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**SUPPLY CHAIN MAPPING AND BACKWARD  
AND FORWARD LINKAGES OF  
POMEGRANATE SUPPLY CHAIN IN INDIA****Dr. K C Prakash<sup>1</sup> Praveena<sup>2</sup> Dr.R.Arun<sup>3</sup> Dr Sundarapandiyam<sup>4</sup>  
Dr.K.Sivaperumal<sup>5</sup>****Article History: Received: 02.07.2023****Revised: 15.07.2023****Accepted: 23.07.2023****Abstract**

This paper provides the in-depth analysis of supply chain management of pomegranate. Pomegranate farming is a significant source of income for many farmers, and efficient supply chain management is critical to ensure that the produce is transported to different markets while maintaining its quality and freshness. The paper outlines the different stages of the supply chain, including farming, harvesting, sorting and grading, packaging, transportation, and marketing and distribution. It also highlights the challenges faced by farmers and stakeholders in the supply chain and discusses possible solutions to improve the efficiency of the supply chain. The research draws on a combination of primary data collected through interviews with stakeholders in the supply chain and secondary data from relevant literature. The study found that the majority of the farmers depends on institutional credit from government and preferred bhagwa variety. Producer-commission agent – retailer- consumer channel was found to be good. Bacterial blight and water scarcity was the main problem faced by the farmers in the pomegranate production.

**Keywords:** supply chain mapping, forward and backward linkage, Pomegranate, constraints.

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## Introduction

Pomegranate is a vital crop with high economic, nutritional, and therapeutic importance. It is grown all over the world, including India, and is becoming more and more well-known because of its various health advantages. Pomegranates are a perennial crop that can grow in dry and semi-arid climates, are drought tolerant, and can help prevent soil erosion and improve soil fertility. According to the Food and Agriculture Organization (FAO) of the United Nations, the global area under pomegranate cultivation was around 320,000 hectares in 2019. The top five pomegranate-producing countries in the world in terms of area are Turkey, Iran, India, Egypt, and Afghanistan. India is the third-largest producer of pomegranate in the world, the total area under pomegranate cultivation in India was around 212,000 hectares during the crop year 2020-21. The total production of pomegranate in India during the same period was around 2.5 million metric tons. The major pomegranate-producing states in India include Maharashtra Karnataka, Gujarat, Andhra Pradesh, Tamil Nadu, and Rajasthan. According to APEDA, the total export of fresh pomegranate from India during the fiscal year 2020-21 (April 2020 to March 2021) was around 106,506 metric tons. The total value of fresh pomegranate exported from India during the same period was around USD 67.28 million. The major export destinations for Indian pomegranate include the United Arab Emirates (UAE), Bangladesh, the Netherlands, the United Kingdom, and Saudi Arabia. Supply chain management of pomegranate involves procurement of seedlings, inputs, production and delivery of the final product to the end user. SCM of pomegranate covers all the processes involved in the production and delivery of a product to the final consumer, including planning, procurement, production, and logistics. The primary goal of the study was to examine the supply chain mapping,

as well as the backward and forward linkages, and limitations in the supply chain.

## Methodology

The primary purpose of the study is to identify the supply chain management of pomegranate in the Vijayapura district of Karnataka, India. Vijayapura district is a major commercial hub for Pomegranate cultivation in North Karnataka, with the largest total area under Pomegranate in the state. To achieve the study's objectives, primary data necessary for the research was collected using a pretested and structured schedule through personal interviews with the 90 farmers. Different statistical tools and methods were used for the analysis of the research.

## Results and Discussion

The results of the study are discussed under supply chain mapping, backward and forward linkages and constraints in production and marketing of pomegranate headings.

### 1. Supply Chain Mapping

The graphical representation of the movement of pomegranate from production to consumption, passing through various stages and processors is depicted in the supply chain map (Fig. 1). The linkages are shown vertically from left to right, with major chain functions listed at the top, including input supply, production, trading, marketing, processing, and consumption. The actors involved in carrying out different functions are shown in the vertical flow from left to right. The left-hand side shows stakeholders who assist and facilitate actors in carrying out their functions, while the enablers are mostly formal and informal institutions as well as private institutions. The enablers' roles may include several actors and functions in the supply chain. As depicted in the diagram, certain actors are responsible for multiple functions while others are restricted to a single function. For instance, traders are

involved in both collecting the produce from farmers and supplying it to wholesaler's or processors.

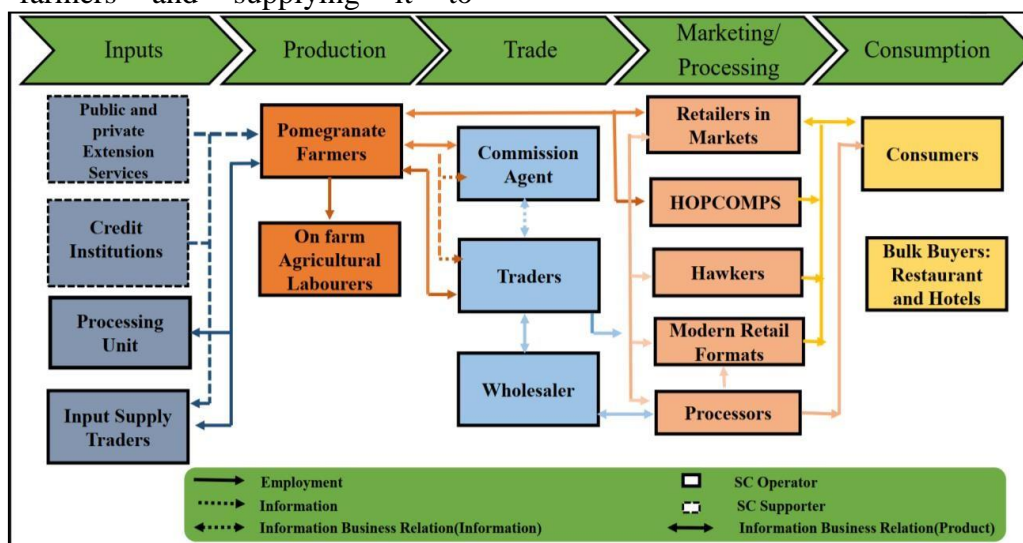


Fig:1 Mapping of pomegranate supply chain

2. Backward and Forward Linkages

The study of the pomegranate supply chain involved the identification of key players involved at different stages of the supply chain management (Fig.2). Starting from the production of fresh pomegranate at the farm level as a reference point, the forward and backward linkages were traced. Forward linkages refer to the movement of the produce at different

marketing stages, while backward linkages pertain to the sourcing of inputs, credit facilities, and production management (Fig.3). As pomegranate cultivation has been practiced in the district for along time, the production inputs such as planting material, manure, and plant protection chemicals are sourced locally.

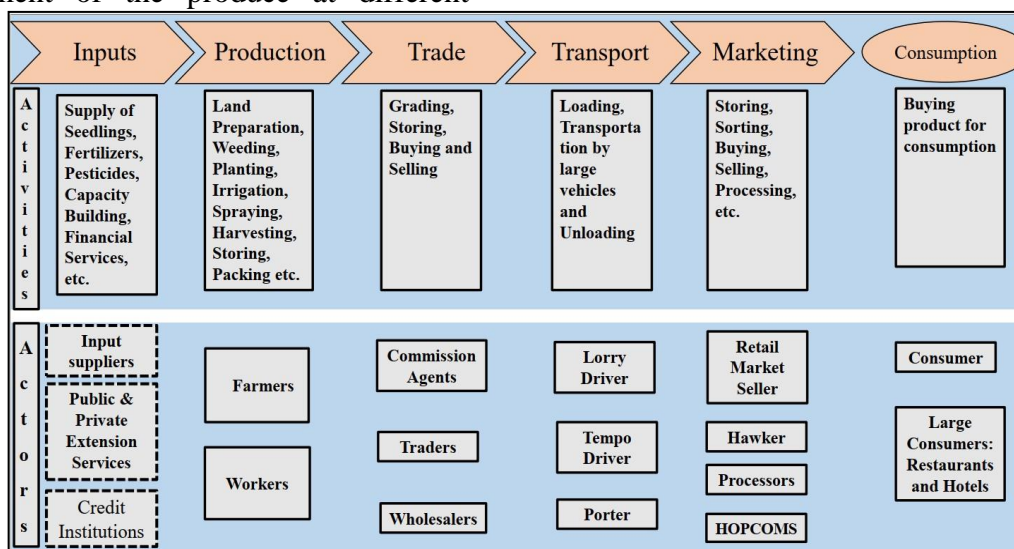


Fig:2 Functions of different players in supply chain

The supply chain of pomegranate in the study area is illustrated in the form of a map which shows the primary relationships and alternative channels involved in the subsector. The map

represents the structure of the supply chain in terms of how the products are flowing and identifies the actors participating in the chain through boxes. The different activities performed by the actors are also

displayed separately. The dotted lines indicate the information and support activities exchanged between the players. However, there is no efficient supply relationship observed among the various segments of the pomegranate supply chain, including the actors performing the

transactional roles and the service providers. The actors involved in the supply chain are input suppliers, producers, commission agents, traders, wholesalers, and consumers.

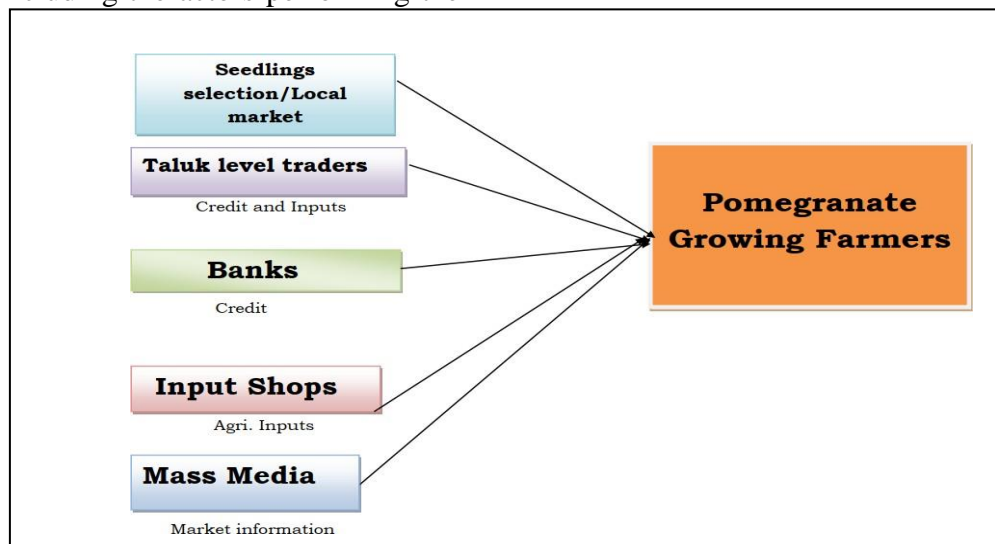


Fig:3 Backward linkages of pomegranate supply chain

### Socio-economic characteristics of the producers

The study categorized the sample respondents based on their age, education, average family size, and average landholding to determine their socio-economic characteristics. About 64% of the respondents belong to the 30-40 age group, indicating that most respondents in this age group are engaged in agriculture and have extensive knowledge in pomegranate cultivation. Additionally, the study found that 41.11% of the respondents had only received primary education, agriculture is their primary occupation and the only source of income to meet their basic livelihood needs. Around 42.23% of the respondents had protected irrigated land, indicating that bore wells are the primary source of irrigation.

### Sample farmers average farm size & Source of seedlings

In terms of area under pomegranate orchards, the small farmers have an

average of 0.62 acres, the medium farmers have an average of 2.78 acres, and the large farmers have an average of 6.85 acres. About 64.4% of farmers believe that they can easily obtain seedlings from local sources and had sufficient experience with production technology. The majority of farmers (80.1%) did not face any problems hiring labour and found it easily available. However, 64.4% of farmers claimed that water availability is an issue in maintaining orchards during summer.

The farmers consider the overall performance of the orchard in terms of ease of managing pests and diseases, price volatility, and marketing methods. Forty four per cent farmers reported a moderate yield dependent on the type of soil. As for price fluctuations, 47.7% of farmers opined that market prices were moderate, and timing the sale was risky. Only 35.5% of farmers had observed low levels of price fluctuations.

### Origin of information regarding production and marketing

It was found that all farmers consulted private consultants for information on varieties and production counseling (Fig.4). The majority of farmers (89%) sought production information from State Department of Horticulture officials, whereas only 28% accessed related programs on TV for such information. For

varietal information, the majority (98%) relied on private consultants followed by advice from traders (73%). Regarding integrated nutrient management (INM) and integrated pest management (IPM), the majority of farmers (80%) consulted departmental officials. In terms of market information, farmers consulted traders (99%) and TV (88%).

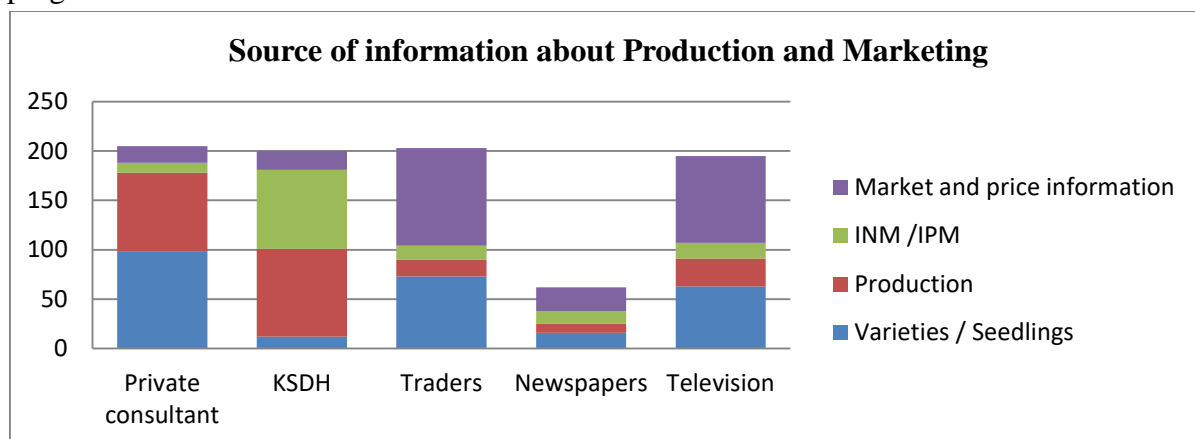


Fig : 4 Source of information about production and marketing

### Preference towards seedlings and purchase of inputs

From the results, 57.7% of the growers preferred the Bhagwa variety, followed by Ganesh (23.3%) and Ruby (18.9%) when selecting seedlings from private nurseries. On the other hand, when choosing seedlings from Government Departments, growers preferred Ganesh variety(42.2%) followed by Ruby (33.3%) and Bhagwa

variety(24.5%). In terms of Seedling type, private nurseries primarily supplied cuttings (64.4%), while Government departments primarily supplied tissue culture seedlings (56.7%). The results indicated that 71% of the farmers preferred traders at the taluk level for the purchase of chemicals and fertilizers, followed by PACS (20%) and RSK (9%).

Table.1. Credit source for pomegranate farmers

| S.no  | Particulars      | No. of respondents | Percentage to Total |
|-------|------------------|--------------------|---------------------|
| 1     | Private banks    | 16                 | 17.70               |
| 2     | Government banks | 28                 | 31.20               |
| 3     | PACS             | 24                 | 26.80               |
| 4     | PCARDB           | 7                  | 7.70                |
| 5     | Traders          | 10                 | 11.10               |
| 6     | Money lenders    | 5                  | 5.50                |
| Total |                  | 90                 | 100                 |

According to the table, 31.2% of the sample farmers obtained credit from government banks, while 26.8% received

credit from PACS followed by private banks (17.7%) and traders (11.10%). Hence, it is concluded that the farmers can



get credit easily from institutional and non-institutional sources.

### Marketing channels used by the farmers

Three different channels through which pomegranate produce in the study area is marketed to reach the end consumers:

Channel I : Producer - commission agent - Retailer - Consumer.

Channel II : Producer - Distant market wholesaler.

Channel III : Producer - exporter.

Three channels were identified in the study area. The producer's share of the consumer's rupee in the first channel was 87.26% after the costs and profits of the intermediaries were subtracted. The overall marketing cost borne by the producers accounted for 4.68% of the consumer's price. The total marketing costs incurred by the commission agent-cum-wholesaler and retailer were Rs. 878.86 per ton and Rs. 1212.29 per ton, respectively. In the first channel, the price difference was Rs. 4,701.37(12.74%), with the commission agent and retailer receiving Rs. 912.55 and Rs. 1,697.67, respectively. After deducting the marketing cost of Rs. 1726.71 (4.68%), the producer-seller received a net price of

Rs. 40,467.24 (82.58%).

The direct selling channel (channel-II) involved the producer selling their produce directly to a distant wholesaler who would arrive during the harvest season from other states, without any intermediaries. After deducting the marketing cost of Rs. 43.86 (0.10%) per ton incurred by the producer-seller, the net price received in this channel was Rs. 43,656.19 (99.90%). This channel was the most popular among farmers in the study area, as it resulted in the highest net price for the producer-seller (99.90%) and saved them time and transportation costs. The immediate payment by the distant wholesaler after taking delivery of the produce also made this channel attractive.

In Channel III, the producer-seller sold his produce directly to the exporter by transporting his produce to the collection point as indicated by the exporter. The cost of marketing incurred by the producer-seller was Rs. 334.93 per ton (0.67%) as the produce was to be transported to exporter's collection point from the production places. In this channel the net price received by the producer was Rs.44,781.08 per ton accounting for 99.33 percent, which was marginally less compared to the channel-II.

### 3.Constraints in Supply chain management

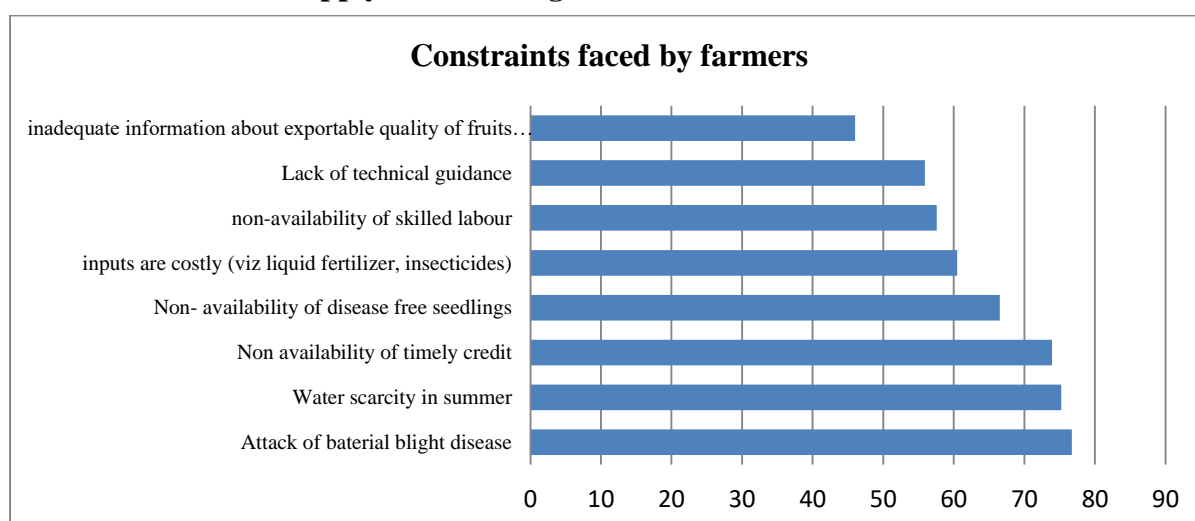


Fig : 5 Constraints faced by farmers in Production and marketing of Pomegranate

### Problems faced by then farmers in production of pomegranate

The list of problems was obtained from the farmers, who were requested to rank them in term of importance. The most important problem was the attack of bacterial blight disease with a mean score of 76.7, followed by water scarcity during

summer due to fluctuations in electricity and low yield of bore well with a mean score of 75.2. Non-availability of timely credit was ranked third followed by non-availability of disease-free seedlings, high cost of inputs, non-availability of skilled labor, lack of technical guidance smaller number of exporters.

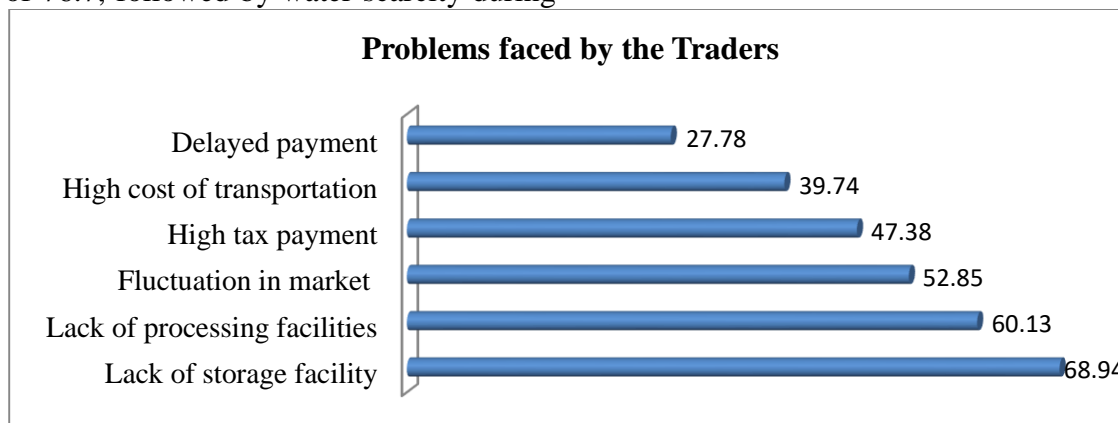


Fig : 6 Problem faced by Traders in Pomegranate trading

### Constraints faced by Traders

Lack of storage facility was identified as the most significant problem faced by traders, with a mean score of 68.94. Lack of processing facilities was ranked second with a mean score of 60.13, followed by Fluctuation in market prices, high tax payment and high cost of transportation.

### Conclusion

The pomegranate crop has a promising commercial potential, and its cultivation area is expanding significantly in the study region. Therefore, the government ought to consider establishing new processing units, providing scientific storage facilities, and facilitating forward linkage in the area to protect the interests of pomegranate growers. The development of resistant varieties is necessary to combat the harmful effects of diseases such as Bacterial Blight and Wilt, which have forced farmers in the study area to uproot their crops and seek other options. Most farmers rely on private consultants and traders to obtain information about production and marketing. It is important

to establish appropriate training and market information dissemination facilities in Agricultural Universities (AU), KVKs, and Krishi Sanjivani Kendra's (KSDH). Farmers need to be educated through demonstrations to adopt the recommended application of fertilizers and plant protection chemicals, as they are currently being underused.

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