ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF JAGGERY IN MANDYA DISTRICT OF KARNATAKA

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in

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BANGALORE **JULY, 2011**

AFFECTIONATELY DEDICATED

to

My

beloved parents

Sri Jnana Sunder

Smt. Mabel Dorothi

DEPARTMENT OF AGRICULTURAL MARKETING, CO-OPERATION AND BUSINESS MANAGEMENT
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CERTIFICATE

This is to certify that the thesis entitled **"ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF JAGGERY IN MANDYA DISTRICT OF KARNATAKA"** submitted in partial fulfillment of the requirements of **MASTER OF SCIENCE (Agriculture) in AGRICULTURAL MARKETING AND CO-OPERATION** to the **UNIVERSITY OF AGRICULTURAL SCIENCES, BANGALORE** is a bonafide record of research work carried out by **Ms. SHUBHA RANJITHA, ID No. PAK 9127,** during the period of her study in this University under my guidance and supervision and no part of the thesis has been submitted for the award of any other degree, diploma, associateship, fellowship or any other similar titles.

Place: BANGALORE **(C.P. GRACY)**
Date: July, 2011 Professor and Major Advisor

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(B.L. CHIDANANDA)

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"..... gratitude is the memory of heart"

Bangalore

July 2011 ***(Shubha Ranjitha)***

ECONOMIC ANALYSIS OF PRODUCTION AND MARKETING OF JAGGERY IN MANDYA DISTRICT OF KARNATAKA

Shubha Ranjitha

Abstract

The production of jaggery ranges between five million tonne to seven million tonne. As much as 40-45 per cent of sugarcane crop has been processed annually in to jaggery or khandasari. The study was conducted in Mandya district of Karnataka during 2010-11.Tamilnadu, Gujarath, Orissa and Hydrabad were the major Markets. A sample of 30 each Jaggery processors and consumers was randomly selected for the study. The investment analysis of jaggery processing revealed that sum of Rs. 5, 28,035 investments was required to set up a jaggery processing unit with a capacity of one tonne per day. The cost of production per tonne of jaggery was found to be Rs.21, 160, and the net return realized per tonne of jaggery was Rs.23, 000. Consumers preferred colour as most important attribute followed by shape. Non availability of labour is one of the major constraints in production process followed by power cuts and insufficient power supply. This is one of the important reasons for hesitation among the processors to take up processing. The major constraints in marketing of jaggery were no transparency in price determination low price offers and no accuracy in weighment. In India, only Uttar Pradesh and Maharashtra produce good jaggery of export quality because they have specialized centres for jaggery production. But Karnataka does not have such jaggery research centre for quality jaggery production. Therefore government and non- government organization need to be worked in this way.

Dr. C.P.GRACY
(Major Advisor)

ಮಂಡ್ಯ ಜಿಲ್ಲೆಯಲ್ಲಿ ಬೆಲ್ಲದ ಉತ್ಪಾದನೆ ಹಾಗೂ ಮಾರಾಟದ ಆರ್ಥಿಕ ವಿಶ್ಲೇಷಣೆ

ಶುಭರಂಜಿತ

ಸಾರಾಂಶ

ಭಾರತ ದೇಶದಲ್ಲಿ ವರ್ಷಕ್ಕೆ ೭ ದಶಲಕ್ಷ ಟನ್ನಿನಷ್ಟು ಬೆಲ್ಲವನ್ನು ಉತ್ಪಾದಿಸಲಾಗುತ್ತಿದೆ. ಕರ್ನಾಟಕದಲ್ಲಿ ಬೆಳೆಯಲ್ಲಿನ ಒಟ್ಟು ಕಬ್ಬಿನಲ್ಲಿ ಶೇ. ೪೦-೪೫ರಷ್ಟು ಬೆಲ್ಲದ ಉತ್ಪಾದನೆಗೆ ಉಪಯೋಗಿಸಲಾಗುತ್ತದೆ. ಕರ್ನಾಟಕ ರಾಜ್ಯದ ಮಂಡ್ಯ ಜಿಲ್ಲೆಯಲ್ಲಿ ೨೦೧೦-೧೧ನೇ ಸಾಲಿನಲ್ಲಿ ಮಾಡಿದ ಈ ಅಧ್ಯಯನಕ್ಕೆ ಮೂವತ್ತು ಬೆಲ್ಲದ ಸಂಸ್ಕರಣಾಗಾಕಾರರು ಮತ್ತು ಮೂವತ್ತು ಬಳಕೆದಾರರಿಂದ ಮಾಹಿತಿಯನ್ನು ಪಡೆಯಲಾಯಿತು. ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಕಂಡು ಬಂದ ಮುಖ್ಯ ಅಂಶಗಳೆಂದರೆ, ಮಂಡ್ಯ ಜಿಲ್ಲೆಯಲ್ಲಿ ಉತ್ಪಾದನಾ ಸಾಮರ್ಥ್ಯ ಸಂಸ್ಕರಣಾ ಘಟಕವನ್ನು ಸ್ಥಾಪಿಸಲು ರೂ ೫,೨೮,೦೩೫ ಬಂಡವಾಳ ಬೇಕಾಗಿರುತ್ತದೆ. ಒಂದು ಕ್ವಿಂಟಾಲ್ ಬೆಲ್ಲದ ಉತ್ಪಾದನಾ ವೆಚ್ಚವು ರೂ. ೨೧,೧೬೦ ರೂಪಾಯಿಗಳಾಗಿದ್ದು, ಒಂದು ಕ್ವಿಂಟಾಲ್ ನಿಂದ ಬರುವ ನಿವ್ವಳ ಲಾಭವು ರೂ. ೨೩,೦೦೦ ಆಗಿರುತ್ತದೆ. ಬಳಕೆದಾರರು ಬೆಲ್ಲವನ್ನು ಖರೀದಿ ಮಾಡಲು ಗಣನೆಗೆ ತೆಗೆದುಕೊಳ್ಳುವ ಮುಖ್ಯವಾದ ಮಾನದಂಡನೆ ಅಂದರೆ ಬೆಲ್ಲದ ಬಣ್ಣ ಮುಖ್ಯವಾಗಿದ್ದು ನಂತರ ಬೆಲ್ಲದ ಹಚ್ಚಿನ ಆಕಾರಕ್ಕೆ ಮಹತ್ವವಾಗಿರುತ್ತದೆ. ಬೆಲ್ಲದ ಉತ್ಪಾದನೆಯಲ್ಲಿ ಎದುರಿಸುತ್ತಿರುವ ಅತಿ ಮುಖ್ಯವಾದ ತೊಂದರೆಗಳೆಂದರೆ ದುಡಿಮೆಗಾರರ ಅಭಾವ ಹಾಗೂ ವಿದ್ಯುಚ್ಛಕ್ತಿಯ ಕೊರತೆ. ನೂತನ ಸಂಸ್ಕರಣಾ ಘಟಕಗಳನ್ನು ಸ್ಥಾಪನೆ ಮಾಡದೆ ಇರುವುದಕ್ಕೆ ಈ ಎರಡು ಕಾರಣಗಳಾಗಿರುತ್ತವೆ. ಬೆಲ್ಲದ ಮಾರಾಟದಲ್ಲಿ ಕಂಡು ಬಂದಿರುವ ಅತೀ ಮುಖ್ಯವಾದ ಅಂಶಗಳೆಂದರೆ, ದರ ನಿರ್ಣಯದಲ್ಲಿ ಪಾರದರ್ಶಕತೆ ಇಲ್ಲದಿರುವುದು, ಮಾರುಕಟ್ಟೆಯಲ್ಲಿ ದರಗಳು ಪದೇ ಪದೇ ಕುಸಿಯುತ್ತಿರುವುದು ಹಾಗೂ ಬೆಲ್ಲದ ತೂಕದಲ್ಲಿ ನಿಖರವಾಗಿಲ್ಲದಿರುವುದು. ಉತ್ತರಪ್ರದೇಶ ಮತ್ತು ಮಹಾರಾಷ್ಟ್ರ ರಾಜ್ಯಗಳಲ್ಲಿ ಬೆಲ್ಲದ ಉತ್ಪಾದನೆಗೆ ವೈಜ್ಞಾನಿಕ ಮೂಲಭೂತ ಸೌಕರ್ಯಗಳಿದ್ದು, ರಫ್ತುಯೋಗ್ಯವಾದ ಬೆಲ್ಲವನ್ನು ಉತ್ಪಾದನೆ ಮಾಡಲಾಗುತ್ತಿದೆ. ಕರ್ನಾಟಕದಲ್ಲಿ ಬೆಲ್ಲದ ಉತ್ಪಾದನೆಯಲ್ಲಿ ಮೂಲಭೂತ ಸೌಕರ್ಯಗಳಿಲ್ಲದಿರುವುದರಿಂದ ರಫ್ತು ಯೋಗ್ಯವಾದ ಬೆಲ್ಲವನ್ನು ಉಪಯೋಗಿಸಲಾಗುತ್ತಿಲ್ಲ. ಸರ್ಕಾರ ಹಾಗೂ ಸರ್ಕಾರೇತರ ಸಂಘಸಂಸ್ಥೆಗಳು ಬೆಲ್ಲದ ಸಂಸ್ಕರಣೆಗೆ ಮೂಲಭೂತ ಸೌಕರ್ಯಗಳನ್ನು ಒದಗಿಸಿಕೊಟ್ಟಲ್ಲಿ ರಫ್ತಿಗೆ ಯೋಗ್ಯವಾದ ಬೆಲ್ಲವನ್ನು ಉತ್ಪಾದಿಸಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.

ದಿನಾಂಕ:

ಡಾ. ಸಿ.ಪಿ. ಗ್ರೇಸಿ
(ಪ್ರಥಾನ ಮಾರ್ಗದರ್ಶಕರು)

ಬೆಂಗಳೂರು

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Introduction

CHAPTER I

INTRODUCTION

Indian agriculture has undergone spectacular technological changes during the last four decades; increasing agriculture output and productivity are concerned. However, the major concern is that this has been unable to ensure stable income to farmers. The benefits of new production technology will not sustain for a longer period unless simultaneous efforts are made in improving the marketing system as a whole. The basic function of marketing is not only to bring about synchronization between the demand and supply of agricultural commodity but also to ensure remunerative and affordable prices for producers and the consumers respectively. Marketing of agricultural commodities has assumed a greater importance with gradual switching over from subsistence farming to commercial farming. Stable farm prices, better returns and attractive terms of trade would motivate farmers to produce more and market larger proportion of their produces.

Sugarcane (*Saccharum officinarum* L.) is one of the most important commercial crops of the tropics and is the main source of sugar in the world. Sugar cane belongs to family *Poaceae* and genus *Saccharum*. Sugarcane crop has its origin from New Guinea, later it spread to many countries of the world. India is considered as homeland of sugarcane.

Globally, sugarcane is cultivated over an area of 20.1 million hectares with a production of 1318.1 million tonnes with a productivity of 65.5 tonnes per hectare (FAO, 2005). In India, sugarcane is an industrial crop with an area of about 4 million hectares and production to the tune of 300 million tonne.

It provides employment to over one million people directly or indirectly besides contributing significantly to the national exchequer. In

India, Uttar Pradesh accounts for nearly half of the total cane area, other major cane producing states are Maharashtra (13 %), Tamil Nadu (12 %), Karnataka (8.06 %) and Andhra Pradesh (6 %). In Karnataka, sugarcane is grown both in command and well-irrigated areas and nearly 99 per cent of the crop area is irrigated. The State ranks third in area (28,11,00lakh ha), fourth in production (2,33,28,110 lakh tonnes) and second with respect to productivity (87t ha^{-1}) .The share of the cane area to the total sugarcane area planted accounts for 6.41 per cent contributing 9 per cent of the total cane production in India. (Directorate of Economics and Statistics, 2008-09)

Karnataka is one among the major sugarcane and sugar-producing states in the country as the sugarcane is being cultivated in large areas since many years for manufacture of jaggery, khandsari and white sugar. It is also a major provider of livelihood to millions of agricultural families and their dependents particularly in rural areas. In Karnataka, Belgaum (9.1mMT), Bagalkote (5.30 mMT), Mandya (2.6 mMT) districts together contribute more than 50 per cent of the total sugarcane produced in the state.(Directorate of Economics and Statistics,2008-09)

Nutritional and medicinal value of jaggery

The acceptable taste and nutritive value of jaggery has attracted man since ancient times. Jaggery is also called “Non Centrifugal Sugar” or Artisan Sugar. It forms an important item of Indian diet for its high nutritive value and as a sweetening agent. White sugar contains only sucrose (99.70%), whereas jaggery has sucrose (51.00%), protein (0.25%), glucose (21.20%) and minerals (3.40%) in addition to traces of fats, (0.02 to 0.03%), calcium (0.39%), vitamin A, vitamin B, Phosphate (0.025%) and provides 383 K cal/100g jaggery (Shrilakshmi, 2003).

Dietary sucrose (sugar) is mixed blessings which makes food more attractive and appetizing but excessive consumption often leads to

various kinds of pathological conditions like, coronary thrombosis, ischemic heart disease, diabetes, acidity, depression and obesity etc., Some studies have also shown that high sugar intake leads to higher cancer risk. Jaggery which is an alternate sweetener from sugarcane crop is health friendly. In Ayurveda jaggery is considered to be the best of all the sugarcane preparations (Shrilakshmi, 2003).

Export potential

Per capita consumption of sucrose in India is much lower (15 kg), compared to that in developed countries (50 kg). Major share (above 75%) of sucrose consumption in rich countries has been through manufactured foods. To over-come these problems many of these countries are seriously looking for alternative sweetener from sugarcane crop. India has one of such eco-friendly sweetener, viz., jaggery and contributes more than 70 per cent to the world jaggery production. It is being exported to countries like Bangladesh, Great Britain, Canada, Chili, Egypt, Iran, Iraq, Kuwait, Malaysia, Nepal and USA (Navadkar et al., 2004).

Being a health friendly sweetener, there is increasing demand for quality jaggery and its value added products. It is being used as sweetener in traditional health drinks and cereal based preparations. Considering the health benefits and nutritive value of jaggery, it is possible to expand market potential by focusing on exports, niche markets and specialty jaggery in various shapes, sizes and form. Jaggery produced using chemicals has lower export potential. Hence, there is a need to popularize scientific and eco-friendly methods of jaggery production.

Jaggery cottage industry

From time immemorial, sugarcane crop has been known as a cash crop by Indian cultivators and so also the art of preparing jaggery. The jaggery making is classified under cottage industries in India. As much as 40-45 per cent of sugarcane crop has been processed annually in to jaggery or khandasari (Kachru, 2001). The production of jaggery ranges between five million tonne to seven million tonne. It is estimated that two third of the sweetening requirement in rural areas is met by jaggery.

The jaggery industry in the country has assumed considerable importance in the country considering the dependence of workforce for employment, food, livelihood and income earning. Although most of the jaggery making units are unorganized and classified as small scale industry, in the recent past these units are revived by way of mechanization and modernization of processing methods. Kolhus used for crushing sugarcane have been replaced by power crushers in many parts of the country. This has helped in improving the efficiency of the industry by way of enhanced percentage of juice extraction from cane. The process of preparation of jaggery has also undergone considerable changes. As a result, the sugarcane demand from jaggery industry is offering stiff competition to sugar industry.

The sugar committee of the Imperial Council of Agricultural Research recommended for a study on existing conditions of jaggery industry with a view to improve the jaggery preparation process in the year 1937. Thereafter it was indeed, a matter of great surprise that inspite of the significance of the industry in the economy, no attention worth mentioning, has been paid to this industry until recently. It has been realized that by organizing jaggery industry on a systematic and scientific basis a good deal of national wealth could be saved from being lost and ameliorate the conditions of Indian farmers. This is particularly

true in view of the enormous problems faced by sugar industry in the country.

In recent years the Indian sugar industry has found itself entangled in a complex web of problems of high stocks, low prices, poor profitability, high raw material cost, financial crunch, and weak international competitive edge. In the 2007-08 sugar season, normal quantity of sugarcane was crushed although there was a carryover stock of around 112 lakh tonne. The annual consumption requirement is about 200 lakh tonnes. As a result, sugar prices touched a low of Rs 1,220 per quintal which was not adequate to cover even the raw material and operating cost of manufacturing sugar. It is a well established fact that there is competitive demand for sugarcane from sugar and jaggery manufacturing units.

Karnataka is one of the leading producers of jaggery apart from sugar. Large numbers of jaggery production units are operating in the state which offer good employment potential. In India, only Uttar Pradesh and Maharashtra produce good jaggery of export quality because they have specialized centers for jaggery production. But Karnataka does not have such jaggery research centre for quality jaggery production.

There are hardly any systematic efforts made to improve jaggery industry which is so vital from the point of view of its importance in the economy and greater employment potential. There has been a steady increase in the demand for jaggery in view of the fact that it is not only the chief source of sweetening agents for rural masses but has considerable socio-economic and cultural significance. The production of jaggery has not been able to keep pace with increasing demand for it. As a result, the price of jaggery have increased sharply in recent years. This study is undertaken to know various aspects of investment, production and marketing of jaggery. The study of this kind would help in identifying

the extent of profitability in jaggery production, constraints in production and marketing of this product.

Specific objectives

1. To assess the cost and returns in jaggery production
2. To evaluate the feasibility of investment in jaggery units
3. To assess consumer preference for different types of jaggery
4. To identify the constraints in production and marketing of jaggery

Hypothesis framed

1. Jaggery production is profitable
2. Investment in jaggery unit is economically viable & financially feasible
3. Colour & shape are the most preferred attributes in jaggery
4. Non availability of labour is the major constraint in jaggery production

An over view of thesis presentation

The Thesis is organized in seven chapters as per the guidelines of the University. Chapter one highlights the importance of the study, while chapter two presents the review of the available theoretical and empirical literature on the subject and its related areas. Chapter three deals with the data source and research methodology including the analytical tools employed in the study. Chapter four presents the detailed findings of the study, while chapter five provides additional insights by discussing the results. Chapter six presents summary, conclusions and policy implications emerging from the findings of the study. Chapter seven cites the references.

Review of Literature

CHAPTER II

REVIEW OF LITREATURE

A review of past research helps in identifying the conceptual and methodological issues relevant to the study. This will enable the researcher choosing appropriate research tools, data collection, analysis and meaningful interpretation. In this chapter attempts has been made to review past studies relevant to the research work and are presented under the following heads.

2.1 Estimation of the cost, returns and processing of farm products

2.2 Economic viability of farm products

2.3 Consumer preference of farm products

2.4 Constraints study for different farm products

2.1 Estimation of the cost, returns and processing of farm products

Sivanandam *et al*. (1980) worked out the cost of production per kilogram of cashew kernel in Pudukkottai district of Tamil Nadu. The study found that the share of raw materials was the major component in cost of production of cashew nut kernels, constituting 73.22 per cent of the total cost, followed by wages for piece rate workers (12.10%) and interest on working capital (7.28%). It further revealed that the cost of production per kg of cashew kernel was Rs. 20.40 and recovery of kernels from one tonne of cashew nuts was 220.91 kg (22.07%).

Balwinder and Okereke (1982) compared the average returns and average costs of processing palm oil and palm kernels in Nsukka local Government area of Anambra state of Nigeria. The average processing cost worked out to Rs.19.8 per litre of oil and that of kernels worked out to Rs.6.72 per Kg. The average price received by the farmer was Rs.19.8 per litre of palm oil and Rs.11.19 per unit of kernel.

Murlidharan (1981) investigated the cost of establishing gur units with different capacities. The average investment on fixed and working capital based on five processing units worked out to Rs.13,50,000 and Rs.1,01,920 respectively. The gross income worked out to Rs.50, 24,250. The cost of Arhar plus operating cost came to Rs.48,404.20 for 5 HP, Rs. 43, 920.80 for 7.5 HP, Rs.46, 678.00 for 10 HP and Rs.65, 185.00 for 15 HP units. On an average the unit processing cost of gur worked out to be Rs.43.05 per quintal. The input cost was the highest for single element which was Rs.9.77 per quintal (22. 69%) of the total cost. The element costing next highest was labour expense which was Rs.8.64 per quintal (20.02 %). The fixed cost amounted to be Rs. 7,878.56 and variable cost was Rs.18,361.69 with a total cost of Rs.26, 240.25.

Hasan and Raghuram (1987) reported (28%) recovery in cashew nut processing. The processing cost of cashew nut was estimated at Rs.87.06 per Kg. the cost of procuring raw material was estimated to be 42.5 per cent while, labour cost accounted for Rs.56.6 per cent. The cost of shelling and peeling together accounted for Rs.40.76 per Kg out of a total labour cost of Rs. 49.76.

Ananth (1989) in his study on economics of processing and marketing of gur in Indore district of Madhya Pradesh study revealed that a sum of Rs.6.80 per quintal of gur was the processing cost of sugarcane under power of kolha units. Study noticed that the processing cost differed from unit to unit. The level of capital investment, type of crusher used and the quantity of sugarcane crushed were the factors influencing the processing cost.

Raju and Ramesh (1989) worked out cost of production of jaggery on per hectare basis of sugarcane cultivated. The cost of production of jaggery worked out to Rs.28, 417 per hectare of sugarcane area. About (70%) of the total cost accounted for the production of sugarcane. The

other major items of costs were wages paid to human labour, rent paid for the use of crushers and chemical ingredients. From one hectare of sugarcane 93.28 quintals of jaggery could be recovered. The net returns from jaggery production per hectare of sugarcane were estimated to be Rs. 5,127 with a total return of Rs. 33,724.

Sikka *et al.* (1989) estimated that operating cost of processing 480 quintals of potatoes to be Rs.53,850 which included cost of potatoes, labour charges, fuel, chemical, maintenance and overhead charges. The processing of 480 quintals of potatoes yielded only 77.52 quintal of potato chips, the recovery factor being 17(%) . The sale of chips at Rs.11 per Kg fetched a gross income of Rs.85, 272 with a net profit of Rs.2.45 per Kg.

In a study by Rohal *et al.* (1989) reported that the average cost of processing of sugarcane in to khandasari worked out to Rs.8.54 per Kg. The economic analysis of capital structure in khandasari units showed a better capital turn over (Rs.1.83 per rupee investment) which indicated further scope of capital investment in the industry.

Ajaikumar and Rajendra (1989) noticed a processing cost of Rs. 7.16 and a net return of Rs.6.84 for hulling one quintal of paddy. The cost of processing worked out to Rs.14.62 Rs.12.84 and Rs.22.35 per quintal of paddy respectively for small, medium and large sized sheller mills. The net return from processing was Rs.11.67, Rs.13.71 and Rs. 15.23 respectively for those three categories of mills. The break even volume of paddy handled amounted to 18, 206 quintals, 31, 271 quintals and 39, 871 quintals which formed 44 per cent, 39 per cent and 33 per cent of the volume of paddy handled respectively for the small, medium and large sized mills.

Raikar (1990) studied investment in production and marketing of cashew in Karnataka. It was observed that the utilization of installed capacity depended upon the volume of cashew nuts procured. The per quintal cost of processing worked out to Rs.553.54. Interest on capital was the major component (53.62%) in the total cost of processing of cashew nuts followed by wage for piece rate workers (20.36%) and the cost of tin (11.71%). It was found that raw material cost alone formed 72 per cent of the total cost.

Subramanyam and Sudha (1993) reported that the cost of processing one tonne of finished tomato products was around Rs.11,185 with a total return of Rs.13,603. The raw material and packing accounted for 71 per cent of the processing cost. The input output ratio was 2.22. They further reported that each tonne of tomato processed would result in an additional return of Rs.2596 which was nearly three times more than the net returns realized from sale of fresh tomato.

Suryawanshi *et al.* (1994) reported that the cost of jaggery production was Rs.565 per quintal. They further noticed that 98 quintals of jaggery was prepared from the sugarcane grown on one hectare. They reported that the per hectare total cost of sugarcane cultivation was Rs. 41,484 and the out-put per hectare was 98.93 tonne. The cost of production per tonne of jaggery was Rs.446.

Anon. (1998) stated that in the conventional method of jaggery manufacture, juice extraction was only 55-60%, compared with 80-82% in a typical cane sugar factory. It is recommended that jaggery be manufactured from juice extracted in a factory; the process by which this is done at Jaknur factory, India, was described.

Malik and Singh (1999) analyzed the cost and returns of sugarcane production in Hardwar district of western Uttar Pradesh. In the case of

reserve area (< 10 kms from sugar mills) cost A1, A2, B1, B2, C1, C2, gross income from main product and by product were Rs.21605, Rs.21605, Rs.24724, Rs.3390.8, Rs.28231, Rs.37415, Rs.45002 and Rs.4419 respectively. In far off area (>10 kms from sugar mills) the above costs in the same order were Rs. 21366, Rs.21366, Rs.24498, Rs.33293, Rs.28009, Rs.42758, and Rs.4416 respectively.

Ramaswamy *et al.* (1999) stated that jaggery making was a traditional enterprise in Tamil Nadu and was more profitable to cane producers than supply to the factory. But, higher profitability was countervailed by price risk in jaggery. Traditionally, jaggery making is undertaken by cane growers in their own farms. The trend changed with the entry of new entrepreneurs who venture jaggery manufacturing as a pure enterprise by procuring cane from the cane growers. The substantially higher price, immediate disbursements of sale proceeds for the sale of cane, missing registration in time with factory, delay in cutting and complex procedure of transactions with the factory make the cane growers favor jaggery making to cane supply. On the other hand absence of price risk, labour shortage in the case of own jaggery making, financial and technical assistance extended by the factory were the major factors attracting supply of cane to factory. Linear probability model was estimated to identify the determinants of sugarcane supply to sugar factory. A two stage procedure was employed to estimate the equation. Profitability in opting for jaggery production emerged as a significant variable in influencing farmers not to favor cane supply to the factory, the education and farm size were non-significant variables in influencing the cane growers' decision to supply cane to the factory. The nonsignificance of farm size indicated sugarcane supply to factory was neutral to scale. The experience in jaggery making had negative influence on the cane supply to factory. Labour shortage had significant influence in encouraging farmers to supply the cane to the sugar mills. Distance of

factory appears less significant in the decision process as the modern transport system viz., tractor had made transport of cane a non issue. Therefore the dummy variable, ownership of tractor had no influence on cane supply decision to factory.

Lohar *et al.* (2000) estimated per tonne cost of production of sugarcane, per quintal production of jaggery, per quintal manufacturing of sugar and profitability of production of jaggery and sugar. The study was conducted with a sample of 30 jaggery producers from six villages in Karveer, Tahsil, Kolhapur district, Maharashtra, India and it revealed that profitability was more in jaggery production.

Pawar (2001) studied the jaggery processing in India, and the study revealed that; India produces 10.3 million tons of jaggery (gur) annually. The paper report was based on data collected from 23 processing units in the Satara and Kolhapur districts of Maharashtra, and made recommendations for the production of quality jaggery.

Shivaramu *et al.* (2002) undertook a detailed survey of jaggery-making units in Cauvery Command Area (Karnataka, India) to evaluate the performance of a triple pan jaggery making furnace compared to local types. It was noted that the local types, i.e., single pan and double pan furnaces, took more time in boiling and also affected the quality of jaggery produced. Local furnaces also contained less safer inorganic clarificants and bleaching agents (sodium bicarbonate and sodium hydrosulfites) as compared to the triple pan jaggery, which contained bhendi mucilage. Because of the shorter boiling period, the daily production rate of jaggery in a triple pan furnace was 11.5 q, as compared to 7-8 q in local types. Using the triple pan furnace, the net returns were almost 2-2.5 times more (Rs122 000/year) than with local types (Rs51 000-65 000/year). In conclusion, the triple pan furnace was rated as more efficient than the local types of furnaces.

Nain *et al.* (2002) reported that the irregularity in the distribution of sugar cane purchase indent, delay in payment of sugar cane to the farmers, delay in unloading, lack of transportation facilities etc., were the major problems reported by the selected respondents in marketing of sugar cane to the sugar mills.

Patil *et al.* (2003) conducted a study on the effect of fertilizer on the yield and quality of sugarcane during 1997/98 and 1999/2000, in Kolhapur, Maharashtra, India. Increasing the rate of commercial cane sugar yields and improved the juice quality, but had no significant effect on juice purity. Sulphate improved the quality of jaggery and increased its recovery at 80 kg/ha was superior but statistically on par with the 60 kg/ha treatment.

Usha *et al.* (2004), conducted a study to investigate the prevailing processing practices being followed by jaggery manufacturers in the Cauvery Command Area of Karnataka, and Study revealed High income manufacturers used a triple pan furnace while the majority used a double pan furnace due to lower investment and skill required. It was found that sodium bicarbonate, sodium hydrosulphite and sodium formaldehyde sulfoxylate were the inorganic additives commonly used by all. Besides this, some used trisodium phosphate, while the majority used Magnafloc, of which the chemical composition was not known. Some chemicals were found to be unlabelled and the safety limits not set by quality control institutions. Organic additives include bhendi mucilage and coconut or castor oil to get the light golden yellow colour and crystalline texture of jaggery. Pan cleaning with dilute HCl was regular and daily among triple pan furnace users, but a majority of double pan furnace users cleaned their pans once every 3 days. None of the manufacturers used disinfectants. A majority of manufacturers stored jaggery in jute bags or in open storage with an average storage

time of less than one week. About 40 per cent of the manufacturers felt a need for an improvement in colour and hardness and were concerned with discoloration during storage. It was concluded that jaggery manufacturers were not satisfied with the jaggery they produced. This may prompt them to use chemicals indiscriminately to achieve good colour and texture. The manufacturing units were also unhygienic.

Mungare *et al.* (2005) conducted an experiment at the Regional sugarcane and jaggery research station, Kolhapur, Maharashtra, India to investigate the clarification efficiency of some synthetic and herbal clarificants suitable for quality jaggery. Based on this it was concluded that application of synthetic clarificants viz., Bhendi Powder SN 22 mg/lit (2ppm) with Bhendi plant 2 kg/100 lit of sugarcane juice is recommended for maximum removal of scum, improving the colour and higher jaggery recovery.

Meena *et al.* (2006) examined the economic viability of different sizes of chilli processing units in Rajasthan. The results showed that the cost of processing per quintal of chilli was Rs. 180.06, Rs. 167.30, Rs. 234.42 for small, medium and large processing units, respectively. Margin of processors increased with increase in the size of processing unit. However, the difference in the size of processing units had no influence on the recovery of chilli powder. All the processing units were operating above the break-even quantity, but failed to utilize their installed capacity.

2.2 Economic viability of processing

The investment in processing units is in the form of construction of buildings and installation of machineries and equipments. These investments were made at particular point of time and they yielded

returns continuously over a period of time. Hence, the studies which employed cash flow techniques and financial ratios are reviewed here.

Nagaraj (1987) employed discounted cash flow techniques to evaluate investment in coconut gardens in Tiptur taluk of Tumkur district assuming a discount rate of 15 per cent. The results indicated that the NPW was Rs.19, 112.18, Rs.20, 663.73, Rs.30, 021.64 and Rs.59, 476.87 respectively for one hectare of marginal, small, rainfed large, and irrigated large farms. The benefit cost ratio for the respective groups was 1.17, 1.15, 1.30 and 1.22 and IRR was 28.84, 24.02, 44.92 and 27.04, per cent respectively for the above mentioned groups.

Hemanth (1991) studied appraisal of investments on bakery enterprise in Bangalore city through discounted cash flow techniques and reported 55.50 per cent and 1.08 of IRR and BCR, respectively at 15 per cent discount factor, indicating that investment on bakery processing unit is highly profitable.

Joshi *et al.* (1999) studied the cost of processing and profitability of Mango pulp in south Konkan region of Maharashtra. Results indicated that input- output ratio was 1/1.1, 1/1.16, 1/1.13, and 1/ 1.39 for home scale, cottage scale, small scale and large scale of processing, respectively.

Chinnappa (2000) examined various stages involved in processing (shelling/dehusking, boiling, drying, and grading) and the costs of areca nut processing in Karnataka, India. The total processing cost was found to be Rs.723.18 per quintal, while the investment required for establishing a processing unit at the farm level was Rs.12, 016.50 per acre.

Gangwar *et al.* (2007) studied economics of peach cultivation in Punjab and Uttarakhand. The investment in peach orchards has been found to be profitable business. The internal rate of return (IRR) ranged from 20.98 per cent to 23.80 per cent, depending on the size of peach orchards. The net present value, benefit-cost ratio and IRR at 12 per cent discount rate have been reported as Rs.44, 807; 1.681 and 22.20 per cent, respectively in an average situation. The economic life of peach orchards in Punjab and Uttarakhand calculated up to 24 years.

Sachin (2008) in a study of economics of jaggery production in Karnataka reported that the investment made in the establishment of jaggery production unit was recovered within a short period of 1.7 year. The NPV of jaggery production units at 12 per cent discount rate was estimated at Rs.10,30,268 over the average life span of jaggery production unit (10 years). Positive and high net present values reiterated the profitability in jaggery production. The IRR in jaggery production was more than 100 per cent. It is mainly due to generation of returns from the very beginning. This revealed that the jaggery production units were economically viable even at higher discount rates. The benefit cost ratio was quite appealing. The encouraging project indicators revealed the economic viability of jaggery production units.

Santhosh (2008) analyzed production and processing of Red gram in Gulbarga district of Karnataka. The study reported that both small sized dalmills and large sized dalmills were processing red gram more than the break-even volume, indicating that both the categories of dalmills were running on profitable lines. The profitability ratios were relatively higher in large sized dalmills compared to small sized dalmills, mainly due to the lower level of processing cost, which shows that large sized dalmills were profitable. Turnover ratio indicates that the small sized dalmills were not using their fixed assets efficiently in redgram

processing. Therefore, there was a need to improve the performance of small sized dalmills.

From the above reviews, it is found that establishment of processing industry requires heavy investment and there was a direct relationship between extent of capital investment and the size of processing units. Investment on processing units was viable in many cases.

2.3 Consumer preference of different farm products

Prince *et al.* (1980) evaluated the marketing arrangements for roses on the basis of unit size, stem length, cultivar, flower condition including openness, bent neck, discoloration and price using the conjoint analysis. Long stemmed 12 unit red hybrid tea roses lost competitive position in favour of shorter 9 and 5 unit rose arrangements. Price was the major determinant for the favourable consumer acceptance of the smaller sized short stemmed roses in arrangements. The cultivar of rose marketed and the degree of flower openness were important factors influencing the consumers purchase decision. Low priced short stemmed roses (40cm) in a tight-bud-stage were the most highly valued; however, 'Sonia' roses evoked a strong consumer appeal regardless of price or stage of bud openness.

Weaver *et.al.* (1992) studied consumer attitudes towards pesticide use and residues in fresh produce and tomatoes using personal interviews of shoppers in produce sections of retail grocery stores. The results indicated a lower frequency of concern for pesticide use than earlier studies and a belief in both personal and external effects of pesticide use indicating altruism may affect consumer purchases. Almost half of the respondents indicated a willingness-to-accept cosmetic defects in chemical pesticide residue-free (CPRF) tomatoes. The majority of

respondents indicated willingness-to-pay up to 10 per cent more for CPRF tomatoes.

Salheim and Lawless (1996) studied the effect of consumers attribute towards low fat foods on their purchase probability. The purchase probability increased as price and fat content decreased. Evaluation was based only on survey appeal as shown by preference scores after testing influences the purchase probability.

Gregory (1998) examined the tradeoffs consumers were willing to make relative to food safety attributes and other product attributes, such as quality and price, and developed implications for both the government and private sector firms. The results indicated that most consumers had a strong preference for increased food safety. Government policy options that were explored include stricter production standards, improved regulatory monitoring, and government-defined labels. Private industry options that were examined include grower labels, retailer labels, and third party labels.

Murray (2000) suggested that Products' packaging attributes could predispose the consumer to purchase whilst products' sensory attributes confirm liking and may determine repeat purchases. Principal component analysis showed relationship between products and sensory or packaging attributes. Hierarchical cluster analysis and principal components analysis of preference data revealed groups of consumers within the two samples who had diverse preferences for cheeses' packaging and sensory attributes. Consumer clusters' preference for packaging and sensory attributes was then successfully predicted using partial least squares regression. Relationships between descriptive packaging and sensory attributes were also investigated and determined only general associations between products' sensory and packaging attributes.

Bhuvaneshwari (2007) made a comparative study of different markets for selected cut flowers in Bangalore. Conjoint analysis was conducted to determine the consumers preference for flowers and its attributes. Four important attributes were considered for this purpose, *viz.*, colour, size of the flower, floral arrangement of the flower, stem length and the price of the flower. The results showed that the most important attribute was colour. The average importance attached to colour was 33.4 per cent. Among the various colours available, red was the most preferred. This was reflected by the high utility value attached to it (2.9).

Quantitative descriptive analysis (QDA) was used to analyse the sensory quality of eight cod products, different with regard to origin (wild/farmed), storage time (short/extended) and storage method (fresh/ frozen/packed in modified atmosphere). The QDA discriminated well between the products. The farmed cod products were considerably different from wild cod, with more light and even colour, meaty texture, odour and flavour. Country differences were considerable with regard to fish consumption, attitudes and preferences of the eight cod products. However, it was demonstrated that within each country, different segments of consumers existed with different preferences, motives/barriers and demographic background. The results indicated various potential to increase fish consumption. (Kolbrún Sveinsdóttir *et.al.* 2009)

Chengyan (2009) Determined consumers' preferences and willingness to pay (WTP) for organically grown and locally grown fresh produce. This helps them to figure out what type of fresh produce to grow and sell, what to emphasize in marketing efforts, and what price was reasonable to charge. The results showed that consumers' WTP for the organic attribute was about the same as their WTP for the local

attribute. Consumers' socio-demographics affected their choice between organically grown and locally grown produce. Furthermore, they found that consumers patronized different retail venues to purchase fresh produce with different attributes. The findings of the research have great importance for fresh produce stakeholders to make correct production and marketing decisions; the findings also contribute to experimental method choice in consumers' WTP research.

Jyotsna Krishnakumar and Catherine (2010) explored consumer preferences for imported, specialty, high-end Kona coffee in South India. Conjoint choice experiment with latent class analysis was used and results indicated that India offered an export market potential for Kona coffee. Results showed a significant preference for strong taste. The relative importance of price was lower than taste but majority were also adverse to higher prices. However, 15% of the sample population who did not care about price were concerned about taste, indicating the possibility of a high-end niche market segment.

2.4 constraints in processing

Gupta and George (1974) studied the modernization of rice processing mills in Punjab. They found that the main problems faced by the Millers were lack of financial resources to meet the procurement requirement, non availability of gunny bags, high moisture content and lack of storage facilities.

Singh *et al.* (1981) in a study on economics of marketing and processing of arhar in Unnao district of Uttar Pradesh reported that inadequate transport, storage and credit facilities, irregular supply of electricity were the constraints faced by processing units.

Hemachand (1989) studied the economics of processing units in Narasinghpur district of Madhya Pradesh. He found that non availability

of raw materials, shortage of power supply, inefficient utilization of labour and machinery were the major problems faced by the processing units.

Krishnamurthy *et al.* (1998) in their study reported that majority (60.00%) of sugarcane growers expressed lack of technical knowhow, non-availability of inputs like credit, fertilizer and pesticides and high cost of fertilizers and pesticides as the main reasons for non-adoption of recommended cultivation practices in sugarcane. Further, they reported that, non-availability of high sugared and high yielding varieties (23.00%) non-availability of farm implements and mulching materials (16.90%) and small size farm (10.70%) as other constraints.

Ramandev *et al.* (1998) studied problems faced by cashew processing industry using cluster analysis. They reported that problems regarding procurement and availability of raw nuts, labour, and taxation, availability of land, government policies, infrastructure facilities and marketing were the major problems of cashew processing.

Radhakrishnan *et al.* (1999) conducted a study on constraints faced by mango growers. The study revealed that the foremost problems faced by mango growers were high cost of inputs *i.e.*, grafts, fertilizers and pesticides, more than three-fourths (78.30%) expressed this problem. High cost of inputs was a major economical constraint among the growers followed by more incidences of pests and diseases.

Ravishankar and Katteppa (2000) conducted studies on potato growers in Chikkmagalure district of Karnataka State. They reported that 94.16 per cent respondents faced the problems of lack of technical guidance, more pests, more diseases, high cost of fertilizers, high cost of plant protection chemicals and non-availability of fertilizers in time were

the problems faced by 90.00, 83.33, 85.00, 81.66 and 68.33 per cent of the respondents, respectively.

Sadaphal *et al.* (2001) conducted a study in Raigad district of Maharashtra state found that majority of the respondents (99.00%) had faced marketing constraints for white onion. All (100%) the respondents reported the problems namely "could not get reasonable price". while, 45.45 per cent had reported the problem of non-availability of transport facilities.

Naik (2001) studied the problems faced by cashew processing units in North Eastern part of Goa. He reported that the problems like competition from other units, non-availability of raw nuts, shortage of skilled workers, low recovery of kernels and high working capital were the major constraints.

Tarde *et al.* (2003) reported fluctuation in market rates (69.56% & 91.36%), lack of market facility in the village and nearby village (63.04% & 60.87%) as the major problem in vegetable cultivation. Nearly one-half (47.83% &46.65%) of the tomato growers and brinjal growers respectively expressed that markets were at long distance, while 69.56% & 28.26% of the tomato and brinjal growers stated that there was monopoly of middle men in the market.

Shivaji (2007) analyzed strengths, weaknesses, opportunities and threats of sugar factories in Maharashtra. The strengths like, huge employment generation, support to the downstream industries by providing raw material, profitability of sugarcane farming, strong government policies were identified. Management problems, old technology, low installed production capacity, lack of professionalism are considered as weaknesses. Opportunities such as high value of by-products for downstream industries, huge potential to increase the

productivity of cane and sugar recovery rate, technology up-gradation etc. were highlighted. Threats include vulnerability to political interest, less ground water availability for irrigation, deterioration of soil quality and unhealthy competition between members of the society.

Santhosh (2008) analyzed production and processing of red gram in Gulbarga district of Karnataka. He documented that major problem faced by the processors was poor supply of power resulting in underutilization of dal mills. The scarcity of labour and inadequate finance were other problems encountered by the red gram processing units.

Sachin (2008) stated that Weaknesses in jaggery processing were, higher working capital requirement, irregular electricity supply and labour scarcity in peak periods as expressed by all the respondents. About 80 per cent of the respondents opined that lack of efficient equipments for jaggery processing was the major weakness. Excessive use of chemicals and lack of proper storage facilities were the weaknesses in jaggery processing as expressed by 55 per cent of the respondents. Lack of information, both market and production was one of the major weaknesses in jaggery processing in the Gokak taluk.

Methodology

CHAPTER III

METHODOLOGY

This chapter deals with the description of the study area, selection of samples, sampling techniques adopted, nature and sources of data, various tools and techniques employed in analyzing the data. At the end of the chapter, some of the important concepts and terms used in the study are defined and explained to facilitate a clear understanding of the issues with which the current investigation is concerned. The chapter is organized under the following broad sections.

3.1 Selection and description of the study area

3.2 Data base and sampling procedure

3.3 Analytical tools used

3.1 Selection and description of the study area

Sugarcane is one of the important cash crops grown in Karnataka, which plays a major role in the state's economy. The crop is cultivated on an area of 2,81,100 hectares with a production of 2,33,28,110 tonne. It is cultivated extensively in 16 Districts of the state. The District-wise area under sugarcane in Karnataka is represented in (Appendix I) Mandya District ranks third in the cultivation of sugarcane with an area of 22,257 hectares and production of about 26,64,163 lakh tonne. Further, as many as 2000 Jaggery processing units are located in the District. Hence, Mandya District was purposively selected for the current study. Map of the study area is given in Fig.1.

Description of Mandya District

Mandya District is one of the agriculturally most prosperous districts in Karnataka. With the advent of irrigation from the K.R. Sagar reservoir (during 1930's), there was marked transformation in cropping

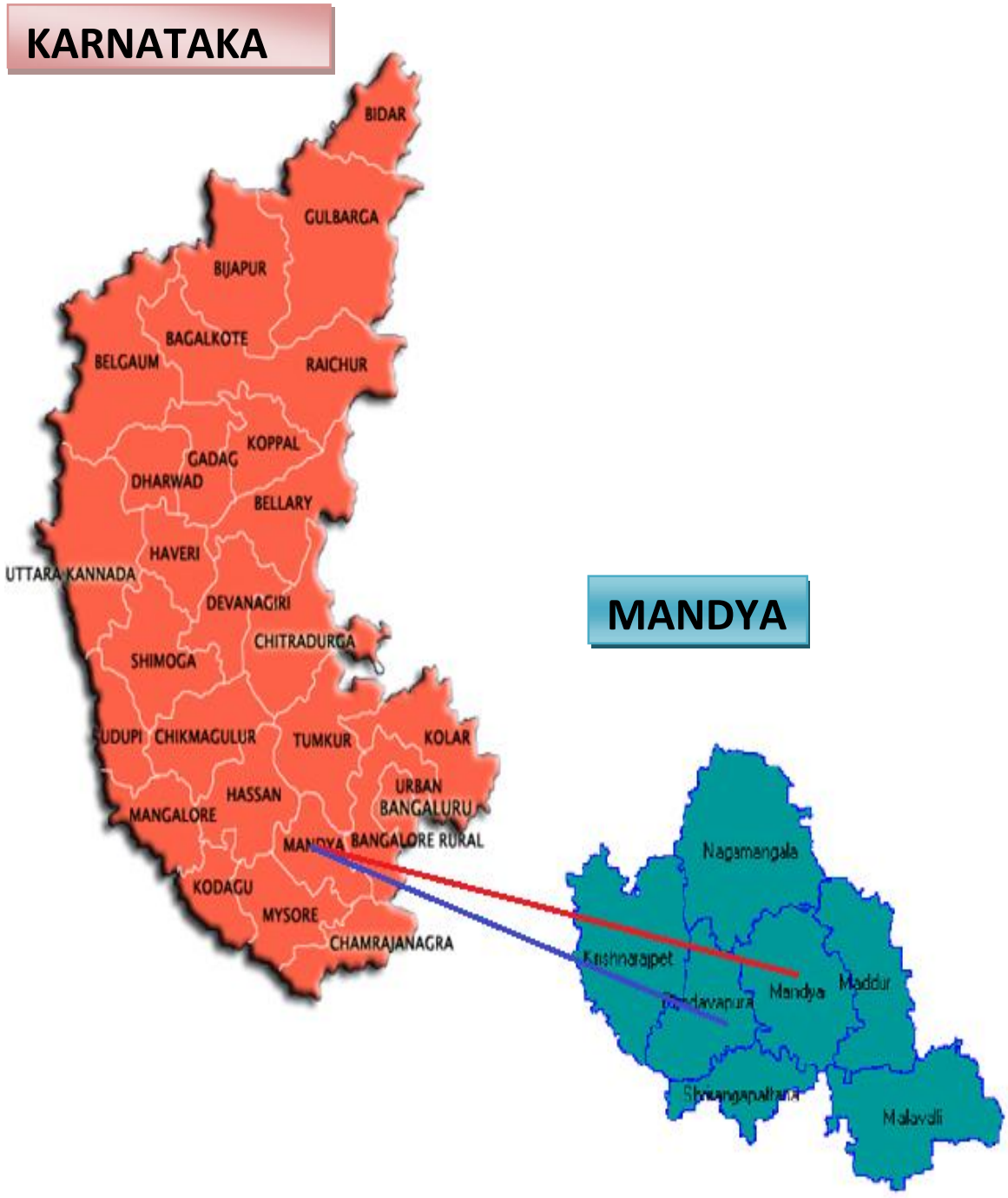

Fig. 1: Map showing study area

pattern, composition of crops, higher yield level, ultimately leading to better economic conditions of the people.The total geographical area of the district was 4,98,244 ha; out of which 2,48,825 ha formed the net sown area. More than half of the total land area in the district was put to agricultural use. The total irrigated area was 1,69,534 ha out of which around 88,000 ha was irrigated by K.R. Sagar and around 16,000 ha, by Hemavathi reservoir. The rest of the land is irrigated by other sources like tanks, wells and bore wells.

Mandya District is bounded on the South by Chamarajnagar and Mysore District, on the West by Hassan and Mysore District, on the North by Tumkur District and on the East by Ramanagar District. As on 2001, its population was 17,63,705 of which 16.03 per cent was urban.

The Land of Sugar

Mandya district popularly known as 'Land of Sugar' came in to existence on 1st of July 1939. Paddy and Sugarcane are the main crops of the irrigated region. Ragi, Horse gram are the major crops of dry land agriculture. Agriculture is the main occupation of people in the district. Most of the industries of the district depend on agriculture for their raw material. Sugar Mills, Jaggery making units, Rice Mills are the prominent industries of this district.

The major crops of the district are ragi (85,467 ha.), rice (79,892 ha.), sugarcane (47,944ha), pulses (predominantly horse gram and to some extent tur, cowpea, green gram, black gram, avare*)* and oilseeds (mainly groundnut and sesame) (Table 3.1).

3.2 Database and Sampling Procedure

For the purpose of collection of primary data from jaggery processors, three stage sampling design was adopted, taking taluks at

the primary level, villages at the secondary level and jaggery processors at tertiary level. Mandya & Pandavapura taluks were purposively selected at the primary level based on the number of jaggery processing units operating in that area and the area under sugarcane.

Five villages from Mandya taluk were considered at secondary level. They were Holalu, Ghandalu, Thaggalli, Hemge and H .Malligere, and also Five villages from the Pandavapura taluk were considered at secondary level. They were Dodda byadarahalli, Chikka byadaahalli, Thimmana koppalu, Kennalu and Lakshmisagara. The main criterion for the choice of villages was the relative proportion of area devoted for cultivation of sugarcane. Care was also taken to ensure that sufficient jaggery processing units were located in the chosen villages. Totally ten villages were selected for the study; a list of Jaggery processors was prepared for each of the selected villages. Using simple random sampling technique for respondents at the tertiary level, were selected. From each village, three processing units operated by farmers were selected randomly. Thus, 30 processing units spread over ten villages in Mandya & Pandavapura taluk formed the total sample for the present investigation.

The consumer preference for different attributes of jaggery was studied by randomly selecting 15 consumers in Bangalore and 15 consumers from Mandya.

3.2.1 Nature and sources of data

Both primary and secondary data were used in the present study. Pre-tested and well structured schedules were used for eliciting the required information from the respondents. The data pertaining to area under sugarcane, inputs used and output realized in sugarcane cultivation along with their market values, investment requirements for

establishing jaggery processing units in physical and monetary values, cost incurred in jaggery processing and quantities of jaggery produced were collected through personal interview. Information on place and time of sale, price received, cost incurred in marketing were also collected from the respondents. The difficulties and problems faced by the respondents were also listed. And also related to another objective of the study, consumer preference for different attributes of jaggery was also studied. All efforts were made to elicit as accurate information as possible from the respondents. The data for the study were collected through personal interview method for the agricultural year 2009-10.

The information on area under sugarcane, number of processing units operating in the study area was obtained by consulting various statistical reports published by the Office of the District Statistical Officer, Mandya.

3.3 Analytical techniques

The analytical techniques used for evaluating the objectives of the current investigation are summarized below.

3.3.1 Measures of central tendency

Measures of central tendency, specifically averages were used for estimating cost and returns. The average cost and returns per jaggery processing unit was computed. Similarly, cost per unit of jaggery processing was also estimated. Appropriate percentages were worked out for the purpose of comparison. The major cost items involved in jaggery processing units have been detailed as follows.

a. Processing cost

The quality and value of different chemicals/materials used in jaggery processing were calculated at the actual price paid by the

processor including transportation charges. The other costs included in processing were, wages paid to labour, fuel charges, interest on investment and depreciation. Depreciation was computed by using straight line method. The interest on investment was calculated at a rate of 12 percent per annum on the book value. The actual wages paid to the labour were considered as labour charges. Bagasse was the bye-product of the jaggery processing units. Bagasse was the major source of fuel for the jaggery processing units. However, the bagasse produced from each unit was not sufficient to meet the entire fuel requirement of the respective processing units. A part of the fuel requirement was therefore, met by purchasing fuel wood and coconut husk, frond etc. The actual price paid for purchasing fuel including the transportation cost was considered.

b. Cost of establishing jaggery processing unit

The jaggery processing units considered for the study were established in different years. Therefore, the written down values of all the machineries/equipments were considered and compounded to the reference year (2009-10) for the purpose of computing cost of establishing jaggery processing unit. Cost of each machinery/equipment including the shed requirement for establishing jaggery processing unit was considered. An attempt was made to identify important jaggery marketing channels operating in the study area. The various marketing costs incurred by different market functionaries were tabulated.

3.3.2 Financial analysis

The financial analysis of jaggery processing unit is mainly based on the cost and returns accruing from processing units. The Pay-Back Period (PBP), Net Present worth (NPW), Benefit-Cost Ratio (BCR) and Internal Rate of Returns (IRR) were used as criteria for evaluating financial viability of processing units.

Pay-Back Period (PBP): Pay-back period refers to the length of time period required for an investment to generate net cash income to be equal to the original investment. This time period is expressed in years.

$$PBP = I/Y$$

Where, I= Initial Investment

Y= Net cash flow

Net Present Worth (NPW): The net present worth represents the discounted value of the net cash inflow to the project .The NPW has been defined as fallows.

$$NPW = \sum_{t=0}^{n} Y_t (1+r)^{-t} - C$$

Where Y_t= Series of Net Cash Inflows

r = Discount Rate

c = Initial Cost of Investment

t = Time Period

Benefit Cost Ratio (BCR): It is the ratio of discounted project benefits to project cost. It has been defined as fallows.

$$BCR = \sum_{t=0}^{n} Y_t (1+r)^{-t} / C$$

Where, Y_t , r, t and c are as defined in NPV

Internal Rate of Returns (IRR): It is the discount rate at which the net present value of the project is zero. It has been defined as follows.

$$\text{Internal rate of return} = \left[\text{Lower discount rate}\right] + \left[\text{Difference between two discount rates}\right] \times \left[\frac{\text{Present worth of the cash flow at the lower discount rate}}{\text{Absolute difference between present worth of cash flow at two discount rates}}\right]$$

Many workers have argued that the opportunity cost of capital or cost of borrowing and social rate of time preference should be the criteria in selecting desired discount rate in the financial analysis. Hence, the cost of borrowing (12%) was considered as discount rate in the present investigation. A ten year time horizon was considered for the present investigation.

3.3.3 Break even analysis

The break even analysis was attempted to estimate the level of jaggery production at which the returns are just sufficient to recover the cost of investment in processing units. The break even volume of output was determined with help of the following formula.

$$Break\,Even\,output = \frac{Fixed\ cost}{Unit\,price\,of\,output - unit\,variable\,cost}$$

An attempt was also made to estimate full capacity utilization of processing units under considerations. Based on this, the present capacity utilization was worked out. Accordingly, the number of days a processing unit required to operate for reaching break even output was worked out.

3.3.4 Conjoint Analysis

Conjoint analysis is a versatile marketing research technique that can provide valuable information for new product development, forecasting, market segmentation and pricing decisions, advertising and distribution, competitive analysis and repositioning. It is a technique used in assessing consumer's value judgments. Hence in the present study, it was used to measure the consumer's preference for the jaggery attributes.

One of the important requirements in the conjoint analysis is the identification of appropriate attributes to describe the processed jaggery and the specific levels of these attributes. On the basis of the objective attributes, representative indicators for a given attribute were chosen. Further, the overall judgement of consumer is broken down into the contribution of each attribute level. The contributions of the various attribute levels to the overall judgement are called 'part-worths' or 'relative utilities'. Another important requirement for the use of the technique is the specification of the basic form of relationship between product attribute and overall judgement. In the present study, additive conjoint model was used instead of other forms like the interactive or the multiplicative models. The additive part-worth model is the simplest and by far the most frequently used model. Further, in this model, the omission of the attribute does not have a major impact on part-worth estimates.

The additive model assumes that the overall evaluations are formed by the sum of separate part worth or utilities of the attribute levels. The model has been formulated as:

$$Y=\sum_{i=1}^{n}\sum_{j=1}^{m}V_{ij}X_{ij}$$

Where,

Y = Consumers overall evaluation of the product alternative.

V_{ij} = Part worth associated with j (1,2,3, …m) of attributes i (i=1,2…,n).

Terms and concepts used in the study:

- **Shed:** Mainly used for providing shade while preparing jaggery. It is also used for temporary storage of jaggery.

- **Pan:** It is a flat open vessel made up of iron. The general dimension are 2 ½ feet height and 3 ½ feet radius. It is mainly used for boiling the cane juice up to 85-90°C.
- **Cane crusher:** It is a machine made up of iron, used to crush sugarcane for juice extraction.
- **Electrical motor:** It is electrical machines, used for crushing cane and to lift the sugarcane juice from bani and transfers it to boiling pans.
- **Filter plate:** It is made up of iron used for filtering sugarcane juice.
- **Bani:** An underground construction made up of cement and bricks used for collecting juice.
- **Gori:** It is made up of iron, mainly used to remove waste materials and scum from juice during boiling.
- **Hutta/Agarwali:** Made up of iron which is small in size, mainly used to transfer hot juice to moulds/buckets to provide uniform shape and size to jaggery.
- **Magi /Katti:** It is constructed on the ground surface, with four walls which are made up of wooden plates to help in cooling the hot juice before it is transferred to iron moulds.
- **Ash-spade:** Made up of iron, thin and long in shape used for removing ash from the furnace.
- **Moulds:** Moulds are made up of crude iron having a shape of bucket with a capacity to accommodate 20 to 22 Kg of jaggery.
- **Processor:** He is a person, who undertakes the processing of sugarcane into jaggery on his own processing unit.

- **Marketing channel:** It consists of intermediaries that perform the various marketing functions in sequence as the produce moves from the producers to the ultimate consumers.
- **Market intermediaries:** These are individuals / agencies who specialize in performing various marketing functions involved in the purchase and sale of goods from producers to consumers.
- **Wholesaler:** Wholesaler purchases jaggery in large quantities with a view to sell it to the retailers. He also performs storing and transportation functions.
- **Retailer:** He is a person, who purchases jaggery in small quantities to sell it to the final consumers.

Plate 1: Four Pan system for efficient jaggery making

Plate 2: Bagasse stocking for fuel purpose

Plate 3: Pan boiling of sugarcane juice

Results

CHAPTER IV

RESULTS

The results obtained from the analysis of the data are presented under the following headings.

4.1 Profile of jaggery processing unit and processors

4.2 Returns to investment in jaggery production

4.3 Viability of investment on jaggery production

4.4 Consumer preference for jaggery

4.5 Constraints in jaggery production

4.1 Profile of processing unit and processors

The socio-economic characteristics of jaggery processors, like age, education, family size and size of holding were computed to understand the influence of these characteristics in motivating farmer to take up jaggery processing. Similarly the general characteristics of the processing unit help in familiarizing with characteristics of jaggery processing in Mandya district.

4.1.1 Age of the respondents

The distribution of the processors according to age groups is presented in table 4.1. Out of 30 processors interviewed, eight were within the age group of 30-40 years and 16 were in 40–50 years range. Thus, 80 percent of the processors were found to be of the middle age group of 30-50 years.

4.1.2 Education status of sample respondents

The education status of jaggery processors is presented in Table 4.2. Maximum number of processors were found to be above high school

Table 4.1: Distribution of jaggery processors according to age groups

Sl. No.	Age group (years)	No. of processors	Percentage
1.	20-30	2	6.7
2.	30-40	8	26.7
3.	40-50	16	53.3
4.	50 and above	4	13.3
	Total	**30**	**100.0**

Table 4.2: Distribution of jaggery processors according to education

Sl. No.	Education level	No. of processors	Per cent
1.	Illiterate	1	3.3
2.	Secondary school	2	6.7
3.	High school	0	0.0
4.	Above high school	27	90.0
	Total	**30**	**100**

(27) forming 90 per cent of the total sample. The number of processors having education up to secondary level was two (6.7%). Only one processor was illiterate (3.3%).

4.1.3 Family size of the respondents

The results showing the distribution of jaggery processors according to family size is presented in Table 4.3. The maximum number of processors had four to ten members in the family maximum forming 70 per cent of the total sample, followed by family size of one to three (16.7 %). The number of processors having family size of ten and above was found to be four which worked out to be 13.3 per cent of the sample.

4.1.4 Sugarcane land Holding size of the respondents

The distribution of the processors according to land holding is presented in Table 4.4. The number of processors having land holding of 5.01 to 10 acres was found to be maximum (12) forming 40 per cent of the total sample. This is followed by number of processors having land holding between and 2.51 to 5 and up to 2.5 acres forming 26.6 per cent and 20 per cent respectively, 13.3 per cent of the processors had more than 10acres of land.

Jaggery manufacturing is labour intensive as many of the operations are doing manually. It is hypothesized that a bigger family would be able to have participation of members of family in jaggery making.

4.1.5 General characteristics of jaggery processing units in study area

The characteristics of the jaggery processing unit reveals that Co-419 (table 4.5) was the most popular sugarcane variety cultivated by

Table 4.3: Distribution of jaggery processors according to family size

Sl. No.	Family size(No.)	No. of processors	Per cent
1.	1 to 3	5	16.7
2.	4 to 10	21	70.0
3.	10 and above	4	13.3
	Total	**30**	**100**

Table 4.4: Distribution of jaggery processors according to area under sugarcane

Sl. No.	Area (ac)	No. of processors	Per cent
1.	Up to 2.5	6	20.0
2.	2.51 to 5	8	26.6
3.	5.01 to 10	12	40.0
4.	10.01 and above	4	13.3
	Total	**30**	**100**

4.2 Returns to investment in jaggery processing

The investment details of jaggery processing unit, the cost of jaggery processing on processing unit basis as well as, per tonne basis were studied with a view to evaluate the profitability of jaggery processing units.

4.2.1 Initial investment on jaggery processing units

The details of investment required for establishment of jaggery processing units is given in Table 4.5. A sum of Rs. 5,28,035 investment was required to set up a jaggery processing unit with a capacity of one tonne per day. Among the various investment items, the investment on shed had a maximum share (52.96%) accounting for Rs.2,79,630. This was followed by investment on processing pan which stood at Rs.98,519 (18.66%), cane crusher at Rs.82,074 (15.54%), moulds and buckets at Rs.20,100 (3.81%), electrical motor value at Rs.4,926 (0.93%), and other minor items at Rs.42787 (35.8%).

4.2.2 Cost and returns in jaggery processing units

The cost incurred and returns obtained from jaggery processing units are presented in the following

Cost of jaggery processing per processing unit

The costs incurred in establishing processing unit is presented in Table 4.6. The total variable cost worked out to Rs. 72,50,274 out of which the cost of procuring, sugarcane was the prime cost accounting for 73.76 per cent of the total cost. Labour, diesel and fuel charges were the other important items of cost accounting for Rs.4,91,146, Rs.39,906 and Rs.4,77,422 respectively forming 6.67 per cent, 0.54 per cent and 6.49 per cent of the total cost, respectively. The fuel charges includes coconut husk and dried fronds of coconut tree were used. Total fixed cost per processing unit was relatively less (Rs.1,09,712) when compared with the

Table 4.5: General characteristics of jaggery processing units in study area

Sl. No.	Items	Average	Ranges	per cent
1.	Sugarcane variety Co-419 Co-62175 Co-86072	 63.33% 16.66% 20.00%	□	□
2.	Shed area(gunta)	4.00	<4 >4	50 50
3.	Yard area(gunta)	14	<14 >14	67 33
4.	Cane crushed(ton/day)	14	<14 >14	83 17
5.	Jaggery produced(qtl/day)	13.58	<14 >14	83 17
6.	Own cane (ton/annum)	376.7	<376 >376	57 43
7.	Purchased cane(ton/annum)	3024	<3000 >3000	57 43
8.	Pan system a)double b)triple c)four	 43.33 40.00 16.66	□	□
9.	Maximum Capacity to produce (qtl) a)double pan b)triple pan c)four	 4 8 10	□	□
10.	Sale of jaggery a)on farm b)APMC	 26.66 73.33	□	 26.66% 73.33%

variable cost. The percentage of fixed cost to total cost was only 1.49. The major item in the fixed cost was interest on investment (Rs.63,264) which formed 0.86 per cent of total cost. Sodium hydrosulphate, lime sulphur and saffolite were the essential chemicals used, accounting for Rs.23,652. The maintenance cost the processing appeared to be negligible.

4.2.4 Returns from jaggery processing per processing unit

The details of the physical output, returns per processing unit are presented in Table 4.7. The average production of jaggery per processing unit was 347.02 tonnes per year and the net return realized per tonne of jaggery was Rs.23,000.

The total returns from jaggery processing worked out to Rs. 86,75,417 with net returns of Rs.13,15,430 per unit. In jaggery processing, returns per rupee of expenditure was 1.2 implying not only profitability but also economic viability of processing units.

4.2.5 Cost per tonne of jaggery production

The cost of production of one tonne of jaggery was found to be Rs.21,160 (Table4.8). Among the various cost items, cost of sugarcane was the maximum (Rs.15,644/tonne) which formed about 73.93 per cent of the total cost. Labour (Rs.1,415/tonne), fuel charges (Rs.1376/tonne), Diesel (Rs.115/tonne), chemical (Rs.49/tonne), and interest on working capital (Rs.2,220/tonne) formed the next important items of cost in the production of jaggery.

The processor on an average realized Rs.1980 per tonne of jaggery. On an average 10 tonnes of sugarcane was used to produce one tonne of jaggery. Thus, the conversion ratio of sugarcane to jaggery was approximately 10:1

Table 4.6: Investment details in establishment of jaggery processing unit (one tonne capacity per day)

Sl. No.	Items	No.	Amount (Rs.)	Per cent
1	Shed	1	2,79,630	52.9
2	Pan (single)	3	98,519	18.6
3	Cane crusher	1	82,074	15.5
4	Electric motor	1	4,926	0.9
5	Filter plate	2	300	0.06
6	Bani	1	2000	0.3
7	Gori	1	150	0.03
8	Hutta	2	600	0.1
9	Ash Spade	2	300	0.06
10	Madi –Katti	1	100	0.02
11	Buckets /Moulds	3	20,100	3.8
12	Plastic pipes(ft)	25	1500	0.2
13	Other		37837	7.1
	Total		**5,28,035**	100.00

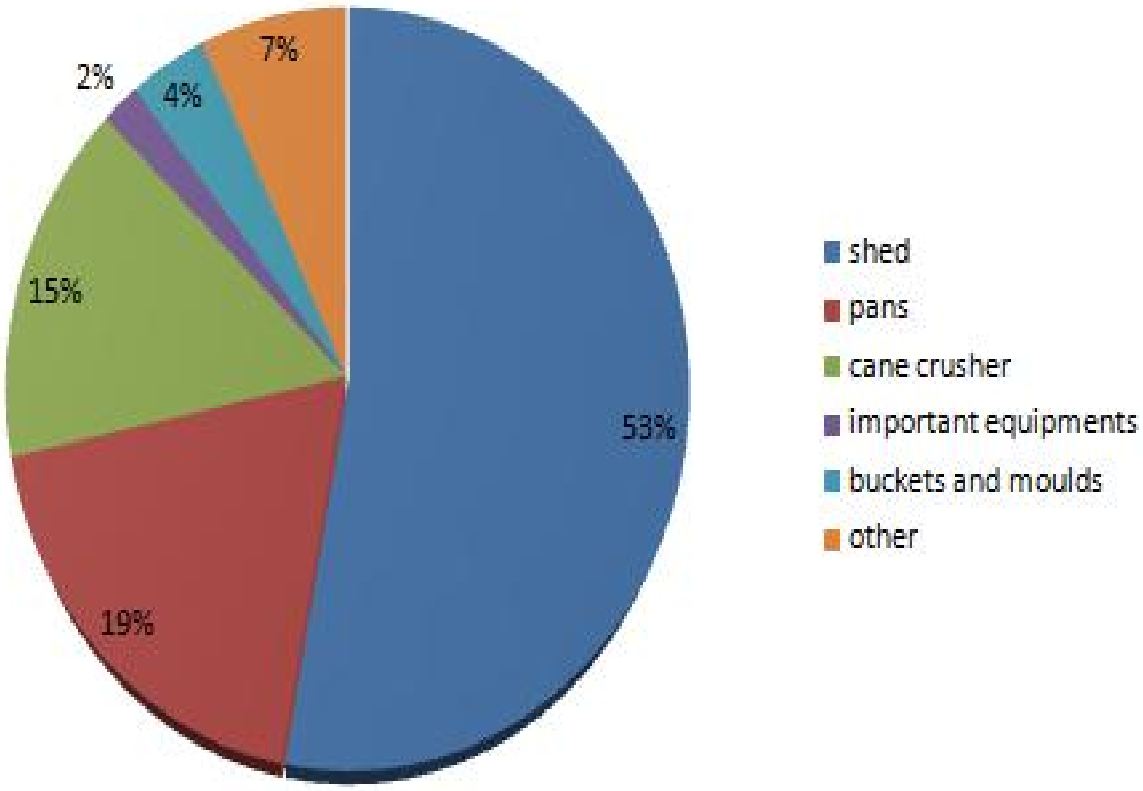

Fig.2 : Investment details in establishment of jaggery processing unit

Table 4.7 : Cost particulars of jaggery making unit (2009-10)

Sl. No.	Material	Quantity	Price/unit (Rs.)	Amount (Rs.)	Per cent
	I Variable cost				
1	Sugarcane, own (tonne)	365	1200.00	4,38,000	5.9
	Purchased (tonne)	3105	1607.28	49,90,877	67.8
	Total			54,28,877	73.7
2	Sodium Hydrosulphate (Kg)	115	146.67	16,965	0.2
3	Lime superphosphate (Kg)	69	30.00	2,082	0.03
5	Saffolite (Kg)	34	150.00	5,205	0.07
6	Bendi Extract (cut)	34	100.00	3,470	0.05
7	Safflower oil (lt.)	43	62.00	2,689	0.04
8	Soda Powder (Kg)	69	50.00	3,470	0.05
10	Labour Charges (Man Days)				0.00
	Men labour	1,948	215.33	4,19,534	5.7
	Women labour	431	166.00	71,612	0.9
11	Diesel (lt)	867	46.00	39,907	0.5
12	Fuel	_	_	4,77,422	6.5
13	Maintenance	_	_	8,698	0.12
14	Interest on working capital @12 %	_	_	7,70,340	10.4
	Sub total			**72,50,274**	**98.51**

Sl. No.	Material	Quantity	Price/unit (Rs.)	Amount (Rs.)	Per cent
	II. Fixed cost				
1	Depreciation	_	_	33,991	0.46
2	Interest on fixed capital (12%)	–	–	63,364	0.86
3	Opportunity cost of land	–	–	12,357	0.17
	Sub total			**1,09,712**	**1.49**
	Total cost			**73,59,986**	**100.00**

Figures in parentheses indicate the per cent to subtotal

4.2.6 Feasibility of jaggery processing units

The financial viability of the processing units was assessed and the results are presented in Table 4.9. The jaggery processing unit required 0.8 year to repay the initial investment made in establishing the units. The net present value at 12 per cent discount rate worked out to Rs. 30,39,572. The benefit cost ratio for the jaggery processing unit was found to be 1.07. The internal rate of return in jaggery processing unit was found to be more than 100 per cent. Thus, investment in jaggery processing is economically viable and financially sound.

4.2.7 Break-Even analysis in jaggery processing units

The result of break even analysis in jaggery production is presented in Table 4.9. The investment needed for establishing jaggery processing unit was Rs.5,28,035. The variable cost incurred per tonne of jaggery production worked out to Rs.21,160.

The break-even level of output for processing units in the study area was estimated to be 61.25tonnes per year. The number of days required for achieving the break-even level of output was 45.8 days at the existing level of capacity utilization of processing units.

4.2.8 Marketing channels in jaggery

Three major marketing channels were identified in respect of jaggery marketing in the study area, namely,

Channel- I: Producer → Commission agent → Wholesaler → Retailer Consumer

Channel- II: Producer → Wholesaler → Retailer → Consumer

Channel- II: Producer → Wholesaler → Retailer → Consumer

Table 4.8: Returns from jaggery processing unit

Sl. No.	Particulars	Value
1	Jaggery Production (tonne)	347
2	Price (Rs/tonne)	24,040
3	Cost of production (Rs.)	72,50,274
4	Marketing cost in (Rs.)	68,728
5	Total cost * (Rs.)	73,59,986
6	Gross returns (Rs.)	86,75,417
7	Net returns (Rs.)	13,15,430
8	Returns per rupee of expenditure	1.2

Note: * Includes marketing cost

Table 4.9: Cost of jaggery production (Rs/tonne)

Sl. No.	Particulars	Quantity	Amount(Rs)	Per cent
1	Sugarcane (tonne)	10	15,644	73.9
2	Chemicals (Kg)	1.06	49	0.23
3	Labour (mandays)	7	1,415	6.7
4	Fuel (tonne)	880	1,376	6.5
5	Diesel (lt)	2.5	115	0.54
6	Interest @ 12%	-	2,220	10.5
7	Maintenance	-	25	0.11
8	Total fixed cost	-	316	1.5
	Total		**21,160**	100

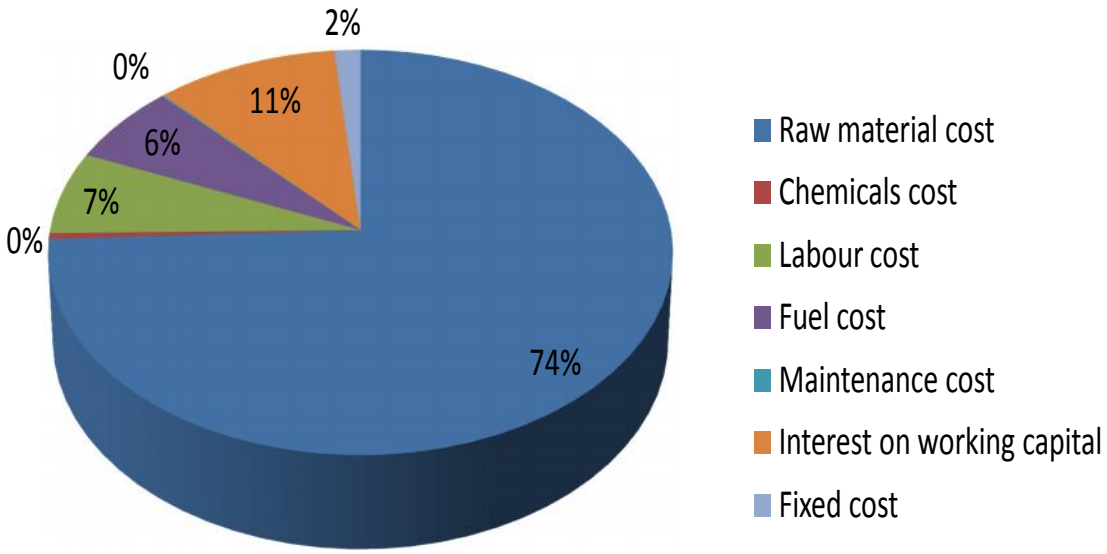

Fig.3 : Cost of producing Jaggery(Rs./t)

4.2.9 Magnitude of jaggery marketed through different channels

The percentage of quantity disposed and the percentage of processors preferring each of the identified channels are given in Table 4.11. It is evident from the table that majority of processors (63.33%) sold bulk of their produce through channel–I (221.74 tonne/ annum).followed by channel-II for transacting 116.25 tonne of jaggery. However, Channel-III appeared to attracted only 2.6 percent of the processors with negligible quantity.

4.3 Marketing costs incurred by different market functionaries

The marketing cost incurred by different functionaries in each of the identified channels is given in Table 4.12. The marketing cost incurred by the producer in the case of channel-I was Rs.98.75, whereas in the case of channel-II it was only Rs.11.75. Similarly the marketing cost incurred by the wholesaler in channel-I was about Rs.79.3 whereas in the case of channel-II it was Rs.105.8. The marketing cost incurred by retailer in both channel-I and channel-II was around Rs.79.

4.3 Consumer preference for jaggery

Consumers attach different levels of importance to quality attributes of jaggery. It is of interest to know the most important value criterion attached while buying jaggery. It be noted that the processors always try to match consumers' expectation with respect to the product..

4.3.1 Socio-economic profile of consumers

Socio-economic profile of consumer respondents is presented in table 4.9. Majority (33.3%) of them were in the age group of 31-40 years followed by 41-50 years, accounting for 30 per cent. The literacy levels of sample consumers revealed that 26.67 per cent had studied up to SSLC,

Table 4.10: Returns to investment in jaggery processing

Sl. No.	Project indicators	Value
1	Payback period (year)	0.8 (< 1 yr)
2	NPW (@12%)	Rs. 30,39,572
3	BCR (@12%)	1.07
4	IRR	>100

Table 4.11: Break-even analyses of jaggery processing units

Sl. No.	Items	Value
1	Total fixed cost/processing unit (Rs.)	1,09,712
2	Variable cost/ tonne (Rs.)	21,209
3	Price of output/ tonne (Rs.)	23000
4	Break even output (tonne)	61.25
5	Time period to reach break-even output (days at present level of capacity utilization)	45.8

Table 4.12: Magnitude of jaggery marketed through different channels

Channels	**Quantity**	**Respondents (%)**
Channel- I	221.74(63.9)	63.33
Channel- II	116.25(33.5)	26.66
Channel- III	9.02(2.6)	10

(Figures in parentheses indicate percentage to total)

Channel- I: Producer → Commission agent → Wholesaler → Retailer → Consumer

Channel- II: Producer → Wholesaler → Retailer → Consumer

Channel- III: Producer → Retailer → Consumer

40 per cent had completed their 12th standard and 33.33 per cent of sample respondents were graduates.

The family size of the sampled consumers revealed that 13.33 per cent of the households had four members in the family, 56.67 per cent had less than or equal to three members in the family and 30 per cent had more than five members.

About 53.33 per cent of the respondents had monthly income between Rs. 6,000 and 15,000, followed by 26.67 per cent of the respondent were in Rs 15,000 and 25,000 income range and 20 per cent earned more than 25,000 income.

4.3.2 Consumer preference

In the present study, conjoint analysis was used to assess the consumer preference for jaggery. This technique focused on the evaluation of preferred traits for jaggery. Consumers' preference for specific attributes of major types of jaggery is presented in table 4.10.

The part-worth's of each attribute is calculated using regression analysis using SPSS software to translate the respondents' answers into relative importance values or utilities. The most important attribute considered by the consumers was colour. The relative importance attached to colour was 27.32 per cent. Among black, yellow and golden colour, yellow was the most preferred colour which was reflected by the high utility value attached to it (0.48). Golden colour was next in the order of importance with an utility value of -0.07. It was found that the black was the least preferred among all having the value of -0.41.

Table 4.13: Marketing cost incurred by different market functionaries (Rs/qt)

Sl. No.	Particulars	Channel-I			Channel-II		
		Producer	**Wholesaler**	**Retailer**	**Producer**	**Wholesaler**	**Retailer**
1	Packing	6.0	8.5	7.5	6.0	8.5	7.5
2	Loading and unloading	8.0	8.0	10.0	2.5	8.0	10.0
3	Transportation	15.0	20.0	35.6	0	45.5	35.6
4	Incidental charges	5.25	7.35	5.8	0	7.35	5.3
5	Commission charges to commission agents	62.5	0	0	0	0	
6	Storage cost	0	7.25	7.5	1.75	7.25	
7	Interest on working capital	2.0	12.5	1.5	1.50	13.5	
8	Office maintenance cost	0	15.75	0	0	15.75	
	Total	**98.75**	**79.35**	**67.9**	**11.75**	**105.8**	

Second importance was attached to shape. The average importance attached to it was 24.54 per cent. The square shaped jaggery was most preferred by the consumer with the utility value of 0.689, followed by the round shaped and bucket shaped with the utility values 0.29 and -0.98 respectively.

Purity of jaggery assumed an important value of 24.20. Its importance averaged at 24.20 per cent. Consumers preferred and they have ranked high quality and medium purity with utility values of 0.50 and 0.21 respectively. Least preference was given to jaggery with low level of purity (-0.71).

Least importance was given to the storage whose relative importance was 23.95 per cent. Among the various periods of storage of 1-2 month, 3-4 month and 5-6 months considered, consumers wanted a minimum storability of 1-2 months as reflected by the utility value 0.61. 3-4 months storability was next in order with an utility value of 0.36 followed by 5-6 months with a utility value -0.97. Consumers in general buy jaggery as and when it is required rather than storing for long period of time.

Production and Marketing constraints faced by jaggery processors

The quality of Jaggery depends on the quality of cane, infrastructure facilities available in the processing unit and manufacturing practices followed. Since it requires special care in storage, farmers normally dispose off immediately after manufacturing.

4.4.1 Production Constraints faced by the processors

Constraints faced by the farmers / processors were ranked by using garrett scores. The results are presented in table 4.16. Non-availability of labour for jaggery production is the first important

Table 4.14: General characteristics of consumers of jaggery

Sl.No.	Group	Number	Per cent (%)
I	**Age group**		
	a. Up to 20 years	2	6.67
	b. 21- 30 years	4	13.33
	c. 31- 40 years	10	33.33
	d. 41- 50 years	9	30.00
	e. Above 50 years	5	16.67
II	**Literacy group**		
	a. Up to SSLC	8	26.67
	b. Up to pre-university	12	40
	c. Graduate	10	33.33
III	**Family size**		
	a. Small (<=3)	4	13.33
	b. Medium (4-5)	17	56.67
	c. Large (>5)	9	30
IV	**Income group**		
	a. Rs. 6,000 to 15,000	16	53.33
	b. Rs. 15,000 to 25,000	8	26.67
	c. Above Rs. 25,000	6	20

Table 4.15: Consumers' preference for specific attributes of jaggery

Sl. No.	Attributes	Levels	Utility Estimate	Relative importance (%)
1	Colour	Black	-0.411	27.322
		Yellow	0.478	
		Golden	-0.067	
2	Purity	Low	-0.711	24.196
		Medium	0.211	
		High	0.500	
	Storage	1-2 month	0.611	23.946
		3-4 month	0.356	
		5-6 month	-0.967	
4	Shapes	Bucket	-0.978	24.537
		Round	0.689	
		Square	0.289	

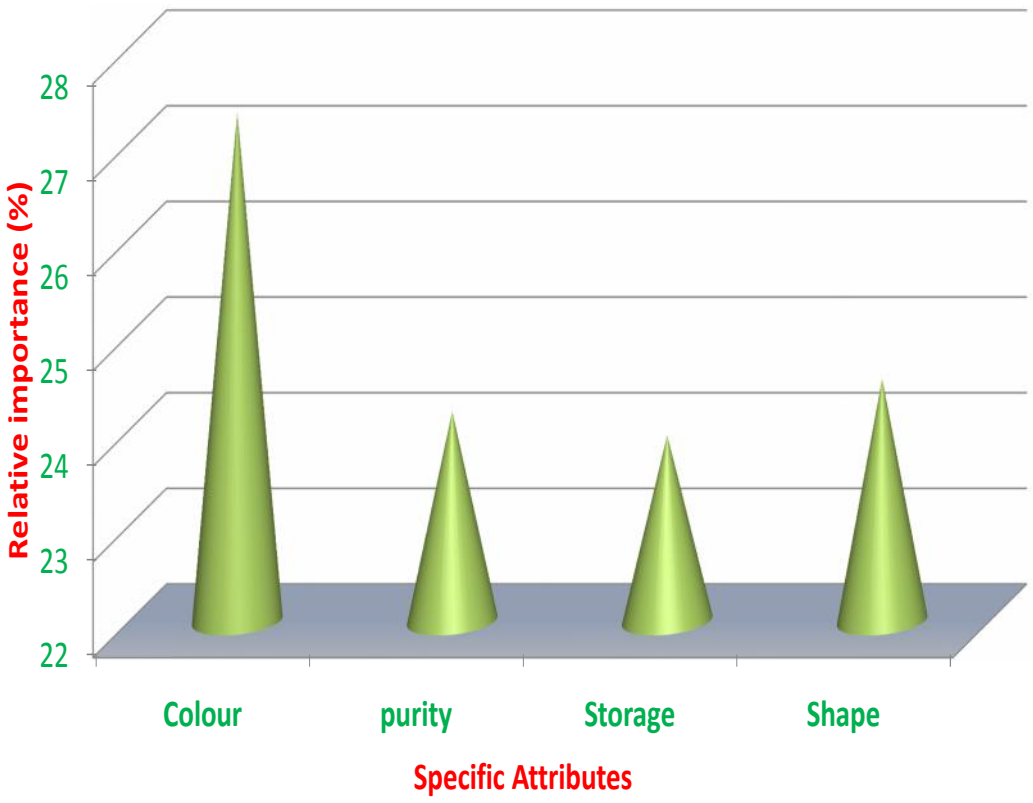

Fig.4 : Consumers' preference for specific attributes of jaggery

production constraint with a mean score of 80. Inadequate electricity supply to the processing units were considered as the second most important constraint with a mean score of 63.53. High initial cost, problem of drying bagasse, improper supply of sugarcane, complexity of problem in the production process, high wages of labours due to non-availability of skilled labours and insufficient water supply were assigned third, fourth, fifth, sixth, seventh and eight ranks with respective mean scores of 57.7, 56.8, 41.9, 35.6, 32.2 and 30.9 respectively.

4.4.2 Marketing Constraints faced by the processors

Constraints faced by farmers/processors in marketing are presented in table 4.17. Non transparency in jaggery transactions was the first most important marketing constraint with a mean score of 57. Low price during auction was considered as the second most important constraint with a mean score of 56.66. Management problem in market, less financial support by the banks and Exploitation by middlemen were ranked third, fourth and fifth with respective mean scores of 52.2, 45.6 and 44.8 respectively.

Table 4.16: Garrett scores of production constraints faced by processors

Sl. No.	Opinion	Mean score	Rank
1	Sugarcane	41.90	V
2	Bagasse	56.80	IV
3	Water	30.96	VIII
4	Electricity	63.53	II
5	Complexity of problem	35.66	VI
6	High initial cost	57.70	III
7	Non availability of labours	80.00	I
8	High wages of labours	32.23	VII

Table 4.17: Garrett scores of marketing constraints faced by the respondents

Sl. No.	Opinion	Mean score	Rank
1	Auction	57	I
2	Low price	56.6	II
3	Exploitation by Middleman	44.8	V
4	Management problem	52.2	III
5	Low financial support by banks	45.6	IV

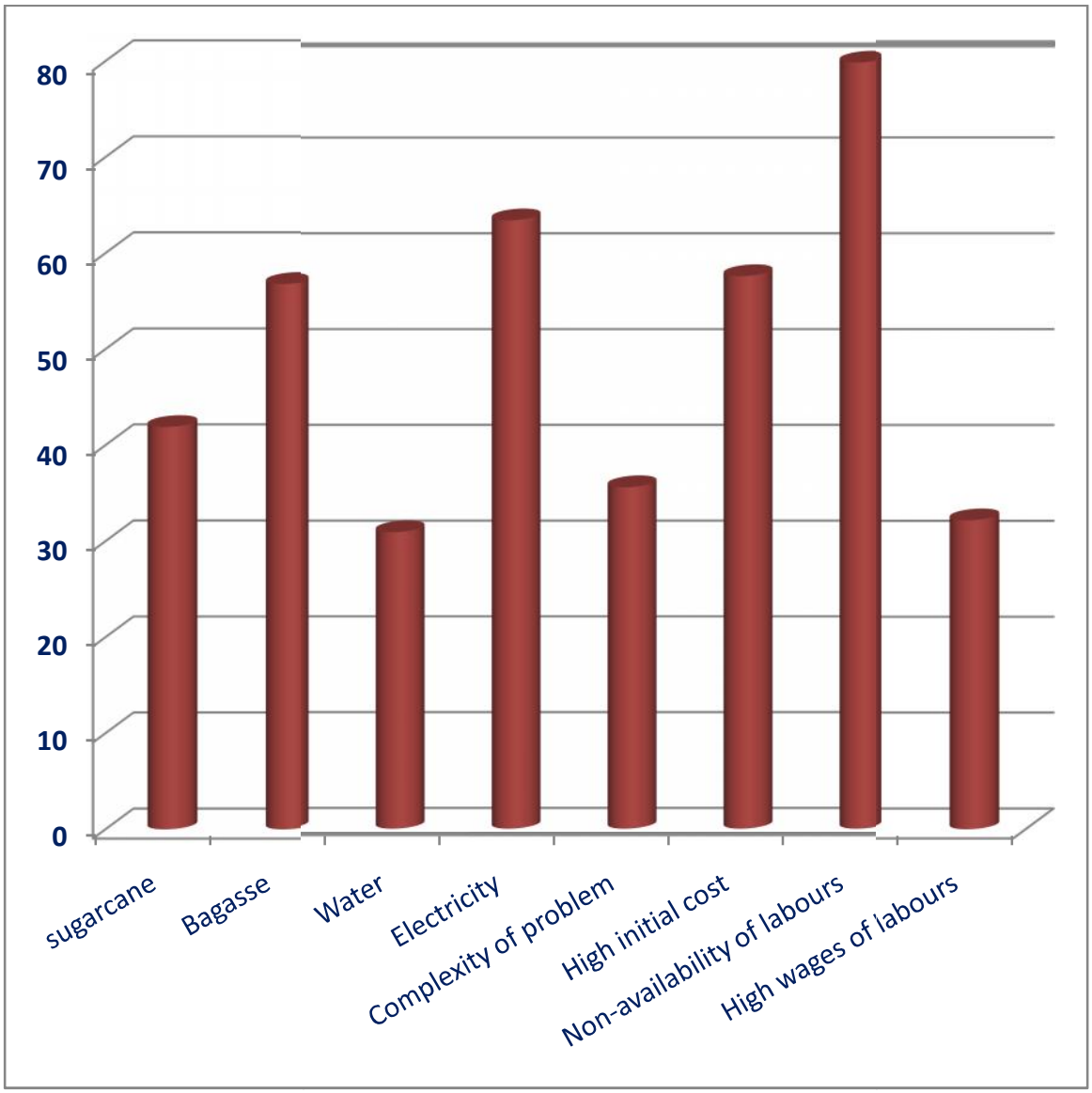

Fig.5 : Constraints faced by the processors in production

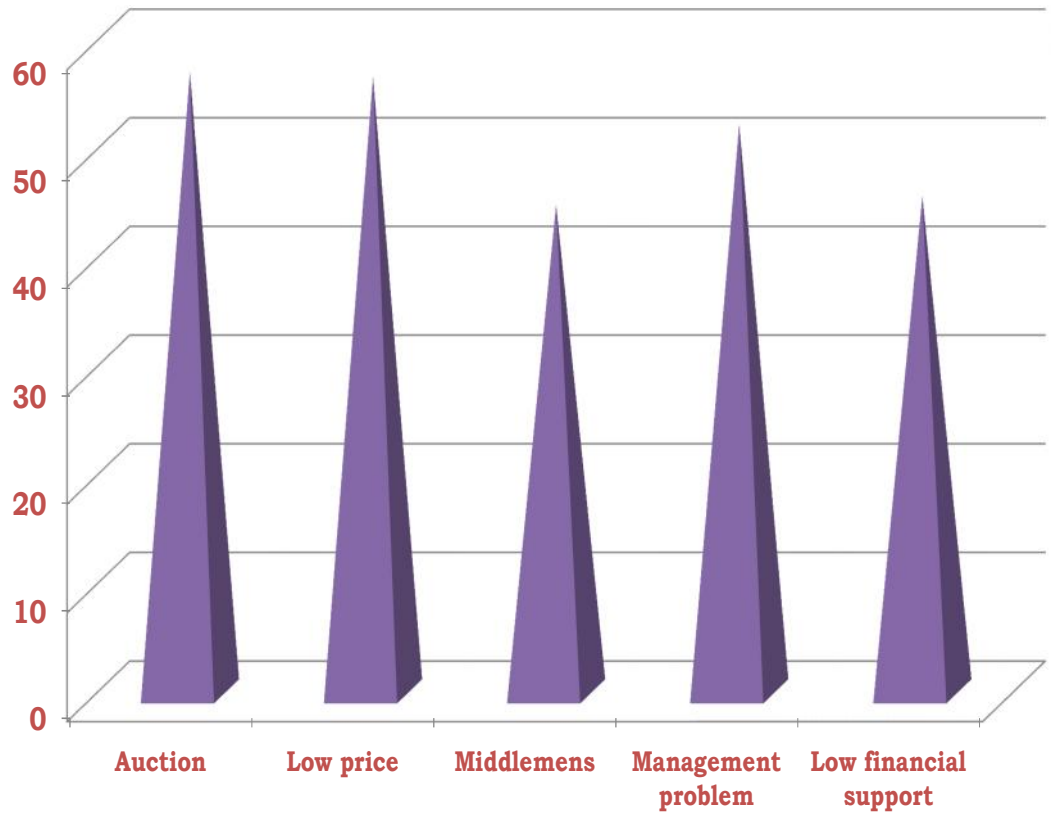

Fig.6 : Constraints faced by the processers in marketing

Discussion

CHAPTER VI

DISCUSSION

The results of the study presented in the previous chapter are discussed under the following broad heads.

5.1 Profile of jaggery unit and processors

5.2 Returns to investment in jaggery processing

5.3 Viability of investment on jaggery unit

5.4 Consumer preference for jaggery

5.5 Constraints in jaggery production

5.1 General characteristics of jaggery processors and unit

Socio-economic characteristics of farmers will have a bearing on different aspects of production and marketing decisions of sugarcane and jaggery. The socio-economic characteristics like age, education, family size and size of holding of the farmers in the study area were studied to understand the influence of these characteristics in motivating farmers to take up jaggery processing. Similarly the general features of jaggery processing unit are studied to gain general view of jaggery making in Mandya.

The results revealed that, 80 per cent of the processors are found in middle age group of 30- 50 years (Table 4.1). From this, it could be inferred that jaggery processing is continued as a tradition by these households. The number of units has declined over the years due to difficulty in getting skilled labour, fuel and assured quality and quantity of cane availability. It may be mentioned here that the processing of jaggery requires considerable investment. This has perhaps prevented the youngsters from taking up jaggery processing.

Although jaggery making is a mechanical process, education of the people is likely to help in eco-friendly production practices. Majority of jaggery processors (90%) had studied above high school level. (Table 4.2). About 10% per cent of the processors had an education level of up to secondary and some of them were illiterate.

Jaggery making is labour intensive as it involves a number of simultaneous operations in different wings of the production facility. The percentage of processors having a family size (Table 4.3) of four to ten was found to be maximum (70%) followed by one to three persons per family (16.7 %). The availability of labour in the study area was highly limited as observed in any other assured irrigation areas. From this, it could be said that to ensure the availability of labour during the peak period of crushing, persons capable of supplementing labour requirement through family labour preferred to establish jaggery processing units.

The size of land holding and extent of area under sugarcane determines successful operation of jaggery units. The results revealed that about 37.9 per cent of respondents have 5.01 to 10 acres of Sugarcane. The canal irrigation, well developed market and other geographical advantages has motivated processors to establish jaggery units in Mandya district. Sugarcane being a high valued crop, the processors preferred to meet major part of the cane requirement by growing cane on their own fields. Although three varieties of sugarcane is cultivated in the region, Co-419 is the most common as 2/3rd of farmers cultivated the same. (Table 4.4)

The average shed and yard area measured 4 gunta and 12 gunta respectively. Some processors maintained bigger yards in order to dry and stock huge quantity of Bagasse. The average daily cane crushing

was to the tune of about 13.72 tonnes which yielded approximately a tenth part as jaggery (table 4.5).

The supply of cane grown on the own field was 376.7 tonnes, while purchased cane amounted to 3024 tonne signifying the importance of dependence on purchased cane by the processors. The processors generally used two or three pans in order to speedup jaggery making process.

A majority of processors sold the produce in APMC (73.33%) as compared to on farm sale by 26.66 per cent of processors.

5.2 Returns to investment in jaggery processing

The investment details of jaggery processing, the cost of jaggery processing on per processing unit basis as well as per tonne basis were studied with a view to evaluate the feasibility of jaggery processing units. An attempt is also made to work out the breakeven level of output in jaggery processing units.

5.2.1 Initial investment on jaggery processing units

The average investment required for establishing jaggery processing unit with a capacity of one tonne per day is Rs.5,28,035. The share of shed in the total investment is maximum (52.96%) followed by investment on pan and crusher (Table 4.6). In most of the processing units, brick shed with cement plastering and with iron roof is observed. The size of shed depended on number of furnaces. It is noticed that all these processing units used one furnace and electrically operated crushers are used.

5.2.2 Cost and returns in jaggery processing units

The cost of sugarcane as raw material is the prime variable cost accounting for 73.76 per cent of total cost in jaggery processing (Table 4.7), labour charges accounted for about 6.6 per cent. Similar results were obtained by Rikar (1990) and Nagaraj et al. (1989) in their study on production and marketing of cashew and fruit processing respectively. Though as many as eight different chemicals/ materials were used in jaggery processing the expenditure on these chemicals/materials is negligible. It is noticed that processors use more than the required quantities of chemicals. This called for standardizing the methods of jaggery processing. The share of fixed cost in the total cost is about 1.49 per cent. From the findings, it could be said that, the cost of sugarcane played a major role in determining cost and return structure in jaggery processing units. The results further indicated that on an average 347.02 tonnes of jaggery is produced annually (Table 4.8). The net returns realized in jaggery processing is Rs.13,15,430. A rupee expenditure in jaggery processing resulted in a returns of Rs.1.2. these findings are similar to those reported by Rohal et al. (1989) in their study on Khandasari units. On an average 10 tonnes of sugarcane is needed to produce one tonne of jaggery. Thus, the recovery of jaggery is 10 per cent. Similar findings were reported by Raju and Ramesh (1989) in their study on jaggery processing.

The decision of whether to supp1y cane to the sugar mills or to process it into jaggery depended on many factors, mainly on the site price of cane, cost of processing of cane in to jaggery and the price of jaggery.

5.2.3 Cost per tonne of jaggery production

The unit cost of jaggery production helps processors in suitable decision on jaggery manufacturing business. The total cost of processing inclusive of raw materials worked out to be Rs.21,160 per tonne of jaggery produced (Table 4.8). The processor on an average realized Rs.1,980 net return per tonne.

5.3 Feasibility of investment in jaggery processing units

Feasibility of investment in jaggery processing units is evaluated with the help of discounted cash-flow techniques. It may be noted that establishment of jaggery processing unit has a very short payback period of 0.84 year (Table 4.10). The net present value of jaggery processing units at 12 per cent discount rate amounted to Rs.30,39,572 over the average economic life of 10 years. Positive and high net present values reiterate the profitability in jaggery production. The internal rate of return in jaggery processing is more than 100 per cent. It is mainly because positive net cash flows are generated within a year leading to higher IRR from the project. This revealed that the investment in jaggery processing units is economically feasible. Similar results were obtained by Teggi (1995) in Ghataprabha command area and Lohar et al. (2000) in Maharashtra on their study on jaggery processing.

5.3.1 Break-Even analysis in jaggery processing units

Break-even analysis reflects the minimum quantity to be produced to cover the cost of production. On an average the jaggery processing units are required to produce only 61.25 tonnes of jaggery to reach the break-even level (Table 4.11). It is interesting to note that on an average jaggery processing units are producing around 347.02 tonnes of jaggery annually (Table 4.9). The time period required to achieving break-even volume of output in jaggery processing units with the present level of

capacity uti1ization is on1y 45.8. However, on an average, the processing units in the study area crush for about 260 days in a year. This result showed that jaggery processing in the study area is profitable.

5.3.2 Channels in jaggery marketing

The marketing system for jaggery is similar to that of any other agricultural commodity. In the study region, processors take-up orders from wholesalers regarding the type of jaggery to be produced. It is also reported that the necessary chemicals are supplied by them to suit the upcountry market demand.

5.3.3 Magnitude of jaggery marketed through different channels

Three main channels are identified in the study area of which only two channels are popular in the study area as evident from the results (Table 4.12). It is noticed that about 26.66 per cent the processors sold bulk of their produce through channel-II (Producer->Wholesaler->Retailer->Consumer). This is mainly because on most of the occasions the wholesalers visited the processing site and purchased jaggery to distribute to upcountry markets. Further, they offered a little higher prices than that prevailed in the market. Contrary to this, in Mandya market, most of the processors (63.33%) preferred to dispose bulk of their produce through channel-I (Producer->Commission agent->Wholesaler->Retailer->Consumer). The processors in Mandya market, no doubt realized more price by disposing the produce through channel-I, but in the process they incurred marketing cost by way of transportation.

The marketing cost incurred by producer per quintal in channel-I is higher (Rs.98.75) than channel-II (Rs.11.75). This is mainly because farmers have paid commission charges and transportation charges. On the other hand cost incurred by wholesalers is more in channel-II

(Rs.105.8) compared to channel-I (Rs.79.35). It is because of the fact that, the wholesalers visited the processing sites and purchase required quantity of jaggery if there is demand from upcountry markets.

5.4 Consumer preference for jaggery

Preference studies are useful to delineate the most important product attribute of value to consumers. The general profile and preference rating are presented in this section.

Among the four different attributes, consumers preferred colour as most important attribute followed by shape with a relative importance of 27.3 and 24.5 per cent respectively. The changing food habit and mental attitude among urban consumers has lead consumers to attach higher importance for attractive colour. Purity of the produce the third import attribute with a relative importance of 24.19 per cent. On the whole it could be observed that all the four attributes carried almost equal importance weight age. (Table 4.15)

5.5 Constraints in jaggery production and marketing

5.5.1 Production constraints faced by processors

Constraints faced by jaggery processors/farmers in production of jaggery are presented in the table 4.15. Non availability of labour is one of the major constraints as viewed by 80 per cent of the processors. The processers supplement labour shortage by hiring migrant labourers from Uttar Pradesh apart from nearby Chamarajanagar and Yelandur taluks. Further, sugarcane is extensively cultivated in the study area and hence most of the available labour force is engaged in cane harvesting during peak season.

The second most important constraint is that of power cuts and insufficient power supply with a mean score of 63.53. This is one of the

important reasons for hesitation among the processors to take up processing.

The third most important constraint in production is High initial cost. Setting up a processing unit requires sufficient startup capital for purchase of land and machinery. The fourth important constraint is with respect to the difficulties associated with managing bagasse by way of drying and storing during rainy season. The other alternatives fuel like coconut husk and frond are more expensive. The type of furnace for jaggery making plays an important role in deciding the efficiency and quickness of boiling juice. Hence, it is very much essential to improve combustion and heat utilization efficiency of existing furnaces. Fuel use efficiency in traditional furnaces is very poor. In some cases farmers are using old vehicle tires and tubes as fuel source which emit toxic gases which are directly absorbed in the syrup, thus leading to inferior quality of jaggery. Similar results were reported by Shivaramu et al. (2002) in their study on jaggery units in Cauvery Command Area of Karnataka.

Quality and timely availability of cane assumed fifth most important constraint with a mean score of 41.90. Since during shortages, procuring cane from far off places add to the cost of transportation which inflates the cost of production.

The other constraints in production related to the complexity of managing the unit, high labour cost and water shortages for various operations (Table 4.16).

5.5.2 Marketing constraints faced by processors

The results from Garrett ranking indicate that the jaggery trade in APMC is not transparent as it is dominated by north Indian traders using signals. A majority of processors are unhappy with the method of sale but have no alternative.

Price fluctuation and low prices is the second major constraint with a mean score of 56.6, followed by management problem in the market with a mean score of 52.2. Fluctuation in the prices, faulty system of weighing, Delay in cash payments, long distance to markets and lack of market information were considered as major marketing problems. Cash payment after delivery of the commodity into the market it might 10-15 days for some processors, because they made payment only after the commodity was sold .but compare to sugar factories it is too early payment.

Difficulty in getting finance from the bank is ranked fourth with a mean score of 45.6. The entrepreneurs' complaint about bureaucracy and corruption as a hindrance in availing timely and adequate financial assistance from financial institutions.

Exploitation by the middlemen by way of charging higher than usual commission and unauthorised deduction is ranked fifth with a mean score of 44.8 (Table 4.17).

Summary and Policy Implications

CHAPTER VI

SUMMARY AND POLICY IMPLICATIONS

The basic function of marketing is not only to ensure remunerative prices for the producers and consumers but also to bring about synchronization between the demand for and supply of agricultural commodities. This function of marketing could be achieved only through adequate and proper, processing, storage, transportation and other market facilities. Processing is an important marketing function in the present day marketing of agricultural commodities. This is more so for crops like sugarcane wherein it undergoes a considerable weight reduction and value addition. Many technological changes have occurred in the processing of sugarcane in the recent past. The process of jaggery preparation has also witnessed considerable changes as a result of which jaggery industry is offering stiff competition to sugar industry. It is a fact that as much as 45-50 per cent of sugarcane produced in the country is being utilized annually for jaggery preparation. Further, it is estimated that two thirds of sweetening requirements in rural areas is met by jaggery. The jaggery industry in the country has thus, been continued to be an industry of great importance and significance.

In recent years the Indian sugar industry has found itself entangled in a complex web of problems of high stocks, low prices, poor profitability, high raw material cost, financial crunch, and weak international competitive edge. This has resulted in delayed and low payments to sugarcane supplied to sugar factories. Under such circumstances, diversion of sugarcane towards jaggery processing may give more benefits to farmers as jaggery prices are continually on the rise and only specific localities prepare jaggery. However, no systematic efforts have been made to improve jaggery industry. Hence, an attempt is made in the present investigation to examine the production and

marketing of jaggery in Mandya district. The study was undertaken with the following specific objectives.

Objectives

1) To assess the costs and returns in jaggery production
2) To evaluate the feasibility of investment on jaggery units
3) To assess the consumer preference for different types of jaggery
4) To identify the constraints in production and marketing of jaggery

6.1 Study area and sampling design

Sugarcane is grown extensively in 16 districts of the state. It is evident from secondary data that Mandya District ranks third in sugarcane production from an area of 28,233 hectares and production of about 14.743 lakh tonnes. Further, as many as 2000 Jaggery processing units are located in the district. Hence, Mandya District was purposively selected for further investigation on production and marketing of jaggery.

Although the crop is cultivated in almost all the taluks, keeping in view of the objectives of this study, Mandya and pandavapura taluk were considered for in depth analysis because large number of jaggery processing units are operating in these taluks. Further, of the 2000 Jaggery processing units located in the district as many as 600 units are operating in these taluks.

For the purpose of col1ection of primary data from Jaggery processors, three stage sampling design was adopted. Ten villages spread over each selected taluk were considered for the study. From each village, three sugarcane processors were selected randomly, thus, forming a total sample of 30 processors. The data pertained to the crop

year 2010-11, the required secondary data were also collected from consumers were selected for the study of consumer preference of jaggery.

6.2 Analytical techniques

The measures of central tendency were adopted for the estimation of cost and returns and marketing costs for which percentages were calculated and compared. Investment evaluation criteria were employed to measure the financial feasibility of processing units. The standard financial tests like Pay-Back Period, Net Present Value and Benefit Cost Ratio and Internal Rate of Returns were used for evaluating financial viability of processing units. To study the consumers' preference for quality attributes of jaggery, Conjoint analysis was applied. The constraints in production and marketing of jaggery was studied with the help of gerratte ranking technique.

6.3 Major findings of the study

1. Majority of the jaggery processors were found to be middle aged with high school education. About 70 per cent of the processors were having a family size of four to 10 members. Majority of the processors were found to grow sugarcane on an area of more than 5 acres.

2. In Mandya region majority of the farmers were cultivating Co-419 variety of cane followed by Co-62175 and Co-86073 sugarcane varieties for jaggery production. However, Co-920065 variety with a higher jaggery recovery (12%) is not popular in the region.

3. Majority of the units have adopted double and triple pan system for jaggery production.

4. The cost of establishing a jaggery processing unit with a capacity of one tonne per day was around Rs. 5,28,035. The investment on

processing shed, pans and cane crusher shared as much as about 85 per cent of the total investment.

5. The share of cane in total cost was estimated to be 73.76 per cent.

6. The return from jaggery processing unit was Rs. 86,75,417 with a net profit of Rs. 13,15,430.

7. The cost of producing one tonne of jaggery worked out to Rs. 21,160.

8. About 61.25 tonnes of jaggery was required to be produced by processing units to reach breakeven level. Hence, a processing unit should crush for a minimum of 45.85 days to reach the point of no profit or loss.

9. The Pay-Back period in processing units was found to be 0.84 year, with a Benefit Cost Ratio of 1.07, IRR more than 100 per cent and a positive Net Present Values indicating the economic viability of jaggery processing unit in the study area.

10. Majority of the processing units crushed sugarcane for a period of 7-8 months. The average crushing period was 260 days.

11. Three major channels in marketing of jaggery in the study area were identified. However, Channel-I consisting of Processors, Commission agents, Wholesalers, Retailers and Consumers was popular.

12. Consumer preference results showed that colour and shape were the major preferred attributes in jaggery with relative importance of 27.32 per cent and 24.53 per cent. Yellow coloured and round shaped jaggery was most sought after by consumers. All the four

important attributes, viz., colour, shape, purity and storability carried more or less equal importance value.

13. Garratte ranking was used to study the production and marketing constraints in jaggery processing. Non-availability of labours followed by inadequate supply of electricity to processing units was found to be the major constraints faced in processing.

14. The other constraints pertained to high initial investment, difficulty in managing Bagasse (fuel), quality and availability of sugarcane (raw material), high wages and insufficient water supply.

15. The major constraints in marketing of jaggery were, no transparency in price determination and low price offers and exploitation by middlemen.

Policy implications

The important implication of the study is summarized below.

1. Jaggery units are depending on electric power crushing sugarcane. The power supply in the study area was not only inadequate but highly erratic. Hence there is a need to ensure uninterrupted power supply on par with other industries.

2. Undertake research on priority basis for technology up gradation of jaggery units for increased efficiency and jaggery outturn.

3. New varieties with better jaggery recovery need to be promoted in this region.

4. The jaggery processors have to be educated regarding maintenance of hygiene and adherence to quality standards to make Indian jaggery export competitive.

5. Consumers have placed excessive importance on colour which is possible only with the addition of chemical agents in the processing. Therefore, consumer education on quality and promoting organic jaggery in a big way are necessary.

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CHAPTER VII

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Appendix

Appendix 1: District-wise areas under sugarcane in Karnataka (2005-2006)

Districts	Area under Sugarcane (ha)	Production (lakh tonnes)	Productivity (kg/ha)
Bagalkot	56598	5430578	101
Bangalore (Rural)	0	0	0
Bangalore (Urban)	93	7686	87
Belgaum	114181	9111644	84
Bellary	1932	249614	136
Bidar	24616	1449882	62
Bijapur	20604	1135280	58
Chamrajnagar	8665	716162	87
Chikkballapur	0	0	0
Chikmagalur	688	39870	61
Chitradurga	0	0	0
Dakshina Kannada	19	1570	87
Devanagrre	2679	310496	122
Dharwad	2869	174435	64
Gagad	178	14712	87
Gulbarga	7944	392434	52
Hassan	2659	270287	107
Haveri	2237	110508	52
Kodagu (Coorg)	0	0	0
Kolar	0	0	0
Kopal	417	34465	87

Districts	Area under Sugarcane (ha)	Production (lakh tonnes)	Productivity (kg/ha)
Mandya	22257	2664163	126
Mysore	5588	621106	117
Raichur	0	0	0
Ramanagram	936	89809	101
Shimoga	2625	229425	92
Tumkur	2063	170507	87
Udupi	10	826	87
Uttarakannada	1242	102651	87
Karnataka	281100	**23328110**	**87**

Source: Directorate of Economic and Statistics, 2006-07, Govt. of Karnataka