EVALUATION OF NON-TOMATO BASED PRODUCT LINES FOR EFFICIENT CAPACITY UTILIZATION OF FARMER OWNED TOMATO PROCESSING UNIT IN CHITTOOR DISTRICT OF ANDHRA PRADESH

BY

G. SAI INDRANI REDDY

B.Sc. (Ag.)

PROJECT REPORT SUBMITTED TO THE ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF

MASTER OF BUSINESS ADMINISTRATION

(AGRIBUSINESS MANAGEMENT)

CHAIRPERSON: Dr. I. BHAVANI DEVI

ANGRAU

INSTITUTE OF AGRIBUSINESS MANAGEMENT

SRI VENKATESWARA AGRICULTURAL COLLEGE, TIRUPATI

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY

GUNTUR – 522 509, ANDHRA PRADESH

2019

DECLARATION

I, **Miss. GAJJALA SAI INDRANI REDDY,** hereby declare that the project report entitled **"EVALUATION OF NON-TOMATO BASED PRODUCT LINES FOR EFFICIENT CAPACITY UTILIZATION OF FARMER OWNED TOMATO PROCESSING UNIT IN CHITTOOR DISTRICT OF ANDHRA PRADESH"** submitted to the **Acharya N. G. Ranga Agricultural University** 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

Date:

(G. SAI INDRANI REDDY)
I.D.No. TMBA/2017-14

CERTIFICATE

This is to certify that Ms. G. Sai Indrani Reddy has satisfactorily prosecuted the course of research and that the project report entitled **"EVALUATION OF NON-TOMATO BASED PRODUCT LINES FOR EFFICIENT CAPACITY UTILIZATION OF FARMER OWNED TOMATO PROCESSING UNIT IN CHITTOOR DISTRICT OF ANDHRA PRADESH"** 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 been previously submitted by her for a degree of any university.

Place: Tirupati

Date:

(Dr. I. BHAVANI DEVI)

Chairperson

Professor & Head
Institute of Agribusiness
Management and Agricultural
Economics
S.V. Agricultural College,
Tirupati-517502,
Andhra Pradesh, India

CERTIFICATE

This is to certify that the project report entitled "**EVALUATION OF NON-TOMATO BASED PRODUCT LINES FOR EFFICIENT CAPACITY UTILIZATION OF FARMER OWNED TOMATO PROCESSING UNIT IN CHITTOOR DISTRICT OF ANDHRA PRADESH"** submitted in partial fulfillment of the requirements for the degree of **'MASTER OF BUSINESS ADMINISTRATION (AGRIBUSINESS MANAGEMENT)** of the Acharya N. G. Ranga Agricultural University, Guntur is a record of bonafide original research work carried out by **Miss. GAJJALA SAI INDRANI 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 received during the course of the investigation have been duly acknowledged by the author of the thesis.

Project report approved by the Students Advisory Committee

Chairperson : **Dr. I. BHAVANI DEVI**
Professor & Head
Department of Agricultural Economics &
Institute of Agribusiness Management,
S.V. Agricultural College,
Tirupati – 517 502, A.P

Member : **Dr. S. RAJESWARI**
Assistant Professor
Dept. of Agricultural Economics,
S.V. Agricultural College,
Tirupati – 517 502, A.P

Member : **Dr. P. LAVANYA KUMARI**
Scientist
Dept. of Statistics and Computer
Applications,
Regional Agricultural Research Station,
Tirupati – 517502, A.P

Date of final viva – voce :

ACKNOWLEDGMENTS

No creation in this world is a solo effort, neither is this thesis. I would like to take this opportunity to acknowledge all, who supported me directly or indirectly, bringing in this thesis to a really good shape.

Firstly, I thank the almighty ***GOD*** *for his unconditional love and blessings, without which I would not have been able to complete my studies hitherto and present this piece of work.*

I am inexpressibly ecstatic to extend my deep sense of gratitude to luminous educationalist and esteemed chairperson of my Advisory Committee ***Dr. I. Bhavani Devi,*** *Professor and Head, Department of Agricultural Economics and Institute of Agribusiness Management, S.V. Agricultural College, Tirupati for her affectionate guidance, encouragement and unabated help throughout the investigation which made it possible to bring out a refined dissertation successfully to reckon with set standards.*

I am ineffable to express my esteemed thanks to the honored member of my advisory committee, ***Dr. S. Rajeswari,*** *Assistant Professor, Department of Agricultural Economics, S.V. Agricultural College, Tirupati for her keen interest, valuable suggestions, ardent support and persistent encouragement during my course of study.*

I am pleased to place my profound etiquette to ***Dr. P. Lavanya Kumari,*** *Scientist, Department of Statistics and Computer Applications and member of my advisory committee for her inspiring, meticulous and valuable guidance, constructive advice during the entire period of my investigation.*

I express my fidelity and respectable regards to ***Smt.Y. Prabhavathi,*** *Assistant Professor, Institute of Agribusiness Management, S.V. Agricultural College, Tirupati for her immense help rendered during the course of study.*

I thank ***Sri N.T. Krishna Kishore,*** *Assistant Professor, Institute of Agribusiness Management, S.V. Agricultural College, Tirupati for his inspiring guidance for my research work.*

I humbly express my intense gratitude to ***Dr. P. Raghu Ram,*** *Professor and University Head (Retd), Department of Agricultural Economics, S.V. Agricultural College, Tirupati for his inspiration, articulate criticisms, transcendent suggestions, persistent encouragement and for providing congenial atmosphere during the course of my study.*

I owe all my success to the special persons in my life my parents ***Smt. G. Sri devi*** *and* ***Sri. G. Madhava Reddy*** *and my dear sister* ***G.V. Bhoomica Reddy*** *for their affection, words of encouragement, boundless love, unflagging inspiration, interest and selfless sacrifice without whom I would have not been what I am today.*

I extend my profound thanks to ***Associate Dean*** *and* ***Professors*** *of S.V. Agricultural College, Tirupati, Shri* ***Lakshmana Rao, DDA, Chittoor*** *for their concern in enlightening me on various aspects of research, whole hearted cooperation and for their constant appraisal on subject matter to bring out this success during my investigation*

I also thank **Dr. T.N. Venkat Reddy**, Professor, Department of Agricultural marketing, GKVK campus, Bangalore for his constant support and inspiration with his immense knowledge.

Diction is my predilection to express my heartful thanks to my joyful friends' gallery **Sunitha, Deepa, Priyanka, Vishal, Shalini, Shabana, Praveen, Hitesh, Sreedhar Sai Krishna,Vinay and Kavitha** during my productive education career.

It gives me immense pleasure to express my profound thanks to my seniors **Rupa, Sushmitha, Suneesha, Devakrupa, Rohindra, Sudheer varma, Pruthvi, Sreekanth, Munikanth, Rafi, Irfan and Shivaji** for their affection and help.

I will never forget all memories with my classmates. They were helpful in all my stressful situations and were always there in need. I thank **Bharath, Charwaka, Phani, Geetha, Pinky, Abdul, Joshna, Charishma, Swarna, Madhu, Anil, Uday, Murali, Ashok, Sreekanth and Prem** for their unforgettable help and co-operation during the course of this research.

I thank all my junior friends **Supraja, Anusha, Teja, Sowmya, Renuka, Yeshwanth, Naveen, Rajesh, Sree Hari, Javeed, Bala Krishna, Sadik, Dileep, Azmath** for their affection and co-operation.

I also express my pleasure to thank **all my friends** and **family members** for all their love, help and support.

I am thankful to Record assistant **Lokanatham, Krishnaiah and Muniram** Institute of agribusiness Management, S.V. Agricultural College, Tirupati for their help during my course of study.

I am grateful to **Acharya N.G. Ranga Agricultural University** for providing financial help in the form of stipend during my course of study.

I extend my sincere thanks to Assistant librarian and other staff of the Regional library, S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University for extending help in collecting literature during my study.

It is nothing but incomplete, if I do not pen here about the boundless affection and sincere cooperation which I had received from all the farmers, during my research work. I express my heartfelt thanks to all of them who spared their valuable time for my research and cooperated during my data collection

Indrani...

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LIST OF SYMBOLS AND ABBREVIATIONS

APEDA	:	Agricultural and Processed Food Products Exports Development Authority
ARDL	:	Autoregressive Distributed Lag
CAGR	:	Compound Annual Growth Rate
CIPHET	:	Central Institute of Post Harvest Engineering and Technology
et al.	:	and other
etc.	:	and so on
e.g.,	:	Example
FDI	:	Foreign Direct Investment
F&V	:	Fruits and Vegetables
Fig.	:	Figure
GDP	:	Gross Domestic Product
GVA	:	Gross Value Added
ha	:	Hectare
i.e.	:	That is
Kg	:	Kilogram
Mha	:	Million hectare
MFPs	:	Mega Food Parks
MINICOM	:	Ministry of Trade and Industry
MoFPI	:	Ministry of Food Processing Industries
MSME	:	Micro, Small and Medium Enterprises
MT	:	Metric Tonnes

$MTha^{-1}$	:	Million tonnes per hectare
NCA	:	Net Cropped Area
No.	:	Number
%	:	Per cent
Rs	:	Rupees
RTS	:	Ready-To-Serve
SPSS	:	Statistical Package for the Social Sciences
t/ha	:	tonne per hectare
USD	:	United States Dollar
viz.,	:	Namely

ABSTRACT

Author of the project	:	**G. SAI INDRANI REDDY**
Title of the thesis	:	**"EVALUATION OF NON TOMATO BASED PRODUCT LINES FOR EFFICIENT CAPACITY UTILIZATION OF FARMER OWNED TOMATO PROCESSING UNIT IN CHITTOOR DISTRICT OF ANDHRA PRADESH"**
Degree to which it is submitted	:	**MBA (AGRIBUSINESS MANAGEMENT)**
Faculty	:	**AGRICULTURE**
Discipline	:	**AGRIBUSINESS MANAGEMENT**
Chairperson	:	**Dr. I. BHAVANI DEVI**
University	:	**ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY**
Year of submission	:	**2019**

The study was conducted to understand the processing scenario in the study area, potential crops suitable for value addition other than tomato and suitability of these products in the farmer owned tomato processing plant. The study was conducted in Chittoor district, Andhra Pradesh. The sample constituted 60 farmers and 3 processing units.

About 68.3 per cent of respondents were middle aged while old aged were 5 per cent and the rest 6.7 per cent were young aged.

The entire respondents were literates and half of them completed their higher education and intermediate, 31.7 per cent completed graduation and the other 18.3 per cent had only primary education.

About 55 per cent had only agriculture as their core occupation, whereas 26.7 per cent reared cattle, 10 per cent had jobs and 8.3 percent were running their own businesses.

Major proportion of the farmers came under small and marginal categories with 45 and 33.3 per cent respectively, while medium and large farmers occupied 16.7 and 5 per cent correspondingly.

In the area under horticultural crops, mango occupied major share of 46.94 percent of area. Tomato was next to follow with an area of 15.98 per cent. Papaya was grown in 2.33 per cent of the entire area and banana occupied 1.5 per cent.

There were several marketing channels through which the end produce was marketed. Out of the whole sample, 30 per cent sales were through mandi, 3.3 per cent sales were through processing units, farm gate sales were 40 per cent, 20 per cent

through both mandi and processing units and 6.7 percent marketed through both mandi and farm gate sales.

The perception of farmers towards food processing indicated that 20 per cent of total sample was unaware of the processing, 8.3 per cent expressed that the system was good, 23.3 per cent had low price realization, 10 per cent felt the need for good procurement practices and the remaining 20 per cent had no bulk production which was adequate to supply to the processing units.

On creation of necessary infrastructural facilities, 70 per cent were willing to supply to processing units, while 30 per cent were unwilling.

In mango, the cost of cultivation was Rs.51750/ha, while it was Rs.90625/ha in banana and was highest for papaya with Rs.306875/ha. Per hectare gross income for these fruit crop enterprises was Rs.80875, Rs.198750 and Rs.643750 respectively. The per hectare net income over working costs was of the order of Rs.29125, Rs.108125 and Rs.336875 for the above three crop enterprises. The returns for rupee of expenditure over working costs were Rs.1.53 for mango, Rs.2.19 for banana and Rs.2.10 for papaya.

The results from the chi-square test showed that there was a significant relationship between locality of the farmers, age, education and land holding with the type of marketing channel used; location of the farmers with the satisfaction level with the price; location, age and land holding of farmers with the perception towards the processing sector; location and the land holding with the willingness to supply and satisfaction of price with the selection of marketing channels.

In the economics of processing, for the given unit which dealt with mango, papaya, tomato, banana, guava, pineapple, and chillies, the revenue obtained from mango is likely to Rs.50 crore, where total working costs would be Rs.39.96 crore with a fixed cost of Rs.8.04 crore and net income of Rs.2 crore. In papaya processing, Rs 2 crore of gross income can be obtained with total costs of Rs.1.896 crore deriving a net return of about Rs.0.104 crore. Pineapple processing would bring a gross income of Rs.1 crore with total costs of Rs.0.9399 crore with a net profit of Rs.0.0601 crore. In respect of guava, gross revenue of Rs.1 crore is going to be attained. The total costs that would be Rs.0.9546 crore helping the entrepreneur to gain a net income of Rs.0.0454 crore. Banana processing brought an income of Rs.0.4 crore. Total costs would be Rs.0.378 crore and the net income is expected to be Rs.0.0278 crore. The gross revenue derived from tomato products will be Rs. 6 crore while total working capital and total fixed costs will be of the order of Rs.4.793 crore and Rs.0.913 crore respectively with a net return of Rs.0.294 crore. In red chilli, sale proceeds would be Rs. 3 crore with a total cost of Rs.2.8686 crore and the net returns would be Rs.0.1313 crore, whereas in green chilli paste production, gross income and net income would be Rs.0.3 crore and Rs.0.017 crore respectively.

CHAPTER – I

INTRODUCTION

Chapter - I

INTRODUCTION

Food processing industry in India is a sunrise sector that has gained prominence over the recent years. Availability of raw materials, changing lifestyles, appropriate fiscal policies, huge scientific and research talent pool, well developed distribution network, rapid urbanization and increased literacy has given a considerable push to the industry's growth. The food processing industry has came to sight as one of the important segments in terms of its contribution to Indian economy, as it contributes 9% and 11% of GDP in manufacturing and agriculture sector respectively. Gross Value Added (GVA) by agriculture & allied sectors stands at 322.01 USD billion, contributing approximately 17% to total GVA in 2015-16. Food processing sector's share in manufacturing sector's GVA was 8.71% and in that the share of agriculture, forestry and fishing stood at 10.04% in 2015-16 (Report on food processing 2017, Make in India). The key sub-segments of the food Processing industry in India are: dairy, fruits & vegetables, poultry & meat processing, fisheries, food retail etc.

The Government of India through the Ministry of Food Processing Industries (MoFPI) is also taking all necessary steps to boost investments in the food processing industry. The government has sanctioned 42 Mega Food Parks (MFPs) to be set up in the country under the Mega Food Park Scheme in the year 2008. Registered food processing units increased from 37,450 in 2013-14 to 38,608 in 2014-15. Food Processing Industry stands as one of the chief employment intensive industries, generating 12.77% of employment in all manufacturing factories registered under Factories Act 1948. Additionally, the sector constitutes 13.72% of employment in unregistered manufacturing sector. The sector makes up for 13% of India's exports and 6% of total industrial investment. The sector is regarded as the 13^{th} largest recipient of FDI in India (Make in India website).

With production at 314.27 million MT in 2018-19, India ranks as the second largest producer of Fruits and Vegetables (F&V) in the world and F&V processing levels currently stand at close to 2% (agricoop.nic.in). India is the world's largest producer of bananas, papaya, mangoes and guavas, second largest producer of potatoes, green peas, tomatoes, cabbage and cauliflower. India witnesses nearly 4.6-15.9% wastage in fruits and vegetables annually, due to lack of modern harvesting practices and inadequate cold chain infrastructure (foodprocessingindia.co.in). Uttar Pradesh, Andhra Pradesh, Maharashtra, Gujarat and Karnataka are the leading producers of fruits in India, having a combined share of around 51% in the total fruits production. For vegetables, major producers include Uttar Pradesh, West Bengal, Madhya Pradesh, Bihar, and Gujarat, together accounting for around 55% of the national production (Report by Department of Agriculture and Cooperation, 2017).

Andhra Pradesh took its position as one of the leading states in horticultural produce with nearly 2 million hectares under different fruit crops. The presence of rich climatic and soil conditions make Andhra Pradesh a major agricultural belt. The state is agrarian in character with over 60% of population dependent on agriculture. Total production of horticultural products is up to 157 lakh MT which include 10 million MT of fruits, 5.4 million MT of vegetables and 1.1 million MT of spices. It is the principal producer of eggs, spices, mango, papaya, citrus, lime, tomato, ladies finger; second main producer of rice, groundnut, cashew, cocoa and one of the important producers of coconut, banana, pomegranate, guava, sugarcane and milk. Production of banana is about 3570 thousand tonnes, mango is 2803 thousand tonnes and papaya accounts for 987 thousand tonnes (2017-18). There are 285 agricultural markets in which 93 functional markets in the state divided into commercial markets - 15, cattle markets - 32, vegetable markets - 21 and, fruit markets - 21, 324 cold storage units, 1060 warehouses with storage capacity of 8.48 lakh MT (foodprocessingindia.co.in).

Chittoor in Rayalaseema region is the southern most district of Andhra Pradesh. It shares its border with the states of Tamil Nadu and Karnataka. The district abounds in the production of mangoes and tomatoes. The major products contributing to the GVA of the district from agriculture and allied services are tomato, mango, milk, meat, groundnut, and fisheries. Besides possessing a good horticulture base, the district has easy access to the leading horticulture belts of Tamil Nadu, Karnataka and Andhra Pradesh. In tune with the inherent advantages, the district has the more number of fruit processing units. The units in Chittoor district are termed as "Fruit Processing Cluster". "A cluster means a group of enterprises, operating in the same industry, concentrated in a geographical area, possessing similar characteristics and facing common growth. The fruit processing units in Chittoor district process largely mango. Other fruits processed are guava, papaya, banana, chillies, tomato etc. In addition to supplying to the local domestic markets, these units contribute substantially to mango pulp and RTS (Ready-To-Serve) fruit juice exports from India. The development of Chittoor fruit processing industry assumes significance, considering the inherent strengths and weaknesses of the units. The strengths are the presence of dependable raw material base, good export potential for tropical and sub-tropical fruit pulps and juices, expanding urban markets within the country for natural fruit juices, easy accessibility to better technologies, major domestic markets for end products and a sea port for exports. The weaknesses relate to highly seasonal operations of the units, narrow product mix, inadequate effort to enhance product range and explore domestic markets, lack of cost optimization effort, limited inter-firm interaction, absence of critical common facilities, varying product quality, excessive dependence on merchant exporters, lack of alternative market effort, no waste utilization, objectionable practices of waste disposal etc.

Utilization of the installed capacity to the fullest extent is critical for the successful running of a food processing unit. Capacity utilization in manufacturing sector is a key indicator which not only helps to determine the level of utilization of existing capacity but it also helps to define the required level of expansion of capacity for a targeted output. In general, capacity utilization of units in India varies around 60 to 70 per cent. Some sectors and companies even struggle to achieve 50 per cent of utilization.

1.1 Problem Statement

India's food processing sector has experienced a tremendous boom over the years and is the sixth largest food processor in the world. Based on Agricultural and Processed Food Products Exports Development Authority (APEDA) report 2017, "Food processing industry accounts for 32 per cent of the country's total food market". Majority of these units in developing countries fall under the Micro, Small & Medium Enterprises (MSMEs). India produces over 450 million tons of raw materials for food processing every year that are refined, stored and transformed into edible products.

Among several constraints faced by food processing industry like availability of raw material, technological constraints, storage constraints, heavy competition etc, inefficient capacity utilization of the established plant is also considered to be a severe issue. So, there is need for the units to have a alternate plan or strategy to stand in the competition. In this regard, a detailed study on processing other fruit crops along with tomato with the preinstalled machinery is done, so that the capacity utilization of the plant increases by reducing the machineries idle time. In the light of the need for efficiently utilizing the existing capacities of processing unit, the present study is taken up with the following objectives.

1.2. Objectives of Investigation

1. to conduct a baseline study on major fruits and vegetable crops grown and food processing units in the study area.
2. to identify the potential non-tomato crops suitable for value addition, and
3. to assess the possibilities of value added products of other crops by utilizing the existing potential of tomato processing plant.

1.3 Plan of Project Report

The current research problem is organized into five chapters. Brief introduction including specific objectives was given in first chapter. In second chapter, applicable studies reviewed are presented in accordance with the objectives. Chapter III describes main features of the study area, database, sampling framework and analytical tools used in the data analysis. The pragmatic results are presented in chapter IV.

1.4 Limitation of the Study

This study was based on primary data collected from sample respondents by survey method. As many of the respondents delivered the necessary information from their experience and memory, the collected data may still have recall bias. As huge difference exists among the respondents, the findings may not be applicable to the areas other than Chittoor district. Hence, the conclusions of the study may be considered appropriate for the situation similar to the area studied and additional care should be taken while generalizing the results.

CHAPTER – II

REVIEW OF LITERATURE

Chapter - II

REVIEW OF LITERATURE

To attain comprehension 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. This attempt would also help the researcher to have better understanding to modify and improve the analytical framework in the right direction to suit the problem situation. This chapter briefly reviews findings of the past studies which are relevant for present study. In this chapter an attempt has been made to summarize the results of the research related to the objectives of the present study. The review has been grouped in the following sub-heads.

2.1 Baseline studies on major fruit and vegetable crops grown and food processing units in the study area,

2.2 Studies on potential non - tomato crops suitable for value addition, and

2.3 Studies on assessing the possibilities of value added products of other crops using existing potential.

2.1 Baseline Studies on Major Fruit and Vegetable Crops Grown and Food Processing Units in the Study Area

Lathika and Kumar (2005) in their study on growth trends in area, production and productivity of coconut in India observed that growth rate of area during 1950-51 to 2001-02 was 2.28, production growth rate was 2.48 and overall productivity of coconuts during the period was 6709 nuts/ha.

Dutta (2010) in his study on growth of area, production and productivity of fruits and vegetables in West Bengal studied the major fruits and vegetables during 1997-98 to 2006-07. The study revealed that proportions of fruit and vegetables area to Net Cropped Area (NCA) in West Bengal were increasing gradually. He observed that there was 6.15 per cent per annum rate of change in production of fruits and growth rate of area under vegetable cultivation is 1.63 per cent per annum.

Acharya *et al.* (2012) in their study on growth in area, production and productivity of major crops in Karnataka observed the trends of growth rates during the period 1982-83 to 2007-08 and expressed that growth rates showed a significant positive growth in area under pulses, vegetables, spices and fruits and nuts while cereals showed a significant negative growth. Similarly, the production of cereals, pulses, vegetables and fruits showed a significant positive growth and the production of oil seeds and commercial crops registered insignificant positive growth.

Sharma *et al.* (2013) in their study on growth and trends of pulse production in India used time series data on area, production, yield and trade pertaining to the period 1980-81 to 2008-09. The findings of the study revealed that pigeon pea registered positive growth in area and production as 0.50 and 0.20 per cent annually while its yield has shown downtrend with 0.30 per cent annually. Total pulse production and yield have risen by 0.50 and 0.70 per cent annually respectively, while the area has been down by 0.20 per cent per annum.

Kumar and Singh (2013) observed that in Una district of Himachal Pradesh, the percentage share of production out of the total cereals for wheat and maize was 52.1 per cent and 44.59 per cent during 2013 which was 48.13 per cent and 49.15 per cent in 2006-07. In 1997-98. The production of pulses was 565 metric tons which decreased to 171 metric tons in 2007-08. They concluded that the decrease was due to shift of pulses in to cereal crops. The total production of food and non food crops in district Una was 104582 metric tonnes in 1997-98 which increased to 146197 metric tonnes in 2006-07.

Singh and Rani (2013) estimated the growth rate of area, production, and productivity of fruit crops in Jharkhand. The study revealed positive growth rate in litchi, mango, banana and guava except citrus. It was also observed that the period of 2005-10 was favourable for litchi, mango and guava particularly, while negative growth rate was found in banana and citrus. The productivity growth rate was 2.56 percent, 2.56 percent, 1.50 percent, 5.21 percent respectively in litchi, mango, guava and banana respectively.

Kondal (2014) observed the growth rate of area, production and productivity of onion crop in Andhra Pradesh and concluded that compound annual growth rate of onion in terms of productivity was negative (-1.84 per cent) during 2007-08 to 2011-12 period.

Chowdary and Kundal (2015) in their study on area, production and yield of tomatoes in India calculated compound annual growth rates and observed that the area under tomatoes has risen from 458 thousand ha to 865 thousand ha; production of the same has gone up from 7462 thousand tonnes to 16826 thousand tones and the yield has increased from 16 t/ha to 19 t/ha during the period from 2002-2011.

Velayutham and Damodaran (2015) in their study on growth rate of chilli production in Guntur district of Andhra Pradesh used exponential growth model to determine CAGR of area, production and productivity. They observed that the CAGR of area, production and productivity in Andhra Pradesh during the period 2002-03 to 2011-12 were -0.48, 0.41 and 1.20 per cent respectively whereas CAGR values for Guntur district were 5.55, 2.59 and 2.87 respectively.

Narayan and Kumar (2015) in their study titled - constraints of growth in area, production and productivity of pulses in India: An analytical approach to major pulses observed that the total pulse area occupied 26.28 Mha which contributed 18.10 million tonnes of production. The growth rates of area were -0.09, -0.60, 1.62 and production 1.52, 0.59 and 3.35 during 1980s, 1990s and 2000s. This rates affected the net per capita per day availability of pulses with a decline from 61 grams to 32 grams from 1951-2010.

Dinesha and Sriramappa (2015) in their study on growth in area, production and productivity of vegetables and fruits in India with a special reference to Karnataka analysed the secondary data of 22 years from 1991-92 to 2012-13. They divided the study period to two parts as 1991- 92 to 2000-01 and 2001-02 to 2010-11. The results showed that the area and production of fruits in Karnataka were positive with rates of 1.80 and 0.90 percent respectively but productivity recorded negative rate of -0.90 percent during the study period. The growth rates of area, production and productivity of vegetables exhibited positive rates of 1.90, 2.50 and 0.70 percent respectively.

Raj and Naik (2016) studied the area, production and productivity of vegetables in Haveri district of Karnataka and observed that green chilli recorded the highest growth rate among the vegetables. Compound growth rate of area and production was highest for green chilli *i.e.,* 10.78 and 13.07 per cent respectively whereas compound growth rate for productivity was highest in tomato *i.e.,* 3.42 per cent.

Kashish and Dhawan (2017) in their study on production and trade performance of fruits in India examined the trend of area, production, export and import of different fruits in India. The growth rate was found to be 3.18, 4.72 and 1.48 per cent per annum for area, production and productivity of fruits, respectively. He also calculated that the productivity of fruits in India increased from 9.96 $MTha^{-1}$ to 14.2 $MTha^{-1}$ during the year 1991-92 to 2014-15.

2.2. Studies on Potential Non - Tomato Crops Suitable for Value Addition

Singh and Singh (2004) in their study on processed products of pomegranate reported that a number of processed products can be manufactured by processing the fruits and also explained the methods of processing different value added pomegranate products like fruit juice, wine, concentrate and beverage, syrup and jelly, anar rub (pomegranate jam) and anardana.

Reddy and Kumar (2010) observed that there were about 56 mango processing units in Chittoor district with wide range of capital investment from Rs.2 crores to Rs.15 crores. They also observed that the export of mango pulp has shown a quantum jump from 13 thousand tonnes in the year 1999-2000 to 120 thousand tonnes in the year 2006-07, which depicts the importance of mango value addition.

Prasad *et al.* (2010) in their study on post harvest handling and processing of pomegranate expressed that development and standardization of processing techniques such as the preparation of RTS (Ready to serve), nectar, squash, jelly, anardana, wine etc. were the best way to utilize the cracked and undersized fruits to prevent huge losses.

Dattatreya *et al.* (2012) in their work on evaluation of guava products quality stated that more diversified products can be made from guava like RTS, nectar and guava leather/bar, etc. The developed products were excellent in taste, rich in nutritional quality, retained original fruit flavour and safe for consumption. Development of such nutritional products using pilot scale facilities would not only reduce the post-harvest losses but also impart value to less appreciated fruits. They also explained that processed guava pulp can be converted into a novel "guava leather/bar" product developed by CIPHET, Ludhiana/Abohar which would add 3-4 times value to the fruits and hence manufacturing of such products will provide ample avenues for employment generation in the rural areas by way of setting small scale processing unit.

Manjula (2012) opined that papaya crop not only helped to improve the farm income but also served as a cottage industry. She reported the ingredients and method of producing value added products of papaya like papain, papaya candy and papaya pickle.

Sanghamithra *et al.* (2013) in their study on coconut-value added products gave a detailed description on various value added products from coconut like dessicated coconut, coconut milk, coconut cream, coconut flour, coconut yogurt, coconut water concentrate, coconut vinegar, snowball tender coconut, virgin coconut oil, coconut protein powder, coconut jaggery, coconut jam, coconut syrup, coconut refined sugar, coconut candy and honey. Also they expressed that coconut has great culinary, medicinal, cosmetic and industrial application; therefore, all the efforts should be made to promote the value added products of coconut through national and global level.

Hossain and Bepary (2015) in their study on post-harvest handling of pineapples gave a detailed flow chart of producing value added products from pineapple like pineapple juice, pineapple squash, pineapple RTS beverage, pineapple jam, canned slices, wine, pineapple vinegar, ferulic acid for cosmetic industry, bromelain for meat tenderization, fiber and as a animal feed.

Garg (2015) in her study on value addition and processing of opportunities of guava in Varanasi expressed that guava being a highly nutritive fruit can be processed to guava powder which is used in the preparation of jams and jellies. She identified that the gross income obtained from processing 1000 kg of guava into 145 kg of guava powder was Rs.45000.

Singh *et al.* (2016) studied on development, sensory evaluation, nutrient composition and shelf life evaluation of value added biscuits. He concluded that the dehydrated Shitake mushroom can be successfully employed for product development. The changing food habits and increasing health consciousness have led to a gradual increase in demand of processed mushrooms among urban and rural consumers.

Kanwal *et al*. (2016) in their review on production, losses and processing technologies of Guava observed that guava being a poor man's apple can be made available all-round the year by processing in to different products like dehydrated powder, pulp, puree, juice, nectar, jam, jelly, preserve, leathers, canned slices and some other alcoholic beverages.

Kumari *et al.* (2017) examined that there is great scope of value addition in guava by producing several value products like guava pulp, guava juice, blended RTS beverages, guava nectar, jelly, toffee, guava wine, guava leather, guava dehydrated slices, guava cheese and guava powder. In their study, she opined that development of low cost processing technologies, value addition through extension of shelf life, processing of marketable surplus into value added products and utilization of food industries' by-products are the key areas to be focussed to increase the share of value added products in Indian exports.

Saloni *et al*. (2017) in their study on pineapple production and processing in north-eastern India reported that peak availability of pineapples was in the months of July - Sep and Nov - Dec. The fruit can be processed to juice, squash, jam, RTS beverages, canned pineapple, wine and vinegar using different technologies like vacuum drying, radiation processing, thermal processing, ultrasound, osmotic evaporation and high pressure technology. They found that the by-products of the process can also be put to efficient use by producing biogas or methane.

Vishwanath *et al.* (2018) in their study on processing for value addition of fruits and vegetables explained the various value added products that can be derived from pomegranate like jellies, Anardana, RTS beverages, pomegranate molasses, pomegranate powder, pomegranate jams and wine. They also explained that some minor fruits like aonla, ber, fig, tamarind, karonda, passion fruit, phalsa, roselle, custard apple and bael fruit can also be processed into various value added products.

2.3 Studies on Assessing the Possibilities of Value Added Products of Other Crops Using Existing Potential.

Adeyemi and Olufemi (2016) in their research on the determinants of capacity utilization in the Nigerian manufacturing sector between 1975 and 2008 reported that there was a positive relationship between consumer's price index, fixed capital formation in manufacturing sector and capacity utilization. It also showed that there was negative relationship between electricity generation, real manufacturing output growth rate and capacity utilization which resulted in low manufacturing productivity growth rate in Nigeria.

Ndemezo *et al.* (2018) in their study on determinants of capacity utilization of food and beverage manufacturing firms in Rwanda analysed the data from the manufacturing industry through a comprehensive survey carried out by Rwandese Ministry of Trade and Industry (MINICOM) during 2013-2014. In their study, they observed that in the food processing industry, main factors which undermine the capacity utilization of firms were shortage of raw materials, lack of specialized technology and tax administration and standards. They also reported that four factors that harmed the capacity utilization of beverage manufacturing firms were oversize in terms of fixed assets, lack of working capital, standards and insufficient demand.

Okunade and Oluwaseun (2018) in their work on effect of capacity utilisation on manufacturing firms' production examined the effect of capacity utilisation on manufacturing firms' output in Nigeria using time series data covering the period of 1981 to 2016 through an Autoregressive Distributed Lag (ARDL) model approach. The study found positive but insignificant relationship between capacity utilisation and manufacturing firms' output since capacity was grossly under-utilised in virtually every productive firm in Nigeria.

CHAPTER – III

MATERIAL & METHODS

Chapter - III

MATERIAL 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 sub-headings.

3.1 SAMPLING PROCEDURE

3.2 COLLECTION OF DATA

3.3 TOOLS OF ANALYSIS

3.1 SAMPLING PROCEDURE

3.1.1 Selection of the District

Chittoor district was purposively chosen for the study as there are many processing plants and the area has a great potential for establishing new processing units for most of the fruits and vegetables. According to 2017-18 data, a total of 1,96,815.74 ha was cultivated under horticultural crops in Chittoor district of Andhra Pradesh.

3.1.2 Selection of the Mandals

Based on the crops that have potential for value addition, one mandal for each crop is selected based on the highest area criterion. The selected mandals in such manner were Bangarupalem for mango, Gudipala for banana and Kalikiri for papaya.

3.1.3 Selection of the Villages

Using the criterion of highest area under cultivation, two villages from each mandal are purposively selected. The selected villages were Ragimanupenta and Nalagampalli in Bangarupalem mandal; Papasamudram and Bommasamudram in Gudipala mandal; Guttapalem and Marrikuntapalli in Kalikiri mandal.

3.1.3 Selection of the Farmers

From each village 10 farmers who were cultivating the selected crops were randomly selected for the study. So the total sample size of the farmers was 60.

Table 3.1. Selection of mandals and villages for the study

<table>
<tr><th>District</th><th>Mandal</th><th>Villages</th><th>Farmers</th></tr>
<tr><td rowspan="6">Chittoor</td><td rowspan="2">Bangarupalem</td><td>Ragimanupenta</td><td>10</td></tr>
<tr><td>Nalagampalli</td><td>10</td></tr>
<tr><td rowspan="2">Gudipala</td><td>Papasamudram</td><td>10</td></tr>
<tr><td>Bommasamudram</td><td>10</td></tr>
<tr><td rowspan="2">Kalikiri</td><td>Guttapalem</td><td>10</td></tr>
<tr><td>Marrikuntapalli</td><td>10</td></tr>
<tr><td colspan="4">Total Sample : 60</td></tr>
</table>

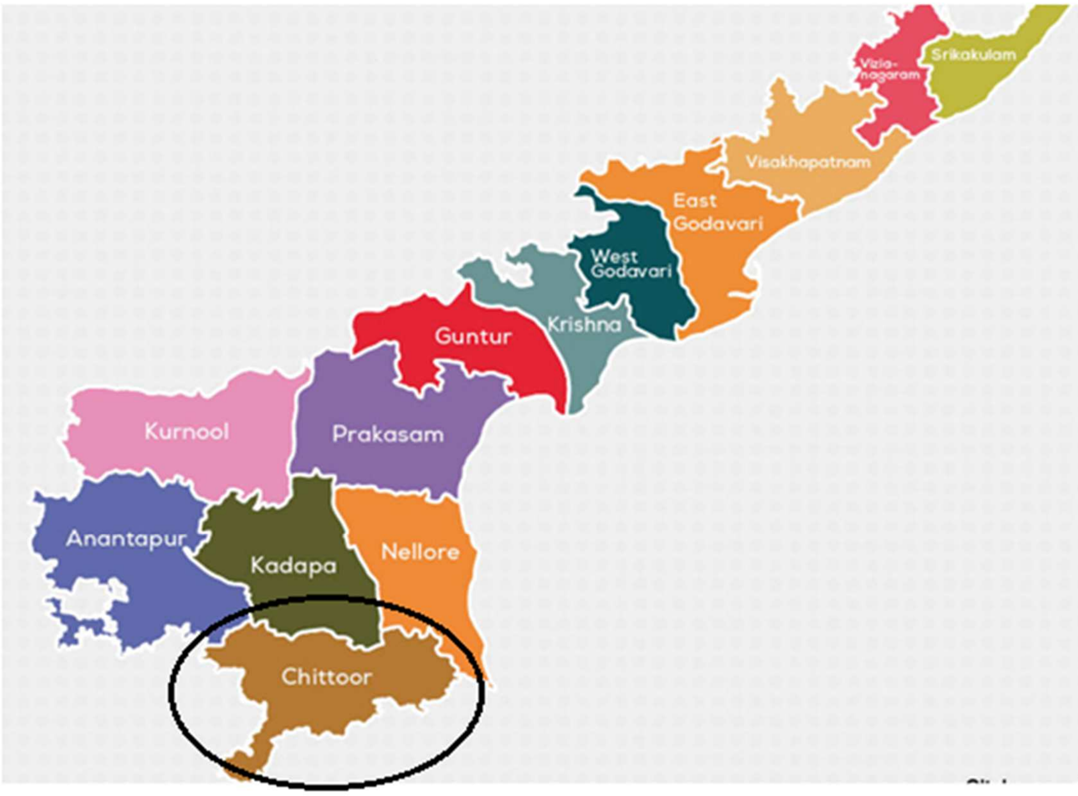

Fig. 3.1. Map showing the study area - Chittoor

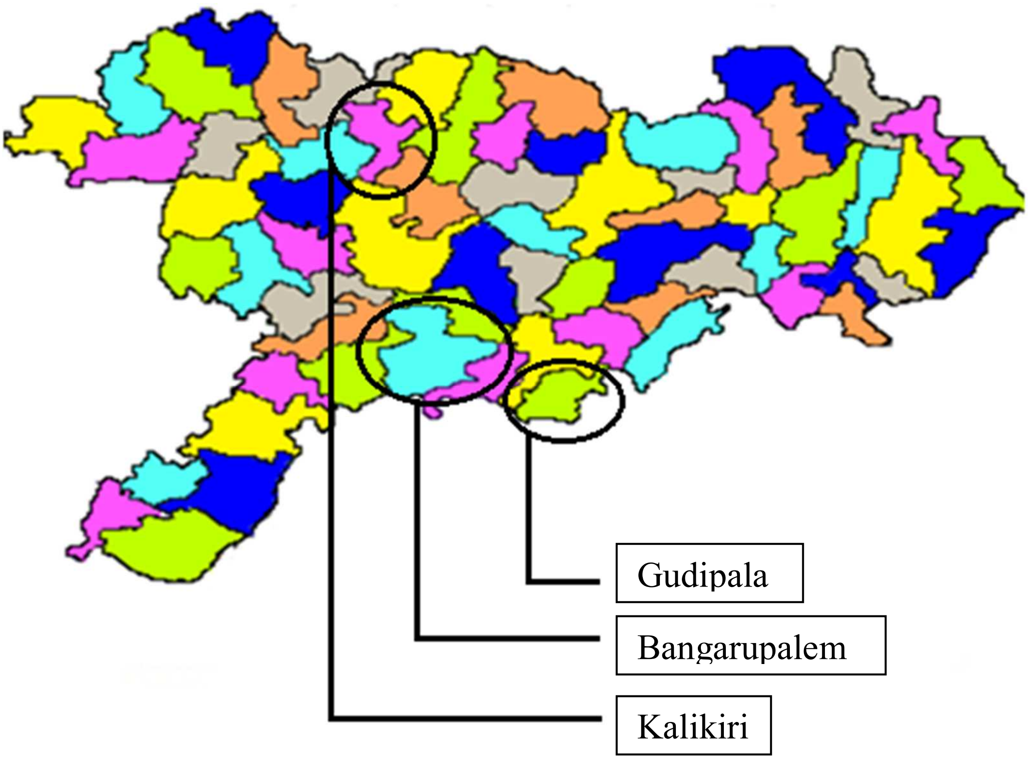

Fig. 3.2. Map showing the selected mandals in Chittoor district

3.1.4 Selection of Food Processing Units

There are a total of 23 potentially operating food processing plants in the region. A total of 5 processing units were randomly selected which are representative of all the processing units.

3.2 COLLECTION OF DATA

3.2.1 Primary Data

The primary data were 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 mango, banana and papaya, problems in marketing etc. Different sets of interview schedules were also prepared for interviewing food processing units. The primary data pertained to the year 2017-18.

3.2.2 Secondary Data

The present study focuses on availability of mango, banana and papaya in the study area. Hence, the secondary data required was collected from Horticulture office - Chittoor, District planning office - Chittoor, and relevant websites.

3.3 TOOLS OF ANALYSIS

Descriptive statistics were worked out for the data collected from primary and secondary sources and the results were tabulated. The details of the analytical tools used are briefly discussed below.

3.3.1 Tabular Analysis

The collected data was presented in tabular form to facilitate easy comparison. Simple percentages and averages were worked out to present the general characteristics of sample farmers and intermediaries such as age, literacy, crop pattern, land holding pattern, number of farmers following different marketing channels, etc.

3.3.2. Cross Tabulation:

Cross tabulation is used to compare the relation between two variables in the study like mandal and age or mandal and literacy status.

3.3.3. Chi-Square Test for Independence of Attributes:

The Chi-square test of independence determines whether there is a statistically significant relationship between categorical variables.

The null hypothesis H_0 may be tested by using the following statistics:

$$\chi^2 = \sum_{i=1}^{k} \frac{(O_i - E_i)^2}{E_i}$$

Where,

O_i = Observed frequencies

E_i = Expected frequencies = $\frac{Row\ total\ X\ Column\ total}{Grand\ total}$

K= Number of categories

Degrees of freedom = (r-1) (c-1)

r = no. of rows in contingency table

c= no. of columns in contingency table

If this value χ^2 is greater than the table value of χ^2 at a specified level of significance for (r-1)(c-1) degrees of freedom, it will be significant and then we shall be justified in suspecting that the two variables are independent.

If the value of χ^2 is non-significant, it justifies the agreement between the observed fact and the theory or hypothesis. If the χ^2 is equal to zero, then the agreement is perfect.

CHAPTER – IV

RESULTS & DISCUSSION

Chapter - IV

RESULTS AND DISCUSSION

The chapter presents the results obtained by the examination of data compiled for the study. This study was accomplished with objectives of understanding the selected study area by base line survey, identification of potential crops for value addition and their suitability to the existing tomato processing machinery in farmer owned processing plant.

The findings of the study are given in this chapter with the following headings.

4.1 Distribution of sample based on socio-economic characteristics

4.2 Present scenario in the study area

4.3 Identification of potential crops for value addition (Non-tomato), and

4.4 Economics of fruit and vegetable processed products proposed to be taken up by farmer owned tomato processing unit.

4.1. Distribution of Sample Based on Socio-Economic Characteristics:

4.1.1. Age

The age particulars of the mango, banana and papaya farmers are presented in Table 4.1. and Fig 4.1. They indicated that 75 per cent of mango farmers were middle aged and 25 per cent were old aged. In banana sample, 60 per cent of the farmers were middle aged and the other 40 per cent of the were old. Similarly, in papaya sample, greater proportion were middle aged (36-55), 20 per cent were young and rest 10 per cent of the farmers were old.

Table 4.1. Distribution of respondents based on their age (n = 60)

S.No	Age	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Young age (20-35)	0	0	0	0	4	20
2	Middle age (36-55)	15	75	12	60	14	70
3	Old age (>56)	5	25	8	40	2	10
	Total	20	100	20	100	20	100

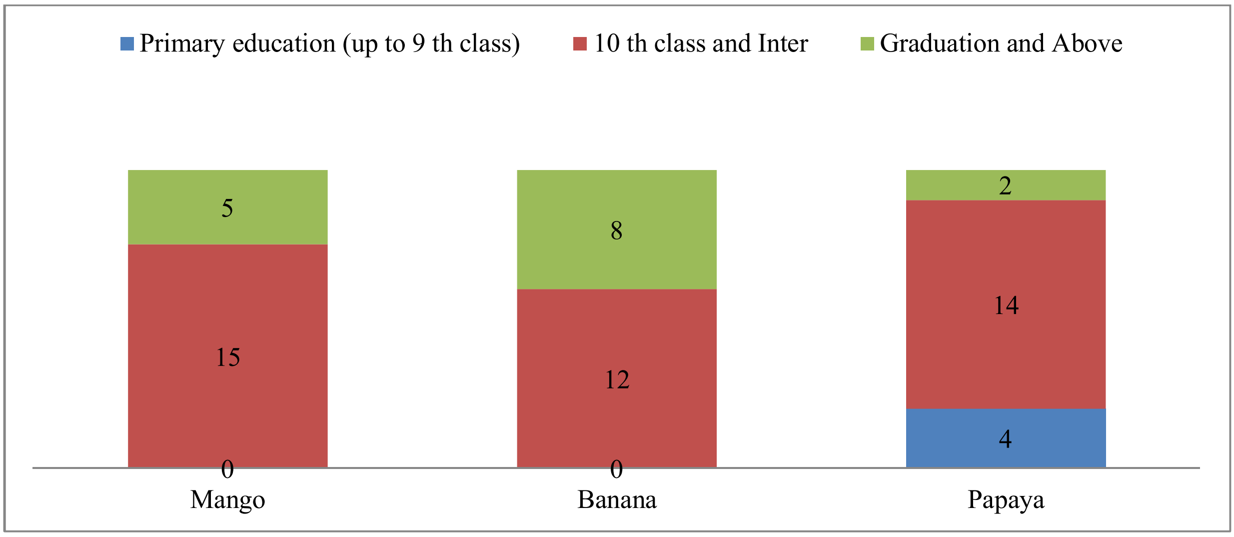

Fig. 4.1. Distribution of respondents based on their Age

4.1.2. Literacy Status

In the present situation, where education is a very important criterion, all the sample respondents were found literate. As shown in Table 4.2. and Fig. 4.2. among the mango farmers, graduates were 45 per cent, farmers with primary education were 25 per cent and remaining 30 per cent fall under high school educated. Among banana farmers, twenty per cent completed primary education, 60 per cent pursued high school education and graduated respondents were 20 per cent. Among the papaya farmers, 10 per cent of the respondents were primary educated, where high school educated were 60 per cent and other 30 per cent had fallen under graduate - qualified.

Table 4.2. Distribution based on literacy status (n = 60)

S.No	Education level	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Primary education (up to 9 th class)	5	25	4	20	2	10
2	10 th class and Inter	6	30	12	60	12	60
3	Graduation and Above	9	45	4	20	6	30
	Total	20	100	20	100	20	100

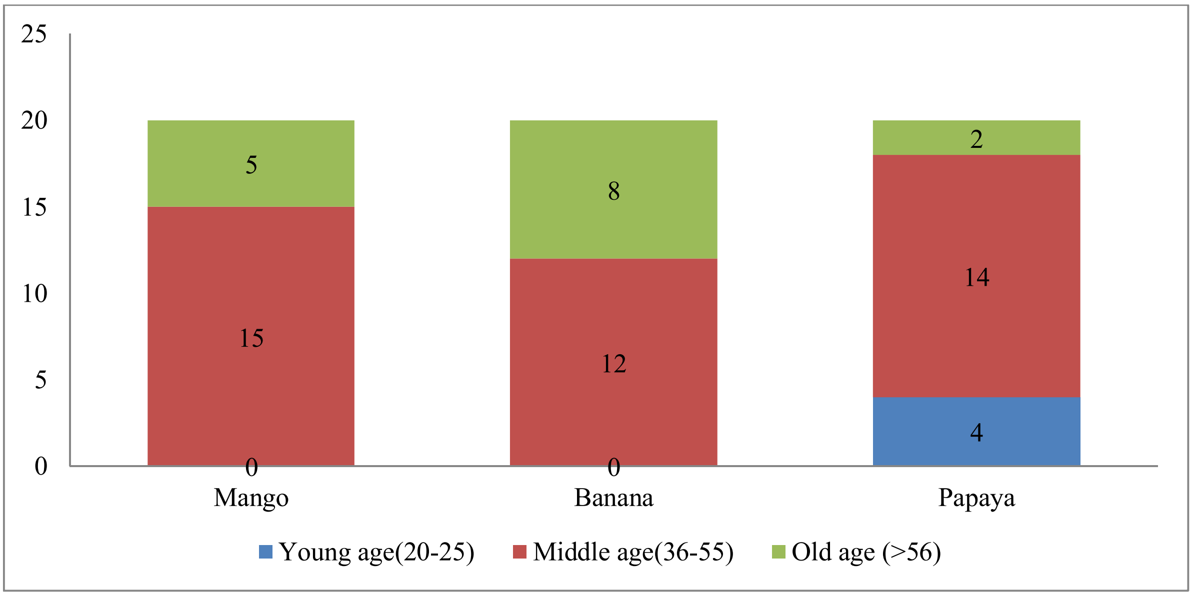

Fig. 4.2. Distribution of respondents based on their Literacy status

4.1.3. Subsidiary Occupation

Few sample farmers in study area were having supplementary occupation with agriculture as their core occupation. They have cattle/dairy units, some were running small businesses and some others were job holders. Table 4.3. and Fig 4.3. clearly represent the diverse types of occupations they pursued. Major portion of the mango farmers (55 per cent) had only agriculture as their occupation, where 20 per cent of sample farmers maintained cattle/dairy, 15 per cent had other jobs and other 10 per cent of farmers run their own businesses. Among banana respondents, half part of the sample were dependent on agriculture as their main occupation and the rest 50 per cent had cattle, jobs and businesses. 60 per cent of papaya farmers solely dependent on agriculture, with 25 per cent of them rearing cattle, 5 per cent with jobs and 10 per cent involved in businesses.

Table 4.3. Distribution based on subsidiary occupation (n = 60)

S.No	Occupation	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Nil	11	55	10	50	12	60
2	Cattle /Dairy	4	20	7	35	5	25
3	Job	3	15	2	10	1	5
4	Business	2	10	1	5	2	10
	Total	20	100	20	100	20	100

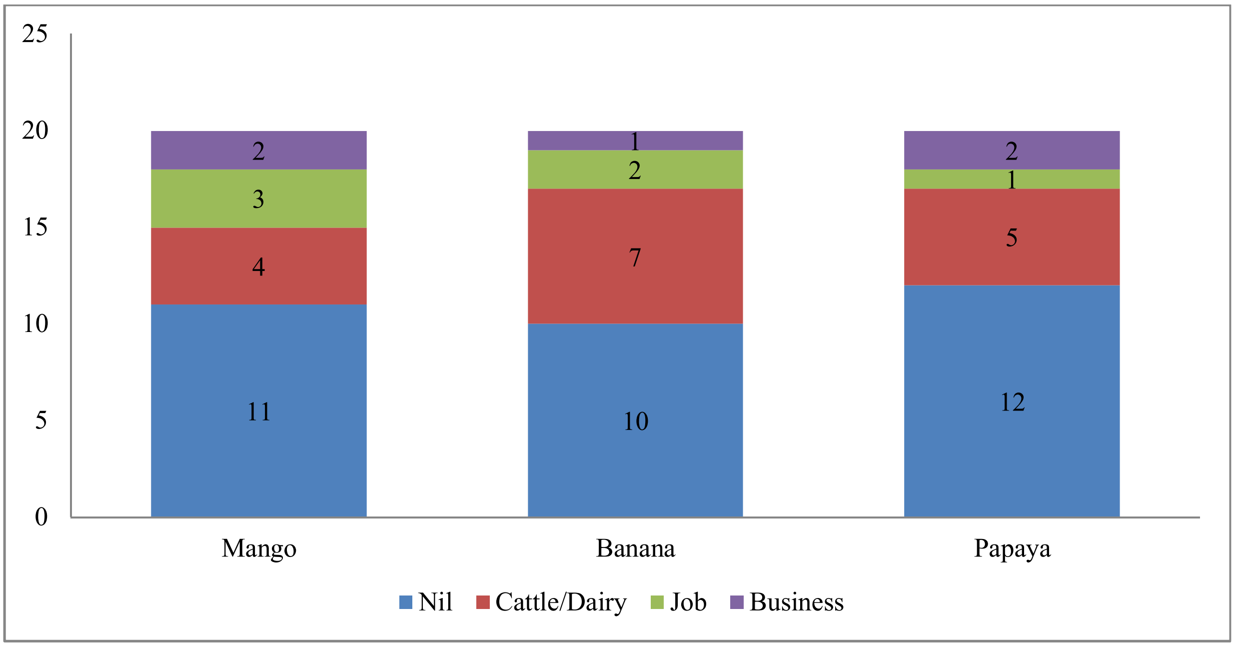

Fig4.3. Distribution of Respondents Based on their Subsidiary Occupation

4.1.4. Family size

Table 4.4. and Fig 4.4. shows the family size of sample. In mango farmers, half of them had a family size of 4 and the other 50 per cent had greater than 4 members. In banana, 45 per cent and 55 per cent of the families had 4 and more than 4 members respectively, whereas, in papaya farmers, one fourth of the sample was with 4 members and the remaining 75 per cent had more than 4 members.

Table 4.4. Distribution based on family size (n = 60)

S.No	Family size	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Up to 4	10	50	9	45	5	25
2	More than 4	10	50	11	55	15	75
	Total	20	100	20	100	20	100

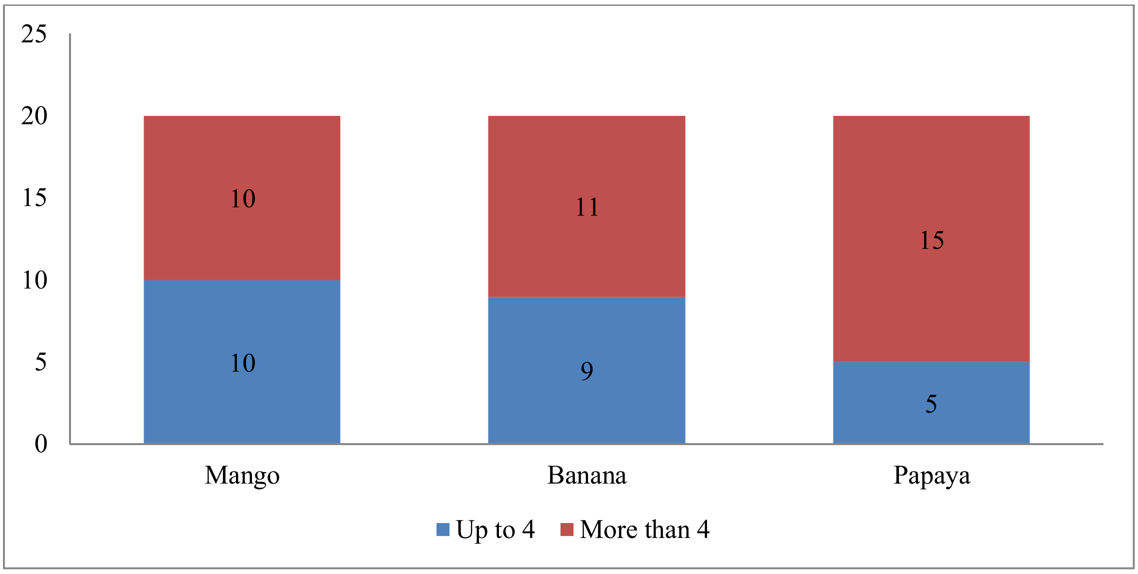

Fig.4.4. Distribution of respondents based on their Family size

4.1.5. Land Holding

Based on land holding, the farmers were divided into three categories like marginal (less than 2.5 acres), small (2.5-5 acres), medium (5-10 acres) and large farmers (greater than 10 acres). As shown in Table 4.5. and Fig 4.5. among mango farmers, marginal were 15 per cent, 35 per cent each were small and medium respondents respectively and the remaining farmers were large. Among banana respondents, major portion (70 per cent) were marginal farmers and the other 30 percent were small farmers. Among papaya farmers, 15 per cent each were marginal and medium and 70 per cent were small. The land holding particulars specifically showed that most of the sample farmers were marginal and small.

Table 4.5. Distribution based on land holding (n = 60)

S.No	Acreage	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Marginal (less than 2.5 acres)	3	15	14	70	3	15
2	Small (2.5-5 acres)	7	35	6	30	14	70
3	Medium (5-10 acres)	7	35	0	0	3	15
4	Large (more than 10 acres)	3	15	0	0	0	0
	Total	20	100	20	100	20	100

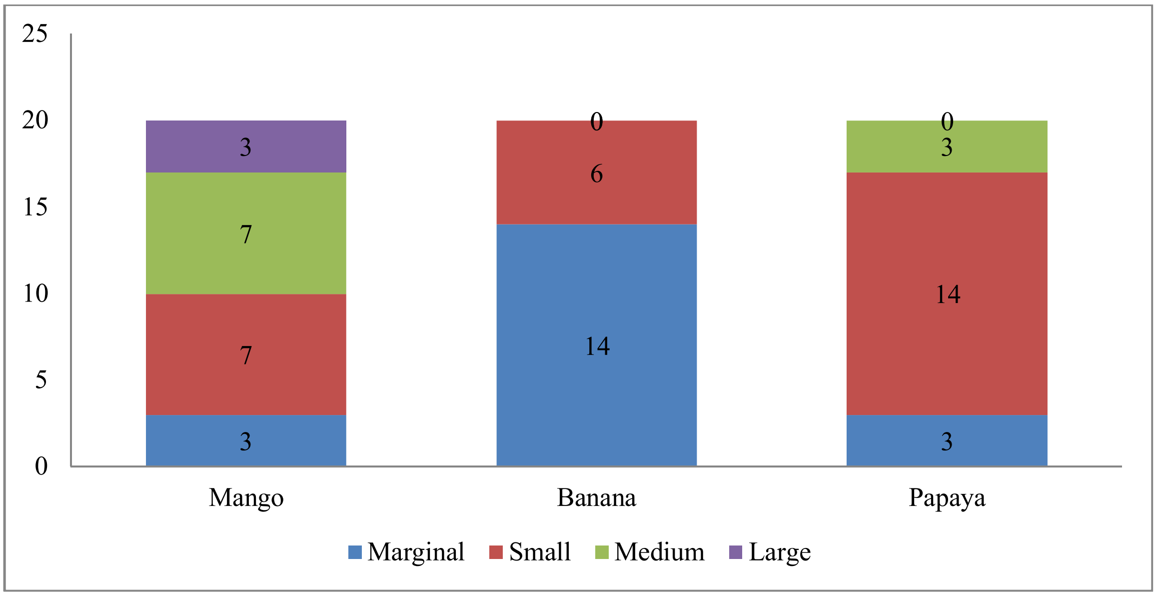

Fig. 4.5. Distribution of respondents based on their Land holding

4.2. Present Scenario of Study Area

4.2.1. Area, Production and Productivity Particulars of Horticultural Crops in Chittoor District 2017-18

It is clear from the Table 4.6., mango was the major horticultural crop in the district. It occupied 46.94 percent of area. Tomato was next to follow with 15.98 per cent of area. Papaya was in 2.33 per cent of total area, while banana occupied 1.5 per cent.

Table 4.6. Area, production and productivity of horticulture crops in Chittoor 2017-18

S.No	Crop	Area in hectare	Production in MT	Productivity(t/ha)
1	Mango	96595 .38 (46.94)	953639.80 (23.73)	9.87
2	Tomato	32890.12 (15.98)	1480050.11 (36.82)	44.99
3	Papaya	4809.38 (2.33)	288540.38 (7.18)	59.99
4	Brinjal	4272.00 (2.076)	106800.00 (2.65)	25.00
5	Banana	3114.00 (1.51)	144801.00 (3.60)	46.50
6	Bhendi	4319.00 (2.09)	107975.00 (2.68)	25.00
7	Coconut	3465.00 (1.68)	48563200 (nuts)	14015.35 (nuts)
8	Chilli	534.00 (0.25)	1335.00 (0.03)	2.50
9	Acid lime	210.00 (0.10)	2177.70 (0.05)	10.37
10	Turmeric	78.00 (0.03)	624.00 (0.01)	8.00
11	Cashew nuts	95.00 (0.04)	66.97 (0.001)	0.70
12	Batavia	30.00 (0.01)	276.00 (0.006)	9.20
13	Others	55353.00 (26.87)	932327.00 (23.20)	16.84
14	Total	205764.96	4018612.98	19.53

Figures in parenthesis indicate percentages to the total area and production

4.2.2. List of Efficient Processing Plants in the Study Area:

Table 4.7. List of processing units in Chittoor district

S. No	Name & Address of the Processing Unit
1	Galla foods, Tenepalli, Puthalapattu Mandal
2	Jain foods, Gollapalli, unit – 1
	Jain foods, Gollapalli, unit – 2
3	Haith foods, Cherlopalli, Chittoor
4	RMM foods, Gangasagaram, Gudipala
5	Varsha foods, Suryanarayanapuram, Renigunta
6	Capricon foods, Palagunta, Satyavedu
7	Navya foods, Mudigolam, Irala
8	Foods and Inns, Gollamadugu, Gudipala
9	PLR foods, Yerrativaripalli, Sodum
10	Sri Manjunatha industries, Masddipatlapalle, Irala
11	Sun Gold, Madupoluru, Bangarupalem
12	M/s Leon foods, Parameswaramangalam Puttur
13	M/s Rasaa foods, Gajulapelluru, B.N.Kandriga
14	Sri Sannidhi foods, Petapalli, Puthalapattu
15	Global farm, Puthalapattu
16	M/s Tasa foods, 189 Kothapalli, Gudipala
17	Srini food Park, Mogili, Bangarupalem
18	New Ranga Food Products, Vellore Road, Gopalapuram, Narigappalle, Chittoor
19	Sri Sai Sanjana Fruit Products, Mutharapalle, Thavanampalle
20	Maruthi Fruit Canning Industries, Gajulapalle, Thavanampalle
21	Navaras Food Products, Polakala, Irala
22	N.K.Foods, Chamanchipuram, Baitapalle, Puthalapattu
23	Sri Devaraja's Agro Foods, KVB Puram Village & Mandal

4.2.3. Marketing Channels

The sample respondents marketed their end produce through different marketing channels as represented in Table 4.8. and Fig 4.6. Among mango farmers, 30 per cent marketed their produce in Chittoor mandi, 10 per cent supplied to processing units nearby and the remaining farmers sold their produce at mandi and also supplied to the processing units. Banana farmers marketed through local mandi (60 per cent) and some of them sold at the farm gate. But, all the papaya respondents marketed their produce only at the farm gate.

Table 4.8. Distribution based on marketing channels (n = 60)

S.No	Channel	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Mandi	6	30	12	60	0	0
2	Processing Units	2	10	0	0	0	0
3	Farm gate sales	0	0	4	20	20	100
4	Mandi+ Processing units	12	60	0	0	0	0
5	Mandi+ Farm gate sales	0	0	4	20	0	0
	Total	20	100	20	100	20	100

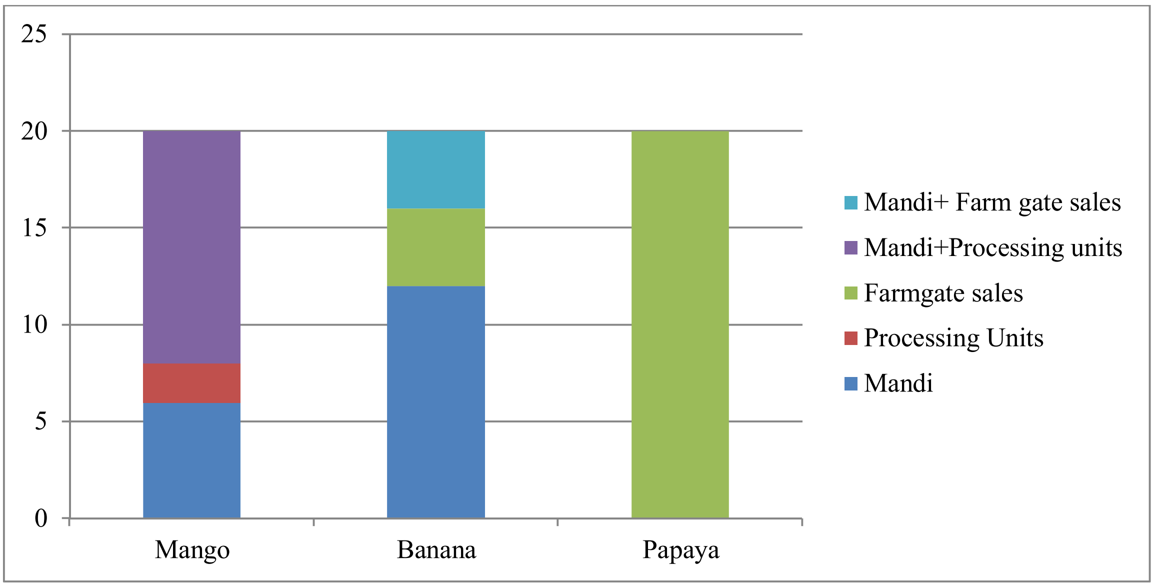

Fig.4.6. Distribution of respondents based on their marketing channels

4.2.4. Constraints in Marketing

Table 4.9. and Fig 4.7. depicts different restraints faced by the farmers during marketing of their produce through different modes as discussed above. Major constraint affecting the mango farmers was lower price realization (50 per cent). Other constraints included late payment from the processing units (25 per cent), labour problems during harvesting (10 per cent) and transport problems from the farm to the market (5 per cent). 75 per cent of the banana farmers had no constraints with the existing marketing channels, and only the remaining 15 per cent had less price realization, 5 per cent each had labour related issues and exploitation from intermediaries. In the case of papaya farmers, 65 per cent did not have any constraints while 20 per cent felt lesser prices and the remaining 15 per cent had labour related constraints.

Table 4.9. Distribution based on Marketing Constraints (n = 60)

S.No	Constraint	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Nil	2	10	15	75	13	65
2	Price	10	50	3	15	4	20
3	Late Payment	5	25	0	0	0	0
4	Labour	2	10	1	5	3	15
5	Transport	1	5	0	0	0	0
6	Intermediarie's Exploitation	0	0	1	5	0	0
	Total	20	100	20	100	20	100

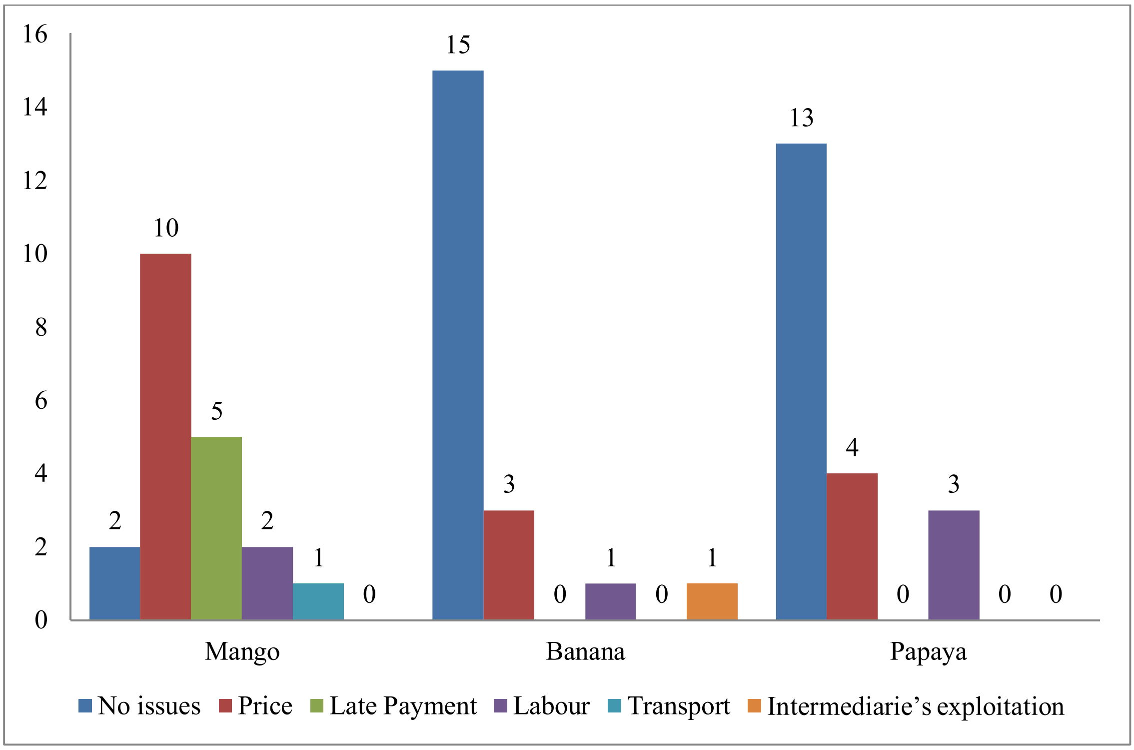

Fig.4.7. Distribution of respondents based on their marketing constraints

4.2.5. Satisfaction with the Price

With the on hand marketing provisions and various constraints reported, sample respondents expressed their satisfaction with the price in the existing system as shown in Table 4.10. and Fig 4.8. Dissatisfaction levels of the mango farmers were more *i.e.,* 95 per cent while only 5 per cent expressed satisfaction with the price. In banana, 80 per cent sample was contented with the prevailing marketing and the remaining 20 per cent of respondents were dissatisfied. Similarly in papaya, 60 per cent were satisfied and for the rest 40 per cent, price was a cause of concern.

Table 4.10. Distribution based on satisfaction with price (n = 60)

S.No	Satisfaction level	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Not satisfied	19	95	4	20	8	40
2	Satisfied	1	5	16	80	12	60
	Total	20	100	20	100	20	100

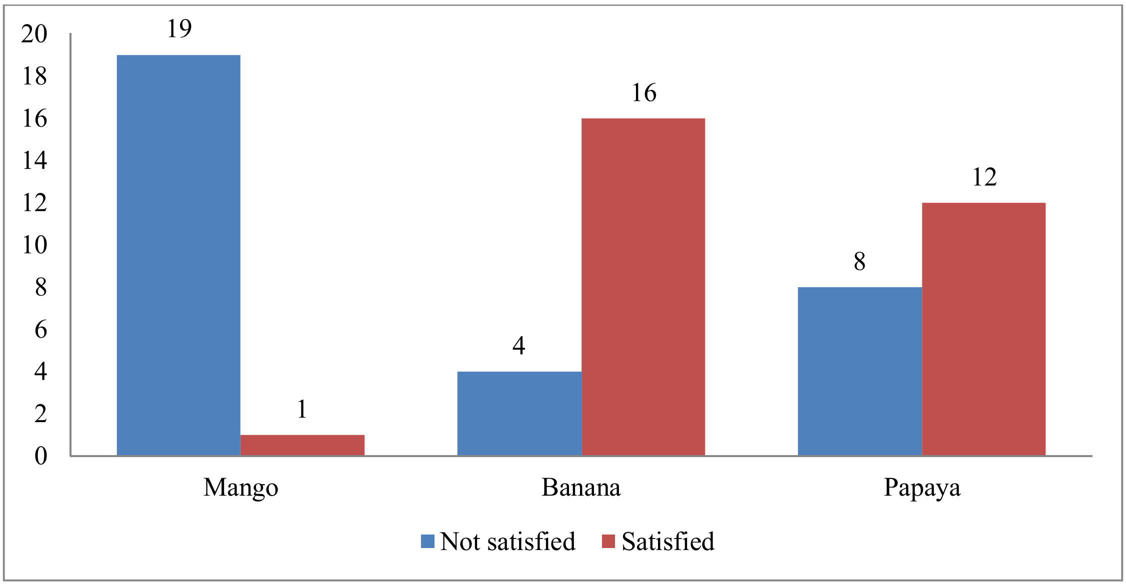

Fig.4.8. Distribution of respondents based on their Satisfaction with the price

4.2.6. Perception towards Food Processing

As our major concern is to know the perception of the farmers on the food processing units, they conveyed mixed opinions on the processing sector as depicted in Table 4.11. and Fig 4.9. Among the mango respondents, 10 per cent felt that this sector was good, 15 per cent received meager prices, 50 per cent were discontented with the payment process of processing units as it was very late affecting the next crop season, and remaining 25 per cent found that the procurement methods of the units were very poor. In banana respondents, majority of them (60 per cent) felt that they had no ample production to supply to the processing units, where 35 per cent were completely unaware of the processing units and only 5 per cent farmers felt that the food processing sector was good and profitable. Among papaya respondents, 55 percent were not willing to supply as they received very less price for their produce and was procured only at very ripe stage. 5 per cent were unaware, 10 per cent felt that it was good, and 5 per cent were concerned with late payment and procurement related problems were ventilated by 5 per cent farmers.

Table 4.11. Distribution based on perception towards food processing (n = 60)

S.No	Perception	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Unaware	0	0	7	35	5	5
2	Good	2	10	1	5	2	10
3	Low price	3	15	0	0	11	55
4	Late Payment	10	50	0	0	1	5
5	Poor procurement	5	25	0	0	1	5
6	Inadequate production for bulk supply	0	0	12	60	0	0
	Total	20	100	20	100	20	100

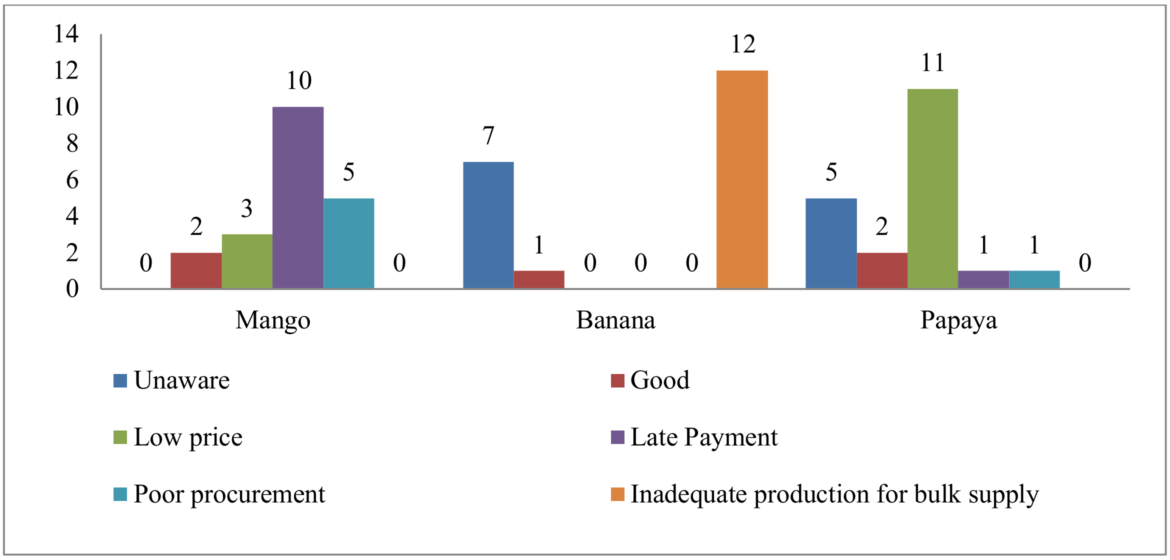

Fig.4.9. Distribution of respondents based on their perception towards food processing

4.2.7. Willingness to Supply

Having analyzed the perception of sample farmers on processing, they were asked to offer their willingness if processing provisions were created in the area. The farmers' responses were analyzed and presented in Table 4.12. and Fig 4.10. 85 per cent of mango farmers were willing if such facility is provided. Cent per cent of banana farmers were in support of supplying to the processing units. In papaya, the response was luke warm. Only 25 per cent of farmers expressed their willingness.

Table 4.12 Distribution based on willingness to supply **(n = 60)**

S.No	Willingness	Mango		Banana		Papaya	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Willing	17	85	20	100	5	25
2	Unwilling	3	15	0	0	15	75
	Total	20	100	20	100	20	100

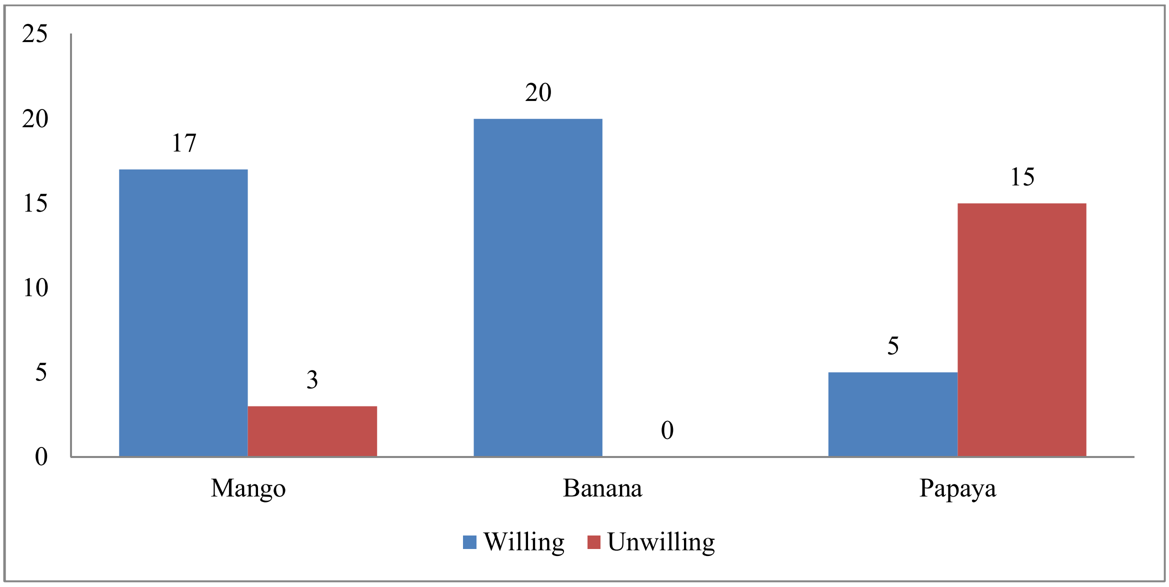

Fig. 4.10. Distribution of respondents based on willingness to supply

4.2.8. Cost of Cultivation and the Returns:

The particulars of cost of cultivation (working costs), gross returns and returns per rupee of expenditure are presented in Table 4.13. In mango, the cost of cultivation was Rs.51750, while it was Rs.90625 in banana and was highest for papaya with Rs.306875. The gross income for the said fruit crop enterprises was Rs.80875, Rs.198750 and Rs.643750 respectively. The net income over working costs was of the order of Rs.29125, Rs.108125 and Rs.336875 for the above three crop enterprises. The returns for rupee of expenditure over working costs were Rs.1.53 for mango, Rs.2.19 for banana and Rs.2.10 for papaya.

Table 4.13. Cost of cultivation and returns (Rs/ha) (n = 60)

S.No	Crop	Cost of cultivation (Working costs)	Gross Income	Net income	Returns per rupee of expenditure over working costs
1	Mango	51750	80875	29125	1.56
2	Banana	90625	198750	108125	2.19
3	Papaya	306875	643750	336875	2.09

4.2.9. Average Price Realized by Sample Respondents

Price received by farming community varied with seasons and market demand. Table 4.14. depicts the prices realized by the farmers for the last season. Average price for mango was Rs.5.10 per kg. Average price for banana was Rs.85.68 per bunch and that of papaya was Rs.6.41 per kg of the produce. This year prices are expected to be higher than the prices of the last year.

Table 4.14. Average prices of different crops

S. No	Crop	Unit	Price
1	Mango	Rs/Kg	5.10
2	Banana	Rs/bunch	85.68
3	Papaya	Rs /Kg	6.41

4.2.10. Socio-economic Factors vis-à-vis Selection of Marketing Channels:

There are different types of marketing channels utilized by the farmers for the fruit crops studied to market their end produce like through local mandi, to processing units, at farm gate, both to the mandi and processing units and both to mandi and traders. Socio economic factors influenced the selection of marketing, and the influence of which was determined by employing chi-square test using SPSS software.

According to the table 4.15, it is depicted that there was significant relationship between the location (mandals) of the farmers, age, education and land holding with the type of marketing channel used for marketing their produce.

Table 4.15. Relation of socio-economic factors and marketing channels

a) Location and Marketing Channels:

Mandal	Marketing channels						Chi square value	p-Value
	Mandi	Processing units	Farm gate sales	Mandi+ Processing units	Mandi+ Farm gate sales	Total		
Bangaru Palem	6 (30%)	2 (10%)	0 (0%)	12 (60%)	0 (0%)	20 (100%)	76.000**	0.000
Gudipala	12 (60%)	0 (0%)	4 (20%)	0 (0%)	4 (20%)	20 (100%)		
Kalikiri	0 (0%)	0 (0%)	20 (100%)	0 (0%)	0 (0%)	20 (100%)		
Total	18 (30%)	2 (3.3%)	24 (40%)	12 (20%)	4 (6.7%)	60 (100%)		

* - Significant at 5 per cent level of significance
** - Significant at 1 per cent level of significance
NS - Not significant

b) Age and Marketing Channels

Mandal	Marketing channels						Chi square value	p-Value
	Mandi	Processing Units	Farm gate sales	Mandi+ Processing units	Mandi+ Farm gate sales	Total		
Young age(20-35)	0 (0%)	0 (0%)	4 (100%)	0 (0%)	0 (0%)	4 (100%)	16.32**	0.038
Middle age(36-55)	11 (26.8 %)	2 (4.9%)	18 (43.9%)	9 (22%)	1 (2.4%)	41 (100%)		
Old age(56 and above)	7 (46.7 %)	0 (0%)	2 (13.3%)	3 (20%	3 (20%)	15 (100%)		
Total	18 (30%)	2 (3.3%)	24 (40%)	12 (20%)	4 (6.7%)	60 (100%)		

c) Literacy status and Marketing Channels

Literacy Status	Marketing channels						Chi square value	p-Value
	Mandi	Processing units	Traders /business men	Mandi+ Processing units	Mandi+ Busines smen	Total		
Primary and secondary education (Up to 9 th class)	7 (63.6%)	1 (9.1%)	2 (18.2%)	0 (0%)	1 (9.1%)	11 (100%)	18.302*	0.019
10 th and Inter	8 (26.7%)	1 (3.3%)	14 (46.7%)	4 (13.3%)	3 (10%)	30 (100%)		
Graduation and above	3 (15.8%)	0 (0%)	8 (42.1%)	8 (42.1%)	0 (0%)	19 (100%)		
Total	18 (30%)	2 (3.3%)	24 (40%)	12 (20%)	4 (6.7%)	60 (100%)		

d) Land Holding and Marketing Channels

Land holding	Marketing channels						Chi square value	p-Value
	Mandi	Processing units	Traders /business men	Mandi+ Processing units	Mandi+ Busines smen	Total		
Marginal (less than 2.5 acres)	10 (50%)	0 (0%)	6 (30%)	2 (10%)	2 (10%)	20 (100%)	25.028*	0.015
Small (2.5-5 acres)	6 (22.2%)	1 (3.7%)	15 (55.6%)	3 (11.1%)	2 (7.4%)	27 (100%)		
Medium (5-10 acres)	2 (20%)	1 (10%)	3 (30%)	4 (40%)	0 (0%)	10 (100%)		
Large (More than 10 acres)	0 (0%)	0 (0%)	0 (0%)	3 (100%)	0 (0%)	3 (100%)		
Total	18 (30%)	2 (3.3%)	24 (40%)	12 (20%)	4 (6.7%)	60 (100%)		

4.2.11. Socio-economic Factors vis-à-vis Satisfaction with Price:

There are varied levels of satisfaction with the price among the sample respondents. The influential reasons for diverse results are determined using chi-square analysis.

As shown in the table 4.16. only location of the farmers influenced the satisfaction with the price while the other socio-economic characters like age, education and land holding did not exhibit a significant effect.

Table 4.16. Relation of socio-economic factors on satisfaction with price

a) Location and Satisfaction with Price

Mandal	Satisfaction with the price			Chi square value	p-Value
	Dissatisfied	Satisfied	Total		
Bangaru Palem	19 (95%)	1 (5%)	20 (100%)	24.160**	0.000
Gudipala	4 (20%)	16 (80%)	20 (100%)		
Kalikiri	8 (40%)	12 (60%)	20 (100%)		
Total	31 (51.7%)	29 (48.3%)	60 (100%)		

b) Age and Satisfaction with Price

Mandal	Satisfaction with the price			Chi square value	p- Value
	Dissatisfied	Satisfied	Total		
Young age(20-35)	2 (50%)	2 (50%)	4 (100%)	0.024^{NS}	0.988
Middle age(36-55)	21 (51.2%)	20 (48.8%)	41 (100%)		
Old age(56 and above)	8 (53.3%)	7 (46.7%)	15 (100%)		
Total	31 (51.7%)	29 (48.3%)	60 (100%)		

c) Literacy Status and Satisfaction with Price

Literacy status	Satisfaction with the price			Chi square value	p- Value
	Dissatisfied	Satisfied	Total		
Primary and secondary education (Up to 9 th class)	6 (54.5%)	5 (45.5%)	11 (100%)	0.077^{NS}	0.962
10 th and Inter	15 (50%)	15 (50%)	30 (100%)		
Graduation and above	10 (52.6%)	9 (47.4%)	19 (100%)		
Total	31 (51.7%)	29 (48.3%)	60 (100%)		

d) Land Holding and Satisfaction with Price

Land holding	Satisfaction with the price			Chi square value	p- Value
	Dissatisfied	Satisfied	Total		
Marginal (less than 2.5 acres)	8 (40%)	12 (60%)	20 (100%)	4.175^{NS}	0.243
Small (2.5-5 acres)	14 (51.9%)	13 (48.1%)	27 (100%)		
Medium (5-10 acres)	6 (60%)	4 (40%)	10 (100%)		
Large (More than 10 acres)	3 (100%)	0 (0%)	3 (100%)		
Total	31 (51.7%)	29 (48.3%)	60 (100%)		

4.2.12. Socio-economic Factors vis-à-vis Perception towards Fruit Processing:

Relation of perception of the famers towards food processing is expressed in Table 4.17. It is proved that factors - location, age and land holding of farmers significantly influenced the perception towards the processing sector. Literacy levels of the farmers had no influence on the opinion towards the processing units.

Table 4.17. Relation of socio-economic factors on perception towards food processing units

a) Location and Perception towards Food Processing

Mandal	Perception towards food processing							Chi square value	p-Value
	Unaware	Good	Less price realization	Late payment	Poor procurement	Insufficient production to supply	Total		
Bangaru Palem	0 (0%)	2 (10%)	3 (15%)	10 (50%)	5 (25%)	0 (0%)	20 (100%)	68.303**	0.00
Gudipala	7 (35%)	1 (5%)	0 (0%)	0 (0%)	0 (0%)	12 (60%)	20 (100%)		
Kalikiri	5 (25%)	2 (10%)	11 (55%)	1 (5%)	1 (5%)	0 (0%)	20 (100%)		
Total	12 (20%)	5 (8.3%)	14 (23.3%)	11 (18.3%)	6 (10%)	12 (20%)	60 (100%)		

b) Age and Perception towards Food Processing

Age	Perception towards food processing							Chi square value	p-Value
	Unaware	Good	Less price realization	Late payment	Poor procurement	Insufficient production to supply	Total		
Young age(20-35)	0 (0%)	2 (50%)	2 (50%)	0 (0%)	0 (0%)	0 (0%)	4 (100%)	18.67*	0.045
Middle age(36-55)	10 (24.4%)	3 (7.3%)	9 (22%)	9 (22%)	4 (9.8%)	6 (14.6%)	41 (100%)		
Old age(56 and above)	2 (13.3%)	0 (0%)	3 (20%)	2 (13.3%)	2 (13.3%)	6 (40%)	15 (100%)		
Total	12 (20%)	5 (8.3%)	14 (23.3%)	11 (18.3%)	6 (10%)	12 (20%)	60 (100%)		

c) Literacy Status and Perception towards Food Processing

Literacy status	Perception towards food processing							Chi square value	p-Value
	Unaware	Good	Less price realization	Late payment	Poor procurement	Insufficient production to supply	Total		
Primary and secondary education	1 (9.1%)	0 (0%)	2 (18.2%)	3 (27.3%)	1 (9.1%)	4 (36.4%)	11 (100%)	9.88^{NS}	0.451
10 th and Inter	8 (26.7%)	3 (10%)	8 (26.7%)	4 (13.3%)	1 (3.3%)	6 (20%)	30 (100%)		
Graduation and above	3 (15.8%)	2 (10.5 %)	4 (21.1%)	4 (21.1%)	4 (21.1%)	2 (10.5%)	19 (100%)		
Total	12 (20%)	5 (8.3%)	14 (23.3%)	11 (18.3%)	6 (10%)	12 (20%)	60 (100%)		

d) Land Holding and Perception towards Food Processing

Literacy status	Perception towards food processing							Chi square value	p-Value
	Unaware	Good	Less price realization	Late payment	Poor procurement	Insufficient production to supply	Total		
Marginal(less than 2.5 acres)	5 (25%)	2 (10%)	1 (5%)	3 (15%)	1 (5%)	8 (40%)	20 (100%)	25.078^{*}	0.049
Small(2.5 -5 acres)	5 (18.5%)	1 (3.7%)	11 (40.7%)	4 (14.8%)	2 (7.4%)	4 (14.8%)	27 (100%)		
Medium(5-10 acres)	2 (20%)	2 (20%)	2 (20%)	2 (20%)	2 (20%)	0 (0%)	10 (100%)		
Large(More than 10 acres)	0 (0%)	0 (0%)	0 (0%)	2 (66.7%)	1 (33.3%)	0 (0%)	3 (100%)		
Total	12 (20%)	5 (8.3%)	14 (23.3%)	11 (18.3%)	6 (10%)	12 (20%)	60 (100%)		

4.2.13. Socio-economic Factors vis-à-vis Willingness to Supply:

Table 4.18. represents the influence of location, age, education and land holding on the famer's willingness to supply to food processing units. The results showed that the factors viz., location and the land holding particulars had significant relationship with the willingness levels of the farmers, while age and education levels did not influence the willingness to supply to food processing units.

Table 4.18. Relation of socio economic characters on farmer's willingness to supply

a) Location and Willingness to Supply

Mandal	Willingness to supply			Chi square value	p- Value
	Unwilling	Willing	Total		
Bangaru Palem	3 (15%)	17 (85%)	20 (100%)	30.000**	0.000
Gudipala	0 (0%)	20 (100%)	20 (100%)		
Kalikiri	15 (75%)	5 (25%)	20 (100%)		
Total	18 (30%)	42 (70%)	60 (100%)		

b) Age and Willingness to Supply

Age	Willingness to supply			Chi square value	p- Value
	Unwilling	Willing	Total		
Young age(20-35)	2 (50%)	2 (50%)	4 (100%)	1.038^{NS}	0.595
Middle age(36-55)	11 (26.8%)	30 (73.2%)	41 (100%)		
Old age(56 and above)	5 (33.3%)	10 (66.7%)	15 (100%)		
Total	18 (30%)	42 (70%)	60 (100%)		

c) Literacy Status and Willingness to Supply

Literacy status	Willingness to supply			Chi square value	p-Value
	Unwilling	**Willing**	**Total**		
Primary and secondary education(Up to 9 th class)	2 (18.2%)	9 (81.8%)	11 (100%)	2.884^{NS}	0.236
10 th and Inter	12 (40%)	18 (60%)	30 (100%)		
Graduation and above	4 (21.1%)	15 (78.9%)	19 (100%)		
Total	18 (30%)	42 (70%)	60 (100%)		

d) Land Holding and Willingness to Supply

Land holding	Willingness to supply			Chi square value	p-Value
	Unwilling	**Willing**	**Total**		
Marginal (less than 2.5 acres)	2 (10%)	18 (90%)	20 (100%)	9.330*	0.025
Small(2.5-5 acres)	13 (48.1%)	14 (51.9%)	27 (100%)		
Medium(5-10 acres)	3 (30%)	7 (70%)	10 (100%)		
Large(More than 10 acres)	0 (0%)	3 (100%)	3 (100%)		
Total	18 (30%)	42 (70%)	60 (100%)		

4.2.14. Marketing Channels vis-à-vis Satisfaction with Price:

Different marketing channels used by the farmers offered different kinds of prices to them. Therefore chi-square test was done to know whether any relationship existed. Table 4.19 clearly specifies that both of them are related at 5 per cent level. This means that the satisfaction with price had a significant influence in selection of marketing channels.

Table 4.19. Relation of marketing channels and satisfaction with the price

Marketing	Satisfaction with the price		Total	Chi square value	p-Value
	Dissatisfied	Satisfied			
Mandi	7 (38.9%)	11 (61.1%)	18 (100.0%)	12.670*	0.013
Processing units	2 (100.0%)	0 (0.0%)	2 (100.0%)		
Farm gate sales	9 (37.5%)	15 (62.5%)	24 (100.0%)		
Mandi+ Processing units	11 (91.7%)	1 (8.3%)	12 (100.0%)		
Mandi+ farm gate sales	2 (50.0%)	2 (50.0%)	4 (100.0%)		
Total	31 (51.7%)	29 (48.3%)	60 (100.0%)		

4.3. Identification of Potential Non-tomato Crops Suitable for Value Addition:

Farmer owned tomato processing plant with the existing own processing unit as given in Fig 4.23. desires to have other product lines. To do so, information on seasonal availability of potential crops suitable, value addition and processing economics which were studied is presented below.

4.3.1. Seasonal Availability of the Potential Crops Suitable for Value Addition:

The availability of mangoes was found from April and extended up to August and the processing units are prepared to buy anytime in the five month period as they thought that there is no influence of the specified month on the price and even if there are little variations in prices among the period of availability, the little highs are offset by the lows. Tomatoes are available round the year, prices were observed to be on the lower side during months from January to April and September to November which are ideal months for processing units to procure. The ideal period to buy papaya by processors was during the period of August and October. These were months during which papaya is completely ripened which the processing plants prefer, and understandably the price offered was low. Though papaya is available in some other months, processing plants were not ready to purchase due to high prices. Pineapple, though not available domestically, processing units intend to include in schedule of crops utilizing same machinery used for processing mango and papaya. Pineapple can be procured from Kerala during period from December to February. Similarly guava, though not available locally in great quantity, it is procured from other parts of Andhra Pradesh, mostly in southern coastal areas. Therefore, they can get plenty of guava fruits during November and December. Banana and chillies are available in the local area and other parts of state. They are not utilized for processing round the year. When there is vacuum in running the processing in firms, these two crops are filled up for undertaking processing. This particular information is generated to provide a blueprint of the availability of fruits and vegetables which the processing units intend to procure in order to optimize the plant capacity. The said crops with their seasonal availability are presented in Table 4.20.

Table 4.20. Seasonal availability of potential crops suitable for value addition

Crop	January	February	March	April	May	June	July	August	September	October	November	December
Mango												
Tomato												
Papaya												
Pine-apple												
Guava												
Banana												
Chilli												

Source: Global Farm Fresh, Chittoor

4.3.2. Potential Value Added Crops other than Tomato:

There are several fruits that have a great potential for value addition. Value added products produced from each crop are given in Table 4.21.

Table 4.21. Potential non-tomato crops suitable for value addition

S.No	Crop	Value added products
1	Mango	Pulp, concentrate, candy, juice, dried mango, jam, pickle, wine, fruit bars
2	Papaya	Pulp, juice, sauce, squash, papain, candy, pickle, jam, jelly
3	Guava	Pulp, juice, RTS beverage, nectar, jelly, toffee, wine, pectin
4	Banana	Pulp, puree, chips, powder, RTS beverage, fruit bar, jam, jelly
6	Pineapple	Juice, squash, RTS beverage, jam
7	Chilli	Paste, powder, sauce

4.3.2. Flow Charts for Processing:

Processing flow charts of some value added products are provided in the below illustrations.

4.3.3. Processing Line Planned to be Established in the Farmer Owned Processing Unit

Processing line planned or the farmer owned tomato processing unit is furnished in Fig. 4.23.

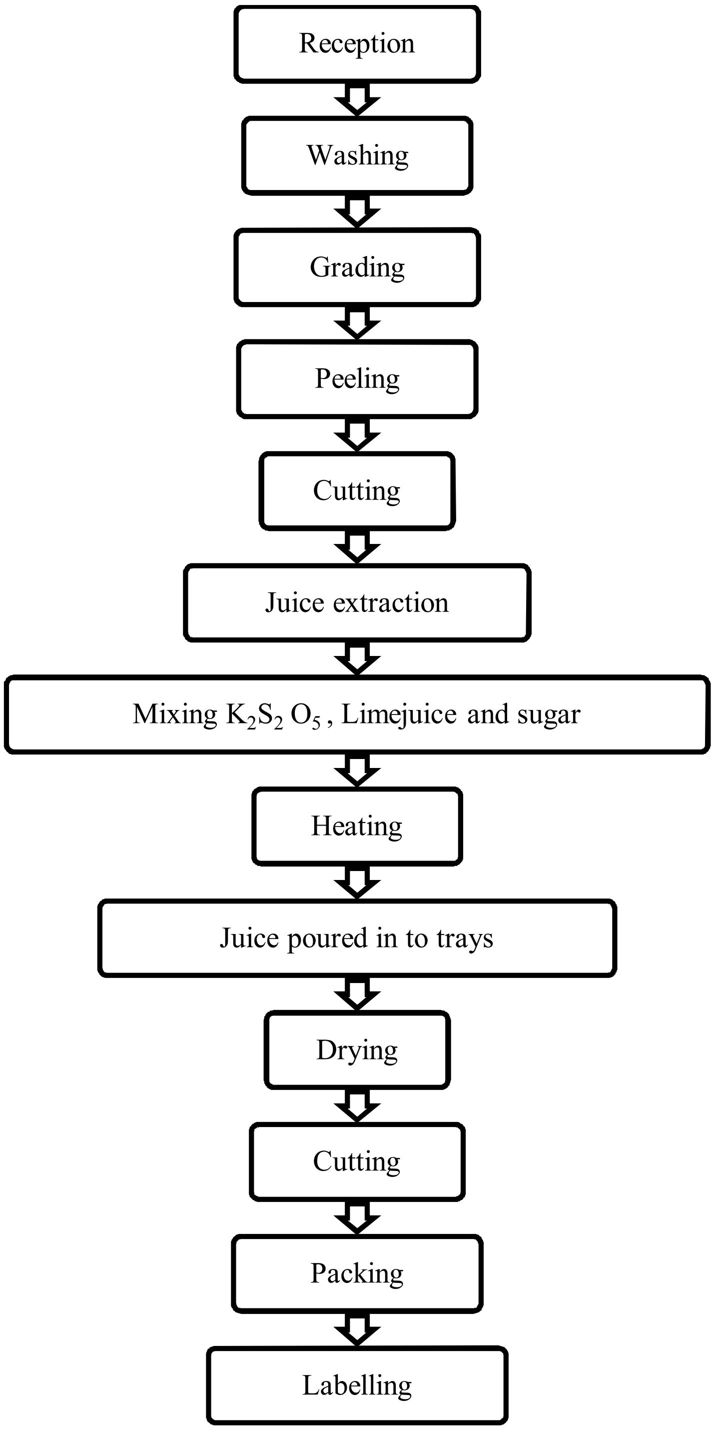

Fig. 4.11. Mango bars

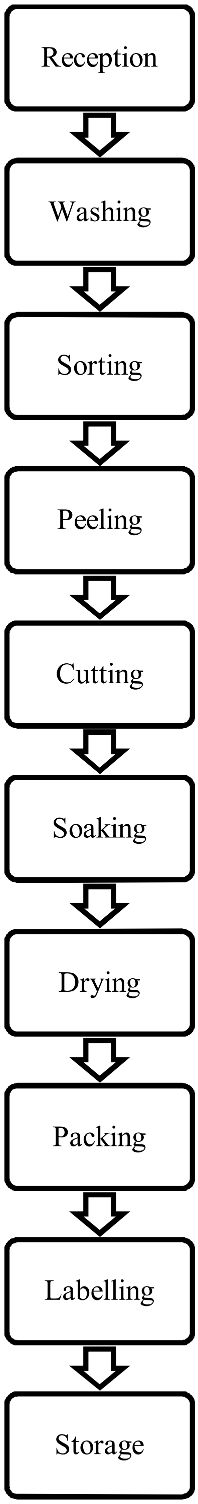

Fig. 4.12. Dried mango slices

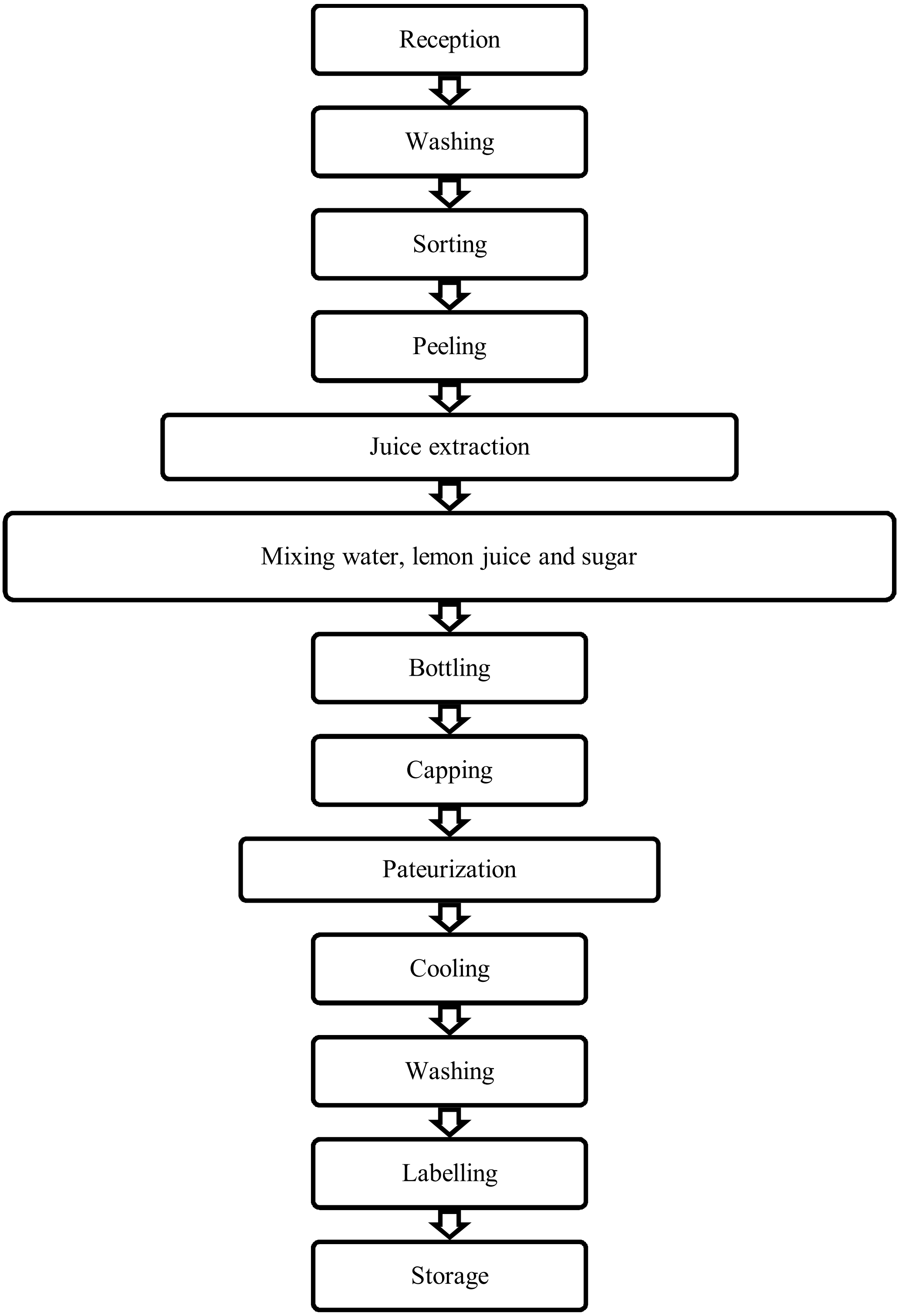

Fig. 4.13. Mango Juice

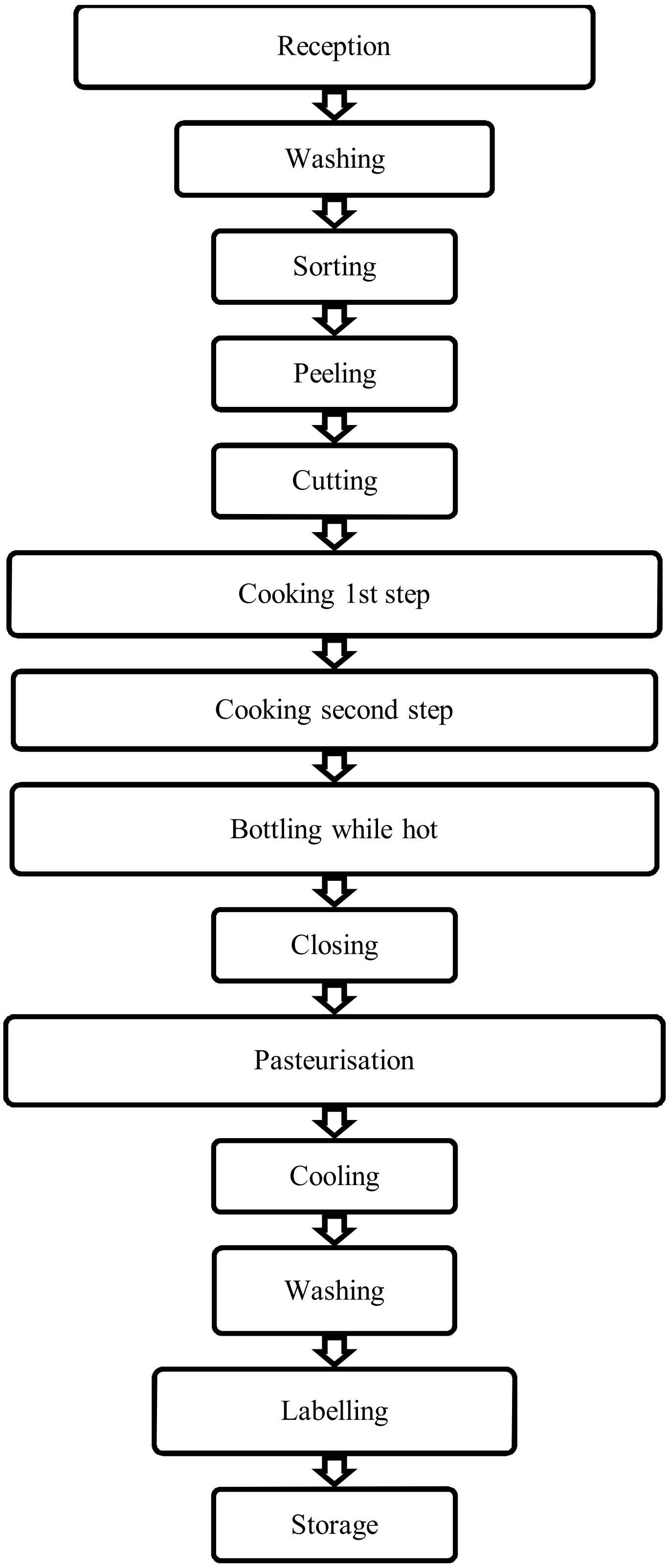

Fig. 4.14. Mango Jam

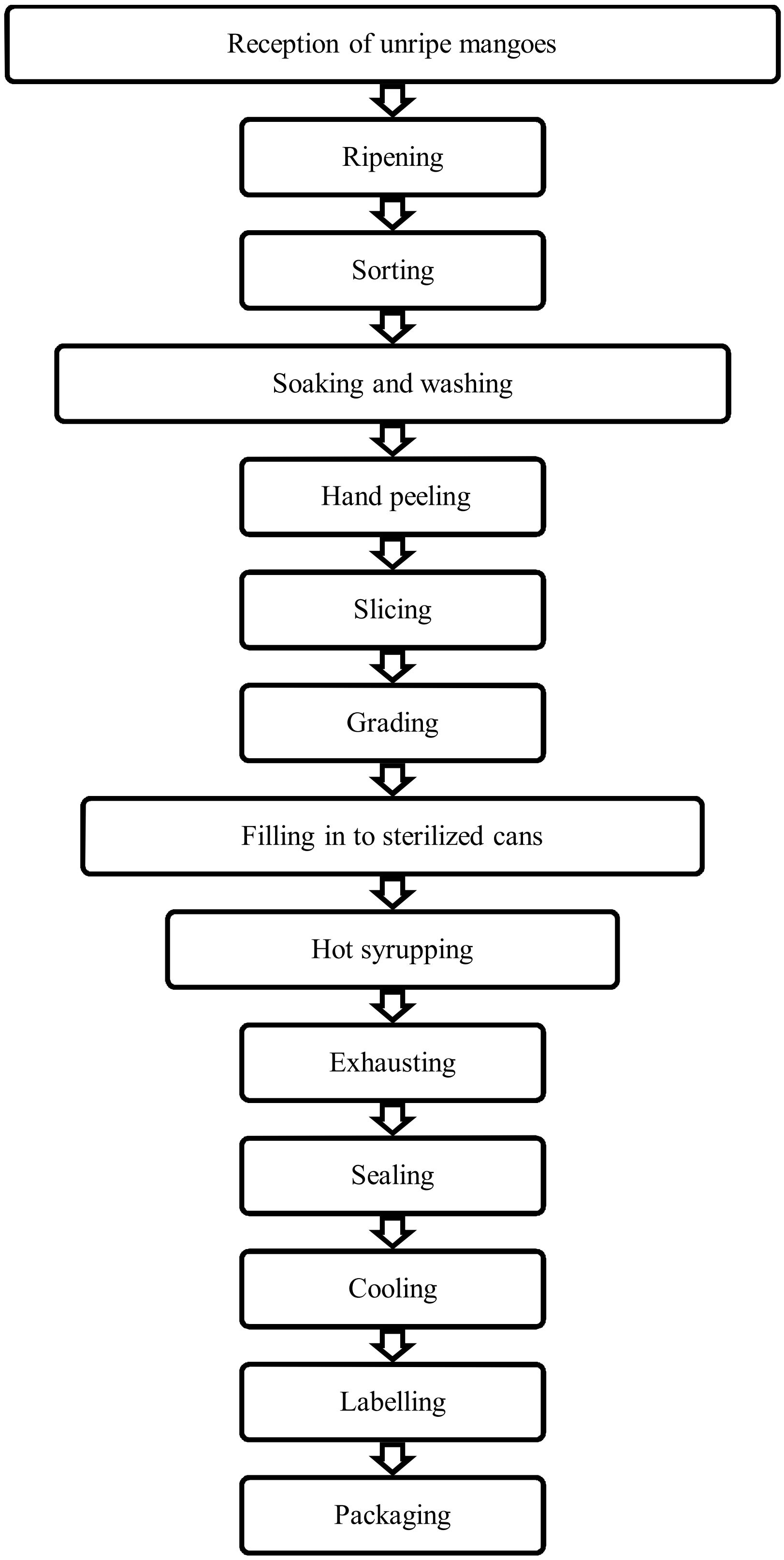

Fig. 4.15. Mango slices in syrup

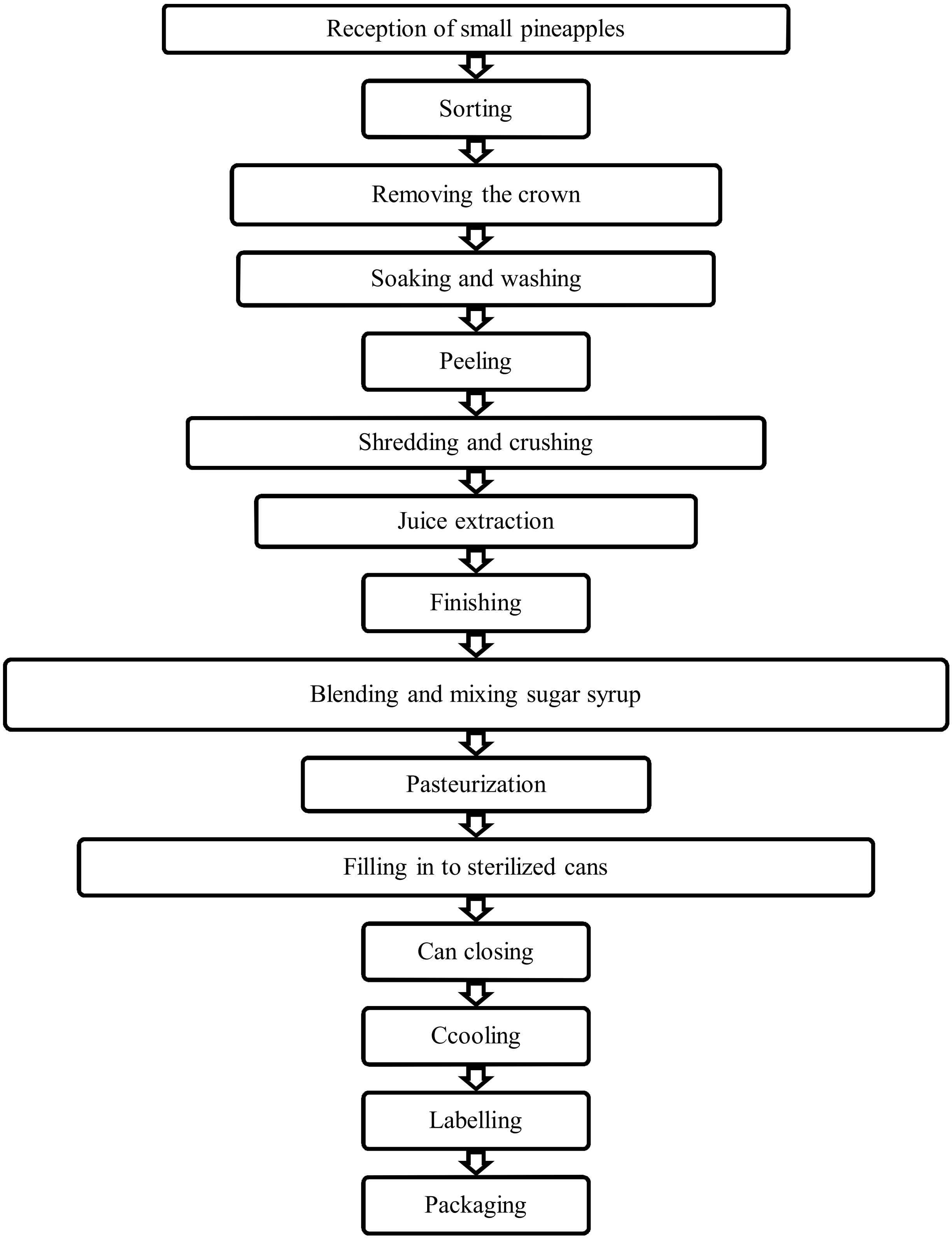

Fig. 4.16. Pineapple juice

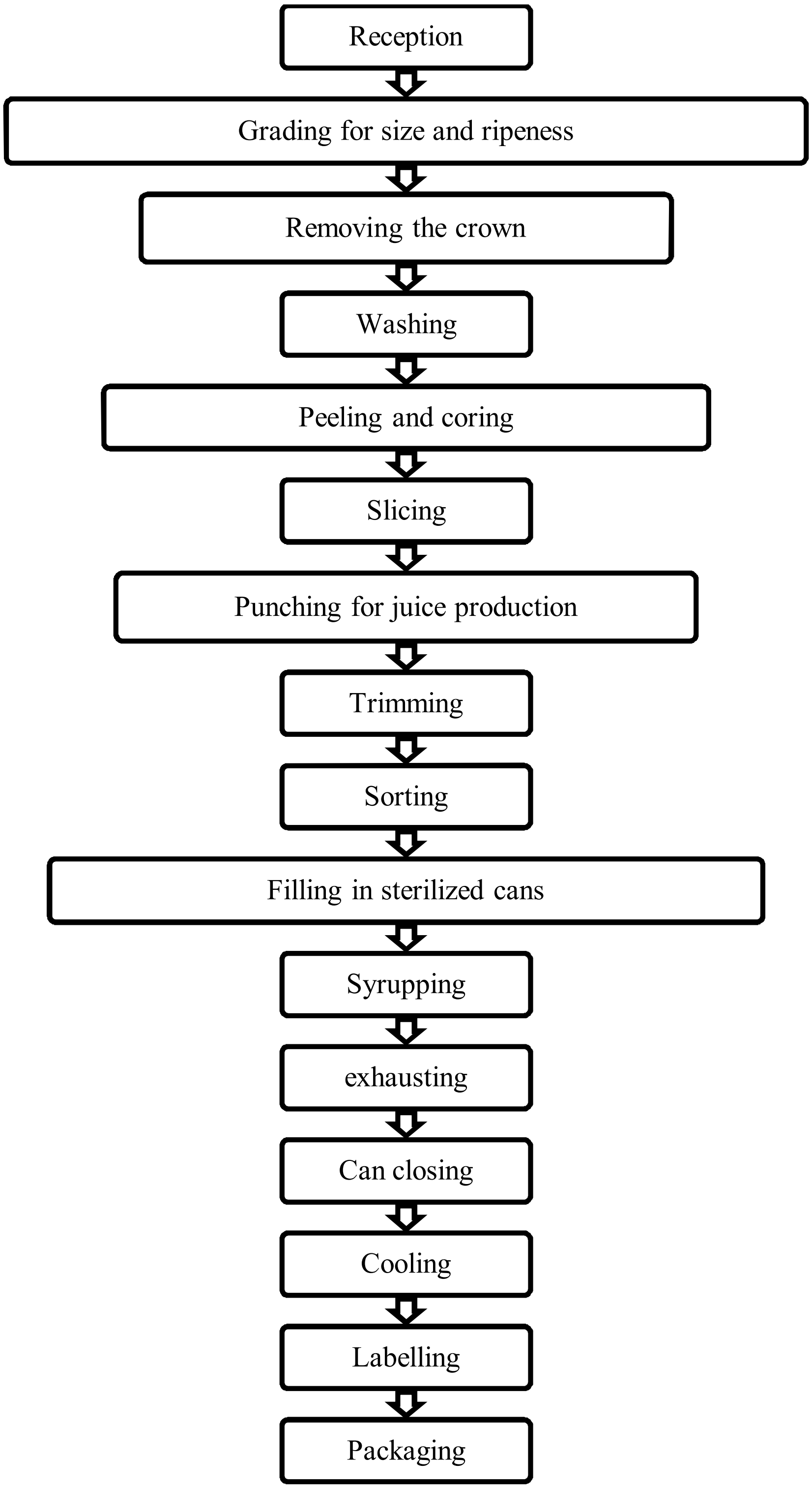

Fig. 4.17. Pineapple rings in syrup

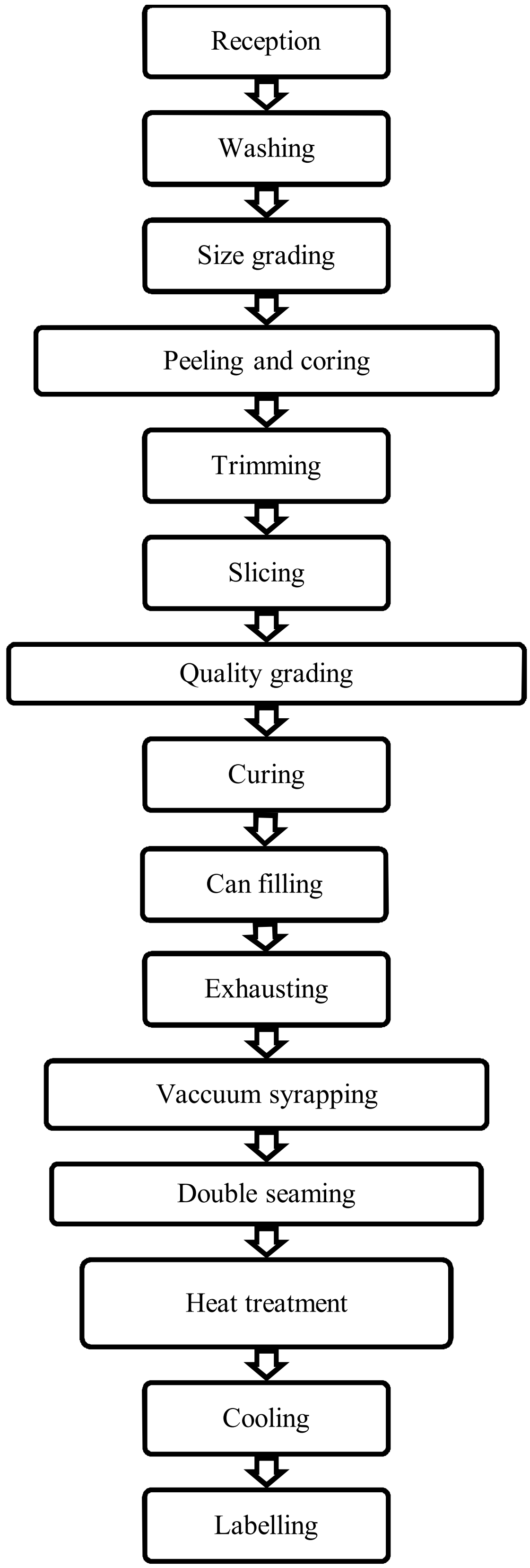

Fig. 4.18. Pineapple canning

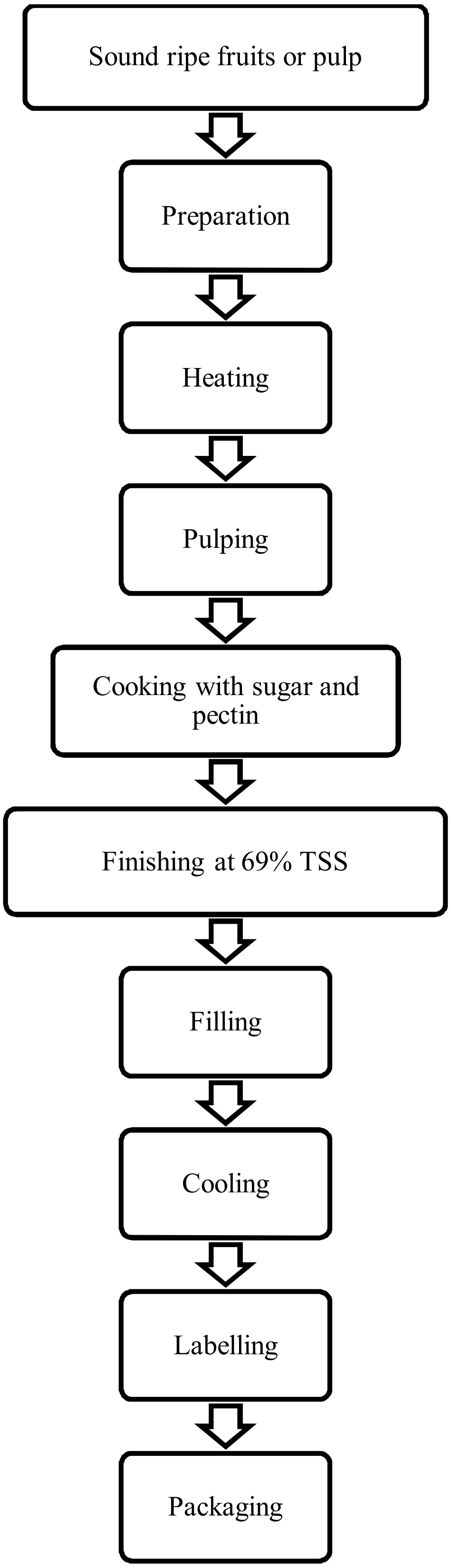

Fig. 4.19. Jams processing (Papaya, guava)

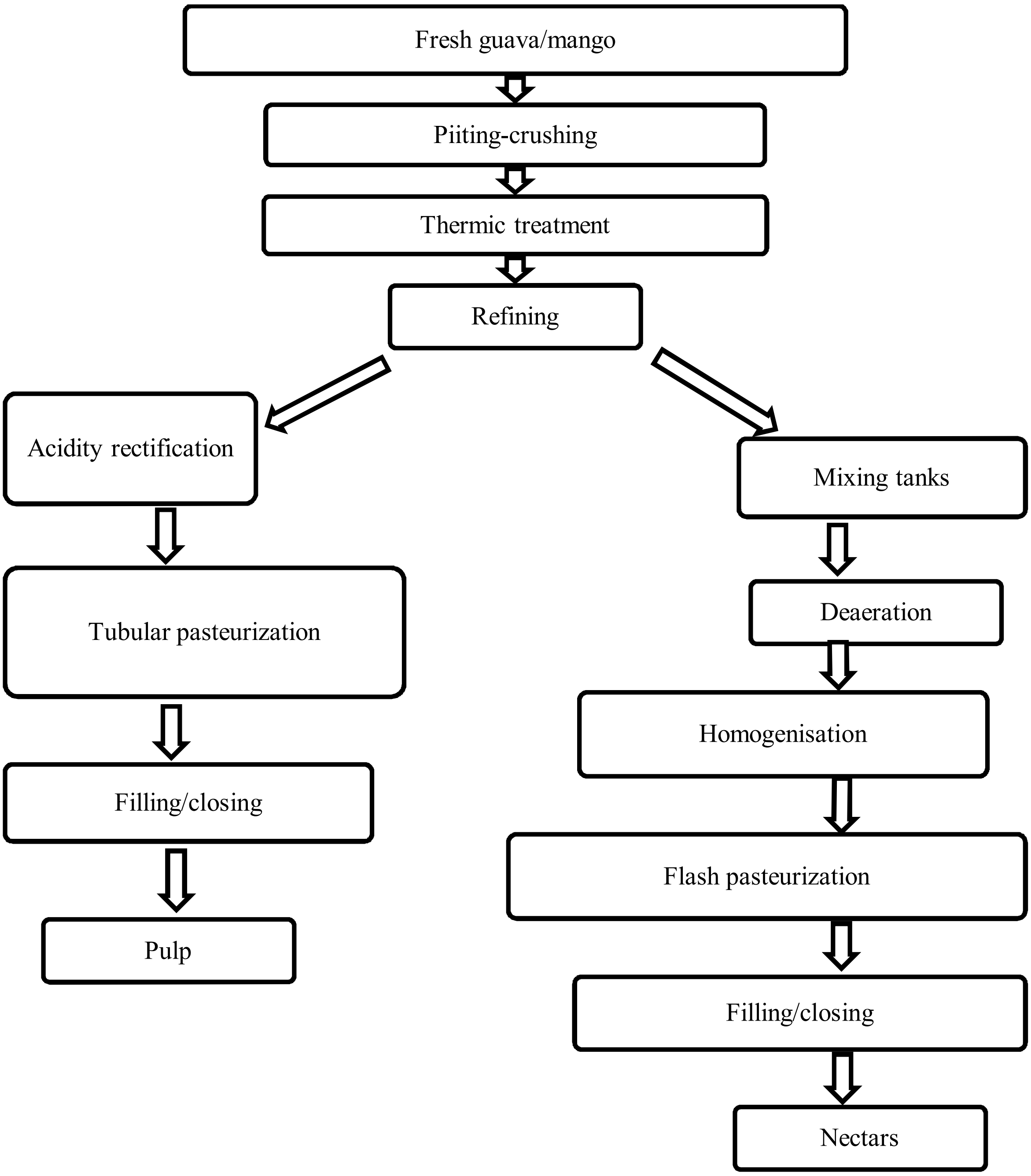

Fig. 4.20. Pulps and nectars (Papaya, mango, guava, chilli)

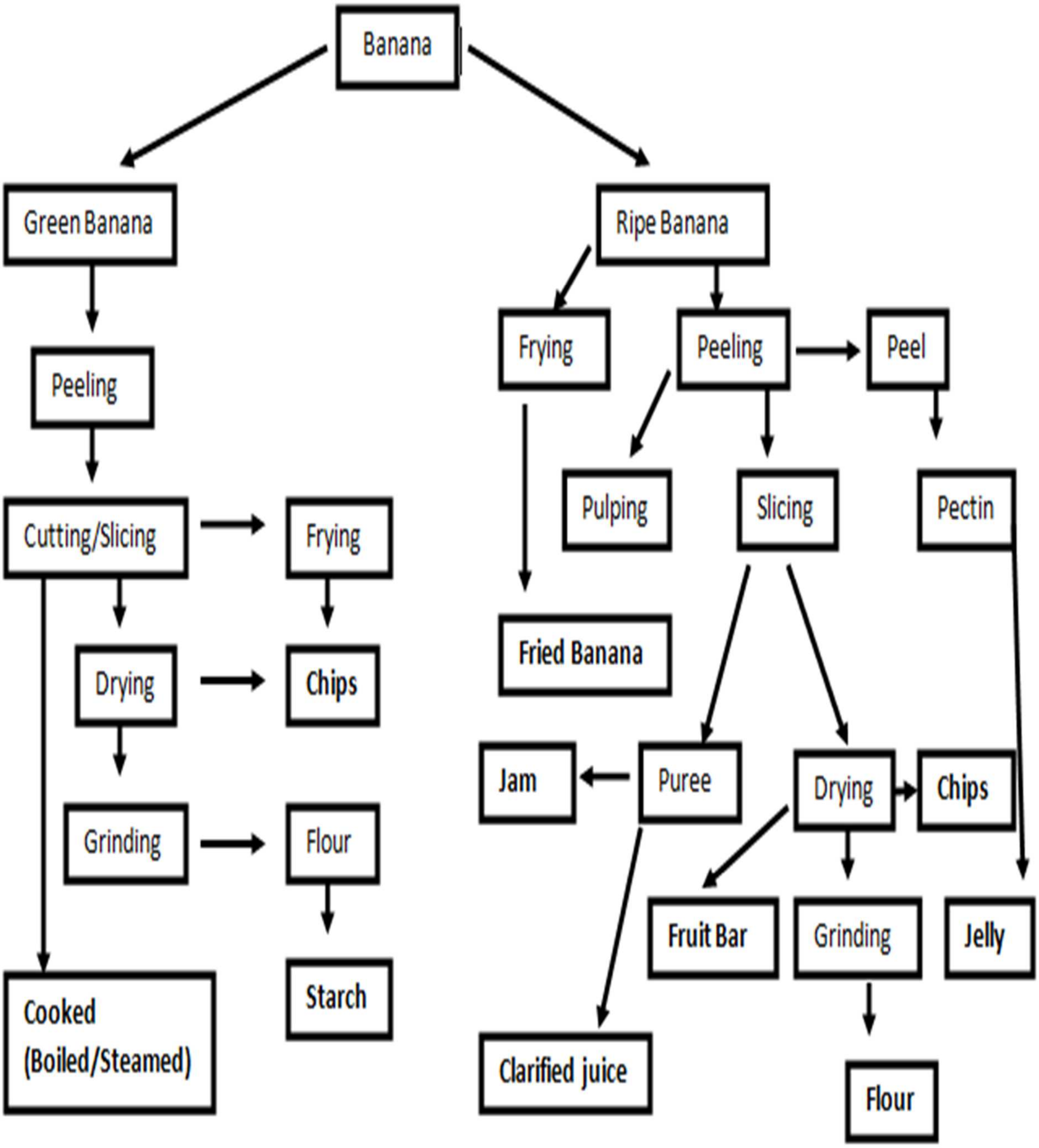

Fig. 4.21. Value addition in banana

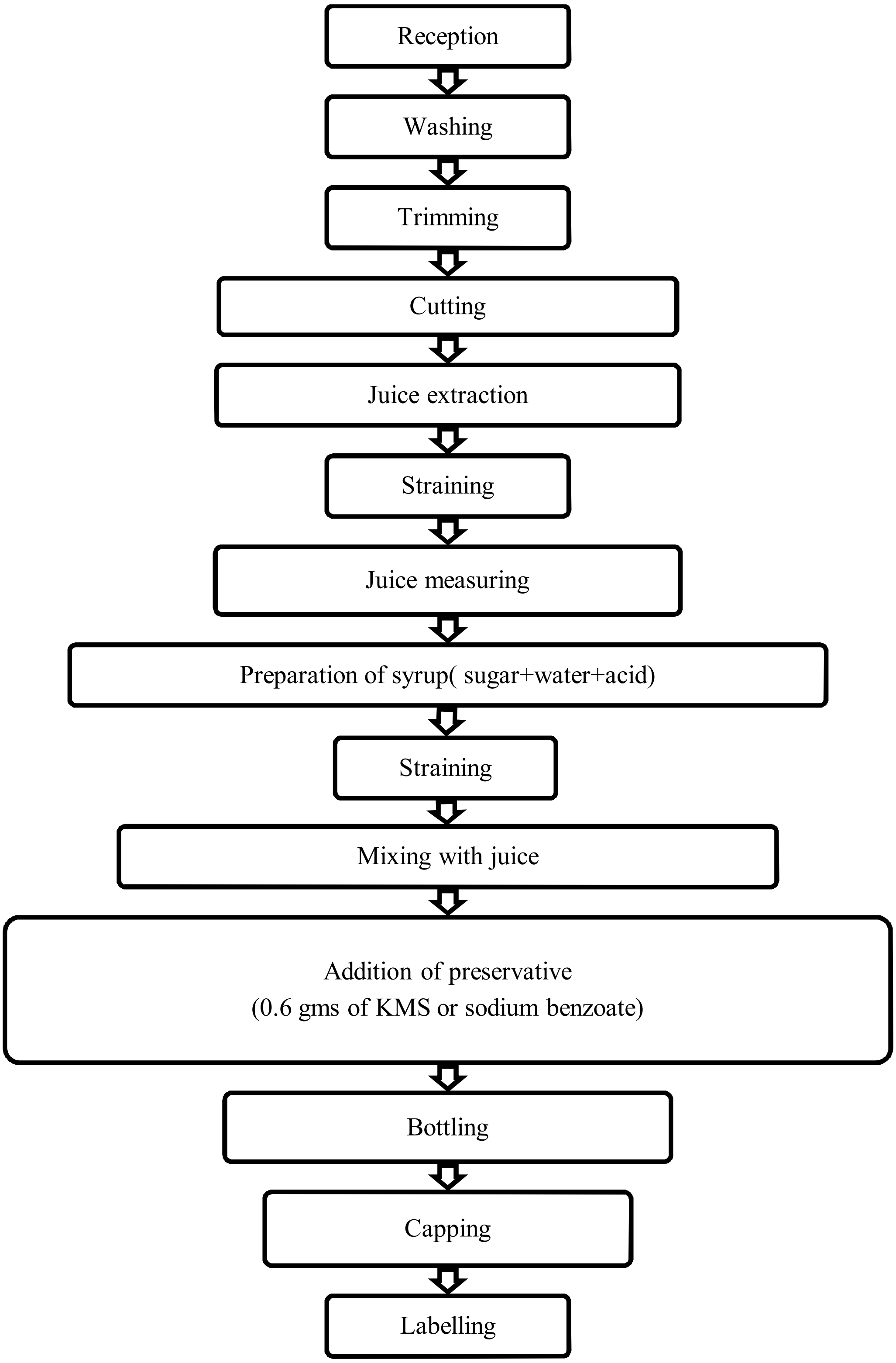

Fig.4.22. Squash (all fruits)

Processing line planned for the farmer owned tomato processing unit is furnished below:

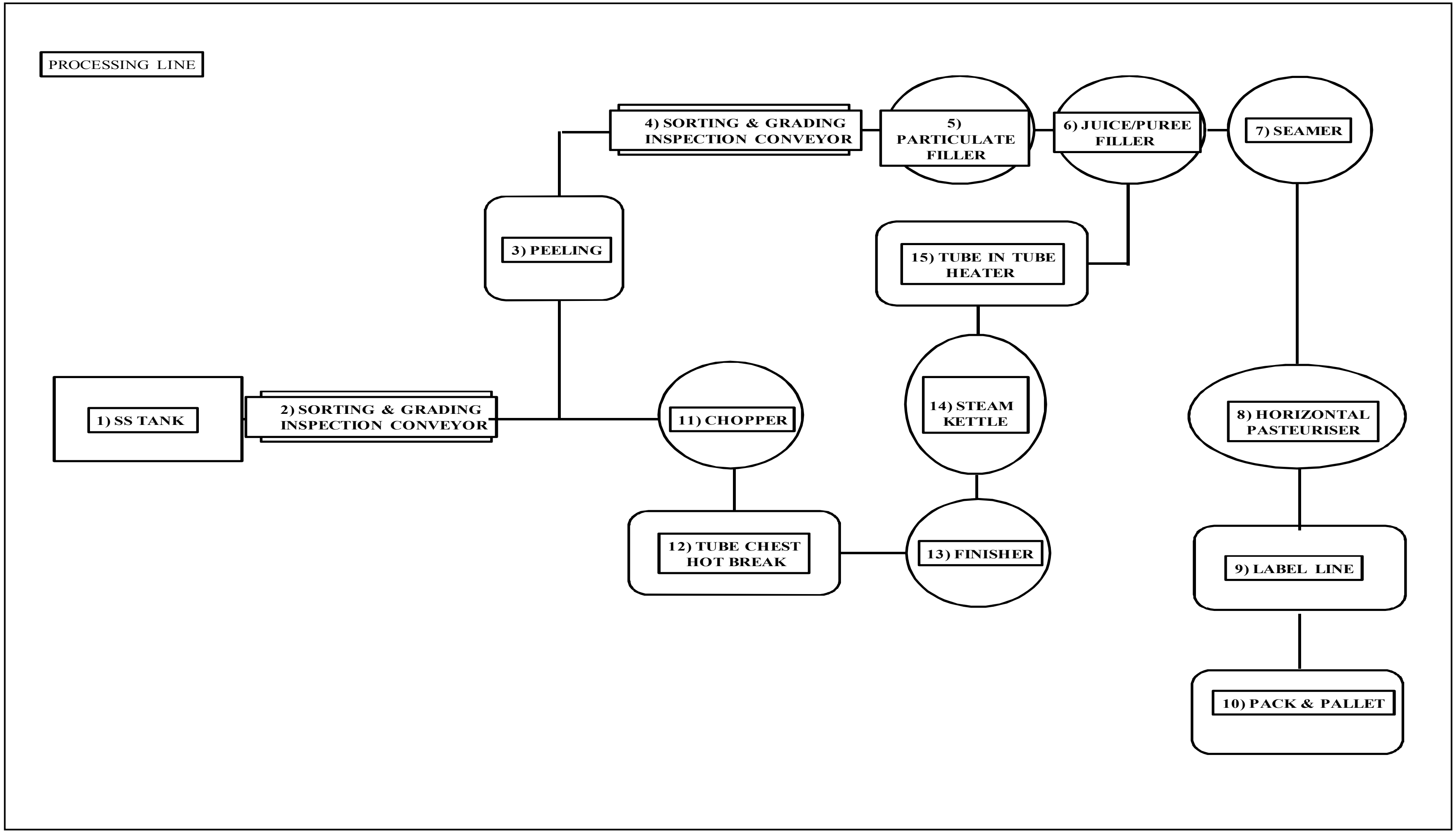

Fig.4.23.Processing line planned to be established in farmer owned tomato processing unit

4.4. Economics of Fruit And Vegetable Processed Products Proposed to Be Taken Up by Farmer-Owned Exclusive Tomato Processing Unit

In Chittoor district of Andhra Pradesh, the value addition units are available for mango, papaya, banana, guava, pineapple, tomato, red chilli and green chilli. The selected processing units acquired needed raw materials from following centres.

Mango is normally procured from Chittoor, Damalcheruvu, Madanapalle, Tirupathi, Bangarupalem, Putturu and Nagiri areas of Chittoor; Rayachoti and Koduru of Kadapa district besides Bengaluru. Papaya is procured from Koduru, Kalikiri, Piler and Madanapalle areas of Chittoor, Ulavapadu of Prakasham and Kolar of Karnataka. Guava mainly bought from Nuziveedu and Vijayawada areas of Krishna district. Prime source of banana is from Koduru and Pulivendula of Kadapa district. Pineapple is solely bought from Kerala. The supply centres of tomato are Madanapalle, Piler, Palamneru, and Punganuru of Chittoor district and Hosur, Ramnagar, Kolar and Tumkur of Karnataka. Red chillies are purchased from Guntur and Warangal districts while Mydukuru of Kadapa and Naidupet of Nellore district are places of supply of green chilli.

The selected processing plants procure and process 450 tonnes of mango, 100 tonnes of papaya, 100 tonnes of guava, 30 tonnes of banana, 250 tonnes of tomato on daily basis during their processing periods.

The value added products produced from the respective commodities are - mango pulp, concentrate, salt dipped slices, papaya pulp and concentrate, pineapple puree and juice, banana pulp, guava pulp and concentrate, tomato paste and puree, red chilli and green chilli paste.

The percentage of pulp derived from mango, papaya, pineapple, guava, tomato and chilli was 60, 70, 50-55, 80-85, 14-15 and 75-80 per cent.

Based on the results of sample units, economics of the processed foods that can be taken up by farmer owned exclusive tomato processing units are given below.

Table 4.22 furnishes the products derived by the selected processing units studied along with prices the products fetch:

Table 4.22. Prices of end products

S. No	Crop	Product	Price in Rs/Kg
1	Mango	Totapuri and local varieties pulp	30
		Concentrate	60
		Alphonso pulp	65
2	Papaya	Pulp	26
		Concentrate	45
3	Pineapple	Puree	55
4	Guava	Pulp	29
		Concentrate	50
5	Banana	Pulp	42
6	Tomato	Paste/Pulp	55
7	Red chilli	Paste	50
8	Green chilli	Paste	45

Having taken in to account the fixed resources available with the farmer owned tomato processing unit, economics of the processing of mango, papaya, pineapple, guava, banana, tomato, green chilli and red chilli contemplated to be processed by farmer owned tomato processing unit is embodied in Table 4.23.

4.4.2. Economics of Processing

Mango:

The average quantity of pulp that can be derived would be 14285 tonnes/annum. The revenue that is likely to be obtained is Rs.50 crores. Total working costs would be to Rs.39.96 crore with fixed cost of Rs.8.04 crore. Total cost would be Rs.48 crores with a net income of Rs.2 crores.

Papaya:

The pulp and concentrate of papaya would be 3333.35 tonnes fetching a gross income of Rs.2 crore. Total costs would be Rs.1.89 crore representing Rs.1.57 crore of working costs and Rs.0.32 crore of fixed costs. Net returns would be Rs.0.10 crore.

Pineapple:

Pineapple puree and juice would be 455.54 tonnes fetching a gross income of Rs.1 crore. Total costs involved will be Rs.0.93 crore with a net profit of Rs.0.06 crore.

Guava:

In respect of guava, pulp and concentrate to be obtained would be 714.28 tonnes generating a gross revenue of Rs. 1 crore. The total costs that would be incurred are Rs.0.95 crore helping the entrepreneur to gain a net income of Rs.0.04 crore.

Banana:

In respect of banana, banana pulp derived would be 1000 tonnes generating an income of Rs.0.4 crore. Total costs would be Rs.0.37 crore and the net income is expected to be Rs.0.02 crore.

Tomato:

The quantity of tomato paste and puree to be obtained from ripened tomato would be 10909.09 tonnes. The gross revenue derived from the products will be Rs.6 crore. Total working capital and total fixed costs will be of the order of Rs.4.79 crore and Rs.0.91 crore leading to the total cost of Rs.5.70 crores. In the process, net returns from the enterprise will be Rs.0.29 crore.

Red chilli:

Red chilli paste will be 1500 tonnes and the sale proceeds of this output would be Rs. 3 crore with a total cost of Rs.2.86 crore. The net returns would be Rs.0.13 crore.

Green chilli:

Relatively green chilli paste would be smaller in terms of quantity compared to other products. The amount of green chilli paste would be about

133.33 tonnes resulting in a gross income of Rs.0.3 crore and net income of Rs.0.02 crore.

Table 4.23. Economics of processing

S.No	Particulars	Mango	Tomato	Papaya	Pineapple	Guava	Banana	Green chilli	Red chilli	Total
1	End products in tonnes/annum after processing	14285.00	10909.09	3333.35	454.54	714.28	1000.00	133.33	1500.00	
2	Total revenue (in crore Rs)	50.00	6.00	2.00	1.00	1.00	0.40	0.40	3.00	63.80
3	Total working costs (in crore Rs)	39.96	4.79	1.57	0.77	0.79	0.30	0.31	2.38	50.87
4	Total fixed costs (in crore Rs)	8.04	0.91	0.32	0.16	0.15	0.06	0.06	0.48	10.08
5	Total costs (in crore Rs)	48.00	5.70	1.89	0.93	0.95	0.37	0.37	2.86	61.07
6	Net revenue (in crore Rs)	2.00	0.29	0.10	0.06	0.04	0.02	0.02	0.13	2.66

It can be well to summarize that given the availability of fixed resources with farmer owned tomato processing unit, the firm can consider establishing processing activities of above fruits and vegetables based on the economics presented. The net return pattern varied among the enterprises studied. Therefore, the firm can take a decision to include those enterprises in their plan based on the market potential of each product.

CHAPTER – V

SUMMARY&
CONCLUSIONS

Chapter - V

SUMMARY AND CONCLUSIONS

With production at 314.67 million MT in 2018-19, India stood in second position in production of Fruits and Vegetables (F&V) in the world and F&V processing levels currently stand at close to 2%. India is the world's largest producer of bananas, papaya, mangoes and guavas, second largest producer of potatoes, green peas, tomatoes, cabbage and cauliflower. India witnesses nearly 4.6-15.9% wastage in fruits and vegetables annually, due to lack of modern harvesting practices and inadequate cold chain infrastructure.

Andhra Pradesh took its position as one among the leading states in horticulture produce with nearly 2 Mha under different fruit crops. Total production of horticultural products is up to 157 lakh MT which includes 10 million MT of fruits, 5.4 million MT of vegetables and 1.1 million MT of spices. It is a key producer of eggs, spices, mango, papaya, citrus, lime, tomato, ladies finger; second main producer of rice, groundnut, cashew, cocoa and one of the foremost producers of coconut, banana, pomegranate, guava, sugarcane and milk.

Chittoor district abounds in the production of mangoes and tomatoes. The major products contributing to the GVA of the district from agriculture and allied services are tomato, mango, milk, meat, groundnut, and fisheries. Besides processing a good horticulture base, the district has easy access to the leading horticulture belts of Tamil Nadu, Karnataka and Andhra Pradesh. The strengths of the district are the presence of dependable raw material base, good export potential for tropical and sub-tropical fruits pulps and juices, expanding urban markets within the country for natural fruit juices, easy accessibility to better technologies, major domestic markets for end products and a sea port for exports. Despite of all these advantages, capacity utilization is still a major problem faced by all the units. By considering this area, the present study is taken up with the following objectives.

5.1 OBJECTIVES OF THE STUDY

1. to conduct a baseline study on major fruits and vegetable crops grown and food processing units in the study area.
2. to identify the potential non-tomato crops suitable for value addition, and
3. to assess the possibilities of value added products of other crops by utilizing the existing potential of tomato processing plant.

5.2 METHODOLOGY

Chittoor district was willingly chosen for the study as there are a number of processing units and with great potential for establishing new processing units for the majorly available fruits and vegetables. Based on the crops that have potential for value addition, one mandal for each crop is chosen based on highest area criterion. The selected mandals in such manner were Bangarupalem for mango, Gudipala for banana and Kalikiri for papaya. From each mandal, two villages were selected purposively and from each village 10 farmers with selected crops were selected in random for the study. So, farmers sample size was 60. The current study was undertaken during the 2018-19 agricultural year. A well thought-out schedule was used to obtain primary data. The requisite secondary data was taken from District planning office - Chittoor, Horticulture office - Chittoor, and relevant websites.

5.3 MAJOR FINDINGS OF THE STUDY

About 68.3 per cent of respondents were middle aged while old aged were 5 per cent and the rest 6.7 per cent were young aged.

The entire respondents were literate in which half of sample completed their higher education and intermediate, 31.7 per cent completed graduation and the other 18.3 per cent had only primary education.

About 55 per cent had only agriculture as their core occupation, whereas 26.7 per cent reared cattle, 10 per cent had jobs and 8.3 percent were running their own businesses.

Forty percent of sample had only 4 members in their family and rest 60 per cent had more than 4 members.

Major proportion of the farmers came under small and marginal with 45 and 33.3 per cent respectively while medium and large farmers occupied 16.7 and 5 per cent correspondingly.

In the area under horticultural crops, mango occupied major share of 46.94 percent of area. Tomato was next to follow with an area of 15.98 per cent. Papaya was grown in 2.33 per cent of the entire area and banana occupied 1.5 per cent.

There were several marketing channels through which the end produce was marketed. Out of the whole sample, 30 per cent sales were through mandi, 3.3 per cent sales were through processing units, farm gate sales were 40 per cent, 20 per cent by both mandi and processing units and 6.7 percent marketed through both mandi and farm gate sales.

Half of the considered sample had no constraints in the marketing process. For the remaining 50 per cent, 28.3 per cent had price related constraints, 8.3 per cent expressed late payments and others had issues with labour and intermediaries.

Different levels of satisfaction with existing price were observed. 51.7 per cent of farmers were discontented with the price, while the rest were satisfied.

20 per cent of total sample were unaware of the processing, 8.3 per cent expressed that the system is good, 23.3 per cent had low price realization, 10 percent felt the need for good procurement practices and the remaining 20 per cent had no bulk production which was adequate to supply to the processing units.

On creation of necessary facilities, 70 per cent were willing to supply to processing units while 30 per cent were unwilling.

In mango, the cost of cultivation was Rs.51750, while it was Rs.90625 in banana and was highest for papaya with Rs.306875. The gross income for these fruit crop enterprises was Rs.80875, Rs.198750 and Rs.643750 respectively. The net income over working costs was of the order of Rs.29125, Rs.108125 and Rs.336875 for the above three crop enterprises. The returns for rupee of expenditure over working costs were Rs.1.53 for mango, Rs.2.19 for banana and Rs.2.10 for papaya.

Average market value of mango was Rs.5.10 per kg. Average price for banana was Rs.85.686 per bunch and that of papaya was Rs.6.41 per kg.

The results from the chi-square test showed that there was a significant relationship between locality of the farmers, age, education and land holding with the type of marketing channel used; location of the farmers with the satisfaction level with the price; location, age and land holding of farmers with the perception towards the processing sector; location and the land holding with the willingness to supply; satisfaction in price and the selection of marketing channels.

The peak availability of mangoes was found from April and extended up to August. Tomatoes were available round the year with lower prices in the months of January-April and September-November. Papaya was available during August and October. Pineapple was found from December to February. Guava arrivals were there in November and December. Banana and chillies are available round the year and are procured by processing units as and when there was a need.

There are several fruit crops that can be value added into diverse products and the process flow charts of the same were depicted.

In the economics of processing, for the given unit which dealt with mango, papaya, tomato, banana, guava, pineapple, and chillies, the revenue obtained from mango is likely to Rs. 50 crore where total working costs would be Rs.39.96 crore with a fixed cost of Rs.8.04 crore and net income of Rs.2 crore. In papaya processing, Rs.2 crore of gross income can be obtained with total costs of Rs.1.89 crore deriving net return of about Rs.0.104 crore. Pineapple processing could raise a gross income of Rs.1 crore with total costs of Rs.0.93 crore and the net profit of Rs.0.06 crore. In respect of guava, gross revenue of Rs. 1 crore is attained. The total costs that would be incurred are

Rs.0.95 crore helping the entrepreneur to gain a net income of Rs.0.04 crore. Banana processing brought in an income of Rs.0.4 crore. Total costs would be Rs.0.37 crore and the net income is expected to be Rs.0.02 crore. The gross revenue derived from tomato products will be Rs.6 crore while total working capital and total fixed costs will be of the order of Rs.4.79 crore and Rs.0.91 crore with a net returns from the enterprise will be Rs.0.29 crore. In red chilli, sale proceeds would be Rs. 3 crore with a total cost of Rs.2.86 crore and the net returns would be Rs.0.13 crore, whereas in green chilli paste production, gross income of Rs.0.3 crore and net income of Rs.0.02 crore can be obtained.

5.4 POLICY IMPLICATIONS

- It is noticed that there is tremendous wastage in fruits and vegetables which can be minimized by creating proper processing technologies. So, there is a need to improve the processing facilities in the state and encourage them with necessary government policies.
- There is every need for improving the alternate marketing channels for the farmers other than through processing units as the plants cannot procure the entire produced crop and the procurement is discontinuous.
- Multiple commodity processing machinery should be designed so that maximum capacity utilization can be obtained and the entrepreneur derives maximum profits.
- Awareness among the farmers on supplying to processing units and awareness among the customers regarding the nutritional components of the value - added products should be initiated.

LITERATURE CITED

LITERATURE CITED

Acharya, S. P., Basavaraja, H., Kunnal, L.B., Mahajanashetti, S.B and Bhat, A.R. 2012. Growth in area, production and productivity of major crops in Karnataka. *Karnataka Journal of Agricultural Science*. 25(4): 431-436.

Adeyemi, P.A and Olufemi, O.B. 2016. The determinants of capacity utilization in the Nigerian manufacturing sector. *Journal of Economics and Sustainable Development*. 7 (5): 1-18.

Chowdary, K and Kundal, R. 2015. A study on area, production and yield of tomatoes in India from 2002 to 2011. *International Journal of Advance Research in Computer Science and Management Studies.* 3(7): 90-94.

Dattatreya, M.K., Kaushik, K and Kumar, R. 2012. Evaluation of guava products quality. *International Journal of Food Science and Nutrition Engineering.* 2(1): 7-11.

Dinesha, M.V and Sriramappa, K.V. 2015. Growth in area, production and productivity of vegetables and fruits in India with special reference to Karnataka. *International Journal of Applied Research.* 1(8): 288-293.

Dutta, J. 2010. Growth of area, production and productivity of fruits and vegetables in West Bengal. *The Horticultural Journal*. 23: 53-58.

FAO reports

foodprocessingindia.co.in

Garg, S. 2015. Value addition and processing of guava: Opportunities and challenges in Varanasi district. *MABM thesis.* Banaras Hindu University, Varanasi, India.

Hossain, M and Bepary, R.H. 2015. Postharvest handling of pineapples: A key role to minimize the post-harvest loss. *International Journal of Recent Scientific Research.* 6(9): 6069-6075.

Kanwal, N., Randhawa, M.A and Iqbal, Z. 2016. A review of production losses and processing technologies of guava. *Asian Journal of Agriculture and Food Sciences*. 4(2): 96-101.

Kashish and Dhawan, V. 2017. A study on production and trade performance of fruits in India. *Agriculture Research Journal*. 54(1): 108-113.

Kondal, K. 2014. Growth rate of area, production and productivity of onion crop in Andhra Pradesh. *Agriculture*. 4(3): 4-6.

Kumar, S and Singh, R. 2013. Crop diversification in Himachal Pradesh with special reference to district Una. *Journal of Economic and Social Development*. 9(2): 20-26.

Kumari, K., Usha, Rishitha, G., Prasad, K., Rajendra, Kumar, P and Suresh. 2017. Value added products of guava. *Agriculture Update*. 12(8): 2270-2276.

Lathika, M and Kumar, A.C.E. 2005. Growth trends in area, production and productivity of coconut in India. *Indian Journal of Agricultural Economics*. 60(4): 686-697.

Manjula, B. 2012. Value added products of papaya. *Rashtriya Krishi*. 7(2): 21-22.

Make In India website

Narayan, P and Kumar, S. 2015. Constraints of growth in area, production and productivity of pulses in India: An analytical approach to major pulses. *Indian Journal of Agricultural Research*. 49(2): 114-124.

Ndemezo, E., Ndikubwimana, J.B and Dukunde, A. 2018. Determinants of capacity utilization of food and beverage manufacturing firms in Rwanda: Do tax incentives matter. *SSRN Electronic journal*. 10: 1-21.

Okunade and Oluwaseun, S. 2018. Effect of capacity utilization on manufacturing firms' production in Nigeria. *Global Journal of Management and Business Research.* 18(1): 29-38.

Prasad, R.N., Chandra, R and Jaime, A. 2010. Post-harvest handling and processing of pomegranate. *Fruit, Vegetable and Cereal Science and Biotechnology.* 4(2): 88-95.

Raj, S and Naik, A.D. 2016. Area, production and productivity of vegetable and estimation of vegetable seed requirement. *International Journal of Business and Management and Research.* 6(6): 1-6.

Reddy, K., Vishwanatha and Kumar, P. 2010. An economic appraisal of mango processing plants of Chittoor district in Andhra Pradesh. *Indian Journal of Agricultural Economics*, 65(2): 277-296.

Saloni, S., Sindhu, Chauhan, K and Tiwari, S. 2017. Pineapple production and processing in North eastern India. *Journal of Pharmacognosy and Phytochemistry.*1: 665-672.

Sanghamithra, A., John, S.G., Prema, S.R., Chandrasekhar, V., Saikala, S and Hasker, E. 2013. Coconut-An extensive review on value added products. *Indian Food Industry Magazine*. 32(6): 29-36.

Sharma, M. K., Sisodia, B.V.S and Lal, K. 2013. Growth and trends of pulse production in India. *Journal of Food Legumes.* 26(2): 86-92.

Singh, D and Singh, R.K. 2004. Processed Products of Pomegranate. *Natural Product Radiance*: 3(2).1-6

Singh, J., Sindhu, S.C., Sindhu, A. and Yadav, A. 2016. Development and evaluation of value added biscuits from dehydrated shitake (Lentinusedodes) mushroom. *International Journal of Current Research*, 8(3): 27155-27159.

Singh, R.P and Rani, N. 2013. To study growth rate of area, production and productivity of fruit crops in Jharkhand. *Journal of Economic and Social Development*. 9(1):1-15.

Velayutham, I.K and Damodaran, K. 2015. Growth rate of chilli production in Guntur district of Andhra Pradesh. *International Journal of Research in Humanities and Social studies*. 2(11): 1-5.

Vishwanath, M., Venkatramudu, K., Srinivasulu, B., Gopal, K and Swarajya lakshmi, K. 2018. Processing for value addition of fruits and vegetables. *Journal of Pharmacognosy and Phytochemistry*. 7(6): 1555-1559.