apple growers in Kullu district of Himachal Pradesh. The

study identified 4 main marketing channels in study area as: Producer-wholesaler-retailer-consumer (channel- A), Producer-primary wholesaler - secondary wholesaler-retailer-consumer (channel- B), Producer -pre harvest contractor-primary wholesaler- secondary wholesaler-retailer- consumer (channel-C) and Producer-retailer-consumer (channel-D). The study revealed that maximum disposal (59%) by growers of apple was through channel-B. Comparison between different channels revealed that farmers received the highest share (73.95%) of consumer rupee in channel- D and marketing efficiency has also been found to be highest in this channel (2.84). Lack of skilled labour and good infrastructure were identified as the main constraints faced by apple growers in study area.

2.2 Sources of fruit procurement and capacity utilization of the processing units and problems faced by processing units

Singh (1977) conducted a study on economics of processing of fruits and vegetables in Ludhiana and Jalandhar districts of Punjab. Various costs incurred and market margins were estimated to show the economic viability of the processing industries. Time series analysis was used to examine the behaviour of market arrival and the prices. The study revealed that being perishable nature of fruits and vegetables, insufficient and costly storage facilities were the main reason for the underutilization of the capacity of processing plants. Lack of transportation facilities resulted in wastage of the raw material and thus increasing the costs of processing units. The study showed that due to availability of ample quantity of raw material there was lot of scope for extension of this industry. However, demand of processed fruits was very low and acted as obstacle in expansion of this industry. Lack of adequate and trained staff was also outlined as a serious concern in the growth of fruit and vegetable processing industry.

Chahal and Gill (1985) examined the scope of tomato processing industry in Punjab. Study revealed that seasonal gluts and off seasonal scarcities were main problems in tomato cultivation and the best suggested solution to address these problems was processing and preservation. The study mainly gave attention on the locational rational of processing industries in state. If these industries would had been located at the production centre itself then the wastage and other losses of transportation could had been minimized. In case of highly perishable commodity like tomato, the required special type of transportation system for further transportation lead to increase in cost of processing industries and also causes high amount of losses during transit. The study stressed upon the need of establishment of processing industries in the hinterlands of production centres.

Singh (1992) conducted a study to examine the problems of fruit processing industries in Punjab. Personal interview method was used for collecting the primary data from sample market committees, fruit processing units, and the farmers. The study brought out that only1.53 per cent of annual market arrival of fruits was used by the processing units. The

procurement of raw material from farmers, local market and distant markets was 9.07, 2.63 and 88.30 respectively. Only 2.87 per cent of total fruit production of sample district was utilized by processing industries where as processing capacity remained highly underutilized at only 23.75 per cent. Kinnow was the main fruit of the sample district and 70 per cent of marketing of kinnow was through the pre-harvest contract method. The processing firms were facing many problems; lack of cold storage facilities and insufficient transportation facilities being the major ones. On the other hand fruit growers faced the problems of inadequate irrigation facilities and breach of contract by the contractors. The study also pointed out that location of processing industries was irrational as most of the processing units were located in those areas and districts where production of fruits was low. The study stressed upon the development of infrastructure and encouraging the establishment of new processing units in the producing area only along with proper policies to provide stability in prices and incomes of farmers and industry.

Subrahmanyam (1995) examined the role of fruit and vegetable industries in economy. The study found that majority of fruit and vegetable processing industries were of home scale .The number of licensed processing units were 3846 with annual capacity of 8.94 lakh tonnes and only 40 per cent of this capacity was utilized. Due to this fact only 1 per cent of total production of fruits and vegetables production in country was being utilized for the processing purpose. Nearly 30 per cent of the total production of fruits and vegetables was lost resulting into loss to the tune of nearly Rs 5000 crores. Major constraints faced by processing industry were the non-availability of suitable varieties for processing, high cost of raw material, long marketing channels and higher rate of commission. The study emphasized on implementation of procurement policy of fruits and vegetables at reasonable prices and on intermediate products processing at production centres.

Sinha *et al* (2003) conducted a study to analyze the challenges and prospectus of development of fruit processing industries in Bihar. Study revealed that unavailability of appropriate raw material at reasonable price along with unavailability of proper grading and packing material were the major problems of processing industries. The reason behind this fact was the lack of proper linkage in farmers and processing industry. Lack of proper backward market (raw material supply) and forward (market) linkage, lack of proper harvesting method and storage facilities were the other problem being faced by the processing industries.

Bhagyalaxmi (2005) conducted a study to analyze the economics of processing and marketing of mango in Chittoor district of Andhra Pradesh. The study was based on primary data collected from 60 farmers and 12 processing units with the help of pre- tested schedule. The selected processing units were categorized in 6 different categories viz: small scale canning units with pre contract system (category-I), small scale canning units with owned

processing (category-II), medium scale canning units with owned processing (category-III), small scale aseptic packing units with owned processing (category-IV), medium scale aseptic packing units with pre contracting packing system (category-V), and medium scale aseptic packing units with owned processing units (category- VI). The study revealed that cost incurred per ton of mango processing for category-I, II, III, IV, V and VI were Rs 1916.85, 19028.86, 18943.26, 21982.96, 4102.5 and 21999 respectively. The break-even output was lowest in category VI (788 tonnes), followed by category II (839 tonnes) and category I (829 tonnes). The margin of safety was higher in category III (3777 tonnes) followed by category – VI (1712 tonnes) and IV (1489 tonnes). The study also highlighted some facts in processing of mango in study area like: the aggregate investment of units were Rs 490 million, aggregate capacity of processing were 2000 tonnes per day, and plants work only 65 to 110 days in a year because of seasonal availability of raw material. About 0.8 to 1 lakh tonnes of pulp obtained with 1.3 to 2 lakh mango and estimated value of this pulp were Rs 170 to 190 crores per annum. High spoilage, lack of skilled labour, underutilization of plants, lack of export market and less foreign earnings were the constraints faced by processing units in the study area.

Kumar (2006) studied the various aspects of post-harvest management and processing of agricultural products in Haryana. The study was based on secondary data from various published sources, whereas the primary data were collected from 10 each of flour mill, rice mill, dal mill, and cotton mills operating in Fatehabad and Karnal district of Haryana. Fibre, food preservation and khadhi industries showed positive growth while cereals and pulses, village ghani oil industries and gur and khandsari industries showed negative growth rate. The study revealed that all five major industries were found economically viable as benefit cost ratio was more than one, but the utilization capacity was well below 50 per cent. Lack of adequate power supply, obsolete machinery and out dated technology were the main reasons behind the underutilization of the installed capacity. Difficulties in getting license, lack of quality control, high taxation, and lack of cold chain, were the other problems faced by processing industries. Study emphasized on need for improvement in power supply, relaxation in taxes, and development of infrastructure for the development of these industries in the state.

Reddy (2010) conducted a study to assess the status and feasibility of mango processing plants in Chittor district of Andhra Pradesh. The study revealed that there was spurt in growth of mango processing firms during the decade of 1980s and 2000s. Out of total firms in district 28 per cent firms were medium and large and 72 per cent constituted small scale firms. The quantity of mango export increased at almost double rate but its value increment was around 10 per cent only and mango pulp export recorded more than 7 time increase both in quantity and value terms. Both backward and forward linkages were present

for existing processing industry in the district. The common linkages of mango processing industry are: i) Producer-pre-harvest contractor-regulated markets-processor, ii) Producer-regulated market-processor, iii) Producer-processor, iv) Distant wholesale market-processor, v) Producer-village trader- processor, and vi) Producer-unregulated market-processor. The Investment ranged from 2 corer (small) firms to 15 corers (large firm). Study revealed that NPV ratio was higher for large firms and IRR ratio was higher for small firms. Inadequate supply of power and labour, high cost of credit and labour, inadequate supply of raw materials other than mango, wide variability and fluctuation in demand of mango pulp both in international and domestic market, were identified as the major constraints faced by the processing plants in the study area.

Bhattacharyya (2013) examined the prospectus and various problems of fruit and vegetable processing industries in Kamrup district of Assam. The study was based on the secondary and empirical data, and multistage sampling techniques were used to select 30 fruit and vegetables processing units. The study revealed that these industries were facing problems regarding proper government policies, underdeveloped infrastructure, unavailability of raw material, and lack of finance and power shortage. The study suggested that Government should initiate awareness rising program along with carrying out the SWOT analysis of entrepreneurs before setting the processing industries. Timely availability of local fruits and vegetables, power, labourers, packaging materials, soft water etc. may brighten the scope of development of these industries.

Mehta (2014) analyzed the processing and marketing of litchi-based value added products in Bihar. The study was based on primary data collected from 60 farmers, 5 processors and 55 consumers from different blocks of Muzaffarpur district. Study revealed that 83 per cent of produce was sold by farmers in the local market only and the commission agents were the main source for procurement of raw materials accounting for 91 per cent of total raw material supply to the processers. Quality, better taste and attractive prices were the main factors influencing consumer's preference. The study suggested that processing industries should be established in litchi producing belt of Muzaffarpur district. Public private partnership mode should apply for diversification of processed products like juice, jam, nectar, pulp, beverage, jelly etc.

Shukla *et al* (2015) analysed the economics of mango pulp processing in south Gujarat. The study was based on primary data collected from 10 processors of Navsari, Valsad, and Surat. The study revealed that 80 per cent of sampled units got 50 to 100 per cent business from mango pulp. About 70 per cent of manufacturers sold their mango pulp to the food processors, mango juice processors, ice cream manufacturers and lassi points. About 90 per cent of raw mangoes were procured directly from farmers followed by market yards, traders and commission agents. Investment ranged from 32.5 lakhs to 14 crores and value of

rate on return on investment for large, medium and small firms was 0.14, 0.13 and 0.10 respectively. The study revealed that large scale firms were more efficient but mango pulp production business was profitable at all levels of scale of production.

Rais and Sheron (2015) studied the opportunity and scope of supply chain management of the fruit and vegetables in India. According to study, the post-harvest losses accounted for 25 to 30 per cent of total production of fruit and vegetables in country. Perishability, seasonality and bulkiness were the main reason for post-harvest wastage of fruits and vegetables. In country, there were around 6,300 cold storage units, with a capacity of 30.11 million tonnes and almost 60 per cent of the total cold storage units were located in Uttar Pradesh, West Bengal, Punjab and Gujarat. Lack of integration of public private system, lack of technology application, lack of demand estimation and presence of unorganized retailers were the main problems of expansion of these industries.

Chuodhary (2019) studied the marketing and processing of papaya in Jaipur district. The study based on primary and secondary data, revealed that in marketing processor account major share of cost (88.82%) and wholesaler account minor share (11.12%). Time elements alone explained 50.53 per cent variation in prices and June month show highest arrival of papaya in mandi. The average processing cost of processing was Rs. 85.86 per kilogram. Positive NPW and BCR more than unity showed that investment in processing of papaya was profitable and financially feasible. Major constraints faced by both seller and processer were high transport charges, high rental value, high cost of power, scarcity of labour and inadequate supply of raw materials.

It may be concluded that in past although lot of studies have been conducted in area of fruit marketing but still research is needed to understand the problems faced by farmers and other intermediaries so that feasible solution can be suggested. Though some of the studies analysed the problems faced by processing industries in various part of county, but no such literature is available in this regard in the Punjab state during the recent past. This study is therefore, an attempt to fill up such information gap existing in the literature on the subject under study.

CHAPTER-III

METARIALS AND METHODS

The quality of research depends upon the materials and methodology adopted to carry out it. It explains the steps adopted by the researchers to study the research problem along with logics behind them. This chapter deals with frame work adopted in selection of study area, collection of data, and analytical framework used to achieve the objectives of present study. The chapter is constructed under the following sub heads:

3.1) Methodological frame work

3.2) Details of data collection

3.3) Statistical analysis of data

3.1) Methodological frame work

Locale of the study

In order to accomplish the stipulated objectives, the present study has been conducted in the Punjab state during the year 2019-20.

Selection of districts, blocks, and villages

Multistage sampling technique was used to select primary respondents viz: fruit growers. At first stage two districts viz: Hoshiarpur and Fazilka with highest area under cultivation of fruits were selected purposively. Block wise data on area under fruits cultivation in the selected districts were obtained from the Department of Horticulture, Punjab. At second stage one block each from both of the selected districts with the highest area under fruits was chosen (Table 3.1.1). Village-wise list with area under fruits for selected block was arranged from the block offices of Department of Horticulture, Punjab. From this list, 4 villages (2 from each selected block) were selected on basis of probability proportions to the area under fruits as shown in Table 3.1.1.

Table 3.1.1 Distribution of selected villages

State	Districts	Blocks	Villages
Punjab	Hoshiarpur	Bhunga	Bairampur
			Darapur
	Fazilka	Abohar	Ramsara
			Kularan

Selection of respondents

A complete list of fruit growers along with area under fruits cultivation in the selected villages were obtained from respective block offices of the Department of Horticulture, Punjab. These fruit growers were arranged in ascending order with respect to area under fruits. By using cumulative cube – root frequency method, fruit growers were categorized into three groups viz: small (up to 4.14 acres), medium (4.14 to 7.47 acres) and large (above 7.47 acres). Using probability proportional allocation method, total 60 farmers (15 from each selected village) were selected randomly from each category in proportion to

their number falling in the respective size group. The category wise number of farmers selected is presented in Table 3.1.2.

Table 3.1.2 Distribution of fruit growers

Farm category	Blocks		Total number of selected growers
	Bhunga	Abohar	
Small (up to 4.14 acres)	18	16	34
Medium (4.14- 7.47 acres)	7	9	16
Large (above 7.47 acres)	5	5	10
Overall	**30**	**30**	**60**

Selection of markets

To analyse the price spread, marketing margins, and marketing cost, the two regulated market i.e. Hoshiarpur and Abohar were selected on the basis of highest market arrival of the selected districts. In addition, Ludhiana fruit market representing the major fruit consuming centre of state was also selected. From the selected fruit producing areas, 10 pre-harvest contractors were selected randomly. Further, from each of three sample markets, 5 wholesalers/commission agents and 5 retailers were also selected randomly. Thus sample consists of total 10 pre-harvest contractors, 15 wholesalers/commission agents and 15 retailers to study the marketing aspects of fruits in the state.

Selection of fruit processing units

District-wise list of licensed fruit processing units was obtained from the District Industrial Centre of Hoshiarpur, Fazilka and Ludhiana. From this list, 6 fruit processing units representing the sample fruit producing and consuming centres were selected randomly. Based on the investment cost the selected processing units were categorized in to three groups viz: micro (Up to 25 lakhs), small (25 lakhs to 5 crores) and medium (Above 5 crores).

Table 3.1.3 Distribution of selected processing units

Category of unit	Investment cost	No. of selected units
Micro	Up to 25 lakhs	3
Small	25 lakhs to 5 crores	2
Medium	Above 5 crores	1
Total		**6**

3.2) Details of data collection

Construction of interview schedule

In order to accomplish the objectives of the study an interview schedule was constructed to record the observations from the selected respondents. The separate interview

schedules were prepared for selected farmers, intermediaries and the processing units. Pre - testing of the schedule was done before starting the data collection in the study area. Some ambiguous undesirable questions were modified and deleted. Certain important questions that emerged during pre -testing were also included in the final schedule.

Collection of data

The current study relies on both primary and secondary data sources. The data on area, production, productivity of total fruits in the state were obtained from various issues of the *Statistical Abstract of Punjab*. District- wise data on area, production, and productivity of major fruits were also obtained from the same source of information.

The personal interview method was used for the collection of primary data. The relevant information related to the socio-economic characteristics like age, education, family size, occupational status, along with operational land holding size, cropping pattern etc. were collected from the selected fruit growers. The data regarding fruit production, marketed surplus, method of disposal of output, price received, marketing costs incurred, problems faced, etc. have also been collected from the sample farmers. Similarly, information on quantities transacted, marketing costs, prices paid and prices received have been collected from various sample market intermediaries like pre harvest contractors, wholesalers, and retailers. The information regarding various products prepared from the various fruits, raw material utilized, sources of procurement, prices paid for fruits, processing capacity and its utilization and the problems faced have been collected from the sample processing units through personal interview method.

3.3) Statistical analysis of data

The responses of the respondents were transferred on the excel sheet and were tabulated according to objectives of the study. The data were analysed by using appropriate statistical tools as per the specific objectives of the study. In data analysis the descriptive statistical tools viz: frequency, percentage, cumulative cube root method and mean score were used along with the following methods:

3.3.1) Compound growth rate

The overtime data regarding area, production, and productivity of total fruits from year 2000-01 to 2019-20 in Punjab were used to analyse the growth performance of fruits in the state. The growth rates can be specified as the percentage change of a particular variable within a given period of time. The compound annual growth rates (CAGR's) of area, production and productivity of total fruits in the state worked out with following growth model:

$$Y_t = AB^t$$

Where,

Y_t = Area/production/productivity of total fruit for the year 't'.

t = Time variable (1, 2……., n) for each period.

A = Constant

B = Growth co-efficient

Log transformation of above function is:

$\ln Y_t = \ln A + t (\ln B)$.

Where,

$\ln B = \ln (1+t)$, and

t = [antilog (ln B) – 1]

CAGR (%) = [antilog (ln B) -1] × 100

3.3.2) Marketed surplus

Marketed surplus is that quantity of the produce which can be made available to the non-farm population. Marketed surplus is the residual left with the producer after meeting his requirement for home consumption, given free to the neighbours, and other disposal. This may be expressed as:

$$MS = P – C$$

Where,

MS = Marketed surplus

P = Total Production

C = Total requirement (Home consumption, given free to the neighbours, and other disposal).

3.3.3) Marketing pattern of fruits

Information about marketing pattern/ marketing cost and prices of fruits collected from the sample fruit growers and marketing agencies involved in marketing of fruits were analyzed to identify the marketing channels along with margins, cost, and efficiency with respect to the each channel.

Marketing margins and costs

Market margin the profit of the various marketing functionaries was calculated by subtracting the purchase price and marketing cost from the sale of market functionaries as following:

$$A_{mi} = P_{ri} – (P_{pi} + C_{mi})$$

Where,

A_{mi} = Absolute margin of the ith middlemen

P_{ri} = Total value of receipts per unit (sale price)

P_{pi} = Purchase value of goods per unit (purchase price)

C_{mi} = Cost incurred on marketing per unit

Marketing efficiency

The marketing efficiency was calculated by using Acharya's method (Acharya and

Agarwal, 2011) as following:

MME = FP ÷ (MC+MM)

Where,

MME = Marketing efficiency

FP = Price received by farmer

MC = Total marketing costs

MM = Net marketing margins of intermediaries

Price Spread

Price spread refers to the difference between price paid by the consumer and price received by the producer for a unit quantity of farm produce. It consists of marketing costs and margins of the intermediaries.

$$\text{Price spread} = Pc - Pf$$

Where,

Pc = price paid by the consumer

Pf = price received by the producer

Producer's share in consumer rupee

It is the price received by the farmer as a percentage in the consumer's price.

$$P_{s=} \frac{P_f}{Pc} * 100$$

Where,

P_S = Producer's share in consumer's rupee,

$P_{f=}$ Price of the produce received by the farmer,

P_C = Price of the produce paid by the consumer

3.3.4) Chi- square test

In the process of production and marketing of major fruits farmers faced many problems. The identified problems were get ranked from the respondents on 5 point scale of severity (1= no problem, 2= low problem, 3= medium problem, 4= severe problem and 5 = very severe problem). The percentage of farmers showing different severity level of problem was tabulated. The significance difference between all five categories of severity level was calculated by using Chi-square test at 5 per cent level of significance.

$$\chi^2 = \Sigma \frac{(O_i - E_i)^2}{E_i}$$

Where,

χ^2 = Chi- square value

O_i = Observed value

E_i = Expected value

CHAPTER-IV

RESULTS AND DISCUSSION

This chapter presents the results and discussion based on analysis and interpretation of both primary and secondary data. Each section presents a detailed account of the results of the study and gives an analytical view of these results by discussing various dimensions. Keeping in view the specific objectives of study, the results have been presented under the following sections:

Section 4.1: Area, production, and productivity of fruits in Punjab

Section 4.2: Socio- economic profile of fruit growers

Section 4.3: Marketable surplus, marketing channels and price spread

Section 4.4: Source of fruit procurement and capacity utilization of fruit processing units

Section 4.5: Problems faced by fruit growers and processing units

SECTION 4.1: AREA, PRODUCTION, AND PRODUCTIVITY OF FRUITS IN PUNJAB

In this section an attempt has been made to evaluate the growth performance of fruits in the Punjab. For this compound annual growth rate (CAGR) were calculated over a period of 2000-01 to 2019-20. District- wise percentage share under total fruits and percentage share of different fruits in total area and production respectively were also worked out.

4.1.1: Trends in area, production, and productivity of fruits in Punjab

The trends in area, production and productivity of total fruits in Punjab during last two decades with their compound annual growth rate (CAGR) are presented in Table 4.1.1. Overtime area under fruits in state has been increased steadily with significant CAGR of 4.95 per cent from 34.21 thousand hectares in 2000-01 to 90.47 thousand hectares in 2019-20. It has also been noticed that the total fruit production increased consistently with CAGR of 7.93 per cent from 479.66 thousand metric tonnes in 2000-01 to 1972.38 thousand metric tonnes in 2019-20. The overall productivity of total fruits in state in last two decades has also shown as increasing trend with 2.85 per cent CAGR. The productivity of fruits which was observed to be 14.02 tonnes per hectare during 2000-01 increased consistently overtime to 21.80 tonnes per hectare in 2019-20. The overall growth rates of area, production and productivity of total fruits have been found to be statistically significant in state at one per cent level of significance. The relative contribution of area in growth of fruit production was higher when compare to productivity.

Table 4.1.1 Trends in area, production, productivity of fruits in Punjab, 2000-01 to 2019-20

S. No.	Year	Area (000'Ha.)	Production (000'M. Ton)	Productivity (Ton/Ha.)
1.	2000-01	34.21	479.66	14.02
2.	2001-02	37.51	531.72	14.18
3.	2002-03	40.49	578.45	14.29
4.	2003-04	43.72	628.17	14.37
5.	2004-05	47.09	679.54	14.43
6.	2005-06	51.64	746.33	14.45
7.	2006-07	57.31	830.58	14.49
8.	2007-08	61.62	1055.41	17.13
9.	2008-09	64.80	1182.88	18.25
10	2009-10	67.55	1365.06	20.21
11.	2010-11	69.81	1373.17	19.67
12.	2011-12	71.41	1419.86	19.88
13.	2012-13	74.90	1502.52	20.06
14.	2013-14	76.59	1541.24	20.12
15.	2014-15	77.75	1644.64	21.15
16.	2015-16	79.09	1657.46	20.96
17.	2016-17	80.08	1700.46	21.23
18.	2017-18	83.66	1784.58	21.33
19.	2018-19	86.77	1856.84	21.40
20.	2019-20	90.47	1972.38	21.80
	CAGR	**4.95*****	**7.93*** **	**2.85*** **

Note: CAGR is significant at 1 per cent level of significance

4.1.2 District-wise area, production and productivity of fruits in Punjab

The tri-annum averages (2017-18 to 2019-20) were calculated in order to present the percentage share of different districts in total area and production as well as relative productivity of fruits in the state and the same have been presented in the Table 4.1.2. The data shows that average area of total fruits during tri-annum ending 2019-20 was 86966.67 hectare. The Fazilka and Hoshiarpur are the major fruit producing districts in state with area of 34861.67 and 8596 hectares respectively. Fazilka ranked one with 40.09 per cent share of area under total fruits followed by Hoshiarpur (9.88%), Shri Muktsar Sahib (8.57%), Bhatinda (5.91%), and Pathankot (5.18%).

The average production of total fruits during TE 2019-20 was 1871271.33 metric tonnes. The data showed that Fazilka and Hoshiarpur are the major fruits producing districts

in state with production of 814514.67 metric tonnes and 181875.67 metric tonnes respectively. Fazilka the leading fruit producing district of state contributed 43.53 per cent of the total fruit production of Punjab. Other important fruit producing districts viz: Hoshiarpur, Shri Muktsar Sahib, Bhatinda and Pathankot accounted for 9.72, 9.10, 6.11, and 4.31 per cent of total fruit produced in the state during TE 2019-20, respectively.

Table 4.1.2 District –wise area, production, and productivity of fruits in Punjab, tri-annum average, 2017-18 to 2019-2020

S. No.	Name of district	Area		Production		Productivity (Ton/ Ha.)
		Area (Ha.)	% share	Production (M. Ton)	% share	
1.	Gurdaspur	1143	1.31	21047.67	1.12	18.41
2.	Pathankot	4508.67	5.18	80648.33	4.31	17.89
3.	Amritsar	2043.33	2.35	41690.67	2.23	20.40
4.	Tarn Taran	1842.33	2.12	38781	2.07	21.05
5.	Kapurthala	362	0.42	6974	0.37	19.27
6.	Jalandhar	2046.33	2.35	41103.67	2.20	20.09
7.	S.B.S Nagar	1632.33	1.88	29323.33	1.57	17.96
8.	Hoshiarpur	8596	9.88	181875.67	9.72	21.16
9.	Rupnagar	3130.67	3.60	55485	2.97	17.72
10.	S.A.S Nagar	2695.67	3.10	48222.67	2.58	17.89
11.	Ludhiana	2867	3.30	56479	3.02	19.70
12.	Firozpur	411.67	0.47	8772	0.47	21.31
13.	Fazilka	34861.67	40.09	814514.67	43.53	23.36
14.	Faridkot	1442.33	1.66	30255.33	1.62	20.98
15.	Shri Muktsar Sahib	7455.67	8.57	170274.33	9.10	22.84
16.	Moga	449	0.52	13508	0.72	30.08
17.	Bathinda	5143.33	5.91	114352.33	6.11	22.23
18.	Mansa	996.67	1.15	21643.33	1.16	21.72
19.	Sangrur	1802	2.07	34474.33	1.84	19.13
20.	Barnala	297.33	0.34	5844	0.31	19.65
21.	Patiala	2614.67	3.01	47758.67	2.55	18.27
22.	Fatehgarh sahib	625	0.72	11483.67	0.61	18.37
	Total	**86966.67**	**100.00**	**1871271.33**	**100.00**	**21.52**

The average productivity of total fruits in state during TE 2019-20 was 21.52 tonnes per hectare. Moga district showed the highest level of productivity with 30.08 tonnes per hectare. Fazilka and Shri Muktsar Sahib stood second and third position in productivity of total fruits in state with 23.36 and 22.84 tonnes per hectare respectively. Bhatinda and

Pathankot the other important fruit producing districts of the state had the productivity level of 22.23 and 17.89 tonnes per hectare respectively.

4.1.3 Area, Production and Productivity of different fruits in Punjab

The data presented in Table 4.1.3 revealed that kinnow with area of 54243 hectares and 59.96 per cent share in total area of fruits in state is the leading fruit in the state. It is followed by guava and mango with area of 9645 hectares (10.66%) and 7012 hectares (7.75%). Other major fruits being produced are pear, malta & orange, and litchi with respective contribution of 3.87, 3.45, and 3.38 per cent in total fruit area of the state. With respect to production, kinnow is the leading fruit with 1328996 metric tonnes of production and 67.38 per cent contribution towards the total production of fruits in the state. It is followed by guava, mango, pear, and litchi with respective contribution of 11.04, 6.02, 4.15 and 2.54 per cent in total fruit production during 2019-20.

Table 4.1.3 Area, production and productivity of different fruits in Punjab, 2019-20

S. No.	Name of the fruit	Area		Production		Productivity (Ton/Ha.)
		Area (Ha.)	% share	Production (M. Ton)	% share	
1	Kinnow	54243	59.96	1328996	67.38	24.50
2	Malta & orange	3118	3.45	26919	1.36	8.63
3	Lemon	1245	1.38	9654	0.49	7.75
4	Mango	7012	7.75	118783	6.02	16.94
5	Litchi	3057	3.38	50091	2.54	16.39
6	Guava	9645	10.66	217738	11.04	22.58
7	Pear	3501	3.87	81892	4.15	23.39
8	Peach	1979	2.19	35406	1.80	17.89
9	Plum	337	0.37	5891	0.30	17.48
10	Grapes	280	0.31	8451	0.43	30.18
11	Ber	1632	1.80	27553	1.40	16.88
12	Amla	606	0.67	8912	0.45	14.71
13	Banana	100	0.11	5679	0.29	56.79
14	Others	3711	4.10	46414	2.35	12.51
	Total	**90466**	**100**	**1972380**	**100.00**	**21.80**

The productivity of total fruits during 2019-20 was 21.80 tonnes per hectare. The banana productivity was found to be highest at 56.79 tonnes per hectare, followed by grapes, kinnow, pear, and guava with 30.18, 24.50, 23.39 and 22.58 tonnes per hectare, respectively.

SECTION 4.2: SOCIO- ECONOMIC PROFILE OF FRUIT GROWERS

The cultivation of fruits is a specialized operation in farming that is different from the

cultivating of traditional crops such as cultivation of wheat, paddy and cotton in the state. Therefore, the knowledge of socio-economic profile of sample farmers is important to provide guidance in identification of potential of fruit growers. The distributions of sample fruit grower according to their socio- economic profile viz: age, education level, family size, occupation, operation land holding and fruit area etc, have been presented and discussed as under:

4.2.1 Age

The data presented in Table 4.2.1 indicate that the age of sample farmers varied from 25 years to more than 55 years. The majority of farmers (45 %) were in middle age group of 41 to 55 years. About 32 per cent farmers were in young age group of 25 to 40 years. The old age group farmers (above 55 year) constituted 23.33 per cent of total fruit growing farmers in the study area.

Table 4.2.1 Distribution of sample farmers w.r.t. age, education level, family size and occupation

S. No.	Characteristics	Category	Frequency	Percentage
1.	Age (years)	Young (25-40)	19	31.67
		Middle (41-55)	27	45
		Old (>55)	14	23.33
2.	Education level	Illiterate	1	1.67
		Primary	2	3.33
		Middle	2	3.33
		Matric	15	25
		Higher Secondary	16	26.67
		Graduate	19	31.67
		Post graduate	5	8.33
3.	Family size (No.)	Up to 5	40	66.67
		More than 5	20	33.33
4.	Occupation	Farming only	52	86.67
		Farming + other occupation	8	13.33

4.2.2 Education level

The education level of farmers in study area ranged from illiterate to post graduate level (Table 4.2.1). Majority of fruit growers (31.67 %) were having graduate level of education. About 27 per cent had education of higher secondary level, while 8.33 per cent were post graduate. About 25 per cent of fruit growers had education of matric level and

remaining 6.66 per cent of total fruits growers were having education of primary to middle level (8th standard). Only 1.67 per cent of farmers were found to be illiterate.

4.2.3 Family size

The family size of fruit growers were categorized in two groups as up to 5 and more than 5 family members. The majority of fruit growers (66.67 %) had family size up to 5 members and about 33.33 per cent of fruit growers had family of more than 5 members.

4.2.3 Occupation

The fruit growers of the study area are not only doing farming as their livelihood but some of them having secondary occupations such as government / private service, trade etc. The sample fruit growers were categorized in two categories viz: with farming as only occupation and farming plus supplementary occupation. The majority of fruit growers (86.67 %) had farming as their only occupation and about 13.33 per cent of fruit growers were having some subsidiary occupations along with farming in the study area.

4.2.4 Operational land holding

The total operational land holding of sample fruit growers was 12.52 acres per farm which constituted 77.14 per cent owned and 22.86 per cent of the leased in land (Table 4.2.2). Category wise small, medium and large farmers were having operational area of 4.82, 8.86 and 23.87 acres per farm, respectively. Further, the proportional share of leased in area in total per farm operational area revealed a direct relationship with size of farm. The leased in area constituted 15.77, 16.24 and 27.84 per cent of the operational area on small, medium and large farms respectively

Table 4.2.2 Operational land holding of sample farmers

(Acre/farm)

S. No.	Category of farmers	Owned and managed land	Leased – in	Total operational land	Leased-out	Average rental value (Rs./acre)
1.	Small	4.06 (84.23)	0.76 (15.77)	4.82 (100)	0.33	27480
2.	Medium	7.42 (83.74)	1.44 (16.24)	8.86 (100)	0.72	29180
3.	Large	17.48 (72.15)	6.39 (27.84)	23.87 (100)	1.25	32500
	Average	**9.65 (77.14)**	**2.86 (22.86)**	**12.52 (100)**	**0.76**	**29720**

Note: Figures in parentheses are percentage of total operational land

In study area the average rental value of land was Rs 29720 per acre. The highest rental value of land in study area was recorded for large farms with Rs 32500 per acre, followed by medium and small with Rs 29180 and Rs 27480 per acre respectively. The reason

for relative high rental value of land on large farm size categories was on account of relatively better access to irrigation infrastructure / facilities.

4.2.5 Area under different crops/fruits on sample farms

For the allocation of available resources in most efficient way as well as to meet the family / farm needs, the farmers adopt different type of cropping enterprises. The farmers in study area had grown kharif, rabi, summer/zaid and fruit crops in the land available to them. It was observed that on average the sample farmers had put their 71.88 per cent (8.82 acres) of operational area under different fruits. Another 28.11 per cent (3.60 acres) of the operational land was devoted towards the cultivation of seasonal/ traditional crops (Table 4.2.3).

Table 4.2.3 Area under different crops on sample farms

(Acre /farm)

S. No.	Season/ Crop	Area	
		(Area in acres)	% share in operational area
1.	Seasonal crops	3.60	28.11
2.	Fruits	8.92	71.89
	Total	**12.52**	**100.00**

As data shown in Table 4.2.4, the average per farm area under different fruits was 8.92 acres. The kinnow was found to be the major fruit in study region with per farm area of 7.81 acres which accounted for about 88 per cent of the total area under fruits. Malta was second most important fruit crops with 1.02 acres per farm (11.44 per cent). The other fruits constituted only 1.01 per cent of total fruit area on study farms.

Table 4.2.4 Area under different fruits on sample farms

(Acre/farm)

S. No.	Fruit name	Area	
		(Area in acres)	% share in area under fruits
1.	Kinnow	7.81	87.55
2.	Malta	1.02	11.44
3.	Other fruits	0.09	1.01
	Total	**8.92**	**100**

SECTION 4.3: MARKETED SURPLUS, MARKETING CHANNELS AND PRICE SPREAD

In this section an attempt has been made to evaluate marketing aspects of major fruits viz: Kinnow and malta being produced by the sample farmers. Marketing aspects includes marketed surplus, disposal pattern of fruits, price spread in different marketing channels along

with farmer's share in consumer rupee, market margin and cost of market intermediaries, and marketing efficiency. The details of each of these aspects have been discussed as under:

4.3.1 Marketed surplus

In country like India where majority of farmers are small and marginal category, the marketed surplus plays a significant role for acceleration of the economic development. Under normal conditions, a producer would market or sell that portion of the produce which is over and above his farms and family consumption requirement. Marketable surplus depends on land holding size, yield per hectare, family size, relation of farmers with neighbours/ relatives and price of fruit in current season (Acharya and Agarwal 2011). Marketed surplus of fruits is the part of produce that is actually sold in the market. The marketable surplus of kinnow and malta was arrived at by deducting the quantity of kinnow and malta used as home consumption that include consumption at home, given free as gifts to neighbours and relatives and other forms of consumption from total production of these fruits on the farm. Due to highly perishable nature of kinnow and malta and lack of adequate cold storage facilities at farm level, it is difficult to store these for longer period. Therefore, there was no difference in marketable and marketed surplus of kinnow and malta.

The data regarding per farm production, home consumption and marketed surplus of kinnow in the study area during the year 2019-2020 has been presented in Table 4.3.1. The perusal of table indicated that average home consumption of kinnow accounted for only 1.80 per cent (13.85 qtl.) out of total per farm kinnow production of 770.28 quintals. The large category of kinnow growers were found to have the proportionally the largest level of marketed surplus (98.50 %) followed by medium and small categories with marketed surplus of 97.93 and 97.25 per cent respectively. The total consumption in absolute terms was also higher in case of large farmers i.e. 21.28 quintals as compared to 12.75 on medium category and 7.52 quintals on small category of farms. Contrarily, in percentage term the total consumption of kinnow was the highest on small farms i.e. 2.75 per cent of the total production followed by medium farmers (2.07 %) and large farmers (1.50 %). The study carried out by Kaur (2009) also reported that the proportional quantity of marketed surplus and home consumption varied directly and inversely with the orchard size respectively.

For the malta, the average marketed surplus and home consumption constituted 96.06 per cent and 3.94 per cent of the total per farm production (Table 4.3.1). The total per farm consumption in absolute terms for malta was found high in case of large farmers i.e. 7.12 quintals as compared to 3.77 for medium category and 2.65 quintals for small category of farmers. However in percentage term, the total consumption of malta was highest for small farmers i.e. 4.26 per cent of total production followed by medium farmers (3.63 %) and large farmers (3.51%). On the other hand, the proportionate and absolute quantity of marketed surplus of malta showed direct relationship with the size of orchard as it constituted 95.74 per

cent (59.74 qtls), 96.37 per cent (99.49 qtls) and 96.49 per cent (171.48 qtls) of its total production on small, medium and large farms respectively. The results are in conformity with the findings of Kaur and Singla (2016).

Table 4.3.1 Marketed surplus of kinnow and malta on different category of sample farmers

(Qtl/ farm)

S. No.	Farm size classification	Kinnow			Malta		
		Production	**Home consumption**	**Marketed surplus**	**Production**	**Home consumption**	**Marketed surplus**
1.	Small	273.00 (100)	7.52 (2.75)	265.49 (97.25)	62.11 (100)	2.65 (4.26)	59.45 (95.74)
2.	Medium	615.45 (100)	12.75 (2.07)	602.71 (97.93)	103.25 (100)	3.77 (3.63)	99.49 (96.37)
3.	Large	1422.40 (100)	21.28 (1.50)	1401.13 (98.50)	178.60 (100)	7.12 (3.51)	171.48 (96.49)
	Average	**770.28 (100)**	**13.85 (1.80)**	**756.44 (98.20)**	**114.65 (100)**	**4.51 (3.94)**	**110.14 (96.06)**

(Figures in parentheses are percentage of total production.)

(Home consumption includes at home, given free as gifts and other consumption)

4.3.2 Disposal pattern of kinnow and malta

It has been observed that the kinnow orchards are either leased out to pre harvest contractors or retained by farmers for marketing themselves (Grover *et al* 2013). Table 4.3.2 reveals that sale to pre harvest contractors was the predominant disposal pattern adopted by 46 fruit growers constituting nearly 77 per cent of total sample in study area.

Table 4.3.2 No. of farmers adopting different pattern of fruit disposal

(Multiple response)

S. No.	Channels	No. of farmers	Percentage share
1.	Sale to the pre- harvest contractor	46	76.67
2.	Sale in the local market	22	36.67
3.	Sale in distant market in state	10	16.67
4.	Sale in distant market outside state	2	3.33
5.	Sale to processing units	7	11.67

About 37 per cent (22) fruit growers disposed their fruits in local markets where as 16.67 per cent (10) farmers had also chosen distant markets with in state for disposal of their

output. Only 11.67 per cent (7) fruit growers sold their fruit output to the fruit processing units directly. A very negligible number of farmers (2) also opted for distant markets falling out of the state for disposal of part of their fruit production. About 51 per cent (383.36 quintals per farm) of kinnow and 68 per cent (75.41 quintals per farm) of malta was estimated part of the production (marketed surplus) on the leased out orchards to the pre harvest contractors. The data shown in Table 4.3.3 present that 58.40 per cent and 71.20 per cent of total area under kinnow and malta respectively was leased out to the pre-harvest contractors. The remaining 41.60 per cent of kinnow and 28.80 per cent of malta fruit area was retained by fruit growers for marketing by themselves.

Table 4.3.3 Area of fruits leased out to PHC and retained for self-marketing by farmers

(Acres)

Channels	**Kinnow**	**Malta**
Leased out to pre-harvest contractors	273.66 (58.40)	43.15 (71.20)
Retained by themselves	194.94 (41.60)	17.45 (28.80)
Total	**468.60**	**60.60**

Note: Figures in parentheses are percentage of total number of farmers

Hence, the pre harvest contractors played an important link in marketing and distribution system of fruits in the study area by accounting for 51 per cent and 68 per cent of the total marketed surplus on the sample farm for kinnow and malta respectively (Table 4.3.4). Similar results were also reported by Kaur and Singla (2016). Such types of contracts for particular seasons of fruits are based on the expected fruit yield, time of harvesting and price of previous year. The payment to farmers was done in three instalments first at the time of signing of contract, second at the time of first picking and third one at the time of last picking. The fruit growers preferred these contracts to avoid risk in fluctuation of market price and to reduce the burden of watch and ward at the time of fruit ripening. The picking, grading, waxing, and transportation of fruits has to be done by the contractors. During the contract period the watch and ward of orchards was undertaken by contractors to reduce the theft of fruits, while irrigation and accommodation facilities has to be provided by the farmers. Some important factors that forced the farmers to lease out their orchards on contract to the pre-harvest contractor were the reduction in burden of watch and ward due to paucity of labour, the cumbersome marketing process, shortage of skilled labour for plucking and packing, reduction in risk of market price and problem of fruit dropping (Kaur 2009).

The other form of kinnow disposal depicted in Table 4.3.4 reveals that 23.26 per cent (175.95 quintal per farm) of marketed surplus of kinnow was sold in local markets followed by 18.47 per cent (139.56 quintal per farm), 5.72 per cent (43.27 quintal per farm) and 1.86

per cent (14.07 quintal per farm) in markets within state, market out of state and directly to fruit processing units respectively. Similarly in case of malta 31.53 per cent (34.73 quintal per farm) of total fruits had been disposed in local markets of study area.

Table 4.3.4 Pattern for disposal of kinnow and malta fruits by sample farmers

(Qtl/ farm)

S. No.	Channels	Quantity sold (Qtls.)		
		Kinnow	**Malta**	**Total**
1.	Sale to the pre- harvest contractor	383.36 (50.68)	75.41 (68.47)	458.77 (52.94)
2.	Sale in the local market	175.95 (23.26)	34.73 (31.53)	210.68 (24.31)
3.	Sale in distant market in state	139.56 (18.45)	-	139.56 (16.10)
4.	Sale in distant market outside state	43.27 (5.72)	-	43.27 (4.99)
5.	Sale to processing units	14.07 (1.86)	-	14.07 (1.62)
	Total	**756.44 (100)**	**110.14 (100)**	**866.58 (100)**

Note: Figures in parentheses are percentage of total quantity

Overall, it can be concluded that the major portion (52.94 %) of marketed surplus of total fruits in study area was sold through pre harvest contractors by fruit growers followed by local market (24.31 %) and distant markets with in state (16.10%).

4.3.3 Marketing channels for kinnow and malta

The chain of different intermediaries performing various marketing operations starting from assembling of produce at farm level to distribution of produce to ultimate consumer is called marketing channels. In this process intermediaries create different type of utilities i.e. time, place, form and possession. Marketing margin refers to the difference between the values of equivalent physical quantity at different levels of marketing. It is represented by spread between the prices paid and received by any specific agency (link) in the market sequence. The gross market margin of intermediaries includes the marketing cost spent at various levels of marketing like grading, packaging and transportation etc. To ensure higher price in consumer's rupees of growers, the choice lies in the selection of channel amongst the existing ones. This section is devoted to elaborate the price spread for kinnow and malta in the study area. The price spread of malta worked out for the month of October 2019 when the major portion of this fruit was sold, similarly for kinnow the month of January 2020 has been selected. Three markets were studied for the purpose of calculating price

spread including Abohar, and Hoshiarpur from the producing area and Ludhiana market representing the major consumption centre in state. Following major marketing channels for distribution of kinnow and malta fruit were identified in the study area:

Channel-I: Producer- Pre harvest contractor- wholesaler (through commission agent) - Retailer- Consumer (Ludhiana)

Channel-II: Producer- wholesaler (through commission agent) - Retailer- Consumer (Ludhiana)

Channel-III: Producer- wholesaler (through commission agent) - Retailer- Consumer (Local market)

Channel-IV: Producer- Retailer (through commission agent) - Consumer (Local market)

Channel-V: Producer- Processing units

The price spread, marketing margin and marketing cost of different functionaries are given in Table 4.3.5 to 4.3.9.

Channel-I: Producer- Pre harvest contractor- Wholesaler (through commission agent) - Retailer- Consumer (Ludhiana)

The Table 4.3.5 depicts the marketing cost, margins and percentage share of different market functionaries when fruit growers had leased out their orchards to the pre harvest contractors and they sold the fruit output in Ludhiana market which is the major fruit consuming centre in the state. The net price received by producer was Rs 863.05 per quintal which accounts 30.80 percent of the price paid by consumer in Ludhiana market. The total marketing expenses of contractors was Rs 469.07 and packaging and transportation were the major cost incurred by contractors. The net margin of contractors was 12.95 percent of price paid by consumer. The net margin received by wholesaler and retailers was 10.16 and 17.58 per cent of price paid by consumer respectively. The ultimate purchase price of consumer was Rs 2802.50 per quintal of kinnow. The earlier study conducted by Kaur (2009) had revealed that the producer's share in the price paid by consumer for kinnow the in Ludhiana market turned out to be 34 per cent.

It is apparent from Table 4.3.5 that in channel-I producers of malta received 39.27 per cent share of price paid by consumer in Ludhiana market. The total marketing expenses of contractors was Rs 477.30 with packaging and transportation being the major cost components incurred by contractors and net margin of contractors accounted for 11.90 percent of price paid by the consumer. The net margin received by wholesaler and retailers was 10.69 and 16.03 per cent of price paid by consumer respectively. The ultimate purchase price of consumer was Rs 4050 per quintal of malta in the Ludhiana market.

Table 4.3.5 Marketing costs, margins and percentage share in consumer rupee of different functionaries in channel-I

(Rs/qtl)

Particulars	**Kinnow**	**% share in consumer's rupee**	**Malta**	**% share in consumer's rupee**
Net price received by producer	863.05	30.80	1590.60	39.27
Cost incurred by pre-harvest contractor				
Watch and ward	52.80	1.88	52.80	1.30
Picking	42.88	1.53	46.50	1.15
Grading	28.28	1.01	31.15	0.77
Waxing	40.35	1.44	42.70	1.05
Packaging	101.68	3.63	98.70	2.44
Loading	14.45	0.52	16.10	0.40
Unloading	18.50	0.66	20.40	0.50
Transportation	150.68	5.38	140.85	3.48
Spoilage	19.45	0.69	28.10	0.69
Total expenses	469.07	16.74	477.30	11.79
Net margin of contractor	362.98	12.95	482.10	11.90
Sale price of contractor /purchase price of wholesaler	1695.10	60.49	2550.00	62.96
Cost incurred by wholesaler				
Market fees @ 1.0%	16.95	0.60	25.50	0.63
Rural development fund (1.0%)	16.95	0.60	25.50	0.63
Commission @ 5%	84.75	3.02	127.50	3.15
Loading/unloading	21.20	0.76	21.20	0.52
Weighing	1.80	0.06	1.80	0.04
Packaging cost	35.35	1.26	38.44	0.95
Other costs (rent for storage space, etc)	19.10	0.68	19.10	0.47
Spoilage	14.18	0.51	18.80	0.46
Total cost	210.20	7.50	277.84	6.86
Net margin of wholesaler	284.68	10.16	432.76	10.69
Sale price of wholesaler /purchase price of retailer	2190.00	78.14	3260.60	80.51
Cost incurred by retailer				
Transportation	21.50	0.77	25.50	0.63
Cost of plastic bags	25.00	0.89	25.00	0.62
Spoilage	56.05	2.00	72.45	1.79
Other costs	17.38	0.62	17.38	0.43
Total cost	119.93	4.28	140.33	3.46
Net margin of retailer	492.58	17.58	649.07	16.03
Sale price of retailer /purchase price of consumer	2802.50	100.00	4050.00	100.00

Channel-II: Producer- Wholesaler (through commission agent) - Retailer- Consumer (Ludhiana)

The marketing cost, margins and percentage share of different market functionaries in channel - II are shown in Table 4.3.6. The net price received by farmers was Rs 1012.84 per

Table 4.3.6 Marketing cost, margins and percentage share in consumer rupee of different functionaries in channel-II

(Rs/qtl)

Particulars	**Kinnow**	**% share in consumer's rupee**
Net price received by producer	1012.84	36.14
Cost incurred by producer		
Grading	33.40	1.19
Waxing	42.55	1.52
Packaging	98.00	3.50
Loading	13.50	0.48
Unloading	17.40	0.62
Transportation	146.83	5.24
Spoilage	13.58	0.48
Total expenses	365.26	13.03
Sale price of producer/ purchase price of wholesaler	1378.10	49.17
Cost incurred by wholesaler		
Market fees @ 1.0%	13.78	0.49
Rural development fund (1.0%)	13.78	0.49
Commission @ 5%	68.90	2.46
Loading/unloading	21.20	0.76
Weighing	1.80	0.06
Packaging cost	35.35	1.26
Other cost	19.10	0.68
Spoilage	14.18	0.51
Total cost	203.68	7.27
Net margin of wholesaler	471.12	16.81
Sale price of wholesaler/purchase price of retailer	2052.90	73.25
Cost incurred by retailer		
Transportation	21.50	0.77
Cost of plastic bags	25.00	0.89
Spoilage	56.05	2.00
Other costs	17.38	0.62
Total cost	119.93	4.28
Net margin of retailer	629.67	22.47
Sale price of retailer/purchase price of consumer	2802.50	100.00

Note: Malta was not disposed through channel-II in study area.

quintal when they sold kinnow to the wholesaler in Ludhiana market. The ultimate price paid by consumer was Rs 2802.50 per quintal and producers received 36.14 percent of the price paid by the consumer. The total marketing costs incurred by producer was Rs 365.26 per quintal. The major costs involving transportation and packaging paid by producer accounted for 67.03 per cent of their total cost for marketing the produce in Ludhiana. The net margin and cost of wholesaler was 16.81 and 7.27 per cent of price paid by consumer. The marketing cost and margin of retailer in channel-II was 4.28 and 22.47 percent of the price paid by consumer respectively.

Channel-III: Producer- Wholesaler (through commission agent) - Retailer- Consumer (Local market)

The marketing cost, margin and percentage share of different market functionaries in consumer rupee for produce disposed in local markets are given in Table 4.3.7. In this channel the kinnow and malta were marketed by growers themselves in local market of district, reasons being lack of market knowledge, risk involved in the marketing of fruits in distant markets both in state as well as out of the state and high transportation cost. The net price received by producer for kinnow was Rs 898.28 per quintal that accounted 42.52 percent of the price paid by consumer in the local market. The total cost incurred for grading, waxing, packaging, and transportation etc. by producer accounted for 10.95 percent of the price paid by consumer. The cost incurred by wholesaler comprised 10.31 percent and margin 6.64 percent of consumer rupees. The retailers were getting margin to the tune of 24.48 percent with 5.10 per cent of price paid by consumer incurred as cost. The ultimate price paid by consumer for kinnow in local market was 2112.50 rupees per quintal.

For malta sold through channel-III, the fruit growers received Rs 1801.92 per quintal that constituted 48.44 per cent of price paid by the consumer in local market The total marketing expenses of producer in packaging, transportation etc. was Rs 223.08 per quintal and it shared 6 percent of price paid by the consumer.

The cost and margin of wholesaler accounted for 7.09 percent and 23.96 percent of the rupees spent by the consumer. The retailer's margin was 11.48 percent with 3.03 percent incurred as cost of price paid by the consumer. The ultimate purchase price of consumer was Rs 3720 per quintal of malta in the local market.

Table 4.3.7 Marketing cost, margins and percentage share in consumer rupee of different functionaries in channel-III

(Rs/qtl)

Particulars	**Kinnow**	**% share in consumer's rupee**	**Malta**	**% share in consumer's rupee**
Net price received by producer	898.28	42.52	1801.92	48.44
Cost incurred by Producer				
Grading	33.00	1.56	32.00	0.86
Waxing	35.48	1.68	30.50	0.82
Packaging	64.00	3.03	65.50	1.76
Loading	15.40	0.73	15.30	0.41
Unloading	19.25	0.91	20.00	0.54
Transportation	49.30	2.33	46.10	1.24
Spoilage	14.79	0.70	13.68	0.37
Total expenses	231.22	10.95	223.08	6.00
Sale price of producer/ purchase price of wholesaler	1129.50	53.47	2025.00	54.44
Cost incurred by wholesaler				
Market fees @ 1.0%	11.29	0.53	20.25	0.54
Rural development fund (1%)	11.29	0.53	20.25	0.54
Commission @ 5%	56.47	2.67	101.25	2.72
Loading/unloading	20.50	0.97	22.25	0.60
Weighing	1.80	0.09	1.80	0.05
Cost of packaging	35.90	1.70	33.50	0.90
Spoilage loss	28.50	1.35	34.00	0.91
Other costs	30.40	1.44	30.40	0.82
Total cost	217.70	10.31	263.70	7.09
Net margin of wholesaler	140.30	6.64	891.30	23.96
Sale price of wholesaler/purchase price of retailer	1487.50	70.41	3180.00	85.48
Cost incurred by retailer				
Transportation	26.18	1.24	20.50	0.55
Cost of plastic bags	26.63	1.26	25.50	0.69
Spoilage	44.00	2.08	52.30	1.41
Other costs	11.00	0.52	14.60	0.39
Total cost	107.80	5.10	112.90	3.03
Net margin of retailer	517.20	24.48	427.10	11.48
Sale price of retailer/purchase price of consumer	2112.50	100.00	3720.00	100.00

Channel-IV: Producer- Retailer (through commission agent) - Consumer (Local market)

Table 4.3.8 shows the marketing cost, margins and percentage share of different market functionaries in price paid by consumer for kinnow and malta in channel-IV, where produce moved from producer to the consumer through retailers only. The net price received

Table 4.3.8 Marketing cost, margins and percentage share in consumer rupee of different functionaries in channel-IV

(Rs/qtl)

Particulars	**Kinnow**	**% share in consumer's rupee**	**Malta**	**% share in consumer's rupee**
Net price received by producer	1138.88	53.91	2646.50	71.14
Cost incurred by Producer				
Grading	31.50	1.49	32.50	0.87
Waxing	31.25	1.48	28.50	0.77
Packaging	52.13	2.47	53.50	1.44
Loading	15.63	0.74	15.75	0.42
Unloading	20.25	0.96	20.00	0.54
Transportation	47.25	2.24	49.50	1.33
Spoilage	25.63	1.21	28.75	0.77
Total expenses	223.63	10.59	228.50	6.14
Sale price of producer/ purchase price of retailer	1362.50	64.50	2875	77.28
Cost incurred by retailer				
Market fees @ 1.0%	13.63	0.65	28.75	0.77
Rural development fund (1.0%)	13.63	0.65	28.75	0.77
Commission @ 5%	68.13	3.23	143.75	3.86
Loading/unloading	19.25	0.91	22.50	0.60
Transportation	26.18	1.24	20.50	0.55
Cost of plastic bags	26.63	1.26	25.50	0.69
Spoilage	44.00	2.08	52.30	1.41
Other costs	11.00	0.52	14.60	0.39
Total cost	222.45	10.53	336.65	9.05
Net margin of retailer	527.55	24.97	508.35	13.67
Sale price of retailer /purchase price of consumer	2112.5	100.00	3720	100.00

by the producer for kinnow was Rs 1138.88 per quintal that formed 53.91 per cent of price paid by the consumer. The total cost incurred by producer in grading, waxing, packaging, transportation etc. by constituted 10.59 percent of price paid by consumer in local market. The retailers paid extra cost, when they buy kinnow from farmers through commission agent including market fees, RDF, commission, cost of plastic bags etc. which constituted 10.53 percent of the price paid by consumer. The margin of retailer in this channel was 24.97 per cent of price paid by consumer. The ultimate price paid by consumer for kinnow was Rs 2112.50 per quintal.

When malta sold by channel-IV, producers received Rs 2646.50 per quintal that was 71.14 per cent of price paid by consumer in local market. The total marketing expenses of producer was Rs 228.50 per quintal which accounted for 6.14 per cent of price paid by consumer. The retailer's margin and cost accounted for 13.67 per cent and 9.05 percent of the price paid by the consumer. The ultimate purchase price of consumer in the local market was Rs 3720 per quintal of malta.

Channel-V: Producer- Processing units

In the study area, it was observed that kinnow also moved from producer to processing unit, before reaching the consumer in the form of a processed product. The channel from producer to processing was different from above channels because processing units were buying low grade kinnow only. The marketing cost and price received by producer for disposing kinnow in this channel has been presented in Table 4.3.9. The data revealed that when farmer sold their product through this channel the farmers have to incur

Table 4.3.9 Marketing cost and producer's percentage share in channel-V

(Rs/Qtl)

Particulars	**Kinnow**	**% share in price paid by processing unit**
Net price received by producer	516.20	83.16
Cost incurred by producer		
Packaging	30.40	4.90
Loading	16.13	2.60
Transportation	41.25	6.65
Spoilage	16.72	2.69
Total expenses	104.50	16.84
Sale price of producer/ purchase price of processing unit	620.70	100.00

the cost of Rs 104.50 per quintal on an account of packaging, loading, unloading, transportation and spoilage losses while delivering the fruits at the processing units. In absolute term farmers were getting net price of Rs 516.20 per quintal in study area which turn

out to be the lowest amongst all the channels identified in the study. The main reasons behind is that the processing units were purchasing only the poor grade (generally c- grade) fruits. In this channel price spread has not been worked out as the processing firms hesitate to share their costs and delivery price for the processed products.

Price spread and market efficiency

Table 4.4.10 presents the comparative information on price spread, producer's share and marketing efficiency in different channels of kinnow and malta. The net price received by producer for kinnow was highest in channel –IV (Rs 1138.88 / qtl) followed by channel- II, III and channel-I with Rs 1012.84, Rs 898.28 and Rs 863.05 per quintal respectively. The total cost incurred by producer was highest in channel- II (Rs 365.26 / qtl) followed by channel-III and IV with Rs 231.22 and Rs 223.63 per quintal respectively. Channel-IV was the shortest channel among all, the producer's share in consumer rupees was maximum in this channel- IV at 53.91 per cent followed by channel-III, channel-II and channel-I with 42.52, 36.14 and 30.80 per cent share of price paid by consumer. The price spread defined as the difference between price paid by consumer and price received by the producer of kinnow was

Table 4.3.10 Price spread, producer's share and market efficiency in different channels of kinnow and malta

(Rs/qtl)

Particulars	**Channel-I**		**Channel-II**	**Channel-III**		**Channel-IV**	
	Kinnow	**Malta**	**Kinnow**	**Kinnow**	**Malta**	**Kinnow**	**Malta**
Net price received by producer	863.05	1598.60	1012.84	898.28	1801.92	1138.88	2646.50
Total cost incurred by producer	-	-	365.26 (13.03)	231.22 (10.94)	223.08 (6.00)	223.63 (10.65)	228.50 (6.14)
Total margin of intermediaries	1140.24 (40.69)	1463.93 (36.15)	1100.79 (39.28)	657.50 (31.14)	1318.40 (35.44)	527.55 (24.97)	508.35 (13.66)
Total cost of intermediaries	799.20 (28.52)	895.47 (22.11)	323.61 (11.55)	325.50 (15.40)	376.60 (10.12)	222.45 (10.53)	336.65 (9.05)
Price paid by consumer	2802.50	4050.00	2802.50	2112.50	3720	2112.50	3720
Price Spread	**1939.44 (69.20)**	**2459.40 (60.73)**	**1789.66 (63.86)**	**1214.22 (57.48)**	**1918.08 (51.56)**	**973.63 (46.09)**	**1073.50 (26.99)**
Producer's share in consumer rupee	**30.80**	**39.47**	**36.14**	**42.52**	**48.44**	**53.91**	**71.14**
Marketing efficiency	**0.45**	**0.65**	**0.57**	**0.74**	**0.94**	**1.18**	**2.47**

Note: Figures in parentheses are percentage of price paid by consumer
Note: Malta was not disposed through channel-II

maximum in channel - I at Rs 1939.44 per quintal followed by channel- II, III and IV at Rs 1789.66, Rs 1214.22 and Rs 973.63 per quintal respectively. In terms of per cent share of consumer's rupee, price spread in respective channels was 69.20, 63.86, 57.48 and 46.09 per cent. The market efficiency was maximum in channel –IV (1.18) followed by channel- III, II and I with magnitude of 0.74, 0.57 and 0.45 respectively.

It is apparent from Table 4.4.9 that the net price received by producer for malta was highest in channel –IV (Rs 2646.50/ qtl) followed by channel- III and I with Rs 1801.92, and Rs 1598.60 per quintal respectively. The total cost incurred by producer was highest in channel- IV (Rs 228.50 / qtl) followed by channel-III with Rs 223.08 per quintal. The data further represent that the price spread of malta was maximum in channel-I with Rs 2459.40 per quintal followed by channel- III and IV at Rs 1918.08 and Rs 1073.50 per quintal respectively. Channel-IV was the shortest channel among all and the producer's share in consumer rupees was maximum in this channel- IV with 71.14 per cent followed by channel-III and channel-I accounted for 48.44 and 39.47 per cent of price paid by consumer. The market efficiency was maximum in channel –IV (2.47) followed by channel- III, and I with magnitude of 0.94 and 0.65 respectively. Thus reduction in intermediaries enhanced market efficiency for both kinnow and malta.

SECTION 4.4: SOURCE OF FRUIT PROCUREMENT AND CAPACITY UTILIZATION OF FRUIT PROCESSING UNITS

An attempt has been made to present the aspects regarding processing of major fruits in this section. The important aspects include location, capacity utilization, source of raw material (fresh fruits) procurement, cold storage capacity and pattern of disposal of processed products by processing units. The details of each aspect are presented as below:

4.4.1 Classification of processing units based on investment cost and location

For the proper utilization of resources available, beside other factors the location of industrial units is very important factor which determines the access to the sources of raw materials and the supply centres of the final products. For easy and adequate supply of raw materials and availing the cost advantages, the industrial plants especially the agro-processing ones need to be established in the hinterlands of raw material producing areas. For profit maximization, both the cost as well sales advantages are important in determining the location of the industry. The investment made by private and public sector in individual processing units is also determined by the location rationality of the units. The number of existing fruit processing units located in Hoshiarpur, Fazilka and Ludhiana districts with their investment are presented in Table 4.5.1. Around 170 processing units were situated in three sample districts which have been categorised into three categories of micro (up to 25 lakhs), small (25 lakhs to 5 corer) and medium (above 5 corer). The majority (85.88 %) of total processing units turned out to be micro followed by small (9.42%) and medium scale (4.70%) units.

Total 32 units were located in Hoshiarpur district and out of these, 87.50 per cent were micro, 9.38 per cent small and 3.12 per cent were medium scale units. Similarly in Fazilka, total 25 units were located and out of these, majority (76 %) were micro followed by small (20%) and medium (4%) scale processing units. Out of total 113 Ludhiana based processing units, micro units constituted 87.60 per cent followed by 7.07 per cent small and 5.33 per cent medium units.

The Fazilka and Hoshairpur are the major fruit producing districts, while the Ludhiana is one of the major consumption centres of the state (Anonymous 2020). Thus, the location of majority of processing units is irrational from the point of major producing areas of Hoshairpur and Fazilka together accounting for 78 per cent of the total fruits production of the state. These major producing districts accounted for only one third (33.53 %) of the total number of fruit processing units in the study districts. There have been several factors that assist this irrationality in location of fruit processing units such as; lack of fruit diversity in major producing area, lack of financial infrastructure, lack of skilled labour, lack of public and private cold store, lack of linkage with research institute and government support. On the contrary, 67.47 of total processing units of study area were located in Ludhiana. Being major industrial centre of state, better availability of skilled labour, more financial support from banks and better linkage with research institutes, ready market for products, etc may be the main reasons for this. Bhagyalaxmi (2005) also reported the locational irrationality of processing units along with associated factors mentioned above.

Table 4.4.1 Classification of processing units

S. No	Name of district	Category of processing unit based on investment			Total
		Micro. (Up to 25 lakhs)	Small (25 lakhs to 5 Cr.)	Medium (Above 5 Cr.)	
1.	Hoshiarpur	28 (87.50)	3 (9.38)	1 (3.12)	32 (18.83)
2.	Fazilka	19 (76)	5 (20)	1 (4)	25 (14.70)
3.	Ludhiana	99 (87.60)	8 (7.07)	6 (5.33)	113 (66.47)
	Total	**146 (85.88)**	**16 (9.42)**	**8 (4.70)**	**170 (100)**

Note: Figures in parentheses are percentage of total units

4.4.2 Processing capacity and its utilization by various size groups of processing units

The proper utilization of processing capacity of any unit is the most important criteria for the success of processing unit. Average processing capacity for different fruits along with utilization of fruits by different size of processing units was worked out and the same has

been presented in Table 4.4.2.

Table 4.4.2 Processing capacity and its utilization by various size group of processing units

(Qtl. /unit)

Scale of unit	Fruits	Processing capacity	Utilization of fruits	% of processing capacity utilized
Micro scale	Kinnow	1902.30	670.45	35.24
	Guava	518.30	208.90	40.30
	Mango	673.60	364.48	54.10
	Apple	334.30	87.80	26.30
	Orange and malta	692	204.65	29.25
	Sub- total	**4120.50**	**1536.28**	**37.28**
Small scale	Kinnow	13210	1539.50	11.65
	Guava	2210	772.30	34.94
	Mango	2592	765.20	29.52
	Apple	1929.50	440.36	22.82
	Orange and malta	4345	1262.20	29.05
	Sub- total	**24286.50**	**4779.56**	**19.67**
Medium scale	Kinnow	54000	2086.50	3.86
	Guava	9000	1320	14.66
	Mango	10800	1325.60	12.27
	Apple	3600	448	12.44
	Amla	18000	1500.10	8.34
	Jamun	1170	110.66	9.8
	Watermelon	871.50	102.50	11.76
	Sub- total	**97441.50**	**6893.42**	**7.07**
Overall average		**41949.50**	**4403.09**	**10.47**

The micro, small and medium scale firms had average processing capacity of 1902.30, 13210 and 54000 quintals of kinnow respectively, whereas respective utilization of the capacity was 35.24, 11.65 and 3.86 per cent. Out of 518.30, 2210 and 9000 quintals of guava processing capacity per unit of micro, small and medium processing plants, the extent of use was 40.30, 34.94 and 14.66 per cent of their processing capacity. The per unit processing capacity of mango for micro, small and medium units was 673.60, 2592 and 10800 quintals respectively and its utilization was observed to the tune of 54.10, 29.52 and 12.27 per

cent. Processing capacity of micro, small and medium scale units for apple was 334.30, 1929.50 and 3600 quintals and they utilized 26.30, 22.82 and 12.44 per cent of the same respectively. The micro and small units with respective average processing capacity for orange and malta at 692 and 4345 quintals, utilized 29.25 and 29.05 per cent of it to make various product of orange and malta. The per unit processing capacity of medium sized firm for jamun was 1170 quintals, but its utilization was of the order of 9.8 per cent only. Similarly the processing capacity for watermelon was 871.50 quintals for medium scale units but utilized extent was observed to be 11.76 per cent. The processing capacity of average medium sized firm for amla was 18000 quintals, but its utilization was of the order of 8.34 per cent only. Overall, the average fruit processing capacity of micro, small and medium firms was 4120.50, 24286.50 and 97441.50 quintals and out of this only 37.28, 19.67 and 7.07 per cent had been utilized respectively. Thus, while amount of fruits procured and processed has been directly related to the size of processing plant, the utilization of respective processing capacity of these units found to be inversely related to the size. Overall fruit processing capacity utilization of the sample processing units was only about one tenth (10.47 %).

Thus, processing units had grossly underutilized their installed fruit processing capacity. Location of processing units away from the hinterlands of producing area, seasonality and perishable nature of fruits, lack of availability of fruits with good processing quality, underdeveloped infrastructure and non-availability of raw material in bulk quantity as required for fully operation of units were some of the factors responsible for the underutilization of installed capacity of the fruit processing industry (Bhattacharyya, 2013). Many locally available fruit varieties were not being considered fit for processing purpose and in order to meet the requirements of specific variety of particular fruit, the processing firms had to arrange the supplies from distant markets.

4.4.3 Sources of procurement of raw material (fresh fruits) by processing units

The fruit processing units required specific quantity of different fruits with good processing qualities. For fulfilment of their raw material requirement the sample processing units were found purchasing the raw material (fresh fruits) from farmers, local markets and distant markets. All three categories, micro, small and medium scale fruit processing units purchased specific quantity directly from farmers. The transportation of fruits to the door of processing plants was made by farmers. The unloading of fruits and cost in this regard was borne by the processing plants. The payments of fruits were made by units to farmers in pre-decided number of instalments at various stages of fruit procurement. The processing units also purchased fruits from local markets by open auction through commission agents. Based on specific requirement for varieties of fruits like apple, mango, etc. the processing units arranged the supplies from distant markets through commission agents. In this case, marketing expenses were borne by commission agents except unloading that was borne by the

processing plants. Processing units used instalment mode for payment to commission agents like advance payment and final payment at arrival of fruits arranged from the distant markets.

` The total quantities of fruits procured by different size categories of processing units and source of their procurement are presented in Table 4.4.3. It has been observed that micro, small and medium scale processing units had purchased on average 1536.28, 4785.11 and 6902.16 quintals of various types of fruits respectively. The quantity procured was directly proportional to the size of processing units. Micro processing units purchased small quantities of fruits because they limited their processing activities to few processed products like fruit pickle and juices only. Likewise small units need more raw materials in comparison to micro units because beside juice and pickles they have extended activities to fruits jelly, jam etc. Medium firms produce a number of varieties of products including jam, juice, pulp, concentrate of fruits and thus, procured largest amount of fresh fruits. According to Singh (1992), the medium scale fruit processing units had more storage capacity, technical knowledge, and better financial status for performing the variety of activities. It is evident from Table 4.4.3 that quantity of kinnow purchased by average micro, small and medium unit was 670.45, 1539.50 and 2075 quintals respectively.

The major proportion of total kinnow i.e. 63.54 per cent by micro unit, 78.98 per cent by small unit and 69.16 per cent by medium size unit were purchased from the local markets. Besides, 36.46 per cent, 21.02 per cent and 30.84 per cent of total kinnow procurement by micro, small and medium units respectively was purchased directly from the farmers. Kinnow found to be dominant fruit crop in state so these processing units fulfilled their all requirement from farmers and markets within state only and thus, they need not to approach commission agents of markets of other states to arrange its supply.

Guava procured by average micro, small and medium processing unit was 208.90, 772.30 and 1314.50 quintals respectively. Out of this, micro, small and medium units procured 54.94, 33.72 and 34.99 per cent from the markets falling within the Punjab State. Guava purchased from farmers constituted 14.05, 7.81 and 18.18 per cent of total purchase of micro, small and medium units respectively. Besides, 31.01 per cent of total guava purchase by micro units, 58.47 per cent by small units and 46.82 per cent by medium units was arranged from the distant markets falling out of the state. The Allahabad, Delhi and Jaipur markets were the major distant sources of guava procurement by processing units.

Mango was procured by processing units from farmers, markets with in state and markets out of state. Average quantity of mango bought by micro, small and medium processing unit was 364.48, 765.20 and 1327.50 quintals respectively. Mango purchased from farmers constituted the 19.37 per cent and 9.85 per cent of total mango purchase by micro and small units respectively. Micro, small and medium units respectively procured

Table 4.4.3 Quantity of raw material (fresh fruits) procured from different sources by various size categories of sample processing units

(Qtl. /unit)

Scale of unit	Fruits	Source of procurement and quantity procured			
		Farmer	**Market within state**	**Market from other state**	**Total**
Micro scale	Kinnow	244.65 (36.46)	425.80 (63.54)	-	670.45 (100)
	Guava	29.35 (14.05)	114.78 (54.94)	64.77 (31.01)	208.90 (100)
	Mango	70.60 (19.37)	175.38 (48.12)	118.50 (32.51)	364.48 (100)
	Apple	-	87.80 (100)	-	87.80 (100)
	Orange and malta	32.35 (15.81)	74.15 (36.23)	98.15 (48)	204.65 (100)
Total		**376.95 (24.54)**	**877.91 (57.15)**	**281.42 (18.30)**	**1536.28 (100)**
Small scale	Kinnow	323.60 (21.02)	1215.90 (78.98)	-	1539.50 (100)
	Guava	60.35 (7.81)	260.40 (33.72)	451.55 (58.47)	772.30 (100)
	Mango	75.40 (9.85)	222.45 (29.07)	467.35 (61.08)	765.20 (100)
	Apple	-	157.08 (35.51)	285.28 (64.49)	442.36 (100)
	Orange and malta	178.70 (14.12)	327.25 (25.85)	759.80 (60.03)	1265.75 (100)
Total		**638.05 (13.33)**	**2183.08 (45.62)**	**1963.98 (41.04)**	**4785.11 (100)**
Medium scale	Kinnow	640 (30.84)	1435 (69.16)	-	2075 (100)
	Guava	239 (18.18)	460 (34.99)	615.50 (46.82)	1314.50 (100)
	Mango	-	515 (38.79)	812.50 (61.21)	1327.50 (100)
	Apple	-	188 (41.96)	260 (58.04)	448 (100)
	Amla	268.70 (17.68)	425.80 (28.01)	825.50 (54.31)	1520 (100)
	Jamun	-	114.66 (100)	-	114.66 (100)
	Watermelon	-	102.50 (100)	-	102.50 (100)
Total		**1147.70 (17.17)**	**3240.96 (45.23)**	**2513.50 (37.60)**	**6902.16 (100)**
Average		**720.73 (16.35)**	**2100.65 (47.66)**	**1586.30 (35.99)**	**4407.68 (100)**

Note: Figures in parentheses are percentage of total quantity

48.12, 29.07 and 38.79 per cent of total mango supply from local markets within state. The supply of mango arranged from markets out of the state accounted for 32.51, 61.08 and 61.21 per cent of total purchase of this fruit by micro, small and medium units respectively. The markets of Saharanpur, Sirsa and Delhi were the main out of state sources of mango procurement as revealed by the processing units.

The apple is not being produced in the Punjab state and was procured by processing units from markets with in state and markets out of the state. Micro, small and medium processing units purchased 100, 35.51 and 41.96 per cent of respective total requirements from markets within state like Pathankot, Amritsar, and Ludhiana. However, the major proportion of apple supply of small and medium units i.e. 64.49 per cent and 58.04 per cent was arranged from markets out of the state. The markets of Jammu & Kashmir and Himachal Pradesh were main source of apple procurement by the processing units.

The quantity of orange & malta procured by average micro and small units was 204.65 and 1265.75 quintals respectively. The micro and small units respectively purchased 15.81 and 14.12 per cent (mainly constituting malta) of total procurement of this group of fruits directly from farmers, and the another 36.23 per cent and 25.85 per cent was procured from markets within the state. Quantity of these fruits purchased from markets of other states constituted 48 per cent and 60.03 per cent of total procurement by micro and small units respectively. Jamun and watermelon was procured only by the medium size processing unit and the entire quantity of these fruits i.e. 114.66 quintals of jamun and 102.50 quintals of watermelon was purchased from the local markets falling within the state.

The information presented in Table 4.4.3 also revealed that amla was purchased only by medium size units. It procured 1520 quintal of amla, out of which 17.68 per cent procured from farmers, 28.01 per cent from markets within state and 54.31 per cent from markets of the other states. Major quantity of amla was procured from the distant markets of Jaipur and Ahmadabad through commission agents.

Overall, quantity of fruits purchased per processing unit was 4407.68 quintals. Out of this, the largest proportion i.e. 47.66 per cent was purchased from the local markets falling within the state As only a few fruits are being produced in the fruit production belt of state and due to some quality related issues more than one third (35.99 %) fresh fruit processed by the sample units were procured from the national markets through commission agents. About 16 per cent of total fruits supply was found to be sourced directly from the farmers. Micro, small and medium size firms purchased 24.54, 13.33 and 17.17 per cent respectively of their total fresh fruit requirements directly from the farmers.

4.4.4 Price paid and marketing cost for different fruits by processing units

The information regarding marketing cost borne and the price paid by the processing firms for the purchase of fruits has been presented in Table 4.4.4. Kinnow being the

predominant fruit produced in the state, the processing units procured its total requirements either from the farmers directly or from the local markets falling in the producing area. Table 4.4.4 reveals that processing units purchased kinnow at the rate of Rs 621.28 and Rs 745.50 per quintal from farmers and local market respectively. With additional marketing cost to the tune of Rs 30.75 and 101.02 per quintal, the total price paid by processing units was Rs 652.43 and Rs 846.52 per quintal for sourcing the kinnow from farmers and local markets respectively.

Table 4.4.4 Price paid and marketing cost for different fruits by processing units

(Rs./qtl.)

Name of fruit	Farmer			Markets within state			Markets out of the state		
	Price	Marketing cost	Total	Price	Marketing cost	Total	Price	Marketing cost	Total
Kinnow	621.68	30.75	652.43	745.50	101.02	846.52	-	-	-
Guava	1368.75	32.30	1401.05	1633.75	171.65	1805.40	1650	34.30	1684.30
Mango	1450.75	30.50	1481.25	2137.50	197.75	2335.25	1832.50	30.80	1863.30
Apple	-	-	-	3085.60	253	3338.60	2850	40.50	2890.50
Orange & malta	1820	27.30	1847.30	2140.50	177.90	2315.40	2065	32.45	2097.45
Amla	930.60	28.60	959.20	1000.50	130.70	1131.20	1020.45	30.25	1050.70
Jamun	-	-	-	2785.40	227.10	3012.50	-	-	-
Watermelon	-	-	-	930.10	109.20	1039.30	-	-	-

The gross price (price plus marketing cost) paid by the processing units for guava was rupees Rs 1401.05, Rs 1805.40, and Rs 1684.30 per quintal for sourcing the supply from from farmers, markets within state and markets out of the state respectively. The respective marketing costs involved in arranging the supply of guava from these sources was Rs 32.30, Rs 171.65 and Rs 34.30. Similarly the total price paid for mango turned out to be Rs 1481.25, Rs 2335.25 and Rs 1863.30 per quintal when processing unit procured from farmer, markets within state and markets out of the state respectively. The cost incurred in procuring mango from farmer, markets within state and markets out of the state was rupees 30.50, 197.75 and 30.80 respectively. The apple was procured from markets within state at total price of Rs 3338.60 including cost of Rs 253 per quintal. Apple was also procured from out of the state markets by paying the total price and cost of Rs 2890.50 and Rs 40.50 per quintal respectively. The total price for orange & malta was Rs 1847.30, Rs 2315.40, and Rs 2097.45 per quintal when processing unit procured these fruits from farmer, markets within state and markets out of the state respectively. The cost incurred in procuring orange &malta from farmers, markets within state and markets out of the state was rupees 27.30, 177.90 and 32.45 respectively. The amla was purchased by processing units at total cost of Rs 959.30, Rs 1131.20, and Rs 1050.70 per quintal from farmers, markets within state and markets out of

the state respectively. The cost incurred in procuring amla from farmer, markets within state and markets out of the state was Rs 28.60, Rs 130.70 and Rs 30.25 respectively. The jamun and watermelon was procured by processing units only from the local markets and paid total price (inclusive of marketing costs) of Rs 3012.50 and Rs 1039.30 per quintal respectively. The marketing cost incurred for jamun and watermelon was Rs 227.10 and Rs 109.20 per quintal respectively.

Thus, it can be concluded that in comparison to to the fruit prices paid for sourcing the fruits from the local markets within state, the processing units have paid relatively low marketing cost for purchasing the fruits from farmers as well as from the markets out of the state. This was due to the fact that in order to purchase fruits from the local markets of state, the processing units have to bear certain costs like transportation cost, commission charges, spoilage. On the other hand in case the fruits are procured directly from the farmers these firms pay less marketing cost as they have to pay only for unloading of fruits at the plant site along with some spoilage losses while the others expenses mainly the transportation costs were born by the farmers. Similarly for fruit procured from distant markets out of the state, the supplying commission agents have to bear all of the expenses except that for unloading at plant site which along with some spoilage losses was borne by the processing units. Relatively low prices paid for the fruits from the distant markets may also be on account that generally these supplies are arranged from the major/special markets of specific fruits in the producing centres during the peak harvesting time and having high degree of competition among the large number of producer/sellers.

4.4.5 Cold Storage facilities for raw material (fresh fruit) to the processing units

The cold storage is one of the most important components of modern logistic infrastructural requirements for the development of the processing sector. Availability of adequate cold storage facility may enhance the performance of processing unit through enabling them in procuring bulk of their fresh raw material requirements during the peak market arrivals and at low prices and carry on the stock through the high price lean periods to operate the units throughout the year. Similarly, the cold storage helps in efficient storage of the final processed products which is necessary in order to maintain the supplies as per the demand. The data presented in Table 4.4.5 shows that cold storage capacity of micro and small processing units was 100 and 785.60 quintal which constituted only 2.43 and 3.22 per cent of their respective processing capacity. The available cold storage capacity with the medium scale unit at 10000 quintals constituted only 10.26 per cent of its processing capacity. For all the sample units taken together, the total cold storage capacity was estimated at 10885.60 quintal which accounted for only 8.65 per cent of total processing capacity of the sample units. Clearly the processing units were lacking the cold storage facilities and thus were not able to indulge in purchase of bulk quantity of fruits at the time of peak arrival and

low price and operate the units throughout the year in order to spread their fixed costs.

Table 4.4.5 Cold storage capacity for raw material to various size processing plants

(Qtl/ unit)

Scale of unit	Cold storage capacity	Processing capacity	Storage capacity as percentage of processing capacity
Micro	100	4120.50	2.43
Small	785.60	24286.30	3.22
Medium	10000	97441.50	10.26
Total	**10885.60**	**125848.30**	**8.65**

Underutilization of capacity, machinery and labour of plant on account of inadequate cold storage facilities push up the processing costs and prices of the final products which are detrimental to the demand of processed food products.

4.4.4 Production of fruit products and its disposal by processing units

After procuring raw material (fresh fruits) from different sources, the processing units produced various products such as juice, jam, pickle, fruit concentrates, etc. and disposed the same in market. The medium scale units prepared the products such as fruit pulp and concentrate that can be further used in production of final products like juices etc. The quantity of fruit products produced by the sample processing units and its disposal pattern during year 2019-20 has been examined and the information in this regard has been presented in 4.4.6. It can be seen that the micro processing units have produced 324.35 tonnes per unit of the fruit products and out of this 226.30 tonnes (69.77 %) was disposed in markets within the Punjab state while the remaining 98.05 quintals (30.23%) was sold in the markets of the other states of the country. Contrarily, around 65 per cent of total quantity (943.19 tonnes) of fruit products produced by small processing units has been disposed in markets falling out of the state and only 35.06 per cent proportion of total production was destined towards the Punjab markets. Similarly, out of 1284.30 tonnes per unit products of fruits produced by the medium size processing unit, the major proportion i.e. 82.34 per cent was destined towards markets of other states of country and only 17.66 per cent of quantity produced was found to be disposed in the Punjab markets. Overall, ignoring the size of processing unit, an average processing unit produced 850.61tonnes of fruit products annually and out of this around 69 per cent was disposed in markets/ destinations out of the state while the remaining 30.71 per cent was disposed in markets within state. Thus it is concluded that on account of better resource position and production of variety of quality products, the small and medium size processing units were supplying the major proportion of their final products in the national markets where as micro units were mostly catering their final supply of fruit products in the local markets falling within the state borders.

Table 4.4.6 Quantity of fruit products produced by processing units and its disposal pattern, year 2019-20

(Tons/unit)

Scale of unit	Quantity produced	Market/ Destination within state	Market/ Destination out of state
Micro	324.35 (100)	226.30 (69.77)	98.05 (30.23)
Small	943.19 (100)	330.68 (35.06)	612.51 (64.94)
Medium	1284.30 (100)	226.81 (17.66)	1057.49 (82.34)
Average	**850.61 (100)**	**261.26 (30.71)**	**572.89 (69.29)**

Note: Figures in parentheses are percentage of total quantity produced.

SECTION 4.5: PROBLEMS FACED BY FRUIT GROWERS AND PROCESSING UNITS

The analysis of problems / constraints inhibiting the growth of production and marketing of fruits is important to find out feasible solutions to enhance productivity and profitability of fruit growers. Similarly there are certain constraints/ problems regarding source of procurement of fruits, capacity utilization and in processing and marketing of processed fruits products which are responsible for inhibited growth of processing units in the state. In this section important problems faced by fruit growers and processing units have been discussed as below:

4.5.1 Production related problems faced by fruit growers

There have been several problems that farmers have to face at different level of production stages. The analysis of production problems helps to find out the feasible solution to minimize the production losses of fruits growers. The problems based on their severity responses given by farmers to particular problem along with their mean score are presented in Table 4.5.1. Each problem based on mean score of severity nature has been ranked and detail of each problem has been discussed under different sub headings as followings:

Problems of insect pests: - The high incidence of insect/ pests at various production stages of kinnow and malta has led to heavy loss in both quality and quantity of fruits (Yadav *et al* 2018). In study area this problem got rank one with 3.18 mean score of severity responses. While 60 per cent of farmers reported medium or severe level for incidence of insect/ pest in their fruit orchards, about 12 per cent farmer reported this problem of very severe nature. The white fruit fly, tela, chepa and citrus psylla were the important insects reported by farmers which caused great harm to both kinnow and malta in study area.

Problems of diseases: - The incidence of citrus fruit disease, citrus die back caused by Phytophthora species and citrus canker caused by Xanthomonas campestris, led to economic losses at production stage as well as marketing stage of kinnow and malta. As reported in Table 4.5.1 this problem was found as second most important problem with 3.03 mean score of severity responses. About 73 per cent of farmers reported medium or very severe level of incidence of disease in their fruit orchards. Many times the control measures were not followed on time as well as insufficient to control pest and disease incidence in state (Kaur, 2009).

High cost of inputs: - The crop of kinnow and malta being perennial crops with 4 to 5 years of gestation period require more cash inputs during this period without relegation of any economic output. Insecticide and fertilizers and other costly inputs in adequate quantity need to apply to plants along with irrigation or directly into the soil. Because of high cash requirements and large number of small and marginal category farmers lacking resources in study area, the problem of high input cost is reported by significant proportion of the fruit growers. The data presented in Table 4.5.1 shows that this problem stand ranked third with mean score of severity of 3. This problem leading to squeezing of profit margins was perceived to be severe or very severe by about 40 per cent of farmers, while other 30 per cent of farmers reported it as of medium nature. The results are in line with finding of Jagtap *et al* (2014) and Kaur (2013).

Inadequate Extension services: - Besides developing quality planting material the research stations, SAUs and ICAR had developed various production technologies regarding improved methods of fruit cultivation. But these technologies have not been transferred to the field due to lack of required extension support. The farmers have not been motivated for the adoption of these improved practices with necessary demonstrations (Kaur, 2009). The data presented in Table 4.5.1 shows that this problem stand ranked fourth in study area with 2.93 mean score of severity responses. About 46 per cent of farmers perceived this problem of severe or very severe nature and reported inadequate extension support which is necessary for the realization of optimum economics benefits of new practices and technologies.

Inadequate irrigation facilities: - The most of kinnow and malta orchards situated in south western region of Punjab depend on the canal water as the source of irrigation for orchards. Due to lack of assured and inadequate supply of canal water, the growers do not follow the proper irrigation schedule of orchards, which adversely affect the growth of the plants. It was also observed that water table in study area is rising overtime that create problem of seepage and salt accumulation on ground surface. However, in several pockets tube well has been installed by the growers for better scheduling of irrigation, but the erratic supply of power damper fruit cultivation. The alternative form of irrigation of water is drip irrigation that has gain popularity in recent past in study area but due to high instalment cost and lack of

technical knowledge this method becomes uneconomical for small and marginal farmers. This problem in study area stands fifth rank with 2.60 mean score on severity scale. About 40 per cent of farmers have stated this problem of severe or very severe nature. The observations are in conformity with finding of Kaur (2009), Meena (2012) and Tejaswini (2015).

Table 4.5.1 Production related problems faced by farmers

Problem	**% share of farmers facing different level of problem**					**Chi-square value**	**Mean score**	**Rank**
	No problem	**Low Problem**	**Medium problem**	**Severe problem**	**Very severe Problem**			
Inadequate Irrigation Facilities	13.33	40.00	5.00	18.33	23.33	15.99	2.60	**V**
Problems of Insect / pest	-	28.34	30.00	30.00	11.67	46.99	3.18	**I**
Problems of disease	-	26.66	45.00	23.33	5.00	88.98	3.03	**II**
Inadequate Extension services	10.00	31.67	10.00	26.67	21.67	12.99	2.93	**IV**
High cost of inputs	3.33	26.67	30.00	36.67	3.33	62.65	3.00	**III**
Lack of skilled labour	10.00	51.67	25.00	13.33	-	44.32	2.15	**VI**

Note: Chi-square value is significant at 5 % level of significance

Lack of skilled labour: - The cultivation of kinnow and malta are very specialized and high-tech activity. The trained skilled labour required for performing various activities such as transplanting, pruning, fertilization, picking, packing, loading, unloading and transportation of fruits etc. Non- availability of skilled labour in study area was also reported as main problem (6^{th} ranked) with mean score of severity 2.15 (Table 4.5.1). About 38 per cent of farmers have stated this problem of medium or severe nature. Unskilled labour caused heavy losses both in the field and in marketing process. The less availability of skilled labour forced fruits growers to sale their orchards to pre harvest contractors (Sateesha and Indumati 2018).

4.5.2 Marketing related problems faced by fruit growers

Being perishable, the fruits need to be disposed immediately after harvesting and farmers have to face several problems in this regard. The analysis of marketing problems helps to find out feasible solution to minimize the marketing losses of fruits growers. Different marketing problems based on their severity responses given by farmers to particular

problem along with their mean score are presented in Table 4.5.2. The each problem has been ranked based on mean score of severity and detail of each problem has been discussed as following:

Lack of processing plants in adjacent area: - The weak processing infrastructure in hinterlands of fruits production areas of Punjab state is one of the main causes of ineffective utilization of these fruits (Mavi *et al* 2012). The sample farmers identified this as most severe problem with a mean score of 4.23 at severity scale (Table 4.5.2). About 80 per cent of farmers have stated this problem as of severe or very severe nature. Lack of kinnow and malta processing facilities on commercial scale is a great handicap in aiding value to the produce and ensuring better returns to the fruit growers.

Lack of cold supply chain: - The comparatively more sensitive and perishable nature of fruits make the fruit cultivation highly risk prone. The post-harvest handling, inadequate cold storage and cold store transportation alone create 20 to 40 per cent of losses both in quality and quantity of kinnow and malta (Ali, 2004). Non-availability of cold supply chain (cold store and transportation) in study area was reported as second major problem with mean score of severity 4.17 (Table 4.5.2). About 86 per cent of farmers have stated this problem as severe or very severe on severity scale. Therefore, availability of adequate cold storages and refrigerated vans could help farmers to earn high profits by selling the produce in the distant consuming markets and in the offseason of fruits.

Lack of local marketing centre: - The marketing of kinnow and malta fruit in an efficient way has been found as main constraint in state. The existing marketing centres are not sufficient for handling of bulk arrival of fruits (Kumar 2017). The location of these marketing centres has found to be irrational to hinterlands of producing area of fruits and markets were not vertically integrated to each other. This forces the farmers to sell their produce to pre-harvest contractors, therefore resulting in low share of producer in the consumer rupee. The present study identified this as a third most important problem with a mean score of 4 at severity scale (Table 4.5.2). About 78 per cent of farmers have perceived this problem of severe or very severe nature.

Export bottlenecks: - The most of the kinnow and malta exported from the country is restricted to developing countries only. The lack of cold supply chain for transportation, inability of fruits to satisfy international standards and preference of seedless kinnow in developed countries are the main bottlenecks identified for export of kinnow to foreign countries (NHRDF, 2018). With 3.98 mean score on severity scale, this problem has been put at fourth rank and about 75 per cent of farmers have stated this problem of severe or very severe nature. Therefore the development of kinnow and malta varieties according to international standards may boost the exports of these fruit from the state. These results are in line with the finding of Bhgyalaxmi (2005).

Fluctuations in prices: - The seasonality and perishable nature of fruits leads to the high level of price fluctuations with low price in the markets during harvesting period. Arrival of fruits in the market has been concentrated in the peak period of 50 to 60 days in the harvesting season. This results gluts of fruits in the market, thus depressing the price. The problem of inter-year and intra-year fluctuations in price in study area was reported as the other main problem (5^{th} ranked) with mean score of severity 3.83 (Table 4.5.2). About 67 per cent of farmers have this problem of severe or very severe on severity scale. The problem of price fluctuation in study area adversely affected the interest of farmers and enthusiasm towards fruit production. The observations are in conformity with finding of Mavi *et al* (2012) and Kaur (2017).

Table 4.5.2 Fruits marketing related problems faced by farmers

Problem	**% share of farmers facing different level of problem**					**Chi-square value**	**Mean score**	**Rank**
	No problem	**Low problem**	**Medium problem**	**Severe Problem**	**Very severe problem**			
Fluctuations in prices	-	15	18.33	35.00	31.67	67.32	3.83	**V**
Poor market information/ intelligence	11.67	30	36.67	21.67	-	43.99	2.42	**VIII**
Lack of local marketing center	3.33	6.67	11.67	40.00	38.33	95.65	4.00	**III**
Malpractices by middlemen /large number of middleman	-	10	33.33	33.33	23.33	69.32	3.67	**VI**
Lack of processing plants in adjacent area	-	11.67	8.33	25.00	55.00	131.31	4.23	**I**
Lack of cold supply chain	-	3.33	10.00	50.00	36.67	137.31	4.17	**II**
Export bottlenecks	3.33	1.67	20.00	40.00	35.00	94.31	3.98	**IV**
Transport / road bottlenecks	3.33	23.34	25.00	31.67	16.67	34.33	3.25	**VII**

Note: Chi-square value is significant at 5 % level of significance

Malpractices by middlemen /large number of middleman: - The marketing process of fruits is associated with large number of market intermediaries which increase their margins through adopting malpractices like unauthorised quality related price cuts, cartel formation, etc. and reduce the producers share in the consumer rupee. The study of Grower *et al* (2013) also revealed that the producers share in consumer rupee was relatively less in comparison to when farmers sold their produce direct to the consumer. This problem of large number of exploitative intermediaries in study area ranked six with 3.67 mean score on severity scale. About 66 per cent of farmers have stated this problem as medium or severe on severity scale. The presence of large number of middlemen depresses farmer's share in consumer rupee on an account of associated marketing costs and margins of market functionaries.

Infrastructural bottlenecks: - The present infrastructure for transporting the fruits is highly uneconomical, insufficient and substantially injurious to the fruit transport. The roads connecting the different orchards are not suitable for specially designed fruit carriers. The railway had also not showed the interest in the development of fruit transportation. The present study identified this as a seventh ranked problem with a mean score of 3.25 at severity scale (Table 4.5.2). About 56 per cent of farmers have stated this problem as medium or severe on severity scale. These results are in line with findings of Sharma and Guleria (2020).

Poor market information/ intelligence:- Lack of sufficient market information / intelligence affects marketing efficiency of agricultural markets. Farmer do not have adequate information regarding fluctuations in price, changes in market demand - supply pattern and forecasted prices of fruits. Little information about market scenario is obtained by farmers from their personal contacts. Thus farmers miss the opportunity of selling fruits at right time on right price in high price markets (Kaur, 2009). This problem in study area was stand eighth rank with 2.42 mean score on severity scale. About 37 per cent and 22 per cent of farmers have stated this problem as medium severe and severe on severity scale respectively.

4.5.3 Fresh raw material related problems faced by processing units

The existing fruit processing units are facing problems related to fresh raw material such as seasonal and inadequate supply, quality problems of fruits, high fruit price, transportation problems, and high marketing cost. In order to suggest the feasible solutions for the growth and development of this sector in the state in this section the details of these problems have been discussed.

Quality related problems of fruits: - The taste**,** odour and presentation of products made from fresh fruits are highly depending on the quality of fruits used as raw material (Mehta, 2014). According to processing units many fruits available in market lack the proper processing qualities. In the study area 100 per cent of processing units stated this problem of severe or very severe nature with mean score of 4.50 at severity scale.

Seasonal and inadequate supply of fresh fruits: - The production of fruits is seasonal with

very short ripening span. This creates the excess supply in the market at harvesting time and no or very low availability at other time. The fruit producing region also lack the diversity of fruits. The fruits processing units require the regular and constant supply of variety of fruits throughout the year for the optimum utilization of investments and capacity of processing units. In the study area this problem stands second rank on severity scale with means score of 4.33. About 83 per cent of sampled processing units stated this problem of severe or very severe nature. Due to seasonal and inadequate supply of fresh fruits the micro and small processing units have to limit their production activities to few products only resulting into underutilization of plant capacity. However, this problem is relatively low on medium scale unit which can shift their production process from one product to another. Bhattacharyya (2013) and Choudhary (2019).

4.5.3 Fresh raw material, production and marketing related problems

Problem	**% share of processing units facing different level of problem**			**Mean score**	**Rank**
	Medium problem	**Severe problem**	**Very severe problem**		
Seasonal and inadequate supply of fresh fruit in local region	16.67	33.33	50	4.33	**II**
Quality problems of fruits	-	50	50	4.50	**I**
Lack of storage facilities	33.33	16.67	50	3.83	**IV**
High marketing costs	-	83.33	16.67	4.17	**III**

Note: Zero observations with no problem, and low problem responses

High marketing costs: - The processing units have to procure the raw material from farmers, markets within state and market out of the state. In this process they have to pay different market costs. The inefficiency of in market system increase costs of processing units to uneconomical level and reduction of their profit and margins. About 83 per cent of processing units perceived this as severe problem with other 17 per cent rating it of very severe nature with overall mean score at 4.17 on severity scale. Thus this problem turns to be third most important problem for the processing units. The high marketing cost constraints faced by processing units were also reported by Reddy (2010).

Lack of cold storage facilities: - The price of fruits in market depends on supply of fruits by fruits. At the time of peak arrival of fruits in the market, the price paid by processing units was found low. But at the time of lean seasonal arrival the processing units have to pay high prices for that fruit. The availability cold storage facilities with processing units may help them for efficient utilization of plants in lean season of fruits. Due to unavailability of sufficient storage capacity, the micro and small units have to suffer more because they have to buy fruits at high prices from nearby markets. This problem stand fourth rank among the

problems and around 50 per cent of processing units stated this as a severe problem with a mean score of 3.83 on severity scale.

4.5.3 Production and marketing of fruit products related problems faced by processing units

After the production of varieties of fruit products such as jam, pickle, concentrates etc. The processing units have to face many constraints in the marketing of these products. The major constraints perceived by processing units are listed and detailed discussion on these constraints has been presented under following sub-headings:

Lack of demand of processed product: - The limited demand of processed product in market is the major reason for discouragement of processing sector (Reddy, 2010). The main demand for processed fruit product is in the urban area. On account of high price, lack of taste development, low rural incomes and lack of knowledge about processed products, the demand of processed products is still very low in rural area comprising the major proportion of Indian population. This problem have been perceived by processing units as the most severe one with 4.83 mean score of severity scale in the study area. About 83 per cent of units stated this as very severe problem with other about 17 per cent perceiving it as of severe nature.

Lack of cold chain for delivery of processed products: - The processed foods come under category of perishable nature and thus need cold supply chain (storage and transportation) for the moving of large quantity from the centre of production to centre of consumption. The high cost and limited availability of cold supply chain facilities results in losses at different marketing stages and thus becomes uneconomical especially for the micro and small units. In the study area this problem is ranked as the second most severe problem with a mean score of 4.50 on severity scale. Two third of processing units stated this as very severe with one third units rating it of severe type. Kumar (2006) and Choudhary (2019) also pointed out that lack of cold supply chain infrastructure is the major bottleneck in development of high value processing sector in the country.

Lack of utilization of waste: - The utilization of left over waste material can help the processing units in achieving financial viability through earning extra income and reducing the cost of production. The existing processing units lack in technology that supports utilization of waste and by- products. Even medium level unit with large diversified products failed to use their waste. With mean score of 3.83, this problem has been ranked third. Half of processing units perceived it of very severe nature, while the remaining half rated it as severe problem.

Strict quality standards for processed products/export: - For the demand creation in foreign market, the processed food products need to fulfil the quality standards of international market. However, due to under developed infrastructures, poor keeping qualities, variations in tastes and flavours the existing processing units are not realizing the

export potential of processed food products. On this account these units lose the potential of foreign earning which suppresses the growth of processing industries (Bhagyalaxmi 2005). Inability to meet strict quality standards of international market was perceived as severe problems by about 83 per cent respondents.

High cost of packing material: - The cost of packing material is one of the major elements of total cost of processed fruit products. Due to high cost, the micro firms were unable to buy the standard packaging material leading to reduction in quality of their products, and thus earn bad name in the market of processed products. With a mean score of 3.67 on severity scale and around 83 per cent of processing units perceiving this as a severe nature, this problem was ranked at number four.

Table 4.5.4 Marketing of fruit products related problem

Problem	**% share of processing units facing different level of problem**				**Mean score**	**Rank**
	Low problem	**Moderate problem**	**Severe problem**	**Very severe problem**		
High cost of packing material	16.67	-	83.33	-	3.67	**V**
Inadequate supply of skilled manpower	-	50.00	50.00	-	3.50	**VII**
Paucity of funds	16.67	33.33	-	50.00	3.67	**VI**
Lack of utilization of waste	-	-	50.00	50.00	4.50	**III**
Strict quality standards for processed products/exports	-	16.67	83.33	-	3.83	**IV**
Lack of demand of processed product	-	-	16.67	83.33	4.83	**I**
Lack of cold chain for delivery of processed products	-	-	33.33	66.67	4.67	**II**

Note: Zero observations with no problem response

Paucity of funds: - For the success of any business activity the availability of capital is the most important factor. Fund required for various activity starts from establishment of unit to its full functional operating and distribution of products to the ultimate consumer. On account of lack of funds/ credit on easy terms the sample processing units especially micro and small ones were not updating their infrastructure which is necessary to expand the business. Use of out-dated methods and machinery raise the cost of production, thus making these firms uncompetitive in the industry. Paucity of funds was observed to be the other major problem

perceived by the sample processing units with mean score of 3.67 on severity scale. About 50 per cent of processing units stated this as very severe problem.

Inadequate supply of skilled man power: - The adequate availability of skilled manpower is the necessary tool for growth and development of processing industry in state. The experienced and trained man power is needed to operate the machinery as well to develop the different products as per demand in markets. Adequate training facilities are required for the staff/ man powers to meet the changing nature of food industry. The manpower employed by study processing units was not trained in modern and advanced production and marketing techniques and found to be confined to producing limited number of products using traditional / out dated techniques. About 50 per cent of processing units stated this as a severe problem with a mean score of 3.50 on severity scale.

CHAPTER-V

SUMMARY

Agriculture is being source of livelihood for major proportion of the total population has a significant impact on the overall economic development of country. Horticultural sector occupies an important place in agricultural economy in country and adds about 33 per cent towards the total value added by agricultural sector. Over the last decade, the area under horticulture grew by 2.6 per cent per annum and annual production increased at the rate of 4.8 per cent. During 2019-20, production of horticulture crops was 319.56 million tonnes from an area of 26.22 million hectares (Anonymous 2020). Fruits occupy an important place from dietic, economic and medicinal value point of view and are considered under the category of protective foods. India with 6.71 million hectares of land under fruits and production of 100.44 million tonnes is the second largest producer of fruits in the world after China and contributing nearly 10 per cent of total world fruit production.

Underlining the importance of horticultural crops, it has been observed that the Punjab state has large potential for cultivation of fruits. Though about 90 thousand hectares of land is under the fruit cultivation in state, the rate of growth in area and production has been slowed down in the recent years (Anonymous 2020). Various studies have pointed out that major bottleneck in further expansion of horticultural crops is the inadequate/inefficient existing marketing and processing infrastructure. Majority of fruit growers are compelled to sell their produce unprocessed at the harvesting time hence resulting into gluts in the market and thereby fall in prices and lower returns. To avoid marketing risk, many fruit producers lease out the orchards to the pre-harvest contractors which further lower their returns. According to experts the existing processing industry besides facing under-capacity utilization and locational problems, suffers on account of high fluctuations in market prices, varying quality and uncertainty in availability of raw material, high cost of energy, inadequate cold storage facilities, etc. To meet the diversification need of Punjab agriculture, the cultivation of high value crops, particularly the fruits have to be made more remunerative through emphasizing on marketing and processing aspects. In this backdrop, the present study was designed to examine the various marketing and processing aspects of fruits in the Punjab state with following specific objectives:

1. To examine the price spreads for fruits through different marketing channels.
2. To study the sources of fruit procurement and capacity utilization of the processing units.
3. To study the problems faced by the fruit growers and the fruit processing units.

To meet the specific objective of present study, secondary data regarding area, production and productivity of fruits was taken from Statistical Abstracts/Department of Horticulture, Punjab. Primary data was collected from sample fruit growers, market intermediaries and processors. Multi-stage sampling was adopted to select the fruit growers.

At first stage of sampling two districts having the largest area (Fazilka and Hoshiarpur) under fruits in state were selected. Two blocks, one each from the sample districts viz. Abohar (Fazilka) and Bhunga (Hoshiarpur) were selected on the basis of the highest area under fruits in the respective district. Further, two villages from each selected block were selected with probability proportional to area under the fruits. For selected 4 villages, a list of fruit growers along with area under fruits was prepared and farmers were arranged in the ascending order with respect to the area under fruits and by employing cumulative cube root frequency method divided into three size categories, small (up to 4.14 acres), medium(4.14-7.47 acres) and large (above 7.47). Using random sampling procedure, representing the three size categories, a total sample of 60 farmers were selected for survey. From selected fruit producing areas, 10 pre-harvest contractors (5 from each district) were selected randomly. Two markets in the hinterlands of producing areas viz: Abohar and Hoshiarpur markets were selected on the basis of highest market arrival of fruits in the respective fruit producing districts of Fazilka and Hoshiarpur. In addition, Ludhiana market representing the major fruit consuming centre of state was also selected. To study the market channels 15 wholesalers, and 15 retailers (5 each from selected markets) were selected randomly. Complete lists of fruit processing units were obtained from District Industrial Centre of Fazilka, Hoshiarpur and Ludhiana. From the list, 6 processing units were selected to study the processing aspects of fruits in state. Thus total sample size includes 60 farmers, 10 PHC, 15 wholesalers, 15 retailers and 6 processing units.

The study revealed that the overtime area under fruits in state increased steadily with significant CAGR of 4.95 per cent from 34.21 thousand hectares in 2000-01 to 90.47 thousand hectares in 2019-20. It has been also noticed that the total fruit production has also been increased consistently with CAGR of 7.93 per cent from 479.66 thousand metric tonnes in 2000-01 to 1972.38 thousand metric tonnes in 2019-20. The overall productivity of total fruits in state in last two decades has also shown as increasing trend with 2.85 per cent CAGR. In Punjab, Fazilka is the leading fruit growing district with 40.09 and 43.53 per cent of area and production of fruits. Hoshiarpur with 9.88 and 9.72 per cent of fruit area and production is the second important district of state. Kinnow is the leading fruit crop in state with 59.96 per cent of area and 67.38 per cent of production share of total fruits during 2019-20. The guava, mango, pear and malta & orange are the other important fruits being produced in study area.

The socio-economic profile of sample farmers revealed that about half of the sample farmers were in middle age group (41-55 years) and 55 per cent of farmers had educational level of higher secondary to graduation. Around two third of the farmers had family size up to 5 members and 86.67 per cent of farmers were having farming as their only occupation. The total operational land holding of sample fruit growers was 12.52 acres per farm which

constituted 77.14 per cent owned and 22.86 per cent of the leased in land. On sample farms about 72 per cent of total operational holding was under the fruits crops and out of this nearly 88 per cent of area was under kinnow followed by malta (11.44%). The total per farm production for kinnow and malta was 770.28 and 165.28 quintals respectively. The marketed surplus of kinnow and malta accounted for 98.20 per cent and 96.06 per cent of total production respectively and it showed direct relationship with the size of orchard.

The study identified the five major channels for marketing of fruits viz: Channel-I: Producer- Pre harvest contractor- Wholesaler (through commission agent) - Retailer- Consumer (Ludhiana),Channel-II: Producer- Wholesaler (through commission agent) - Retailer- Consumer (Ludhiana),Channel-III: Producer- Wholesaler (through commission agent) - Retailer- Consumer (Local market) Channel-IV: Producer- Retailer (through commission agent) - Consumer (Local market) and Channel-V: Producer- Processing units. Around 51 and 68 per cent of total quantity marketed surplus of kinnow and malta respectively was sold to pre- harvest contractors by the farmers and rest disposed by them self through self. The study revealed that the price spread for kinnow was maximum in channel –I at Rs 1939.47 per quintal followed by channel- II, III and IV accounts Rs 1789.66, Rs 1214.22 and Rs 973.63 per quintal respectively. The producer's share in consumer rupees was maximum in this channel- IV at 53.91 per cent followed by channel-III, channel-II and channel-I with 42.52, 36.14 and 30.80 per cent share of price paid by consumer. Channel –IV found to be most efficient with magnitude of marketing efficiency at 1.18 followed by channel- III, II and I with magnitude of 0.74, 0.57 and 0.45 respectively. For malta the price spread was maximum in channel-I (Rs 2459.40 / quintal) followed by channel- III and IV with Rs 1918.08 and 1073.50 per quintal respectively. The producer's share in consumer rupee was maximum in the channel- IV (71.14 %) followed by channel-III (48.44%) and channel-I (39.47%). In case of malta the market efficiency was maximum in channel –IV (2.47) followed by channel- III, and I with magnitude of 0.94 and 0.65 respectively. When farmers sold Kinnow to the processing units through channel-V, in absolute term they received only Rs 516.20 per quintal as net price, the lowest amongst the major study channels. The reasons for this low price in channel –V were that the processing units buy generally the low grade of kinnow.

The study revealed that the total 170 processing units are located in there study districts. The majority of processing units were micro (85.88 %) followed by small (9.42%) and medium scale (4.70%). Around two third (66.47 %) of the processing units were located in Ludhiana, the major fruit consumption centre and rest one third (33.53%) were located in Fazilka and Hoshairpur together comprising the main fruit producing pocket of state. Thus, the location of existing processing units is away from major fruit producing areas are found to be concentrated in the industrial hub of the state. The availability of better infrastructure and

skilled man power are the main reasons for establishment of processing units in the Ludhiana. The Micro, small and medium firms had per annum fruits processing capacity of 4120.50, 24286.50 and 97441.50 quintals and they utilized only 29.87, 21.23 and 7.07 per cent of the same respectively. Thus, amount of fruits procured has been directly related to the size of processing plant whole, whereas the utilization of processing capacity found to be inversely related to the installed capacity.

For producing various fruit products, the processing units have to procure raw material (fresh fruits) from various sources. During study year, total 4407.68 quintals of total fruits were procured by on average processing units. Out this 16.35, 47.66 and 35.99 per cent of total fruits were procured from farmers, market within state and markets out of the state respectively. Thus major source for the procurement of fresh fruits by the processing units was the local markets followed by different markets falling outside the state and farmers respectively.

The fruit processing units produce various products such as fruit jam, juice, fruit pulp, pickles and fruits concentrate. On an average 850.61 tonnes of fruit products per units were produced by the processing units. Out of this, 69.77 per cent was disposed in the market/ destination falling out of the state and only 30.23 per cent of product was disposed in the local markets of the state.

The problems faced by fruit growers and processing units were also identified and ranked them based on severity nature. Problems of insect / pest, problems of disease, high cost of inputs, inadequate extension services and inadequate irrigation facilities were the major problems related to production of fruits faced by fruit growers. The major constraints faced by the fruits growers in marketing of fruits were: lack of processing plants in adjacent area, lack of cold supply chain, lack of local marketing center, export bottlenecks and fluctuations in prices. The quality related problems of fruits was major (ranked I) problem faced by processing units related to fresh raw material, followed by seasonal and inadequate supply of fresh fruit in local region (ranked II), high marketing costs (ranked III), and lack of storage facilities (ranked IV). Lack of demand of processed product, lack of cold chain for delivery of processed products, lack of utilization of waste, strict quality standards for processed products/exports and high cost of packing material were identified as the major constraints being faced by processing units in marketing of final fruits products.

CONCLUSION

In past two decades, the area, production and productivity of total fruits in Punjab increased significantly. Fazilka and Hoshiarpur, the leading fruit producing districts in state, together accounted around 50 per cent of area and 78 per cent of production of fruits. Kinnow is leading fruit both in area and production in state. The marketed surplus of fruits was directly related with the size of orchard. The percentage share of fruit growers in consumer

rupees and market efficiency was highest when farmers sold the produce to retailers (channel-IV) in local markets for both kinnow and malta. On the other hand farmer's share in consumer rupee was observed to be the lowest when orchards were leased out to the pre-harvest contractors who after picking sold the fruits to wholesaler in the market. Thus, reduction in intermediaries leads to enhanced producer's percentage share in consumer rupees as well as to the enhancement of market efficiency of fruit marketing in the state. Kinnow producers who sold their output directly to the processors realized very low price because of low quality of fruit. Majority of the existing fruit processing units are located in the Ludhiana representing major consumption centre of state and away from the producing areas. The processing capacity utilized by processing units found to be very low and inversely related to the size of unit. Major fruits supply was arranged by the processing units during the peak market arrival periods at low price of fruits. Processing units purchased relatively low quantities of fruits directly from the farmers, and both local as well as distant markets were the major sources of procurement of fruits and dependence on distant markets for fruit supply increased with the increase in the size of processing unit. Many sample processing units were found to be utilizing only average/ low quality of fruits which might affect the quality (taste, fragrance, durability, etc.) of the final fruit products. Processing units were disposing their fruit products both in state and national markets. However, relative quantity sold in state markets and national markets showed negative and positive relationship with size of processing units respectively. Problems of insect/disease, inadequate irrigation facility, lack of processing unit in nearby area, lack of local markets and market information were the major constraints faced by farmers. Inadequate supply variety of fruits, low quality of fruits, strict quality standards of fruit products and lack of demand of processed food, and lack of utilization of waste were the main constraints face by processing units.

Policy implications

In order to diversify towards fruits, the problems faced by farmers in production and marketing of fruits need to be addressed at priority. In this regard, the Government/SAU/ KVKs should take the steps for strengthening of existing agricultural extension services along with creation and dissemination of adequate and reliable market related information. For enhanced fruit productivity as well its processing ability there is need to develop and supply the quality (eg. seedless kinnow), disease and insect resistant planting material of fruits. In order to increase producer's share in price paid by consumer, there is need to decrease the number of intermediaries involved and increase the reach of growers to the distant consumers markets of country even exports. For this establishment of FPO's or cooperative marketing need to be encourage among the fruit growers. To meet supply requirement of fruits of the processing units throughout the year and enhance their fruit utilization capacity, there is need to promote the fruit diversification in producing areas of the state. Further the early or late

maturing fruit varieties may be developed. Production technologies may also be developed/ tuned to get early or late harvest from the available main season verities of the fruits. Processing units need to be sanitized regarding the importance of quality of raw material being used through having a bearing on quality of final products and thus as their business standing / repute in the competitive processed food markets. The research institutes should develop technology that helps in utilization of waste generated in the fruit processing units. Government need to encourage research both in public and private institutions through appropriate policies backed with the financial incentives to meet the above research related issues. The establishment of public as well as private fruit processing units along with the strengthening/creation of cold storage infrastructure needs to be encouraged in the fruit producing belts of the state. This will help in increasing the marketing efficiency through decreasing marketing costs and spoilage of fruits. Government may also incentivise the existing processing plants in the fruit producing belt of the state.

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