

SUPPLY CHAIN ANALYSIS OF MAIZE IN RANGAREDDY DISTRICT OF TELANGANA

BY

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B.Sc. (CA&BM)

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2022

DECLARATION

I, **ALLA NIHITH REDDY**, hereby declare that the project report entitled **“SUPPLY CHAIN ANALYSIS OF MAIZE IN RANGAREDDY DISTRICT OF TELANGANA”** submitted to **Acharya N.G. Ranga Agricultural University, Guntur** for the degree of **MASTER OF BUSINESS ADMINISTRATION (AGRIBUSINESS MANAGEMENT)** is the result of original research work done by me. I also declare that no material contained in this project report has been published earlier in any manner.

Place : Tirupati

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CERTIFICATE

This is to certify that **Mr. ALLA NIHITH REDDY** has satisfactorily prosecuted the course of research and that the project entitled “**SUPPLY CHAIN ANALYSIS OF MAIZE IN RANGAREDDY DISTRICT OF TELANGANA**” submitted is the result of original research work and is of sufficiently high standard to warrant its presentation to the examination. I also certify that neither the project report nor its part thereof has not been previously submitted by him for a degree of any university.

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This is to certify that the project report entitled “**SUPPLY CHAIN ANALYSIS OF MAIZE IN RANGAREDDY DISTRICT OF TELANGANA**” submitted in partial fulfillment of the requirements for the award of degree of **MASTER OF BUSINESS ADMINISTRATION (AGRIBUSINESS MANAGEMENT)** of the Acharya N.G. Ranga Agricultural University, Guntur, is a record of the bonafide original research work carried out by **Mr. ALLA NIHITH REDDY** under our guidance and supervision.

No part of the project report has been submitted by the student for any other degree or diploma. The published part and all assistance and help received during the course of investigation have been duly acknowledged by the author of the project report.

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LIST OF SYMBOLS AND ABBREVIATIONS

<i>et al.</i>	:	and other
e.g.,	:	Example
Fig.	:	Figure
%	:	Per cent
<	:	Less than
>	:	Greater than
S.No.	:	Serial Number
i.e.	:	That is
No.	:	Number
NGO	:	Non-Government Organization
GCC	:	Girijan Cooperative Corporation
ITDA	:	Integrated Tribal Development Agency
FPO	:	Farmer Producer Organization
FPC	:	Farmer Producer Company
HoReCa	:	Hotels, Restaurants, and Cafes
FMCG	:	Fast Moving Consumer Goods
WWW	:	World Wide Web

ABSTRACT

Author of the project : **A. NIHITH REDDY**
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Maize is the world's second most widely grown crop. It is known as the "Queen of Cereals" due to its high genetic yield potential. It is a versatile crop that may be cultivated in a variety of environments. More than 170 countries are now producing 1147('000 MT) of maize on 193('000 ha) area, with a mean yield of 5.75 tons per hectare (FAOSTAT, 2020). Feed accounts for 61 percent of worldwide maize consumption, followed by food (17%) and industrial raw material (22%). It has risen to the status of a commercial crop in the world, with 83 percent of its output going to the feed, starch, and biofuel industries. Furthermore, 3000 commodities are produced from maize, either directly or indirectly. It is regarded as a major driver of the global agricultural economy because of its advantages.

Rangareddy district was specifically chosen for the study because there has been an increase in the area under maize cultivation over the past decade due to an increase in the use of the crop as poultry feed. The study was conducted in two mandals, Nandigama and Kothur, were chosen from the Rangareddy district where maize was primarily sown. The villages are Appareddyguda, Cheguru, and Majid Mamidpally from Nandigama mandal and Kodicherla, Penjerla, and Manchanpadu from Kothur mandal were randomly selected for the study. Ten farmers were randomly chosen from each area, making a total of 60 farmers in the sample. 10 market intermediaries, including five commission agents and five wholesalers, were selected randomly to take part in this study together with the farmers.

According to the findings of the study, the majority of farmers (56.67%) and stakeholders (60%) were between the ages of 40 and 60. According to education level, the majority of farmers (38.33%) and market intermediaries (40%) obtained their secondary education. 43.33 percent of the farmers in the sample had less than 1 hectare of land sown with maize,

and the majority of farmers (46.66 percent) had medium acreage with less than 2 to 10 ha. 40 percent of market intermediaries and 81.66 percent of farmers, correspondingly, reported having more than 15 years of dealing experience.

There were four channels identified in the maize supply chain in the study area. The identified channels were Channel – I: Producer – Hatcheries; Channel – II: Producer – Commission agent – Hatcheries; Channel – III: Producer – Wholesaler – Hatcheries; Channel – IV: Producer – Commission agent – Wholesalers – Hatcheries. About 46.67 percent of farmers were adopting Channel I. Among the four marketing channels, Channel I (Rs. 100.20) has the least marketing cost per quintal of maize followed by Channel II (Rs.128.04), Channel III (Rs. 231.27), and Channel IV (Rs. 259.11).

As farmers are selling their produce directly to hatcheries, it was decided from the results above that channel was more effective than the other marketing routes. Most farmers who have slightly high financial status didn't rely on market intermediaries for funding and they sold their produce straight to hatcheries. Farmers seeking marketing channels II, III, and IV depended on marketing intermediaries to earn the capital needed for their maize crop.

Problems faced by the farmers and market intermediaries were analyzed using the Garret ranking technique. The most faced problem by producers during production was labor availability. This was followed by pest infestation. Market intermediaries felt grain quality and cob size was the major problem followed by price fluctuations.

Chapter - I

Introduction

CHAPTER I

INTRODUCTION

INTRODUCTION:

Maize is one of the world's most adaptable crops. It is grown in the tropics, subtropics, and temperate regions up to 500 to 4000 meters above sea level in all semi-arid, irrigated conditions. There is a huge assortment of varieties available, ranging from 85 days to more than 200 days, with a wide range of grain color and texture.

Maize has a broad range of applications due to its global distribution and lower price. It is used not only for direct human consumption, industrially processed food, and livestock feed but also in non-food industrial items such as starches, acids, and alcohol. There has recently been a renewed interest in using maize to make ethanol as a substitute for petroleum-based fuels.

IMPORTANCE OF MAIZE:

As compared to major cereals like wheat (19.0 Quintals/ha) and rice (25.9 Quintals/ha), maize produces the biggest average grain yield (30.5 Quintals/ha). Maize has the distinction of being one of the biggest yielding crops among the world's major crops in terms of its composition, namely effective exploitation of radiant energy and carbon dioxide fixation from the atmosphere. Maize cultivation has the lowest economic for cultivation. Only maize is utilized to extract oil from cereals.

Maize is a valuable crop that is primarily grown for human and livestock consumption. Seeds and cobs are used as raw substances in a variety of industries. For human consumption, the seeds are processed and converted into required preparations such as flakes, grits, and pops. Maize has a nutritional value of 60 to 68 percent starch and 7 to 15% protein. Seeded varieties with a high percentage of fundamental amino acids are more nutritious. Proteins, fats, and sugars are all contained in the fetus, which accounts for about 12% of the

whole grain. Vitamin A is found in abundance in yellow maize. Other than wheat or rice, maize has higher levels of riboflavin as well as phosphorus and potassium.

The edible oil content of maize ranges from 1.2 to 5.7 percent. As much as 14 percent can be found in varieties formulated specifically for oil products. Maize oil can commonly be used in cooking and the generation of hydrogenated oils. This oil like sunflower oil can reduce cholesterol levels in the human blood. The oil has an approximate fat content of 80 percent.

Starch, syrup, dextrose, oil, gelatin, and lactic acid are all constituents of maize. Soups, sauces, and custard powder all benefit from the thickening properties of corn flour. Corn syrup is an ingredient used in confectionery units. Soft drinks and other medicinal formulations use corn sugar (dextrose) as a sweetening element. Known for its ability to retain moisture, corn gel is used as a bonding agent for ice cream cones and as a dry dusting agent for baking products.

The next significant domain whereby maize is extensively used is for livestock feed, such as for cattle, poultry, and pigs in both seed and fodder variants. To significantly increase milk generation, milch cattle can be given green forage. The "South African Maize" cultivar is the greatest for feed. The crop must be harvested once the grains have reached the milk stage. According to reports, this type has a lactogenic influence, making milch cows the best consumption. Compared to sorghum, bajra, and other non-leguminous forage crops, maize fodder is more palatable. The desired crop can be harvested and fed to cattle at any stage of development so the maize plant does not develop hydrogenic acid or prussic acid.

The mid-dough stage, when the dry matter content and digestibility are at their fullest, is the finest time to harvest green fodder. Currently, maize cannot be supplemented in this form by other concentrations.

WORLD SCENARIO:

Because of its gigantic genetic yield potential, maize is remembered as the "Queen of Cereals." It is the world's second most widely grown crop. More than 170 countries are currently producing 1147('000 MT) of maize on a 193('000 ha) field, with a mean yield of 5.75 tons per hectare (FAOSTAT, 2020). Feed accounts for 61 percent of global maize intake. It has risen to the status of a commercial crop in the world, with 83 percent of its production going to the feed, starch, and biofuel industries. Furthermore, 3000 items are produced with maize, either directly or indirectly. It is regarded as a major engine of the global agricultural economy due to its advantages.

INDIAN SCENARIO:

The maize crop is cultivated in an area of 9200('000 ha) in India, with a yield of 27200('000 MT), (FAOSTAT, 2020) according to the 4th advanced estimates (2019–20). Karnataka produces the most maize, with 3730 million tons (MT), followed by Madhya Pradesh and Bihar. Tamil Nadu is the most productive state (6551kg/ha), with Andhra Pradesh and West Bengal coming in second and third respectively. Maize is primarily exported from India to Nepal, Bangladesh, Myanmar, Pakistan, and Bhutan.

TELANGANA SCENARIO:

Maize (Corn) is the second most significant cultivated crop in Telangana, with about 14 lakh acres producing 16 lakh tones annually. In Telangana, during Kharif 2019-20, the area under maize was 3.81 lakh hectares. Major Maize growing districts in Telangana include Siddipet, Nagarkurnool, Rangareddy, Vikarabad, Mehaboobnagar, Kamareddy, Nizamabad, Karimnagar, and Jagtial contributing nearly 85 percent of total maize production. It is used in human food and animal feed as well as in the corn starch industry and the cultivation of baby corn. Since there is increase in meat consumption, there is increase in demand for maize as feed. The

continuous increase in maize production in the Rangareddy district is due to this poultry feed.

In developed countries, it is typically used for animal feed and industrial raw materials, while in developing countries it is primarily used as feed. Maize is a major crop in Indian agriculture and every part of the maize plant is used in some way or the other with zero waste. Domestically maize production is completely utilized for food and exports are negligible. Despite the dramatic upswing in recent years in the harvest of finer cereals such as rice, wheat, and jowar coarse grain, there is no problem with maize surpluses. As a result, it is assumed that, as the market for food grains grows in tandem with population growth, maize will maintain its place as a major cereal food grain.

AGRICULTURE SUPPLY CHAIN:

Supply chains are principally concerned with the flow of products and information between supply chain member organizations-procurement of materials, the transformation of materials into finished products, and the distribution of those products to end customers.

However, due to the inherent issues in the agriculture sector, the supply chain for different agricultural commodities in India is rife with challenges. Specific structural obstacles, like the proportion of small/marginal farmers, fragmented supply chains, the absence of scale economies, low levels of processing/value addition, poor market facilities, etc., affect the country's Agri supply chain systems.

The management of India's Agri supply chains is continually evolving to adjust to the changes in marketing realities decided to bring about by the trend of globalization as well as other internal changes, such as an increase in consumer disposable income as well as a shift in the consumer's food basket toward high-value items like fruits and vegetables. The government agencies are presently pursuing various legal reforms to enable and invite private investment in agricultural marketing infrastructure, lowering entrance

constraints to enhance coordinated supply chains and traceability, in response to the country's new agricultural economic problems.

SUPPLY CHAIN IN MAIZE:

Like all agricultural products maize also comes from farmers where it reaches different levels. Maize is not only used as food for human consumption and animal feed but it is also used as basic raw material in various industries. The supply chain starts from the producer and reaches different market intermediaries and finally reaches the target customer. Different channels have different levels of processing based on usage. All that processing will be done by intermediaries involved in the supply chain thus adding value to the entire production.

1.1 OBJECTIVES OF THE STUDY:

Detailing the supply chain will aid in the identification of structural issues as well as cost savings and quality preservation. Maize production has increased in the Rangareddy district in recent years as its use as poultry feed has increased. As a result, the research was conducted with the following objectives:

- To understand the existing supply chain models in the Rangareddy district of Telangana.
- To determine the marketing costs, margins, and price spreads in different supply chains.
- To study the constraints faced by different stakeholders in the supply chain.

1.2 SCOPE OF THE STUDY:

The study provides a clear-cut vision of different supply chain channels that are existing in the study area. The finding of the study would be useful to the farmers in the context of choosing the best supply chain channel so that the farmers get high prices. The results of the study will be useful to farmers

in context of attracting the attention of Government and Private bodies to build godowns for storage purposes.

1.3. LIMITATIONS OF THE STUDY:

Because of the Covid-19 pandemic, the research was performed with small sample size, over a long time. The research has a few flaws, such as the primary data obtained, which was focused on the knowledge and recollection of survey respondents, but great care was taken to obtain reasonable data from them. The results reached apply to the research field.

1.4. PLAN OF THE STUDY:

The present study is projected in five following chapters.

The first chapter discusses the study's significance, scope, and limitations. It also specifies the study objectives.

The second chapter presents the literature cited during the research period and for the study, while the third chapter describes the study sampling method as well as the methods and principles used in its analysis.

The study findings are depicted in the fourth chapter, along with a debate, and the study conclusion is drawn in the final chapter, which summarizes the study and draws the study conclusion.

Chapter - II

Review of Literature

Chapter II

REVIEW OF LITERATURE

To attain command on any study, it is necessary to review the various concepts, research methodology and analytical tools used by the researcher in earlier studies conducted by them. The findings of earlier studies would give researcher in setting appropriate hypotheses and objectives and enable to evaluate the validity of own findings. In this chapter an attempt has been made to summarize the result of the research related to the objectives of the present study. The review has been grouped in the following sub-heads.

- 2.1. Studies on the marketing channels in the supply chain.
- 2.2. Studies on the marketing costs, marketing efficiency and price spread in the supply chains.
- 2.3. Studies on the constraints faced by different stakeholders in the supply chain.

2.1. STUDIES ON MARKETING CHANNELS

Sharan and Singh (2002) studied on marketing of Kinnow in Rajasthan. In the study they identified two marketing channels for Kinnow in Sri Ganganagar and Kesari singhpur markets. The identified two marketing channels are:

Channel 1: Producer → Preharvest contractor→ Commission agent→ Wholesaler→ retailer→ Consumer

Channel 2: Producer→ Direct consumer.

Chauhan and Chhabra (2005) conducted a study on Marketable Surplus and Price-Spread for Maize in Hamirpur District of Himachal Pradesh. A multi-stage stratified sampling technique has been used to select the sample of

blocks (2), villages (10) and maize growers (120). There were three channels for marketing of maize in the study area

Channel 1: Producer → Consumer

Channel 2: Producer → Local Trader → WS/ Commission Agent → Processor / Consumer

Channel 3: Producer → Local Trader → WS/Commission Agent → Broker → Processor/ Consumer.

Sidhu *et al.* (2011) worked on the marketing efficiency of green peas under different supply chains in Punjab. The maximum quantity of green peas was sold by the growers in the wholesale market (about 89%) and the rest was sold at the farm, in the village and in Apni Mandi. The marketing of green peas has revealed three supply chains,

Channel 1: Producer → wholesaler → retailer → consumer.

Channel 2: Producer → retailer → consumer

Channel 3: Producer → consumer.

Kumaresh and Sekar (2013) identified five marketing channels for mango in Krishnagiri district of Tamil Nadu for Banglora, Alphanso, Neelum and Banganapalli varieties.

Channel 1: Producer → Commission agent → Wholesaler → Retailer → Consumer.

Channel 2: Producer → Processor.

Channel 3: Producer → Pre-harvest contractor → Commission agent → Wholesaler → Retailer → Consumer.

Channel 4: Producer → Local trader → Commission agent → Wholesaler → Exporter. Channel 5: Producer → Commission agent → Roadside vendor.

Bhat *et al.* (2015) identified the following supply chains for citrus in Samba district of Jammu region in detail.

Channel 1: Producer → Forwarding/ Commission agent → Retailer → Consumer

Channel 2: Producer → Retailer → Consumer

Channel 3: Producer → consumer.

Kumar and Kiruthika (2015) conducted “economic analysis of production and marketing of paddy in Tamil Nadu. Primary data were collected randomly from 120 farmers and 30 market intermediaries who comprise wholesalers, processors, and retailers. Three different marketing channels were identified in the study area, of which, marketing through Direct Purchase Centre (DPC) of Tamil Nadu Civil Supplies Corporation found to be the most efficient channel. The market intermediaries involved in the different channels are as follows:

Channel 1: Producer → Wholesaler → Rice miller → Wholesaler (rice) → Retailer → Consumer.

Channel 2: Producer → Broker → Wholesaler → Rice miller → Wholesaler (rice) → Retailer → Consumer.

Channel 3: Producer → Direct Procurement Centers (DPC) of Tamil Nadu Civil Supplies Corporation (TNCSC) → Rice mills → Public Distribution System (PDS) → Consumer.

Reddy *et al.* (2015) conducted study on the economics of marketing channels and efficiency of marketing of finger millet (Ragi) in Kolar district of Karnataka. They identified three marketing channels through which ragi is being passed from producer to the ultimate consumers.

Channel 1: Producer → Village trader → Retailer → Consumer.

Channel 2: Producer → village trader → Wholesaler → Consumer.

Channel 3: Producer → Commission agent → Wholesaler → Consumer.

Maurya *et al.* (2017) conducted “Marketing efficiency and price spread of groundnut marketing in Gorakhpur districts of Eastern U.P.” The study was based on intensive enquiry of 100 farmers, which were randomly from 5 sampled villages in khorabar block of district Gorakhpur. Three marketing channels were found in study area i.e.,

Channel 1: producer → consumer.

Channel 2: producer → wholesaler → retailer → consumer.

Channel 3: producer → village trader → wholesaler → retailer → consumer.

Singh *et al.* (2019) conducted study on “Marketing cost and efficiency of arhar in Chhindwara district of Madhya Pradesh. 50 sample farmers from five villages were selected for primary data collection. Three marketing channels for arhar were found in the study area. The marketing intermediaries in the channels are:

Channel 1: producer → Miller → Retailer → Consumer.

Channel 2: Producer → Wholesaler → Miller → Retailer → Consumer.

Channel 3: Producer → Commission Agent → Wholesaler → Miller → Retailer → Consumer.

Kumar *et al.* (2021) conducted study on marketing efficiency of different marketing channels of mustard crop in Swai Madhopur district of Rajasthan. From each selected villages that were chosen randomly, a separate list of mustard growing farmers was made and 80 farmers, processors, retailers, wholesalers, and consumers were selected. However, there are many marketing channels found in the study area, there are only a few that are operating efficiently.

Channel 1: Farmers → Commission Agents → Traders → Processors → Wholesaler → Retailer → Consumer.

Channel 2: Farmers→ Farmer Producer Organisation→ Traders→ Processors →Wholesaler→ Retailer → Consumer.

2.2. STUDIES ON MARKETING COST, MARKETING EFFICIENCY AND PRICE SPREAD IN DIFFERENT SUPPLY CHAINS

Sharan and Singh (2002) while studying marketing of Kinnow in Rajasthan, identified two marketing channels for Kinnow in Sri Ganganagar and Kesari singhpur markets. In channel-1 the net price received by the producer worked out to be Rs.210.12 per quintal and Rs.185.12 per quintal accounting to 24.72 percent and 21.04 percent of consumer's rupee at Sri Ganganagar and Kesari singhpur markets, respectively In Channel-2, no intermediaries between producer and consumer were involved. The net price received by farmer worked out to be Rs.366.03 and Rs.356.25 per quintal accounting 91.50 percent of the consumer's rupee in case of both the markets respectively.

Pandey *et al.* (2003) estimated the price spread as Producer – Commission agent – retailer – consumer in potato marketing at Shimla. For the present study samples of 25 potato growers, 10 commission agents and 25 retailers were selected purposively. The result showed that the producer realized around 73 per cent share in consumer's price. The retailer and commission agent earned a profit of about 3.5 and 8.0 per cent of the consumer's rupee. The price spread and marketing efficiency was found to be about 27 per cent and 3 per cent respectively.

Verma *et al.* (2004) studied price spread, market efficiency and constraints in marketing of onion in Indore district of Madhya Pradesh and revealed that produce received the maximum share of consumer's rupee in channel –I (97.33%) followed by channel –II (72.00%) and channel –III (58.12%). The highest share of consumer's rupee was observed by the farmers in channel-I as there was no intermediary between the producer and

consumer. The intervention of market intermediaries had reduced the producer's share in consumer's rupee.

Gondalia and Patel (2007) studied marketing of aonla (*Emblica officinalis*) in Gujarat and revealed that, on an average marketable surplus was 97.76 percent of total production. Among the various marketing channels, Channel-1 (Producers- Wholesalers- Retailers- Consumers) was the most popular among the farmers as about 91 percent was marketed through this channel. The total marketing cost and margins came to Rs.240.37 and Rs.507.33 per quintal respectively. The producers share in consumer's rupee was 58.26 percent. The market efficiency was 1.40. this implies that aonla marketing system was working with reasonable efficiency looking to the perishable nature of the crop.

Sidhu *et al.* (2011) worked on the marketing efficiency of green peas under different supply chains in Punjab. The maximum quantity of green peas was sold by the growers in the wholesale market (about 89%) and the rest was sold at the farm, in the village and in Apni Mandi. The marketing of green peas has revealed three supply chains. The net price received by the producer was 67 per cent, 69 per cent and 94 per cent in supply chains I, II and III respectively in the Hoshiarpur market. The supply chain III was found to be most efficient because its marketing efficiency (14.83) as compared to 2.70 in supply chain II and 2.38 in supply chain I.

Kumaresh and Sekar (2013) identified five marketing channels for mango in Krishnagiri district of Tamil Nadu for Bangalora, Alphonso, Neelum and Banganapalli varieties. Among the identified channels channel-II was most efficient for Bangalora with index of marketing efficiency 4.24 and that of Alphonso and Neelum were 7.14 and 4.07 respectively. But for Banganapalli the efficient channel was channel-IV with index of marketing efficiency 1.56.

Patel *et al.* (2013) study was carried out with a view to estimate the marketing costs, margins, price spread and marketing efficiency for lemon grown in Mehsana district of Gujarat. The data were collected by survey method for the year 2010 – 11. The highest disposal of lemon produce was in the month of July (16.57%) and the lowest was in the month of March (1.91%). About 90 per cent of the quantity of lemon produce was sold through channel 1 and only 8.09 and 2.02 per cent of produce were sold through channel 2 and channel 3 respectively in Mehsana district. The net price received by the growers was Rs.1511.78, which accounted for 66.12 per cent producer's share in consumer's rupee. The average expenses incurred in the marketing of lemon by the producers, wholesalers and retailers were Rs. 5,635.70 and 8.22 per cent respectively. The total price spread was 33.88 per cent of consumer's price when produce was sold through wholesalers and retailers.

Prabhavathi *et al.* (2013) identified two supply chains for chilli where in the first one the produce moved through trader, wholesaler, retailer, and consumer and in the second one the produce was acquired by the processor. The farmers with very good quality of chilli preferred supply chain- II to supply chain- I as there involved grading and packing of chillies. The price spread in supply chain-I revealed that the consumer's rupee was shared as producer's share 49 per cent, trader's share 6 per cent, wholesaler's share 6 per cent, and retailer's share 13 per cent whereas the price spread in supply chain- II revealed that the consumer's rupee was shared as producer's share 40 per cent, processor's 17 per cent, and retailer's share 20 per cent.

Reddy *et al.* (2015) made an attempt to study the marketing channels and efficiency of marketing of finger millet (Ragi) in Kolar district of Karnataka. They identified three marketing channels through which ragi is being passed from producer to the ultimate consumers. The producer share in consumer rupee was 77.12 per cent, 82.30 per cent and 80 per cent in channel I, channel II, and channel III respectively. The price spread in channel-I is Rs.

1820 per tonne and channel-II is Rs. 1300 per tonne and channel-III with highest price spread of Rs. 2850 per tonne.

Maurya *et al.* (2017) conducted “Marketing efficiency and price spread of groundnut marketing in Gorakhpur districts of Eastern U.P.” The study was based on intensive enquiry of 100 farmers, which were randomly from 5 sampled villages in khorabar block of district Gorakhpur. The producer’s share in consumer rupee was worked out 97.89, 83.13 and 80.79 per cent in channel - I, II and III respectively. The producer’s share in consumer rupee was decreased with increase in number of intermediaries. The marketing cost came to 2.11, 6.20 and 6.71 per cent in channel - I, II and III respectively. Marketing margin of middlemen in consumer rupee came to 12.66 per cent and 12.50 per cent in channel - II and channel - III respectively. The marketing cost and marketing margin were increased with increase in number of intermediaries.

Kumar *et al.* (2021) conducted study on marketing efficiency of different marketing channels of mustard crop in Swai Madhopur district of Rajasthan. From each selected villages that were chosen randomly, a separate list of mustard growing farmers was made and 80 farmers, processors, retailers, wholesalers, and consumers were selected. The marketing efficiency of FPOs and non – FPOs channel worked out to be 1.23 and 1.09 respectively. Price spread of FPOs and Non- FPOs channels worked out to be 43.19 and 46.11 per cent respectively. Producers share in consumers rupee of FPOs and non-FPOs channel out to be 55.86 and 52.71 per cent respectively. The marketing margin and marketing cost of FPOs channel work out to be less than non-FPOs channel. i.e., FPO’s are more relevant and profitable to the farmers.

2.3. STUDIES ON CONSTRAINTS FACED BY DIFFERENT STAKEHOLDERS IN SUPPLY CHAIN:

Chauhan and Chhabra (2005) conducted study on the production, marketed surplus, disposal channels, margins, and price-spread for maize cultivation in the Hamirpur district of Himachal Pradesh. Firstly, the low-cost transportation which is the backbone of an efficient marketing system is lacking in the study area, particularly, during the peak season, as per the local traders. Secondly, although the government has established a maize market at Kuthera, but due to high standards of procurement at this market, the average farmer in the study area was not found selling his produce in this market. Also, the per unit price of maize offered was less in this market as compared to one which the farmers could get from the private local traders who further marketed it in foodgrains markets of Hosiarpur, Amritsar and Moga in Punjab state. Thirdly, due to small marketable surplus, farmers could not themselves go to the distant markets and were fully dependent on the local traders who purchased their marketable surplus and sold in the district markets. So, there was monopoly of local traders in the market. Fourthly, due to lack of proper and scientific storage facilities and lack of market information on arrivals and prices, most farmers sold their produce immediately after the harvest. Finally, due to high cost and scarcity of good quality gunny bags, during the peak season, local traders were forced to use gunny bags of inferior quality, which increased the post-harvest losses. The higher inter-state tax was another problem forcing its local sale. All these reduced producer's share in the consumer's rupee.

Shilpa (2008) discussed in her thesis that the producers, in the traditional supply chain, encountered major problems of malpractices of buyers, lack of transportation facility and lack of storage facility. These were due to large number of intermediaries and malpractices of buyers. However, in the modern supply chain, the producers faced with the problems such as lack of financial assistance, market information and contracting agencies.

Imtiyaz and Soni (2013) evaluated the supply chain performance of fresh vegetables in Allahabad district. They stated that small and marginal farmers were most exploited due to lack of proper marketing supply chain systems and poor linkage between farmer and potential market. Problems like poor and un-evolved marketing systems, large number of intermediaries in supply chain, poor logistics and storage facilities, lack of food processing industries and high fluctuations in price added to the situation of small and marginal farmers

Kumaresh and Sekar (2013) made a study on constraints in supply chain of mango in Krishnagiri district where they considered the problems of both production and marketing. The major constraint faced by farmers in production was lack of water for irrigation during summer, followed by incidence of pests. The major marketing constraints were cartel among traders and lack of cold storage facilities to enhance the shelf-life followed by unremunerative price and lack of institutional support.

Kumar *et al.* (2013) analyzed the supply chain efficiency of marigold and found that contract farming was more efficient than the traditional supply chain. They further found the constraints in contract farming of marigold. Poor quality planting material, delayed payments, delay in supply of inputs, lack of insurance cover, inadequate field visits and labor problem. Lack of assured price, timely availability of input, input credit and lack of advanced production technologies to the farmers and lack of quantity and quality of raw materials were the problems faced by the marigold farmers when sold their produce in traditional supply chain.

Kumar and Kiruthika (2015) conducted “economic analysis of production and marketing of paddy in Tamil Nadu. Three different marketing channels were identified in the study area. According to the study, the high cost of market functions i.e., packing, transportation and brokerage was ranked as the first major constraint and it was reported by 78.33 per cent of the farmers followed by the distant location of direct purchase centers

(66.67%), delay in weighing and payment at the DPCs (60%), lack of awareness on market information and market intelligence services (53.33%), lack of awareness of credit facilities (48.33%), lack of knowledge on market led production (45.83%) and lack of knowledge on grading and standardization practices (35%).

Reddy *et al.* (2015) conducted study on the economics of marketing channels and efficiency of marketing of finger millet (Ragi) in Kolar district of Karnataka. They identified three marketing channels through which ragi is being passed from producer to the ultimate consumers. Price fluctuations (56%) was the major problem in marketing of ragi followed by lack of availability of market information (45%), commission charges (38%), distance of markets from farm (33%) and lack of skilled labor (27%).

Najmas and Krishnanedu (2018) studied on Marketing efficiency and constraint analysis of fresh mango in Malda district of West Bengal. A sample of 60 farmers were surveyed through three stage stratified random sampling method. The constraint analysis using Garrett ranking techniques revealed that large number of intermediaries involved in the marketing channels (Garrett score 69), faulty method of sale (Garrett score 67) and lack of infrastructural facilities (Garrett score 60.3) were identified as the first, second and third major constraints in the study area respectively.

Chopde (2019) conducted study for estimation of marketing cost, marketing margin and price spread through different marketing channels of capsicum in Akola district. The study revealed the problems faced by the capsicum growers as lack of processing facilities, lack of storage facility, high commission charges, lack of financial facilities etc.

Singh *et al.* (2019) conducted study on “Marketing cost and efficiency of Arhar in Chhindwara district of Madhya Pradesh. 50 sample farmers from five villages were selected for primary data collection. Major problems that were identified in the marketing of Arhar were fluctuation in market prices

(95%), lack of storage facilities (70%), high cost of transportation (65%), lack of grading and packing (55%), lack of market information (55%), and lack of financial assistance from any company (30%).

Chapter - III

Material and Methods

Chapter III

MATERIALS AND METHODS

To accomplish the objectives of the study, it is mandatory to follow a systematic approach so as to investigate the problem and interpret the results in a scientific manner. This chapter presents the description of the study area, nature and method of data collection, sampling procedure and analytical tools and techniques applied in attaining the objectives of the study from the primary and secondary data collected. This chapter is presented under the following subheadings.

3.1 Sampling Procedure

3.2 Collection of Data

3.3 Tools of Analysis

3.4 Concepts and Terms Used

3.1 SAMPLING PROCEDURE:

3.1.1 SELECTION OF DISTRICT:

The area under maize cultivation was considered as a criterion for selection of the district. Area under maize cultivation is steadily increasing for the past decade due to increase in its usage as poultry feed in Rangareddy district and hence, it was purposely selected for this study. Rangareddy is the district with average temperature of 32.42° c and the rainfall here occurs from second week of June to second week of October with maximum rainfall in the month of August. These factors acts as supporting factors for maize cultivation.

3.1.2 SELECTION OF MANDALS:

In Rangareddy district, there are 27 mandals. Out of which two mandals where maize is majorly grown were chosen for the study. The selected mandals for the study were Nandigama and Kothur.

3.1.3 SELECTION OF VILLAGES:

All the villages were enlisted from the selected mandals and the villages with highest area under Maize cultivation were selected. The selected villages were Appareddyguda, Cheguru, Majid Mamidpally from Nandigama mandal and Kodicherla, Penjerla, Manchanpadu from Kothur mandal.

3.1.4 SELECTION OF SAMPLE RESPONDENTS:

All the farmers from the selected villages were enlisted and ten farmers were selected from each village making the sample size to 60. The sample farmers in the villages were selected randomly. For the study, totally ten (10) maize market intermediaries which include commission agents (5), wholesalers (5) were randomly selected.

3.2 COLLECTION OF DATA:

3.2.1 Primary data:

The primary data was collected from farmers through personal interview method by using a schedule. The interview schedule for farmers covered aspects such as general farm and household's characteristics, parameters like education, primary and secondary occupation, details on marketing of maize, particularly channels and their problems in marketing etc. Different sets of interview schedules were prepared for market intermediaries like wholesalers and retailers. The primary data pertains to the year 2020-2021.

3.2.2 Secondary data:

The present study focuses on the aspects of marketing of the maize in the study area. Hence, the secondary data required on area under maize cultivation and cropping pattern and their major markets was collected by contacting Agricultural Officer (AO) from Nandigama mandal and Agricultural Extension Officer (AEO) from Kothur mandal.

3.3 TOOLS OF ANALYSIS:

3.3.1 TABULAR ANALYSIS:

Descriptive analysis in this study was performed by employing tabular analysis technique. This technique was used to analyze the socio-economic characteristics of the sample respondents such as age, literacy, land holding size and experience in farming. The data were analyzed and concluded using percentage analysis.

3.3.2 PRODUCER'S PRICE:

The producer's price is the net price received by the farmer at the time of first sale. This is equal to the wholesale price at the primary assembling centre, minus the charges borne by the farmers in selling.

$$P_f = P_A - C_f$$

Where,

P_A = is the price received by the farmer

C_f = is the marketing cost incurred by farmer

P_f = is the producer's price

3.3.3 MARKETING EFFICIENCY:

Marketing efficiency for the identified supply chain channels can be measured by using three methods.

- a) **Conventional Method:** Efficiency of any activity or process is defined as the ratio of output to input. If 'O' and 'I' are respectively output and input of the marketing system and 'E' is the index of marketing efficiency, then

$$E = O \div I \times 100$$

A higher value of E denotes higher level of efficiency and vice versa. When applied in the area of marketing, output is the 'value added' by the marketing system and 'input is the real cost of marketing (including some fair margins of intermediaries)'

- b) Shepherd Approach: Shepherd suggested that the ratio of the total value of goods marketed to the marketing cost may be used as a measure of marketing efficiency. The higher the ratio, the higher efficiency and vice versa. This method eliminates the problem of measurement of value added.
- c) Modified measure of marketing efficiency suggested by SS Acharya has been used in measuring marketing efficiency in the current study among many other methods available. This is said to be the efficient method in measuring marketing efficiency. It considers marketing costs and marketing margins at every stage and gave the farmer's share in consumer rupee. Acharya's modified method of marketing efficiency was stated as

$$MME = \frac{F_p}{(M_C + M_M)} \times 100$$

Where,

MME - Modified measure of marketing efficiency

F_p – Price received by the farmer

M_C – Total marketing costs

M_M – Total marketing margins

3.3.4 MARKETING COST AND MARGIN:

The concurrent margin has been estimated, as it is the difference between the prices prevailing at successive stages of marketing at a given point of time, e.g., the difference between farmers's selling price and retail price on a specific date is the total concurrent margin. To study the existing marketing system, marketing margins and cost for different channels in the selected markets the price spread was estimated by using the following formulae.

Market Margin of ⁱth middlemen (A_{mi})

Where,

A_{mi} = Market margin of i^{th} middlemen

P_{ri} = Total value of receipts per unit (Sale price) P_{pi} = Purchase value per unit (Purchase price)

C_{mi} = Cost incurred on marketing per unit by the i^{th} middlemen
Total marketing cost

$C = C_f + C_{m1} + C_{m2} + C_{m3} + \dots + C_{mn}$

Where,

C = Total cost of marketing of the commodity

C_f = Cost paid by the producer from the time the produce leaves the farm till he sells it

C_{mn} = Cost incurred by the n^{th} middlemen in the process of buying and selling the produce.

3.3.5 GARRET RANKING TECHNIQUE:

This is used to evaluate the problems faced by the sample respondents and to know preference among the given factors. In this method the respondents are asked to assign ranks to the given factors. The given ranks are converted into score values using the given formula.

$$\text{Per cent position} = 100 \times \frac{(R_{ij} - 0.50)}{N_j}$$

Where,

R_{ij} – Rank given for the i^{th} factor by j^{th} individual

N_j – Number of factors ranked by j^{th} individual

At this point, Garret's table is employed to convert per cent position into scores. Then, for each variable, the scores of each individual are added.

The value of scores and mean value of scores are calculated. The factor with highest mean score is the most important factor.

3.4 CONCEPTS AND TERMS USED:

3.4.1 Supply channel:

This is said to be the path travelled by the produce to reach consumer from the producer.

3.4.2 Stakeholder:

The player involved at different stages of supply chain viz., wholesaler and retailer.

3.4.3 Wholesaler:

He is the stakeholder who deals with large quantities of Maize produce and takes the ownership of the produce.

3.4.5 Marketing cost:

Marketing cost is said to be the cost experienced by the stakeholder in the supply channel to handle and sell the produce which includes transportation, packing, labor charges, weighing and miscellaneous.

3.4.6 Marketing Margin:

Marketing margin is said to be the difference between selling price, marketing cost and purchase price of the produce. It defines the profit margin of the stakeholders.

3.4.7 Marketing channel:

The marketing channel identifies the routes through which agricultural products moving from producers to consumers. The length of the channel differs from one commodity to other commodity, depending on the quantity to be moved and the form of consumer demand.

3.4.8 Price spread:

Price spread is defined as the difference between the price received by the farmer and the price paid by the consumer and is expressed in percentages.

Chapter - IV

Results & Discussion

Chapter IV

RESULTS AND DISCUSSION

This section provides a detailed description and discussion of findings from the research effort in accordance with the study's predetermined objectives. The following sub-headings are used to display this chapter for convenience and easy understanding:

- 4.1 Socio-Economic characteristics of sample respondents.**
- 4.2 Existing supply chains of maize in the study area.**
- 4.3 Estimation of price spread in various identified maize supply chains.**
- 4.4 Problems faced by different stakeholders of supply chain.**

4.1 SOCIO-ECONOMIC CHARACTERISTICS OF SAMPLE RESPONDENTS

The Socio-economic characteristics of the respondents give the understanding of the characteristics of the population such as age, literacy, land holding, and experience of the farmers as well as other stakeholders of the supply chain.

4.1.1 Age particulars of the sample Respondents

Age of the respondents was classified into three categories. First one was young age respondents with age 20 – 40 years. The second one was middle age respondents with 40 – 60 years of age. The last category was called as old age and is filled with the respondents of the age above 60 years.

Table 4.1 Age particulars of sample farmers

Particulars	No. of farmers	Percentage
20 – 40 years (Young)	15	25.00
40 – 60 years (Middle)	34	56.67
Above 60 years (Old)	11	18.33
Total	60	100.00

Greater proportion of sample farmers are of middle age which was 56.67 per cent. Then the young age took second place with 25 per cent followed by old age with 18.33 per cent. (Table 4.1, Fig 4.1)

Fig 4.1 Age particulars of sample farmers

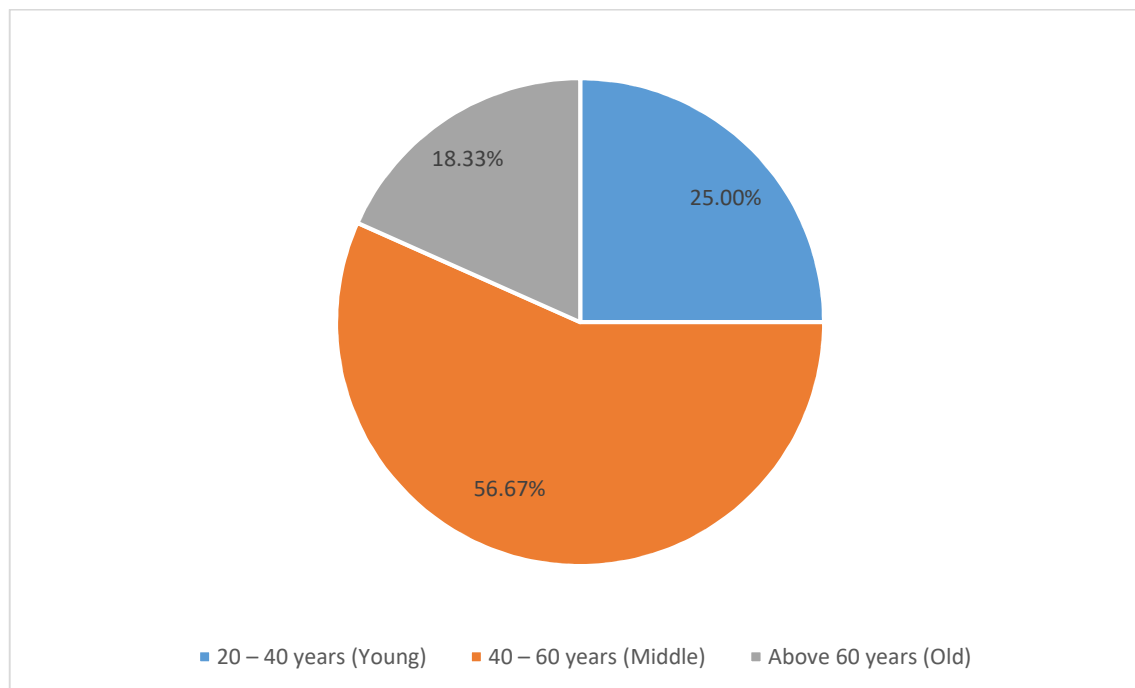
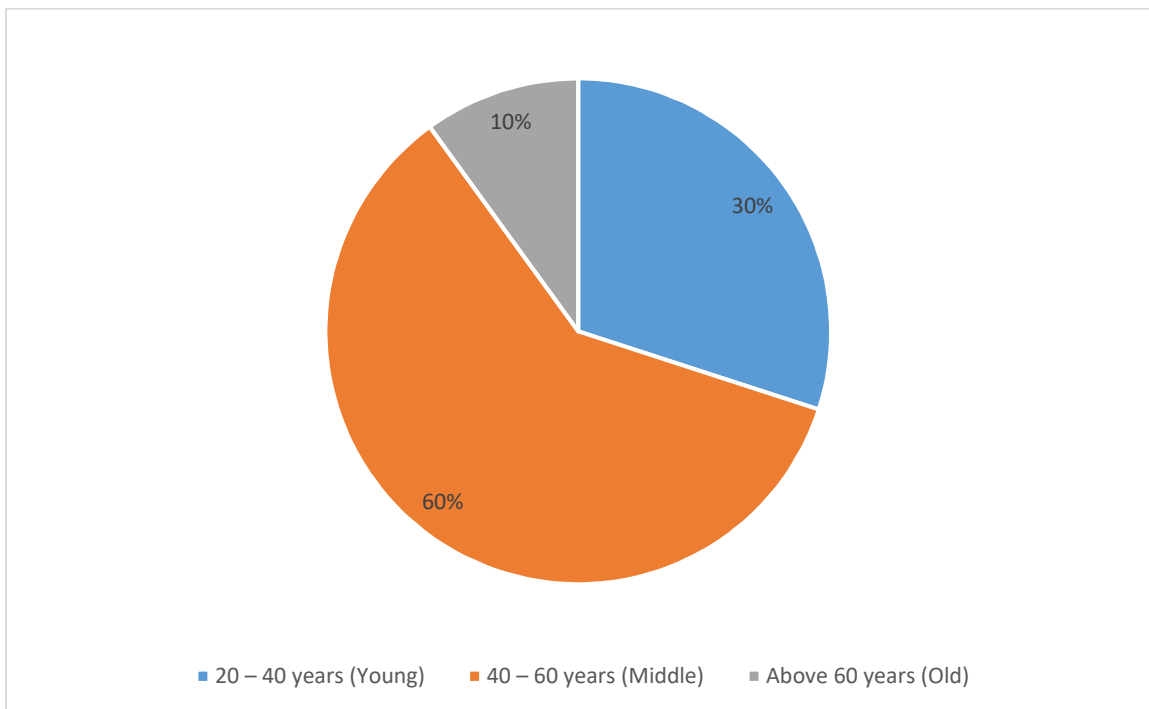


Table 4.2 Age particulars of sample market intermediaries

Particulars	No of intermediaries	Percentage
20 – 40 years (Young)	3	30.00
40 – 60 years (Middle)	6	60.00
Above 60 years (Old age)	1	10.00
Total	10	100.00

An observation of the Table 4.2 spoke about the classification of the age particulars of market intermediaries in the supply chain. The table described that the major proportion of respondents were middle aged i.e., with age between 40 – 60 years (60 per cent). The next proportion was of young age i.e., with the age in between 20 – 40 years (30 per cent) followed by old age i.e., above 60 years (10 per cent). The observation was depicted in fig 4.2.

Fig 4.2 Age particulars of market intermediaries



From the results it was found that most of the sample farmers and also market intermediaries were of middle aged category.

4.1.2 Literacy particulars of sample respondents

Literacy particulars of the respondents were classified into four categories. The first one was illiterate, primary education, secondary education and higher secondary and above.

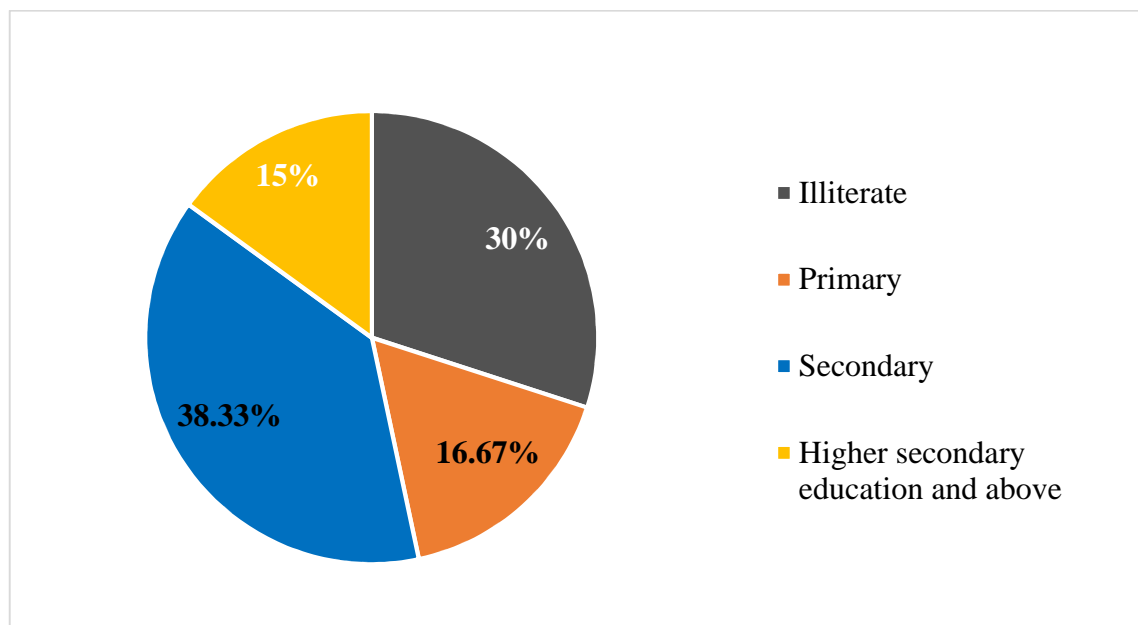
4.1.2.1 Literacy particulars of sample farmers

Table 4.3 Literacy particulars of sample farmers

Particulars	No of farmers	Percentage
Illiterate	18	30.00
Primary	10	16.67
Secondary	23	38.33
Higher secondary education and above	9	15.00
Total	60	100.00

Table 4.3 and Fig 4.3 had shown that majority of the farmer respondents fell under secondary education followed by illiterate with 38.33 per cent and 30 per cent respectively and primary education with 16.67 per cent followed by higher secondary education and above with 15 per cent.

Fig 4.3 Literacy particulars of sample farmers



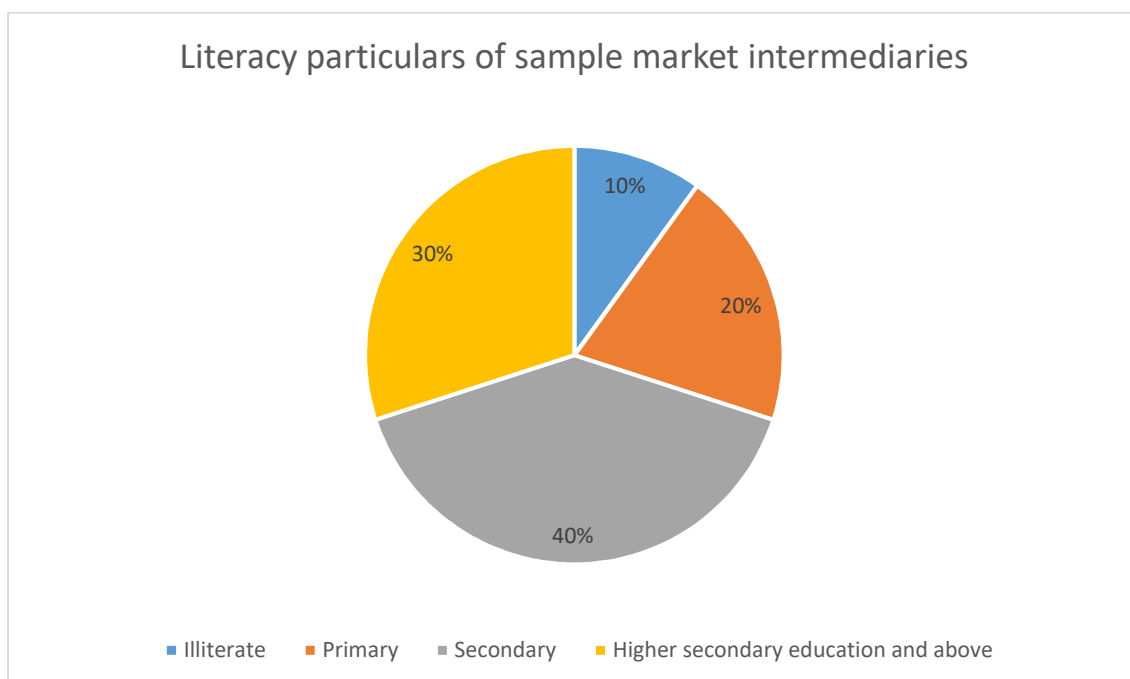
4.1.2.2 Literacy particulars of market intermediaries:

A perusal of the Table 4.4 and Fig 4.4 detailed that majority of the market intermediaries were with secondary education. This category was with 40 per cent followed by higher secondary education and above with 30 per cent of the sample, 20 per cent with primary education and only 10 per cent of the sample was illiterate.

Table 4.4 Literacy particulars of market intermediaries

Particulars	No of intermediaries	Percentage
Illiterate	1	10.00
Primary	2	20.00
Secondary	4	40.00
Higher secondary education and above	3	30.00
Total	10	100.00

Fig 4.4 Literacy particulars of sample market intermediaries



Majority of the sample respondents from both farmers and intermediaries category had their secondary education.

4.1.3 Land holding particulars of sample farmers

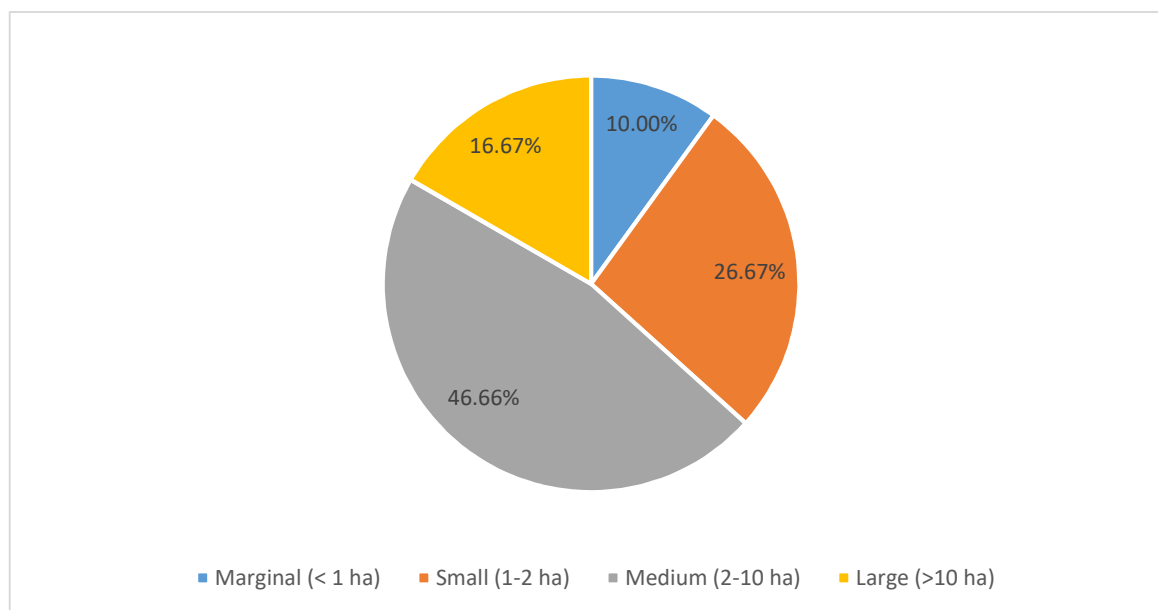
The classification of the sample farmers was done into four categories based on the land holding size. The farmers were categorized as Marginal farmers if they had < 1 hectare of land, small farmers hold 1 – 2 hectares of land, medium farmer’s holds land between two to ten hectares of land and large farmers who had more than ten hectares of land.

Table 4.5 Land holding particulars of sample farmers

Particulars	No of farmers	Percentage
Marginal (< 1 ha)	6	10.00
Small (1-2 ha)	16	26.67
Medium (2-10 ha)	28	46.66
Large (>10 ha)	10	16.67
Total	60	100.00

Table 4.5 detailed that most of the farmers in the sample were medium farmers who composed 46.66 per cent of the sample followed by small farmers with 26.67 per cent, large farmers with 16.67 per cent of the composition and marginal farmers with 10 per cent. Fig 4.5 shows the different proportions of land holdings.

Fig 4.5 Land holding particulars of sample farmers



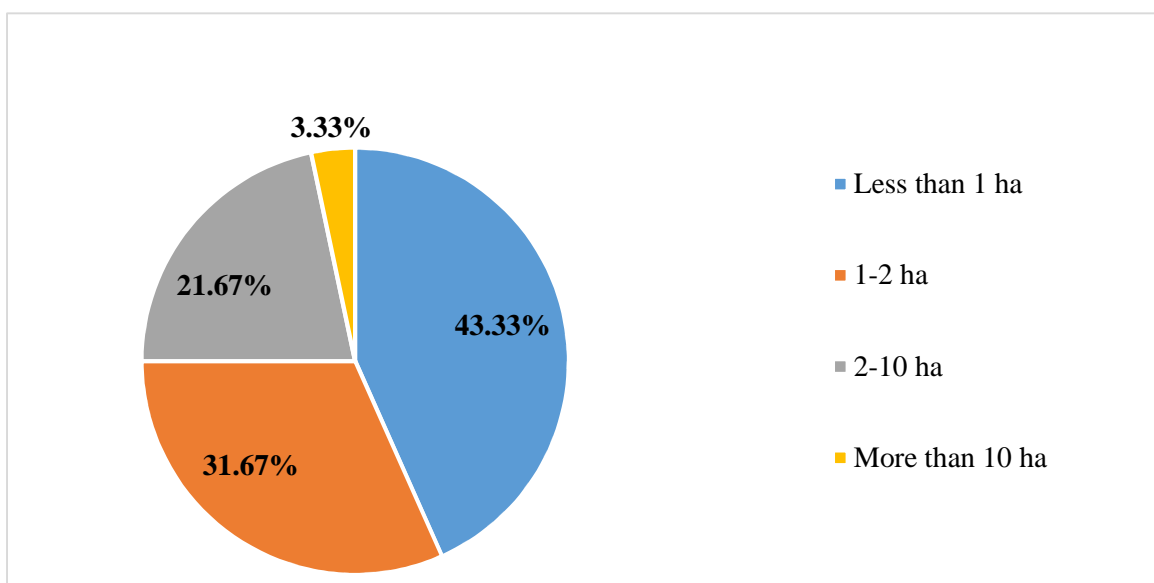
4.1.4 Acreage under maize cultivation by sample farmers

Table 4.6 detailed that majority (43.33 per cent) of the sample farmers were cultivating maize in less than one hectare of land. 31.67 per cent of farmers were cultivating maize in 1 to 2 hectares of land. Further 21.67 per cent of the farmers and 3.33 per cent of sample farmers were cultivating maize under 2 to 10 hectares and more than 10 hectares of land respectively.

Table 4.6 Acreage under maize by sample farmers

Particulars	No of farmers	Percentage
Less than 1 ha	26	43.33
1-2 ha	19	31.67
2-10 ha	13	21.67
More than 10 ha	2	3.33
Total	60	100.00

Fig 4.6 Land under cultivation of Maize by sample farmers



4.1.5 Experience particulars of sample respondents

The respondents were classified based on their experience into four categories. That was less than 5 years, 5 – 10 years of experience, 10 – 15 years of experience and greater than 15 years of experience. Fig 4.7 and Fig 4.7 depicted the details of experience of farmers.

4.1.5.1 Experience particulars of sample farmers

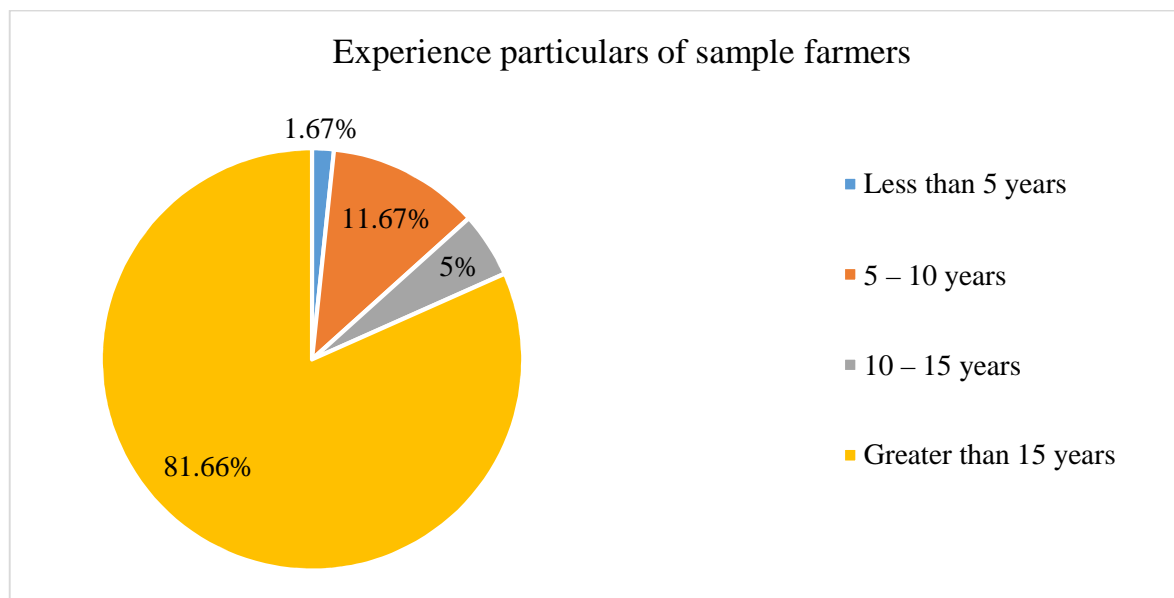
Table 4.7 Experience particulars of sample farmers

Particulars	No of farmers	Percentage
Less than 5 years	1	1.67
5 – 10 years	7	11.67
10 – 15 years	3	5.00
Greater than 15 years	49	81.66
Total	60	100.00

Table 4.7 made us understand the overall farming experience of the farmers. The farmers with more than 15 years of farming experience were of higher proportion *i.e.*, 81.66 per cent, farmers with 10 – 15 years of farming experience occupied 5 per cent, farmers with 5 – 10 years of farming

experience occupies 11.67 per cent, and farmers with less than 5 years of farming experience were 1.67 per cent (fig 4.7).

Fig 4.7 Experience particulars of sample farmers



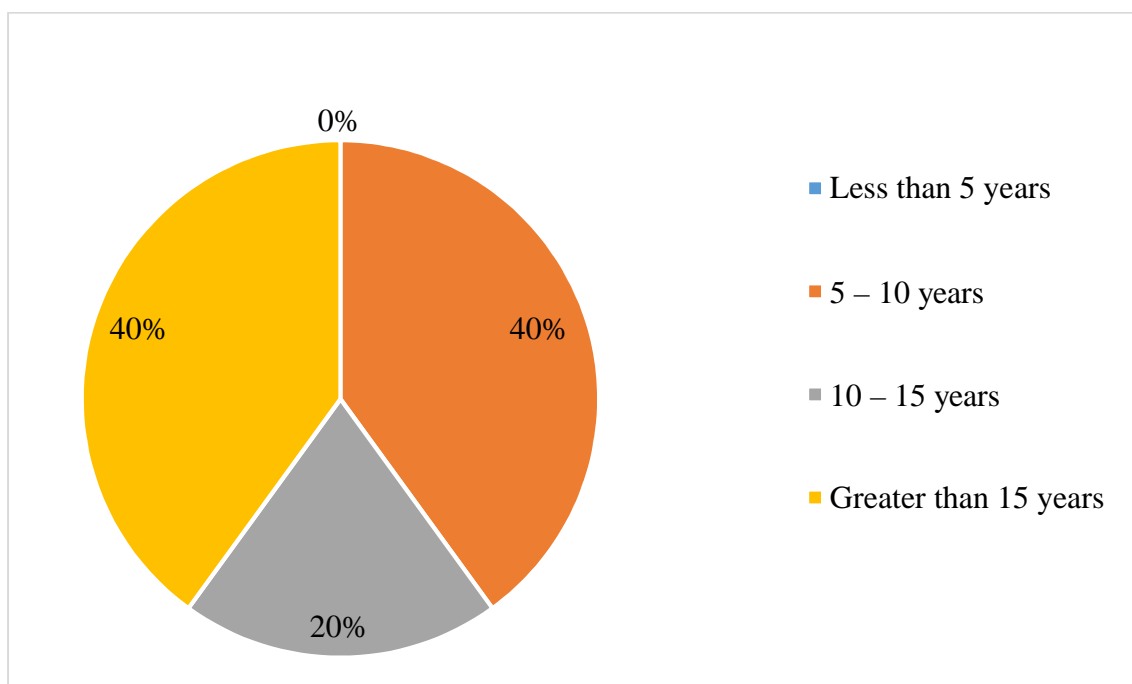
4.1.5.2 Experience particulars of sample market intermediaries

Table 4.8 Experience particulars of sample market intermediaries

Particulars	No of stakeholders	Percentage
Less than 5 years	0	00.00
5 – 10 years	4	40.00
10 – 15 years	2	20.00
Greater than 15 years	4	40.00
Total	10	100.00

An overview of Table 4.8 summarized that the market intermediaries with more than 15 years of experience was 40 per cent followed by 10 – 15 years of experience was 20 per cent, market intermediaries with the experience of 5 – 10 years comprised of 40 per cent (fig 4.8).

Fig 4.8 Experience particulars of sample market intermediaries



4.2 EXISTING SUPPLY CHAINS OF MAIZE IN THE STUDY AREA

Four supply chain channels of maize were identified in Rangareddy district of Telangana State. The identified channels were

Channel – I: Producer – Hatcheries

Channel – II: Producer – Commission agent – Hatcheries

Channel – III: Producer – Wholesaler – Hatcheries

Channel – IV: Producer – Commission agent – Wholesalers – Hatcheries

Among the four channels enlisted above, channel – I was the shortest channel. As there were no intermediaries in the channel, this channel stood as most efficient among all the channels. When the producer was unable to sell the produce directly to the end customer i.e., hatcheries, then he sold the produce to the commission agents in the village. This constituted as channel – II. This channel would be preferred by the producer when the market is nearer.

Channel – III also constituted three stakeholders. The produce went to wholesaler from producer. The wholesaler sold it to the end customer i.e.,

Hatcheries. The producer preferred selling to wholesaler as the wholesaler would be helpful to the producer in terms of weighing, transport and also financial help when required.

Channel – IV was constituted with four stakeholders. The produce first goes to the village level commission agents from the farmers. The commission agents sell this produce to wholesalers and finally these wholesalers will sell the produce to the end customer i.e., hatcheries. The commission agent was preferred by the farmer as he would get the help in lifting the produce from the farm gate, packaging, and transportation. The producer would also get financial help from the commission agents when required.

Among the four channels listed above, 46.47 per cent (28 farmers) followed channel I, 28.33 per cent (17 farmers) followed channel II, 18.33 per cent (11 farmers) followed channel III and only 6.67 per cent (4 farmers) followed channel IV (Table 4.9).

Table 4.9 Number and Percentage of sample farmers following each channel

	No of farmers	Percentage of farmers
Channel I	28	46.67
Channel II	17	28.33
Channel III	11	18.33
Channel IV	4	6.67

4.3 ESTIMATION OF PRICE SPREAD IN VARIOUS IDENTIFIED MAIZE SUPPLY CHAINS

Table 4.10 Marketing costs, Margins and Price Spread (Rs/quintal of maize)

S.No	Particulars	Channel I	Channel II	Channel III	Channel IV
1	Producer	-	-	-	-
	Transportation	58.50 (58.38)	58.50 (45.69)	53.75 (23.24)	53.75 (20.74)
	Packaging	19.76 (19.72)	19.76 (15.43)	19.76 (8.53)	19.76 (7.63)
	Loading, Unloading and Weighment charges	21.94 (21.90)	21.94 (17.14)	17.74 (7.67)	17.74 (6.85)
	Commission Agent's margin	-	27.84 (21.74)	-	27.84 (10.74)
	Sub Total Cost	100.20 (100.00)	128.04 (100.00)	91.25 (39.46)	119.09 (45.96)
2	Wholesaler	-	-	-	-
	Transportation costs			47.99 (20.75)	47.99 (18.52)
	Grading			19.48 (8.42)	19.48 (7.52)
	Loading and unloading			40.00 (17.30)	40.00 (15.44)
	Marketing Fee			32.55 (14.07)	32.55 (12.56)
	Sub Total Cost			140.02 (60.54)	140.02 (54.04)
	Total Costs	100.20 (100.00)	128.04 (100.00)	231.27 (100.00)	259.11 (100.00)

4.3.1 Marketing costs in the identified Supply chains of Maize:

The Table 4.10 indicates the marketing costs incurred by various marketing agencies in the identified supply chain channels of maize in the study area.

Among the four marketing channels, Channel I has the least marketing cost per quintal of maize followed by Channel II, Channel III and Channel IV. The respective marketing costs per quintal of maize in the above market channels worked out to be 100.20, 128.04, 231.27 and 259.11 rupees respectively.

In marketing channel I, entire marketing costs was incurred by the producer alone. An amount of Rs 58.50 (58.38%) was incurred on transportation of maize from villages to the hatcheries, packaging expenditure was Rs 19.76 (19.72%) and loading, unloading and weighment charges was Rs 21.94 (21.90%) per quintal. Hence the sum of marketing cost incurred by the producer which is also the total marketing cost of the channel was Rs 100.20 per quintal.

In marketing channel II, commission agent helps the producer to move the product from producer to hatcheries. In this channel in addition to the transportation cost (45.69%), packaging cost (15.43%), loading, unloading and weighment charges (17.14%), commission agent charges occupies 21.74 per cent of the total marketing cost of the channel II.

The sum of total marketing cost incurred by the producer and also the total marketing cost of the supply chain II was Rs 128.04 per quintal.

In marketing channel III, the producer takes his produce to nearby wholesale market and the transportation cost incurred was Rs 53.75 (23.24%), packaging includes Rs 19.76 (8.53%), loading, unloading and weighment charges includes Rs 17.74 (7.67%). In marketing channel III, the sum of total marketing cost incurred by the producer was Rs 91.25 (39.46%). The transportation cost incurred by the wholesaler was Rs 47.99 (20.75%), grading and packing charges Rs 19.48 (8.42%), loading and unloading charges Rs

40.00 (17.30%) and cost on marketing fee includes Rs 32.55 (14.07%) respectively. The total marketing cost born by the wholesaler was Rs 140.02 (60.54%), In sum, the total marketing cost incurred in supply chain III was Rs 231.27.

In marketing channel IV, the total marketing cost incurred by the producer was Rs 119.09 (45.96%) which includes transportation cost, Rs 53.75 (20.74%), packaging Rs 19.76 (7.63%), loading, unloading and weighment charges Rs 17.74 (6.85%) and commission charges Rs 27.84 (10.74%) respectively. The marketing cost born by the wholesaler is Rs 140.02 (54.04%) and it includes transportation charges from wholesale market to hatcheries Rs 47.29 (18.52%), grading and packing charges Rs 19.48 (7.52%), loading and unloading charges Rs 40.00 (15.44%) and marketing fee Rs 32.55 (12.56%). Thus, the total marketing cost of the supply chain IV was Rs 259.11.

In supply chain I & II the entire marketing cost was born by the producer alone. In supply chain III & IV 39.46 and 45.96 per cent of the marketing cost was born by the producer respectively. In all the supply chains transportation costs was the major component in the total marketing cost.

Table 4.11 Price spread in Supply chain of Maize (Rs/quintal of maize)

S.No	Particulars	Channel I	Channel II	Channel III	Channel IV
1.	Producer				
	Price received by farmer	1624.63 (100.00)	1596.79 (100.00)	1507.12 (89.77)	1506.12 (89.76)
	Marketing costs	100.20 (6.17)	128.04 (8.02)	91.25 (5.44)	119.09 (7.10)
	Net price	1524.43 (93.83)	1468.75 (91.98)	1415.87 (84.33)	1387.03 (82.66)
2.	Wholesaler				
	Purchase price			1507.12 (89.77)	1506.12 (82.66)
	Marketing costs			140.02 (8.34)	140.02 (8.34)
	Margin			31.77 (1.89)	31.77 (1.89)
3.	Hatcheries purchase price	1624.63 (100.00)	1596.79 (100.00)	1678.91 (100.00)	1677.91 (100.00)

Marketing costs and marketing margins of the identified supply chains were calculated to assess the share of different agencies involved in the supply chain along with producers share in consumers rupee as shown in table 4.11.

The producers share in consumer rupee varied from one channel to another channel depending upon the marketing agencies involved. Producers share in consumers rupee was highest (93.83 per cent) in channel I. The same was 91.98 per cent, 84.33 per cent and 82.66 per cent in channel II, channel III and channel IV respectively. The price spread was lowest in channel IV compared to channel I, II and III as nearly 17.33 per cent of the consumer

rupee was shared by marketing intermediaries and marketing costs in channel IV, while it was 6.17 per cent, 8.02 per cent and 15.67 per cent of consumers rupee in channel I, II and III respectively.

In marketing channel, I the producers directly sells his produce to the hatcheries and hence incur Rs100.20 per quintal of produce towards marketing cost. He received a net price of Rs 1524.43.

In marketing channel II, the producer takes the help of commission agent to sell his produce to hatcheries, hence the marketing cost incurred was Rs 128.04 per quintal of produce. He received a net price of Rs 1468.75.

In marketing channel III, the producers sell his produce to wholesaler. The marketing costs incurred by the producer was Rs 91.25 per quintal of maize and the net price received by the farmer was Rs 1415.87. The wholesaler incurred Rs 140.02 towards marketing costs and Rs 31.77 towards marketing margin. The margin realized by the wholesaler was 1.89 per cent of consumers rupee.

In marketing channel IV both commission agent and wholesaler will involve in marketing of the produce. The marketing costs incurred by the farmer was Rs 119.09 which was 7.10 per cent of the consumers rupee. The net price realized by the farmer was Rs 1387.03 per quintal of maize. The marketing cost and margins enjoyed by the wholesaler was Rs 140.02 and Rs 31.77 respectively.

Table 4.12 Marketing efficiency across various supply chain channels of Maize (Rs/quintal of maize)

S. No	Particulars	Unit	Channel I	Channel II	Channel III	Channel IV
1	Hatcheries purchase price	Rs. Per quintal	1624.63	1596.79	1678.91	1677.91
2	Total marketing costs (MC)	Rs. Per quintal	100.20	128.04	231.27	259.11
3	Total net margins of intermediaries	Rs. Per quintal	-	-	31.77	31.77
4	Net price received by the farmers (FP)	Rs. Per quintal	1524.43	1468.75	1415.87	1387.03
5	Value added (1-4)	Rs. Per quintal	100.20	128.04	263.04	290.88
6	Index of marketing efficiency					
a	Conventional Method ($5 \div 2$)		1.00	1.00	1.14	1.12
b	Shepherd Approach ($1 \div 2$)		16.21	12.47	7.26	6.48
c	Acharya Approach ($4 \div (2+3)$)		15.21	11.47	5.38	4.77

Marketing efficiency of identified supply chains of maize were estimated using Conventional, Shepherd, and Acharya's Approach. Marketing efficiency in identified supply chains is presented in Table 4.12. Conventional method suggest that channel III (1.14) was more efficient than channel IV (1.12), channel II (1.00), and channel I (1.00). But in this channel producers share in consumers rupee was less in this channel. Hence this channel was not suggestive if maximization of farmers share is the objective.

Shepherd's method suggests that channel I (16.21) is more efficient than channel II (12.47), channel III (7.26), and channel IV (6.48). Acharya's method also suggests that channel I (15.21) is more efficient than channel II (11.47), channel III (5.38), and channel IV (4.77).

From the results above, it was concluded that channel I was more efficient than the other marketing channels as the farmers are directly selling their produce to hatcheries. Most of the farmers who are having good quality of produce and not depending on market intermediaries for capital requirement were selling their produce directly to hatcheries. Those farmers who were depending on marketing intermediaries for their capital requirement for raising the maize crop were approaching marketing channels II, III, and IV.

4.4 PROBLEMS FACED BY DIFFERENT STAKEHOLDERS OF SUPPLY CHAIN

The problems faced by different stakeholders in the supply chain were detailed and ranked based on the preference given by the stakeholders themselves.

4.4.1 Problems faced by sample farmers:

The problems faced by the producer were analyzed and ranks were given accordingly in Table 4.13 and Fig. 4.9 depicted the same graphically.

The major problem faced by the producer was the labor availability as maize was a labor-intensive crop. Pest infestation was ranked second. Recently the infestation by fall army worm (*Spodoptera frugiperda*) has shown a huge effect on both yield and quality of final produce. Low price during the main season for the produce is mentioned as a third major problem. This is due to the selling of their produce all at one time without storing or processing. Lack of quality and timely availability of seeds by the government is listed as the fourth rank. Although the government is supplying the seeds, the farmers are able to access them after the ideal sowing period.

The fifth problem was identified as to the lack of storage structures. Many farmers told that if the storage facilities are good enough, they can store their produce immediately after harvesting and can sell when the price rise. The sixth problem they mentioned was lack of processing units. The farmers in the surveyed area told that if there were any processing centers, they would opt to sell their produce to processing units and get fair price for their produce.

Lack of market infrastructure was the seventh problem. The local Mandi is located approximately 20 – 40 km from the surveyed villages. The eighth problem faced by farmers is lack of road infrastructure. As there were no proper roads the chances of produce getting damaged and timely delivery becomes difficult and more costly.

Table 4.13 Problems faced by the sample farmers

S. No	Particulars	Rank	Garret ranking mean score values
1.	Lack of processing units	6	50.19
2.	Lack of storage units	5	51.23
3.	Low price during main season	3	58.92
4.	Lack of market infrastructure	7	48.39
5.	Lack of Road infrastructure	8	40.87
6.	Labor availability	1	66.37
7.	Pest infestation	2	60.29
8.	Lack of quality and timely availability of seeds	4	54.62

Fig 4.9 Problems faced by the sample farmers

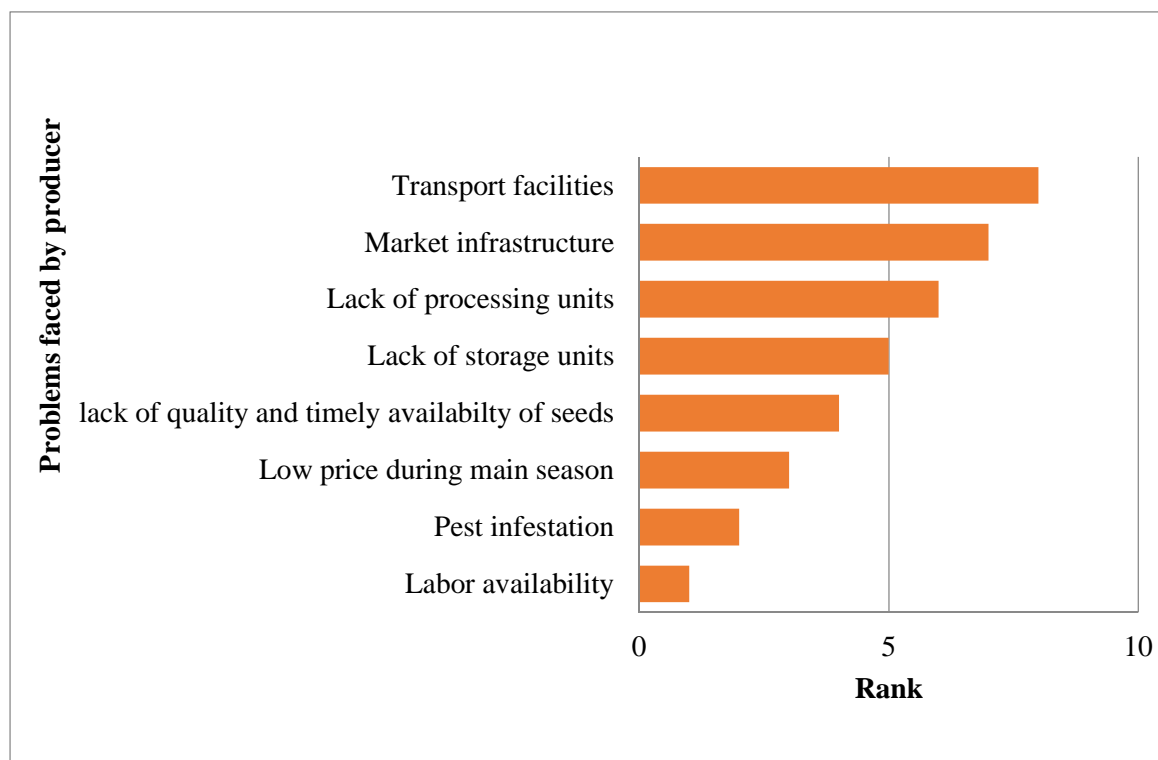
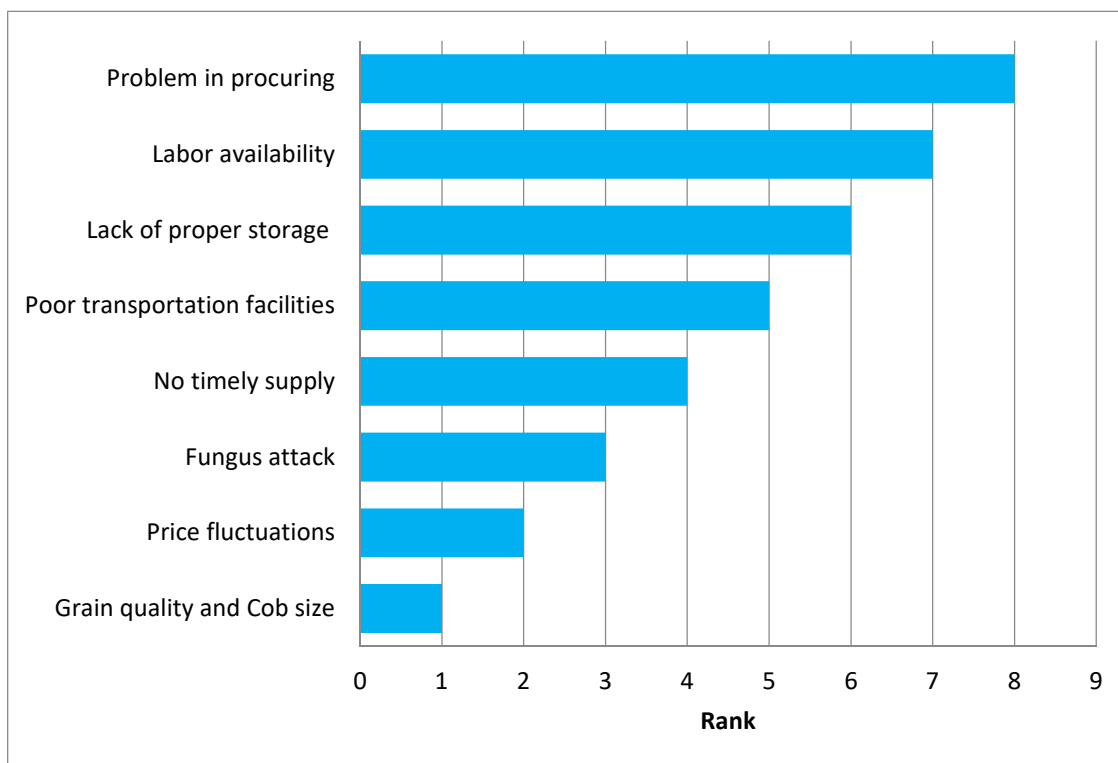


Table 4.14 Problems faced by sample market intermediaries

S. No	Particulars	Rank	Garret ranking mean score values
1.	Poor transportation facilities	5	48.25
2.	Lack of proper storage	6	40.37
3.	Timely availability	4	52.37
4.	Price fluctuations	2	66.12
5.	Fungus attack	3	55.63
6.	Problem in procuring	8	35.87
7.	Grain quality and Cob size	1	66.27
8.	Labor availability	7	38.62

Fig 4.10 Problems faced by sample market intermediaries



4.4.2 Problems faced by sample market intermediaries

The analysis of problems faced by different market intermediaries in the supply chain i.e., commission agents and wholesalers is mentioned in table 4.14 and fig 4.10. The results detailed that grain quality and cob size is the major problem which ranked first, as the price of the maize directly depends on grain quality and size of the cob. The second rank was given to the price fluctuations as the market prices being dynamic, fluctuate very often. Fungus attack was ranked as a third problem, which occurs due to excess moisture in the cobs and poor handling. Timely availability of produce was given the fourth rank as most farmers grow maize crop in kharif season, but demand will be yearlong as maize is used as feed for poultry. The fifth rank was given to poor transportation facilities followed by problems like labor availability and problems in procuring.

Chapter - V

Summary & Conclusions

Chapter V

SUMMARY AND CONCLUSION

5.1. SUMMARY

The present study “Supply Chain Analysis of Maize in Rangareddy District of Telangana” was extended to analyze and define the existing channels in the market and to identify the roles played by the stakeholders in the supply chain and to study and analyze the marketing costs, marketing margins and price spread among various supply chains and to analyze the problems faced by them at different stages of supply chain.

5.2. MAJOR OBJECTIVES OF THE STUDY

1. To understand the existing supply chain models in Rangareddy district of Telangana.
2. To determine the marketing costs, margins and price spread in different supply chains.
3. To study the constraints faced by different stake holders in the supply chain.

Rangareddy district is purposefully chosen for the study because the area under maize cultivation is increasing continuously for the past decade. The increase in area is due to the wide usage of maize as poultry feed. With an interest to study different supply chain models in the maize marketing in Rangareddy district and the problems involved in different supply chains, the study is being conducted.

Out of which 2 mandals where maize is majorly grown were chosen for the study viz., Nandigama and Kothur. All the villages were enlisted from the selected Mandals and the villages with highest area under Maize cultivation were selected. The selected villages are Appareddyguda, Cheguru, Majid Mamidpally from Nandigama mandal and Kodicherla, Penjerla, Manchanpadu

from Kothur mandal. The survey method was used for collecting the required data using a pre-tested schedule for the year 2020-21.

Sixty farmers were sampled from the list of farmers and ten each were selected from each village. Ten market intermediaries from the list of commission agents and wholesalers were selected for the study. Respondents were personally interviewed with well prepared, pre-tested separate set of questionnaires.

5.3. MAJOR FINDINGS OF THE STUDY

Socio-economic characters of the respondents in the study area

Tabular analysis and percentage analysis was performed to analyze the socio-economic characteristics of the sample respondents.

- Age of the respondents was classified into three categories. First one was young age respondents with age 20 – 40 years (Young age) who constituted 25 per cent of farmers and 30 per cent of market intermediaries, the second one was 40 – 60 years (Middle age) with 56.67 per cent of farmers and 60 per cent of market intermediaries and the final category was above 60 years of age (Old age) constituting 18.33 per cent of farmers and 10 per cent of market intermediaries.
- Classification of literacy levels of sample respondents was done into four categories, first one was the category of illiterates with 30 per cent of farmers and 10 per cent of market intermediaries falls into this category. Second one was primary education, third one was secondary education and last one was higher secondary education and above for which farmers constituted 16.67, 38.33 and 15 per cent respectively and market intermediaries constituted for 20, 40 and 30 per cent respectively.
- Land holding particulars of the farmers were categorized into four categories viz., marginal farmers (< 1 ha), small farmers (1 – 2 ha),

medium farmers (2 – 10 ha) and large farmers (> 10 ha). The farmers constituted of 10, 26.67, 46.66 and 16.67 per cent respectively.

- Land under cultivation of maize by farmers was categorized into four categories viz., less than 1 ha, 1 – 2 ha, 2 – 10 ha and more than 10 ha. The farmers constituted 43.33, 31.67, 21.67 and 3.3 per cent respectively.
- On classification of the sample based on their experience, they fell under four categories. First one was below 5 years in which 1.67 per cent were farmers and zero (0) per cent were other stakeholders. Second one was 5 – 10 years with 11.67 per cent of farmers and 40 per cent of market intermediaries and third one was 10 – 15 years with 5 per cent of farmers and 20 per cent of other stakeholders and the final one was greater than 15 years with 81.66 per cent of farmers and 40 per cent of market intermediaries.

Supply Chain of Maize in Study Area

Four channels were identified in the study area

Channel – I: Producer – Hatcheries.

Channel – II: Producer – Commission agent – Hatcheries.

Channel – III: Producer – Wholesaler – Hatcheries.

Channel – IV: Producer – Commission agent – Wholesaler – Hatcheries

- Among the four channels enlisted above, Channel – I is the shortest in both number of intermediaries and the distance travelled by the produce to reach the end consumer whereas Channel – IV was the longest.
- Producer chooses Channel – I because he can sell his produce directly to the hatcheries at Minimum Support Price (MSP) by himself.

- Major number of producers choose Channel – I because the price paid for their produce was higher.

Marketing costs, margins and price spread in various supply chains

- The price spread in supply chain – IV is less than that in supply chain – III, II and I because the producer gets paid less as more market intermediaries are involved.
- The Marketing costs are more in supply chain – IV Rs. 259.11 because it involves more intermediaries i.e., both commission agent and wholesaler.
- The marketing efficiency of supply chain – I is 15.21 per cent, II is 11.47 per cent, III is 5.38 per cent and IV is 4.77 per cent.
- So, Supply chain I has high marketing efficiency.

Problems faced by different stakeholders of supply chain

- Problems faced by different stakeholders in supply chain were detailed and were ranked by the producers and stakeholders during the study.
- The problems thus preference ranked were analyzed using Garret ranking method.
- The problems faced by the farmers during both production and marketing were considered.
- The major problem to the farmers was availability of labors.
- Pest infestation was the second most faced problem.
- The third main problem that farmers are facing is the low price during main season.

- This was followed by other problems such as lack of quality and timely availability of seeds, lack of storage units, lack of processing units, market infrastructure, and Transport facilities.
- Stakeholders like commission agents and wholesalers were seen in channel – II, channel – III and channel – IV.
- The problems faced by market intermediaries were considered.
- The major problem to the market intermediaries was grain quality of corn.
- Price fluctuations was their second most faced problem.
- The third main problem that market intermediaries faced was fungus attack for maize. This was followed by other problems such as timely availability, poor transportation facilities, lack of proper storage, labor availability and problem in procuring.

5.4. SUGGESTIONS

- The findings of the study indicate the need for administrative and policy support in understanding the market situation and problems faced by the farmers during production and marketing and all other stakeholders during marketing.
- Farmers should be educated and trained in post-harvest handling of maize in drying, cleaning, grading, and packing in gunny bags, so that they maintain good quality and get good price.
- Standardizing the package of practices and developing indigenous pest resistant varieties considering marginal holders and providing the information are the major issues to be addressed by the scientists, extension workers and horticulture department.

- Proper godowns need to be built for farmers to store their produce, hence they can sell their produce in the markets based on market demand, thus distress sale can be avoided.
- Installation of processing units will help the farmers in value addition of maize, thus many value added products like popcorn etc can be produced.
- Market infrastructure needs to be developed.

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