STUDIES ON STATUS AND PROSPECTS OF MILK SWEET MAKERS (*Halwai*) IN WESTERN MAHARASHTRA

A Thesis submitted to the
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722, DIST. AHMEDNAGAR,
MAHARASHTRA, INDIA

In partial fulfilment of the requirements for the degree

of

DOCTOR OF PHILOSOPHY (AGRICULTURE)

In

DAIRY SCIENCE

by

Kadam Vikram Sukhadev
(Reg.No. 08/42)

DEPARTMENT OF ANIMAL SCIENCE AND DAIRY SCIENCE

POST GRADUATE INSTITUTE
MAHATMA PHULE KRISHI VIDYAPEETH,
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APPROVED BY

Dr. J.N. Khedkar
(Chairman and Research Guide)

Dr. M.C. Ahire
(Committee Member)

Prof. B.K. Pawar
(Committee Member)

Dr. R.J. Desale
(Committee Member)

Dr. D.P. Kaledhonkar
(Committee Member)

DEPARTMENT OF ANIMAL SCIENCE AND DAIRY SCIENCE
POST GRADUATE INSTITUTE
MAHATMA PHULE KRISHI VIDYAPEETH,
RAHURI - 413 722, DIST. AHMEDNAGAR,
MAHARASHTRA, INDIA

2014

CANDIDATE'S DECLARATION

I hereby declare that this thesis or part thereof has not been submitted by me or other person to any other University or Institute for a Degree or Diploma

Place: MPKV, Rahuri (V.S. Kadam)

Dated: /07/2014

Dr. J.N. Khedkar
Ex. Professor,
Department of Animal Science
and Dairy Science,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra State (INDIA)

CERTIFICATE

This is to certify that the thesis entitled, **"STUDIES ON STATUS AND PROSPECTS OF MILK SWEET MAKERS (*HALWAI*) IN WESTERN MAHARASHTRA"**, submitted to the Faculty of Agriculture, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, M.S. for the award of the degree of **DOCTOR OF PHILOSOPHY** (AGRICULTURE) in **DAIRY SCIENCE**, embodies the results of a *bona fide* research carried out by **MR. KADAM VIKRAM SUKHADEV,** under my guidance and supervision and that no part of the thesis has been submitted for any other Degree or Diploma.

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

Place: MPKV, Rahuri (J.N. Khedkar)
Dated: /07/2014. Research Guide

Dr. B.R. Ulmek
Associate Dean,
Post Graduate Institute,
Mahatma Phule Krishi Vidyapeeth,
Rahuri - 413 722, Dist. Ahmednagar,
Maharashtra State (INDIA)

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Place: MPKV, Rahuri (B.R. Ulmek)

Dated: /07/2014

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"All power is within you,
You can do anything and everything,
Believe in that do not believe that you are weak.
Stand up and express the divinity within you"

- Swami Vivekananda

I think it is the matter of pleasure to glimpse back and remind the path one traverse, the day of hard work and perseverance. It is still great at the juncture to recall all the face and spirits in the form of teachers, friends, near and dear once. I would consider this work nothing more than incomplete without attending to the task of acknowledging to overwhelming help I received during this endure of mine.

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Place: MPKV, Rahuri

Date: /07/2014 (V.S. Kadam)

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ABBREVIATIONS

$	:	Dollar
%	:	Per cent
&	:	And
@	:	At the rate
₹	:	Rupees
≃	:	Approximately Equal To
B:C	:	Benefit Cost ratio
BIS	:	Bureau of Indian Standards
COB	:	Clot on Boiling
CPA	:	Consumer Protection Act
DCS	:	Dairy Cooperative Societies
e.g.	:	Example
etc	:	Et cetra
f	:	Frequency
FDA	:	Food & Drug Administration
FI	:	Food Inspector
Fig.	:	Figures
FSO	:	Food Safety Officer
FSS	:	Food Safety & Standard
FSSAI	:	Food Safety & Standard Authority of India
Ft.	:	Feet
g	:	Gram
GDP	:	Gross Domestic Product
GHP	:	General Hygienic Practices
GMP	:	Good Manufacture Practices
HACCP	:	Hazard Analysis of Critical Control Point
HRD	:	Human Resources Development
HSC	:	Higher Secondary Certificate
i.e.	:	That is
IAMR	:	Institute of Applied Manpower Research
ICMR	:	Indian Council of Medical Research
IS	:	Indian Standard
kg	:	Kilogram
KI	:	Key Informant
km	:	Kilometer

KVK	:	Krishi Vigyan Kendra
Lit.	:	Liter
LPG	:	Liquefied Petroleum Gas
m	:	Meter
Min.	:	Minutes
ml	:	Milliliter
MMPO	:	Milk & Milk Product Order
MPCC	:	Milk Plant Collection Center
MPKV	:	Mahatma Phule Krishi Vidyapeeth
MT	:	Million Tone
NARP	:	National Agriculture Research Project
NDDB	:	National Dairy Development Board
NDRI	:	National Dairy Research Institute
NGO	:	Non Government Organization
NSS	:	National Sample Survey
^{o}C	:	Degree Celsius
PFA	:	Prevention of Food Adulteration Act
QMS	:	Quality Management System
R&D	:	Research & Development
RT	:	Room Temperature
Sec.	:	Second
SNF	:	Solid-not-fat
Sq. ft	:	Square feet
Sq.km	:	Square kilometer
SSC	:	Secondary School Certificate
Std.	:	Standard
TQM	:	Total Quality Management
TS	:	Total Solids
UHT	:	Ultra High Temperature
VADPs	:	Value Added Dairy Products
WHO	:	World Health Organization

ABSTRACT

STUDIES ON STATUS AND PROSPECTS OF MILK SWEET MAKERS (*Halwai*) IN WESTERN MAHARASHTRA

by

Kadam Vikram Sukhadev

for
DOCTOR OF PHILOSOPHY (AGRICULTURE)
in
DAIRY SCIENCE
2014

Research Guide : Dr. J.N. Khedkar

Department : Animal Science and Dairy Science

The research work pertaining to the topic 'Studies on status and prospects of milk sweet makers (*Halwai*) in Western Maharashtra' was completed in the department of Animal Science and Dairy Science, Mahatma Phule Krishi Vidyapeeth, Rahuri during the period from February 2008- November 2013.

With objectives to study the socio-economic status, documentation of the technology used, prospects and the constraints faced by milk sweet makers. Consequently the data was collected from six district of Western Maharashtra (Jalgaon, Nasik, Ahmednagar, Pune, Satara and Kolhapur). Sixty respondents from each district were selected randomly. Disproportionate random sampling method was used to ensure a random selection of 60 milk sweet shops. Data were collected through interview schedule and data employed for statistical analysis.

Abstract contd..... **Mr. V.S. Kadam**

From the study it was observed that more respondents (sweet makers) were in urban areas. The majority of the respondents were middle age, educated up to higher secondary level. Over three-fourth sweet makers doing as main business, most of them migrated from other states especially Rajastan state of India. Also, they have not received any special training in respect to their business. All the shops registered under Shop Act License and majority of them registered under PFA and Shop Act. Over half of them have their own source of investment. Moreover, most of the respondents' borrowed loan from banks/credit societies. Over half of the milk sweet makers had hired shop and most of them purchased their own furniture and equipment. Manpower worked in shop was younger in age and educated up to secondary school level. They procured small volume of buffalo milk on volume basis either from producer as well as retailer/ vendor. Source of water for their daily requirement was municipality/Grampanchayat and LPG as main source of fuel.

Majority of them used buffalo milk for making *khoa* in open pan by heating milk based on their own experience and cool to it room temperature. *Pindi* type *khoa* and crystalline sugar was used for *pedha* making. Most of the *pedha* stored at room temperature. *Pindi khoa* along with crystalline sugar is used for making *burfi.* Most of the ingredients along with sugar are added in raw *khoa*. In case of *gulabjamun dhap khoa*, maida, baking powder, sugar syrup, and rose water were used for making of *gulabjamun*. Generally they used *dhap khoa* for making of *gulabjamun*. Respondent used the combination of *khoa, maida* and baking

powder nearer to the standard recommendation of it. *Vanaspati* ghee is used for frying *gulabjamun* and plastic container used for packaging of *gulabjamun*.

The majority of milk sweet makers used buffalo milk and *danedar khoa* for *kalakand*. Maximum milk sweet makers used crystalline sugar. Almost all milk sweet makers heated *khoa* by their experience for *kalakand* making. Majority milk sweet makers add sugar at raw *Khoa* stage. Milk sweet makers add dry fruits at raw *khoa* stage. *Kalakand* is stored at room temperature for a day.

Generally cow milk is used for making *channa and* buffalo milk used for production of *paneer* in particular. Citric acid used as major coagulant in production of *channa* and *paneer*. Milk sweet makers followed heating process by their experience. Also heated milk cooled to the temperature (71-80^{0}C) by their experience. Cent per cent milk sweet makers used muslin cloth for draining of whey. They were not carrying out any test for detection of adulteration. Addition to this they all are not interested or aware of carrying adulteration tests of milk or any other platform tests to assess the quality of milk procured by them.

Most of respondents established their shop away from polluted and slum area and monitored suitable layout and design of shop. They were careful towards cleaning and disinfection of equipment. Also we observed demand for Bengali sweets in urban/ semi- urban areas. The prices of these sweets

were higher as compared to *khoa* based sweets which are mostly sold in the village.

The food inspectors visit monthly to milk sweet shop. Milk sweet makers were interested in establishment of regulating authority/ apex body for technical guidance and policy support for this sector. Secondly, they would like to make advertisement of specific brand through media in particular locality, Also *halwais* believe that maintaining standards of basic nutrition and food requirement as per specification, majority *halwai* (86.11%) interested in increasing benefit cost (B:C) ratio.

Appealing notable outcome from the present study showed that none of the milk sweet makers were aware about newer technologies put forth by Food Research Institutes, Agricultural University, R&D department of cooperative sector and also no government institutes providing training for skill improvement in this business. All milk sweet makers informed that raw material price inflation, electricity problem, fluctuation in demand of milk products, increase in market competitor, unavailability of quality raw material, lack of availability of skilled labour etc were constraints faced by them.

1. INTRODUCTION

Dairying is acknowledged as the major appliance in bringing out socioeconomic transformation of rural poor in the country. It provides new avenues for employment, both direct and indirect, and improves the nutritional standard of populace. Dairy cattle/buffaloes have an immense contribution for sustainable rural development unlike crop which is seasonal, provides a stable, year round income, which is an important economic incentive for the small and marginal farmer, landless labour etc. to take up dairying. Around 70 million households are engaged in this sector (Aneja *et al* 2007). Milk plays a major role in reducing poverty and it is a source of nutritious food in rural and urban population. For the small scale producer, milk is a key element for household income and food security and is a regular source of income for rural families and their survival.

As milk is a nature's most complete food - practically the only foodstuff that contains almost all the different constituents known to be essential for human diet. No other single natural foodstuff meets the nutritional requirement better than milk. In a predominantly vegetarian population in India, milk and milk products form a major component of the human diet. Hence, Indians consume a glass of milk as an important beverage in their daily diet as nutrition point of view. However, it is quite a complex and perishable substance. It needs to be carefully checked and tested at each stage of the dairy food chain to ensure that consumers get milk and milk products that are safe and wholesome.

1.1 Indian milk production: present scenario

Food availability is a necessary condition for food security. India is more or less self sufficient in cereals but deficit in pulses and oilseeds. Due to changes in consumption patterns, demand for fruits, vegetables, milk products, meat, poultry and fisheries has been increasing over the period. Among the different food sectors, the growth in dairy sector has been commendable. It is not simple task to increase milk production from 17 million tones in 1950-51 to 127.8 million tones in 2011-12; it is forecasted that the milk production will touch 133 million tones in 2012-13. Increase in milk production boosted the per capita availability of milk to the population of the country. In year 1950-51, per capita milk availability was only 130g per day and today the national average is above the ICMR recommended level of 280g per day and is expected to reach 290g per day in 2013. The rate of growth in milk production is also substantially higher (3.6 %) than the world average (1.5 %). Dairy farmers, scientists, cooperative agencies and development departments have all played a pivotal role to reach this level of milk production in the country. The share of livestock sector in agriculture GDP is increasing mainly due to the enhanced rate of production in livestock sector especially for milk which accounts for 68.35 per cent of the value of output from livestock sector. As on date the value of output from livestock sector at current prices was about Rs. 3, 88,370 crore during 2010-11 which is about 23.9 per cent of the value of output of Rs.16,23,968 crore from total agriculture and allied sector. The contribution of milk alone (2,62,215 crore) was higher than paddy (1, 51,634 crore) and

sugarcane (58,470 crore) during 2010-11 (Kumaresan and Srivastava, 2013).

Formal dairy sector

The organized sector still remains a minor stakeholder and handles around 20 per cent of the milk whereas, the unorganized sector of the *dudhiyas* and *halwais* (milk sweet makers) still control about 80 per cent of the production, in which more than 80 per cent milk is utilized in manufacturing of various milk products and by-products. Being the world's largest producer and consumer of dairy products, India represents one of the most lucrative dairy markets (Anonymous, 2010a). This sector has so far not been able to take full advantage of these products, as its current marketing system does not permit the efficient distribution of short-shelf life products. The traditional milk product sector has the potential of emerging as well-structured segment of the dairy industry. Recently, a few organized dairies have started production of some of the commercially important dairy products on a large scale but their impact has been limited. Organized production and marketing would permit efficient distribution of these products to meet the needs of the consumers as well as ensure higher returns of rural milk producers in rural areas.

Informal dairy sector

In India, however, the term informal sector is of recent origin, and has been in use only during the last two decades. A number of studies have been conducted to assess the size and employment structure of the sector in different urban localities by agencies like; The Institute of Applied Manpower Research (IAMR), during the late eighties and early nineties. The first National

Commission on Labour, under the Chairmanship of Justice Gajendragadkari defined the unorganized sector as that part of the workforce who have not been able to organize in pursuit of a common objective because of constraints such as (a) casual nature of employment, (b) ignorance and illiteracy, (c) small size of establishments with low capital investment per person employed, (d) scattered nature of establishments and (e) superior strength of the employer operating singly or in combination. The unorganized sector of the *dudhiyas* and *halwais* (sweet makers) still control about 80 per cent of the production, in which more than 80 per cent milk is utilized in manufacturing of various milk products and by-products (Anonymous, 1987).

Halwai

The milk sweets making business is dominated by *Halwai*, an ethnic group found in India. *Halwai,* is the Arabic word which means sweet maker. They are also known as '*Mithaya*' in Madhya Pradesh, '*Guria*' in Orissa, '*Mayara*' in West Bengal and other names in other regions of the country. The '*Halwai*' name is derived from the word *halwa*, a popular sweet made of milk, flour, carrot, butter (ghee), sugar, almond, raisin and pistachio nuts and saffron (Anonymous, 2009a).

Traditional Dairy Products

Traditional dairy products and sweets are an integral part of Indian heritage. These products have great social, religious, cultural, medicinal and economic importance and have been developed over a long period with the culinary skills of homemakers and *halwais*. A variety of dairy products are made in our country. Some products are popular throughout the country, whereas,

others are region-specific. These products conserve and preserve milk solids for relatively longer periods. However, lack of proper infrastructural facilities, coupled with inadequate technological support has impeded the growth of this sector. Traditionally, Indian dairy products have been manufactured by individual sweet makers- "*halwais*" and small entrepreneurs.

Traditional Dairy Products

Heat desiccated products	*Khoa* : used as the base for preparation of *kalakand, gulab jamun, pedha*, and a variety of *burfis.* *Rabri* *Khurchan* *Pyodhi*
Heat and acid coagulated products	*Chhana* or *Paneer*
Fermented products	*Dahi* *Misti Dahi* (sweet *Dahi*) *Lassi/ Chhaas / Mattha* *Chakka* : base for *Shrikhand* *Shrikhand*
Fat rich products	*Makkhan* made from *Dahi* *Ghee* obtained from heat clarification of *Makkhan* or Butter
Concentrated products	*Kheer* *Payasam* or *Palpayasam* *Basundi / Rabri* Milk sweets / Delicacies – *Burfi* *Kalakand* *Gulab Jamun* *Pedha* *Rasgolla* *Sandesh* *Rasmalai*

Production and marketing of traditional milk sweets is mostly a small scale and scattered affair confined to the '*halwai* '(traditional sweet maker) shops in the local market. One reason for

this is their short shelf –life. The tiny scales of operation and non-organized retailing have resulted in lack of data on the size of traditional sweets market and its various parameters. The traditional sweet sector, which absorbs substantial proportion of milk production, has received little attention due to its concentration in the non – organized sector (Steven *et al.,* 2008).

1.2 Need of study

There is a great demand for sweets in India because of cultural significance in social functions like marriage ceremony, festivals etc. Moreover, sweets dishes are important part of the dietary pattern in India. Recently, some of the sweet makers have adopted modern manufacturing technology and produce packaged sweets in large quantity. Some of which are also exported to other countries with their specific brand names such as *Bikanery*, *Ghasitaram, Haldiram, Chandu, chitale, Dinshaw* etc. On the other hand, the Indian milk based sweets market is approximately estimated at 1million tones. Their market is not easy to estimate as these are manufactured at home or in more than 60,000 sweets making shops in India (Anonymous, 2009b). But other hand processing of milk under unorganized sector is always questionable from the point of view of cleanliness and hygiene, quality of raw materials and consumable end products. Also, from last decades some bad habits, serious issues etc. are coming forward in this sector and the expectation of populace from these sector is abridged.

Besides this, questions always arise in mind are what type of manufacturing technology is adopted by the sweet makers? How they procure the milk or source of milk? Which types of

packaging, storage, and marketing strategies are followed by them? What are the main constraints faced by them in preparing and marketing of sweets? And what are prospects for them in milk sweet making business? So also, limited documentation on milk sweet makers has been appeared to us. So some useful recommendations and modification in program would be possible from this investigation.

Present study has been planned with following mentioned specific objectives.

1.3 Objectives

i. To study the socio-economic characteristics of milk sweet makers.

ii. Documentation of the technology used by milk sweet makers for preparation of indigenous milk products.

iii. To study the prospects of milk sweet makers in Western Maharashtra.

iv. To study the constraints faced by milk sweet makers.

2. REVIEW OF LITERATURE

An apt and exhaustive review of literature from extensive resources is pivotal in research endeavour. Review of significant contribution made by researchers enable to enlarge, enrich and enlighten one`s thinking ability. The main functions of the review of literature are; to determine what work, both theoretical and practically, has already been done; assist in the delineation of statement of problem; provides a basis for theoretical framework, provides insight into methods and procedures used for conducting study and gives a rationale for interpretation of empirical findings. By considering the objectives of the study, this chapter is presented under following captions.

2.1 Socio-economic characteristics of milk sweet makers/*Halwai*

2.2 Procedure used by milk sweet makers for manufacturing of indigenous milk products

2.3 Constraints of milk sweet makers

2.4 Prospects of milk sweet makers

2.5 Role of government in promoting milk sweet maker

2.6 Adulteration of milk and milk products

2.7 Milk and milk product marketing

2.8 Milk and milk product hygiene and safety

2.1 Socio-economic characteristics of milk sweet makers

The socio-economic status describe the age, education, registration details of milk sweet shop, financial sources used for

establishment of shop, total capital investment, infrastructure facility and labour.

2.1.1 Age

Gupta and Panchal (2009) studied the extent of awareness and food adulteration detection in selected food items purchased by home makers. They observed that one-third of homemakers were less than or equal to thirty years of age, while half of the respondents were between 31 to 50 years of age group and 28 per cent of them were educated up to higher secondary level.

2.1.2 Education

Education has an intrinsic value and is seen as a desirable element for all sections of community in the civilization. It can also be an important tool for the under privileged since education is expected to provide more employment opportunities for them. Although the Indian constitution provides a right to education for all its citizens, the opportunities are not the same for everyone.

Hossain *et al.* (2005) informed about the dairy farmers in Rangpur district that highest (60 %) proportion of the farmers had higher secondary level education and nobody was found illiterate and under secondary education level.

Kabir (1995) conducted study on economics of crossbreed farm owners in Bangladesh and found that the average literacy rate of farm households in all farm categories was sufficiently higher than the national average. More than 76 per cent house numbers of family in all the farm categories had above

primary level of education. The crossbred farm owners had relatively higher level of education.

2.1.3 Occupation

Hossain *et al.* (2005) accounted the general information of dairy farm owners in Rangpur district. The results showed that the 57 per cent of the farmers had business as the primary occupation and the rest job seekers, agriculture etc. Moreover, they observed that 53 per cent of the farmers had taken dairying as a main business and the rest as side business.

2.1.4 Registration details of the milk sweet shop

Sharma and Rajput (2006) quoted that for quality production of dairy products it is essential to have regulation policy which was put into action under the government legislation sector for instance compulsory legislation i.e. MMPO Act 1992, prevention of food adulteration act 1954, standard on weights and measures (packaged commodities) rules 1977, export quality and inspection act 1963 etc. They had worked successfully to hasten the dairy sector in the global market and compete with the highest.

The Food Safety and Standards Authority of India (FSSAI) was constituted under FSS act for enforcing the food security and standard. In this act the animal feed, live animals, produce at farm level, plants prior to harvesting, drugs, medicinal products, cosmetics, narcotics or psychotropic substances are expelled from the act, Rajorhia (2012).

2.1.5 Financial sources

Rao and Esakkimuthu (2007) focused on the role of financial institutions; in dairy development for global markets. The financial institutions along with the government played a crucial

role in ensuring the credit delivery for a wide range of activities from production to consumption viz., setting up dairy farms, development of feed and fodder, establishment of processing units, cold chain, storage and marketing infrastructure. The Food Inspectors (FIs) also provide the credit for other integrated and important components of the activity such as training and quality certification systems thereby making the units ready to meet the standards for the global market wherein the quality is the mantra.

According to Technopak report, most of the cases they access to finance is only restricted to the purchase of milch animals rather than financing other tiers of the milk supply chain including procurement, processing, marketing and distribution (Anonymous, 2010b).

2.1.5.1 Capital investment

Singh and Kalra (2004) examined the dairy business of *halwais* in Meerut district of UP by way of their milk utilization and investment pattern, cost, returns and economic viability. The average milk utilized per unit was 166 lit/day with the initial fixed investment of ₹ 1.65 lakhs and ₹ 30,000 in owned and rented shops, respectively.

Deka and Patwari (2006) noted that the major cost involved in starting of a sweet manufacturing unit is construction of building (46 %) followed by cost of utensils (21 %) and furniture and fixture (24 %).

2.1.6 Shop size/ infrastructural details

2.1.6.1 Labour

Staal *et al.* (2008) studied the status of employment in milk marketing and processing. The data were collected from rural

milk producers and commercial farms and also informal milk processing and marketing units. Data related to both direct and indirect job opportunities created in the production, processing and marketing of milk were collected. The data on labour used in various operations and wage rate for the labours were collected. The data collection focused on the informal and locally processed channels, but included retailers of packaged pasteurized milk. These are the key channels for milk and dairy product flows, which reflect both traditional and formal markets, although not all are described in the employment data;

Producer – Consumer

Producer – Vendor – Consumer

Producer – Creamery / *Halwai* – Consumer

Producer – Vendor- Creamery / *Halwai* – Consumer

Producer – Vendor- Retailer – Consumer

Producer – Milk plants – Consumer

Producer – Ice Creamery – Consumer

Producer - Vendor – Milk Plants – Consumer

Producer – MPCC – Milk plant – Distributor – Retailer- Consumer

Among these, the direct Producer-Consumer channel, without any intermediaries, is still the predominant one in terms of market share, not only in the study sites, but also in India as a whole.

De *et al.* (2010) reported that in Rajasthan so many villagers were seen to move out of the village in search of work – there were *halwais* (cooks in sweet shops) who migrated from Saumli, workers from villages in Pali migrated to work in sweet shops in urban areas.

2.1.6.2 Employment

The employment status and type of employment of the sample respondents provide important insights into their life. Employment patterns and economic status of households are usually closely linked and education levels, too, often impact the pattern of employment.

2.2 Techniques used by milk sweet makers for manufacturing of indigenous milk products

2.2.1 Raw material used

Sharma (2012) recorded and reported the various practices to be followed by sweet makers to prevent chemical contamination of traditional milk sweets. He mentioned six major types of chemical contaminants in milk viz. adulterants, antibiotic residues, pesticide residues, heavy metal residues, mycotoxins and food additives (colours). Also gave tips on ways to prevent chemical contamination of milk through clean milk production, proper handling of raw milk, use of safe ingredients in milk products, ensuring compliance to HACCP and proper inspection. He emphasized on the use of clean raw materials for preparing traditional sweets which mainly include sweeteners [*gur* (palm sugar), *khandsari* (raw sugar), sugar, *bura* (finely ground sugar)]; grains [rice, *maida* (finely ground wheat flour), *suji* (semolina)]; nuts and seeds [(*badam* (almond), *kaaju* (cashew), *pista* (pistachio), *copra* (dried coconut meat used to extract oil), *khaskhas* (poppy seeds), *akhrot* (walnut), *kishmish* (raisin/currant]; flavoring and coloring agents [*gulabjal* (rose water), *choti elaichi* (cardamom), *kesar* (saffron crocus), cocoa]. He also informed that dairy animals are sometimes made to consume rations contaminated with aflatoxins

and their feed, at times, are contaminated with substances that lower the quality of milk. He also added that while antibiotic residues in milk are being found these days, to stop the harmful inflow of such harmful toxins therapeutic, prophylactic and growth promotion practices for milch animals are being followed. By following proper withdrawal period of 3–4 days, these practices would lead to the reduction of the percentage of such chemicals in the body of the animals. He explicated the flow of pesticides in the environment and in the food chain.

Deka and Patwari (2006) reported that the price of milk paid by the wholesaler was higher (₹15.00/lit in 2007-08) than that of small (₹13.50/lit) and medium traders (₹14.50/ lit). The price paid by the co-operatives was usually similar to the price paid by small milk traders. The margins in raw milk trading depend on several factors like distance, level of infrastructure, urbanization, availability of milk with respect to demand, purchasing power, tastes and preferences etc. Also noticed that the major suppliers of milk were wholesalers (33 %) and retailers (13 %) and commission agents (12 %). Share of dairy plants, sweet manufacturing unit and milk cooperatives were much lesser than the former.

Grace *et al.* (2009) studied how safety and quality of milk varied according to city of sale, point of sale, and processing method. In total 345 samples were taken, 202 in Guwahati and 143 in Jorhat. Points of sale were: shops, distribution points and door to door vendors. Distribution points consisted of sites on the payment where vendors set up in the morning and evening and sold milk from metal churns. Milk was categorized according to processing method as: ultra-heat treated milk (UHT), pasteurized

milk, and raw milk. The linear regression model showed a significant association between processing and point of sale and bacterial counts, but not between city of sale and bacterial counts. By categorizing according to point of sale and type of processing they were able to develop a hierarchy of risk, shown in table given below. Milk sold from shops and UHT milk was associated with lower levels of hazard and raw milk and milk sold by door-to-door vendors with higher levels.

Bacterial quality of milk samples in Assam according to processing and point of sale

Processing	Point of sale	Total bacteria (log)	Total coliforms (log)	n
UHT	Shop	3.1	0.0	120
UHT	Distribution point	4.7	0.0	3
Pasteurised	Shop	5.5	2.1	34
Raw	Distribution point	5.8	3.5	33
Raw	House-to-house vendor	6.1	3.7	144
Pasteurised	Distribution point	6.9	5.4	4

They compared the bacteriological quality of milk originating from different dairies. According to them milk from dairies within the state of Assam (local dairies=30) contained higher levels of total bacteria and coliforms than milk from dairies outside the state (n=134); other differences were not significant. However, UHT milk, which inherently has higher bacteriological quality, was produced only by dairies outside the state, and when compared pasteurized milk from local dairies with pasteurized milk from the one dairy outside Assam found the later had substantially worse bacteriological results. This is logical given the greater distance it

was transported. However, sample size was not large enough to show if differences between dairies producing pasteurized milk were significant. Adulteration with water was present in milk from all dairies. Among local dairies, there was considerable variation in adulteration with water (from 2 to 20 %). In all samples, total bacteria counts were correlated with coliform counts (associated with faecal contamination).

2.1.2 Different milk based sweet products manufactured by milk sweet makers

Pal and Raju (2007) observed that *khoa* was manufactured primarily by *halwais* in jacketed kettles, which inherently suffers from several disadvantages particularly the poor and inconsistent quality of the product. It has a limited shelf-life of about 5 days at 30^0C.

Mahalingaiah *et al.* (2007) stated that *kunda* is milk based indigenous delicacy popular in and around Belgaum area of Karnataka state. *Kunda* is being manufactured by *halwais* (Sweet makers) under unhygienic conditions. Presently, there are no standards for manufacturing and composition as such quality attributes are not properly documented. Buffalo milk is preferred for *kunda* manufacture.

Gayen and Pal (1991) mentioned that *rabri* is a partially concentrated and sweetened milk product containing several layers of clotted cream (*malai*). It is quite popular in northern and eastern parts of the country. Traditionally, it is prepared from milk at a very small scale by simmering whole milk for a prolonged period and adding sugar after achieving the desired concentration. It is generally manufactured by *halwais* and stored in open and shallow

type of container, which result in wide variations in composition and enormous contamination from surroundings.

They also developed a standard method of manufacture of *rabri*. It involved standardization of buffalo milk to 6 per cent fat, its simmering in a steam jacketed kettle at 90°C, repeated removal of clotted cream (*malai*) on the colder part of the kettle or to a separate container, concentration of milk to three fold after removing about 100 gm clotted cream from 1 kg milk and adding sugar @ 6 per cent of initial milk to the concentrated milk. The clotted cream was finally added to the concentrated sweetened milk and the product is stored at refrigeration temperature.

Pal and Raju (2007) reported that *dahi* is largely made at home using traditional kitchen recipes or in small scale at confectionary (*halwais*) shops involving milk of buffalos, cows and goats. However, buffalo milk is best suited for *dahi* having better sensory quality, particularly body and texture because of its inherent properties. At the consumer's household or *halwai*s' level, milk is boiled, cooled to room temperature, inoculated with 0.5 to 1.0 per cent starter (previous day's *dahi* or butter milk) and then incubated undisturbed for setting for about overnight. In cold weather, the *dahi* setting vessel is usually wrapped up with woolen cloth to maintain appropriate temperature.

Pal and Raju (2007) stated that *S. cremoris* in single or in combination with or without Leuconostoc species along with *Lactobacillus acidophilus*, *L. bulgaricus*, and *S. thermophilus* may be used for *dahi* preparation (IS: 9617, 1980).

Kumar (2007) reported that profitability of dairy products studied separately for two agro-ecological zones of

Haryana, was found to be the highest in case of *Ghee* (59.77 %) followed by *Khoa* (49.62 %) and the lowest in *Paneer* (20.03 %) in Eastern zone. The returns from *Ghee* in western zone were only 16 per cent.

According to National Dairy Development Board (NDDB) the unorganized dairy sector comprises numerous, small and/or seasonal milk producers/ traders (popularly known as '*halwai*') not registered under the MMPO. They handle 10,000 litres of milk per day or less. They are involved in selling raw liquid milk, boiled liquid milk as well as manufacturing and selling mainly indigenous milk products like *pedha, burfi, rasogulla, khoa, paneer, ghee* etc., usually at the local level, but have a major share in these milk products. There are no official records on number of such unorganized dairy units. (Anonymous, 2009b)

2.2.3 Prices of Milk sweet products

Singh and Kalra (2004) stated that total manufacturing cost per kg of sweets decreased very marginally with increase in size of production. Among the *khoa* and *channa* based sweets, share of profit was highest from *kalakand* (24.50 %) in *khoa* based and *rasogulla* (53.57 %) among *channa* based. Analysis of the data further revealed that net returns obtained in conversion of milk into *khoa* and *channa* based sweets was 6.05/litre

Thakare *et al.* (2006) studied the quality of vendors' milk sold in ten tahesils of Yeotmal district. It was observed that total solids content of vendor's milk revealed the lowest value for Yeotmal tahesil was 7.6 per cent and the highest 9.8 per cent with an average 8.53 per cent.

2.2.4 Manufacturing procedure of milk sweet: Organized dairy sector/ laboratory Standardized techniques

Rajorhia (2012) commented the local traditional sweet makers and street food vendors to the various aspects of HACCP that are used in traditional dairy products in India. He explained 12 steps in sequence relating to HACCP (codex guidelines) and briefed on the physical, chemical, biological and quality hazards in traditional dairy products. He also mentioned the general principles of food hygiene and good manufacturing practices.

Ranjan and Bangabash (2006) reported that as a part of its effort to add value to the business, Mother dairy identifies, develops, tests and transfers products and process technologies. Regional preferences are an important basis, for developing products and their manufacturing processes. In addition equipments have been designed and commercialized for manufacturing indigenous milk products like *shrikhand, paneer, khoa, lassi, gulab jamun, mishti doi* and curd as well as popular western products like ice-creams and cheeses. In developing process, product and equipment technology, emphasis is placed on maintaining high quality standards. To check milk quality, test kits have been developed. NDDB also provides services for analysis of dairy product samples.

Pal and Raju (2007) stated that traditional dairy products, apart from being an integral part of Indian heritage, have great social, religious, cultural, medicinal and economic importance. In addition to preservation of milk solids for a longer time at room temperature, manufacture of traditional dairy products add value to milk and also provide tremendous

employment opportunity. Owing to the inherent qualitative and quantitative differences, most of these products, particularly *ghee*, *khoa*, *paneer* and *dahi* have higher yield and better quality when they are made from buffalo milk. On the other hand, some of these products such as *chhana* and *rasogulla* are of superior quality when they are made from cow milk. Most of these traditional dairy products are well characterized and the method of manufacture has been standardized using mechanized or semi-mechanized systems.

Khedkar *et al.* (2007) stated that *burfi* is one of the *khoa* based Indigenous milk products. Varieties of *burfi* are prepared with additives (fruit, nuts etc.) and sold in the market; consumed by the people. Fruits like mango, orange, coconuts are being used extensively in the *burfi* by the *halwais*. No special mention has been made about the use of fruits like papaya, sapota and wood apple in the literature, reviewed. Use of these fruits not only attracts the consumer's acceptance but, also improves the nutritional status of the products through value addition. The Wood apple *burfi* prepared with addition of 20 per cent wood apple pulp and 45 per cent sugar, secured top score (89.67) and was rated "liked very much" by the panel of judges. Controlled sample (plain *burfi*) scored (87.96) significantly ($P<0.05$) lower than that of wood apple *burfi*.

Kumar and Paul (2007) reported that *phirni* is a cereal based indigenous milk product, commonly consumed in western UP and Hyderabad but popular in country wide. Commonly buffalo milk is used for *Phirni* preparation. Rice in the form of paste @ 4 per cent, ground sugar (12 %) and green cardamom powder (1 %)

are added to milk and cooked (85±5°C) for 20 minutes and poured in earthen pot, cooled at room temperature for setting. It is there after kept at refrigeration temperature (4°C) for 30 minutes before serving.

Kulkarni and Reddy (2007) reported a wide variety of traditional dairy foods prepared across the country by adopting processes like condensation, fermentation, clarification, desiccation either singly or in combination. Some of the common dairy foods produced in the country are *pedhas, halwas, payasams, kheers, burfis, chhana* based sweets, *kadhi* etc. Some of these products are produced during special events like marriages, birthdays and other auspicious occasions. The production of many of the traditional foods is cumbersome and time consuming. Attempts have been made to produce and present these products in the form of ready-to-eat and ready-to-use convenience foods. The ready mixes category falls into the category of ready-to-use form and several traditional foods are available in this form and offers convenience of use to the end user. Some of the popular products in this market of estimated size of 200 million US $ (₹ 800 crores) are the jamun mix, badam mix, kheer mix, basundi mixes, dalia dessert mixes etc. The convenience mixes can be prepared by dry blending, tray drying, vacuum tray drying, roller and spray drying, osmotic dehydration and crystallization drying process. Some of the products developed by the above processes are like payasm mix, dehydrated *kadhi*, jowar – milk based porridge mixes, dalia dessert mixes *kheer* mix etc.

Sawhney (2007) explained the need of specific processing requirements for equipment development for traditional

Indian milk products. Concerted efforts have been made at this institute to design equipments for different categories of users and a number of presentable prototypes have been developed. The requisite engineering design inputs could be delineated as preheating, concentration, scrapping of equipment surface, mixing and blending of ingredients and milk-metal-air contact for producing characteristic mild cooked flavour in indigenous dairy products. Sometimes several of the above operations are to be carried out simultaneously in the same processing vessel.

2.2.5 Packaging material used for milk sweet products

In case of atmospheric exposures, contamination with yeast and molds and aerobic spore formers become inevitable. Packing in properly cleaned and sanitized utensils or other packages also lead to the additional shelf-life.

Chandra (2005) stated that successful attempts have been made to increase the shelf-life to one to two weeks from two to three days earlier in selected sweet categories like *badam burfi* (Haldirams), *kesar pista* (Amul) etc; even multinational companies had introduced innovation of blending product design of Western pastries with *khoa*-based sweets marketed as "*Mithai- Magic*" and position it for corporate gifting. The packaging developments will continue to play an important role in favorably influencing consumer's preferences and achieving greater market penetration. The products packaging has helped in enhancing the shelf-life and achieve a higher market penetration for products like *rasogulla, shrikhand and gulabjamun*. The extension of shelf-life through innovative packaging gives an edge for organized sector to have their market share for traditional sweets over the non –organized

sector by giving consumer ample space for choice of selection with regard to quality and brand equity.

It has been stated [Anonymous, (2001)] that about 12.00 per cent of the marketed milk is represented by packaged and branded pasteurized milk. Further, marketed milk and milk products are packaged in the form of glass, metal, paper, plastics material.

2.2.6 Storage technology and shelf-life

Sharma and Zariwala (1976) studied storability of *shrikhand* and *chakka,* and they observed that the deterioration of organoleptic quality of these products were faster at 37^0C than at 10^0C.

Katre (2001) reported that the requirement of storage conditions of following major milk product.

Milk product storage requirements

Sr. No.	Products	Temperature of Storage (^{0}C)
1	Butter	below 2.0
2	Cheese spread	below 0.0
3	Cheese	below 4.0
4	*Paneer*	below 4.0
5	*Paneer*	below -18.0
6	*Shrikhand*	below -18.0
7	Chocolate	15 to 24.0
8	WMP/SMP	cool and dry
9	Ghee	cool and dry
10	*Pedha*	15 to 24.0
11	Milk	below 5.0

2.3 Constraints of Milk Sweet Makers

Kulkarni (1979) opined that the lack of sufficient milk collection of cooperatives in the rural areas, malpractices in weight and quality testing, inconvenient timings of milk collection, spoilage during the rains, and warm seasons and inadequate extension services were some of the constraints in milk collection from the producers.

Deka and Patwari (2006) stated that seasonal variations in production occur mainly due to a) local climatic conditions, b) availability of fodder, c) occurrence of floods and c) terrain (plains or hills). The field study suggests that production of milk is higher during the months from October to March as a result of easy availability of dry fodder, grazing land and crop by- products like rice polish, rice bran and broken rice during this period.

Patil (2002) stated that traditional dairy products have played a significant role in the economic, social, religious and nutritional well being of our people. The market for Indian milk products is estimated to be of the order of ₹ 250 billion. This fact underlines the significance of traditional dairy products in the national economy. In spite of such a great importance of traditional dairy products in our country these products are still produced manually in the small sector with variable quality depending on the skill of *Halwai*

2.4 Prospects of Milk Sweet Makers

Deka and Patwari (2006) studied the seasonality demand of dairy products by conducting primary survey and revealed that demand is very high from January to April followed by May to August. They stated that during January-April there is

number of festivals including marriage ceremony owing to which demand of milk products is high. While, during May-August demand of milk is relatively less in absence of any religious or social festival, although demand for milk products like *Dahi* and Ice-cream increases due to hot climatic condition.

Ganguli (1995) studied the high income elasticity effect on demand of dairy products. He reported that the in addition to the 210 million Indians who are lacto-vegetarians because of religious and cultural reasons, it is estimated that a further 300 million Indians cannot afford meat products and would, therefore, have to depend upon milk and milk products for their dietary protein requirements.

According to Nair (1987) effect of income elasticity on consumption pattern estimated that of the 30 per cent animal protein consumed in India, 70 per cent comes from milk. It is estimated that 10 per cent of the Indians with the highest per capita incomes consume 30 per cent of all milk produced in India and that 30 per cent of the Indians with the lowest income consume 10 per cent of all milk produced in India

Staal *et al.* (2008) studied the cultural significance of milk in the India where a large proportion of population is lacto-vegetarian. The demand for milk and dairy products is income elastic, and growth in per capita income is expected to increase demand for milk and milk products, and urbanization and changing food habits, lifestyles have also reinforced growth in demand for dairy products. Further, per capita consumption of milk is 1.5 times higher among the urban households compared to rural households. Nevertheless, the per capita consumption of milk

has been increasing faster in the rural areas. During 1983-1999, the consumption of milk increased by 71.00 per cent in rural households and 63.00 per cent in urban households. This suggests that though urbanization would remain a key driver of demand, sustained growth in rural income would increase rapid growth in rural demand for livestock products.

According to Saxena (2000) with the relatively high income elasticity; the demand for milk and dairy products is expected to grow rapidly. A study conducted by using National Sample Survey (NSS) data for 1993-94 showed that the income elasticity of demand for milk and milk products is higher (1.96 % national level) in rural areas (ranging from 1.24 % in Punjab to 2.92 % in Orissa) than in urban areas (ranging from 0.99 per cent in Punjab to 1.78 per cent in Bihar).

Income/expenditure elasticity of demand for milk in India

Scientists	Rural (%)	Urban (%)	Demand for milk by 2020 (million tons)
Radhakrishna and Ravi (1992)	1.15	0.99	-
Gandhi and Mani (1995)	1.70	1.06	-
Kumar (1998)	-	-	126.0 - 182.8@
Saxena (2000)	1.96	1.32	85.7#
Delgado *et al.* (2001)	-	-	132.0
Dastagiri (2001)	1.36	1.07	147.21

Note: #: Estimates for 2007-08; @: Estimates based on 4 % growth in GDP (126.0), 5 % growth (142.7) and 7 % growth in GDP (182.8)

Further increases in per capita income and changing consumption patterns would lead to acceleration in demand for milk and other livestock products in India and thus would give a

boost to this sector. Some other estimates are shown in above Table.

Rizvi (2012) focused on the emerging patterns of food consumption, future trends and consequences. He listed a number of factors responsible for the transfer of farm products to market. He emphasized on market intelligence, quantity and quality of food items, state-of-the-art technologies, harmonized standards and regulations, infrastructure, trained manpower, science and emerging technology centers and incubators and capital for developing and promoting traditional and novel products. He said that ensuring both quantity and quality at the same time is the weakest link in this chain and this could be ensured through efficient co-operatives, contract farming, manufacturers, small and medium enterprises, etc. Also, he discussed extrusion technology and explained how high pressure processing (cold pasteurization) is better than heat processing in terms of the quality of produce. He mentioned six important steps followed during new product development viz. idea generation, market intelligence, competition analysis, product formulation, product testing methods, process development and commercialization.

Singh (2012) emphasized on medicinal value and the important role played by authentic Indian sweets in a typical Indian household and gave a quick overview of increased awareness among the consumers on the low calorie traditional Indian sweets. Stressing on the importance of a healthy and nutritious diet, he pointed out sugar and fat as two important factors for increased calories in traditional sweets. He acquainted the audience with the low fat products, fat replacers and sugar

replacers available in the market. He also provided various ways to develop low calorie traditional Indian sweets by using commercial artificial sweeteners and fat replacers.

Rai (2012) highlighted the significance of traditional dairy products in the Indian context and stressed on the need to educate sweet makers on the international standards of food processing. He underlined the prospective market of Indian traditional sweets in the international arena and added that there is a need to standardize the various processes involved in sweet making and packaging for promoting export. He gave an overview of the history and different aspects of traditional dairy products in India.

Kumar *et al.* (2006) mentioned that over the last 10 years, the demand for sweets have increased as much higher pace than any other milk products. Earlier, sweets were available only in tea stalls but now plenty of sweet stalls have come up to sell only different verities of sweets. These stalls are running good business in urban centers and became the major consumer of fresh milk. The study suggests that the trend will further continue in the years to come and it may serve as a growth engine for the milk sub-sector. Presence of sweetmeat manufacturing association in the surveyed areas of the state including Guwahati city is very feeble, and there are only few associations sporadically found in Guwahati, Jorhat or Barpeta town. In Guwahati, there is a sweetmeat manufacturing association called “Brihattar Guwahati Mithai Byabasaai Samiti” with a member of about 410 sweetshops owners.

Grace *et al.* (2009) stated that India is an excellent example of how to target the demand for traditional products to help grow the formal processed market. The last 10 to 15 years have seen a large growth in supply of traditionally processed products, such as *paneer.* Additional support and attention can be given to this process, which allows strong demand for traditional products to be better met.

Kumar and Staal (2010) reported that for increasing farm-level production and productivity there will be need of more improved animals, improved fodder/feed technology, and access to livestock services. Smallholders' access to reliable markets to absorb more milk at remunerative prices may remain a critical constraint. Also they stated that the organized marketing of milk in Assam remains insignificant, despite efforts in the past to develop and promote collective market mechanisms. Formal pasteurized milk and dairy product channel, both cooperative and private, account for only about 3 per cent of the total locally-produced marketed milk. The traditional market, either for fresh liquid milk or importantly, for traditional products such as sweets, thus accounts for about 97 per cent of the market opportunities for farmers. For smallholder producers in areas with poor market access-there are likely to be no alternative market options, besides the traditional market. Developments in the traditional market will be extremely important for the Assam dairy sub-sector, and a set of interventions that could facilitate improvements in that market could complement the ongoing efforts to develop cooperative organized milk markets.

2.5 Role of government in promoting milk sweet maker

Food Safety and Standard is mandated to lay down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption.

Kulkarni and Murthy (1997) presented the review of present food laws relating to milk products in India. Subjects discussed included in his review were milk standards, standards for milk products, tailor-made products, additives, sampling, publicity, quality certificates and licensing.

Vyas (1997) listed the documents on dairy policies and summary of the world dairy scenario in an overview for the Indian dairy industry. The list includes demographic, socioeconomic, technological and legal aspect, measures to be taken to enhance production and quality of milk were discussed and an agenda for achieving improvements has presented.

Bhalla (2001) discussed the challenges of the dairy industry in terms of quality which includes Quality Management Systems (QMS), Total Quality Management (TQM), ISO-9000 series, food safety standards, Environmental Management System (IS0: 14000), quality of raw milk, combating adulteration of milk, and upgrading quality of testing and analytical laboratories.

Uppar (2007) noted that various measures to safeguard the consumer interest through legislation have been taken by government of India. Some of them were Essential Commodities Act 1955, Agricultural Products (Grading and Marketing) Act 1937, Drugs Act 1940, Drugs Control Act 1954, Standards Institutional Certification Marks Act 1952, Prevention of food Adulteration Act

1954, Standards weight and Measures Act 1956, and Consumer Protection Act 1986, etc. The notable one was Consumer Protection Act (CPA) of 1986. This act provides establishment of Consumer Protection Council at state and central level for promoting and protecting the rights of consumers. It also provides for redressal of consumer complaints and grievances. But lack of awareness about the redressal machineries, their own rights and responsibilities as a consumer is some of the major problem among the Indian consumers. Therefore, efforts must be made to disseminate consumer education through lectures, seminars, dramas, pamphlets and through mass media and make the consumers aware of the various goods and services available, the unscrupulous, fraudulent and unethical business practices and make them conscious of their own rights and responsibilities. So consumer education is necessary, since it helps the consumers to decide on the purchase of any product, price to be paid in relation to quality, durability and service.

Srivastava (2011) stated that National Dairy Research Institute is the premier Institute for R and D and Human Resource Development (HRD) in the country. The Institute's endeavours to conduct frontline research on all aspects of dairying, to develop new technologies for increasing milk productivity have contributed significantly in ushering the "White Revolution" in the country.

Grace *et al.* (2009) stated that it is possible to categorize milk actors into different group with respect to the risk they are likely to pose to consumer health. Further, studies would be needed to see if these trends are stable over time and, in the case of dairies, larger samples are needed to evaluate the statistical

significance of differences between groups. Currently, most government attention is paid to the sub-groups which present least risk. This type of analysis can present a case for focusing more inspection and extension activities on raw milk and informal sector channels. The study also gives insights which might not otherwise be available.

Food Safety and Standards Act (FSS Act, 2006) narrates the preservative used in the case of samples for analysis of any milk including toned, standardized milk, skimmed milk *channa*, cream, ice-candy, *dahi*, *khoa* or *khoa* based, *channa* and *paneer* based sweets, such as *kalakand* and *burfi*, chutney and prepared foods, *gur* in liquid or semi-liquid form, prepared coffee and prepared tea, shall be the liquid commonly known as "formalin" that is to say, a liquid containing about 40 per cent of formaldehyde in aqueous solution in the proportion of 0.1 ml (two drops) for 25 ml or 25 grams. In case of samples of ice cream and mixed ice cream, the preservative used shall be the liquid, commonly known as formalin, that is to say a liquid containing about 40 per cent of formaldehyde in aqueous solution in the proportion of 0.6ml for 100ml or 100gms. Wherever any preservative is added to a sample, the nature and quantity of the preservative added shall be clearly noted on the label to be affixed to the container.

2.6 Adulteration of milk and milk products

Milk is essential for nourishment and sustenance of life. Adulteration of milk cheats the consumer and can pose serious risk to health in some cases. Adulteration is either intentional by either removing substances from milk or by altering the existing natural

properties of milk knowingly. Unintentional adulteration is usually attributed to ignorance's, carelessness or lack of facilities for maintaining milk quality. Adulterant means any material which is or could be employed for making the food unsafe or substandard or mis-branded or containing extraneous matter. FSSAI, (2012).

Zagade (2012) reported that the Food and Drug Administration (FDA), Maharashtra, has commenced a state-wide campaign against milk adulteration. Accordingly, around 20,000 litres of adulterated milk in Sangli district and recently in Mumbai (Khar region) of about 450-500 litres of milk," he said, adding that the findings had been discussed with the FSOs in a meeting. It has been found that the milk was adulterated with water and caustic soda (a preservative), it was repacked and resold to small dairy spots, and the truck drivers or owners concerned did not possess a license or registration. Not only this, but also the places where the milk was distributed did not ensure hygienic condition and many a times they were located near drainage. Further, it was also found that the milk was sold in packets without proper labeling and printing or even sold with no clarity in mentioning the "best before." The ones which were meant to be "not to be sold" were also distributed illegally to the sellers and that the rejected milk packets by one of the dairy spots would be purchased by the other in the scenario. Therefore, the FSO would inspect all the check-nakas of the city and the tankers would now need to produce valid documents for the same. Further, all the distributors of milk should possess the list of those milk suppliers and other details. Soon a meeting would be called in order to alert the dairy industry with the Rule 26 of the new law. All those spots, which would be

identified by the FSOs as places of adulteration, hereafter would destroy the repacked milk. And the manufacturers shall now possess the list of all the details of the FSOs of their respective regions in case of emergency. Further, the FSOs would now take up routine inspection of milk in every region, twice a month.

Jagdale (2012) stated that BIS should set new standards for food retail in hygiene and processing. In order to ensure quality and best practices at par with global standards in the food retail sector, the Bureau of Indian Standards (BIS) will soon be launching three new standards in terms of management, hygiene practices and processing of food. The BIS initiative of finalizing Indian standards on basic requirements for street food vendors is also a notable move. With growing popularity of street foods in India and increasing importance of nutritional security it was critical to ensure safety in the entire street food chain. However, another step which was vital was to increase awareness and sensitize the food retail companies and street vendors on the importance of maintaining quality and safety in the entire food value chain by adhering to good hygiene and manufacturing practices. The new standards to be launched would include IS 16019:2012 for basic requirements in food retail IS 16020:2012 for good hygiene and food safety management, and IS 16021:2012 for good manufacturing practices in food processing.

He further informed that the Food Safety and Standards Authority of India compiled a survey to inspect loose and packaged milk in major Indian states. Findings showed that Gujarat failed miserably with 89 per cent of samples not conforming to standards. Gujarat, where India's white revolution began to achieve self-

sufficiency for the country in milk production, also saw urban samples fare badly when compared to samples collected from rural areas. All 85 per cent of the samples collected in the cities did not meet the quality standards regarding the desired Solid Not Fat and fat content as mentioned on the cover. This was due to dilution of milk with water, the body said. Skimmed Milk Powder, used to artificially increase volume of milk, was also noticed in a few samples.

Conferring Mudambi and Rajgopal (1985) adulteration may be intentional or unintentional. The former is a willful act on the part of adulterator who intended to increase the margin of profit. On the other hand, adulteration may be incidental contamination, which is usually due to ignorance, negligence or lack of proper facilities. Also, the causes of adulteration may be availability of too many products in the market, poor buying practices of consumers, consumer mentality of bargaining, consumer psyche, and availability of adulterants.

According to Sundaram (1985) it is true that, adulteration primarily thrives in a period of shortages. The consumer's real income is falling due to rising prices of even essential commodities. Psychologically, consumers pay less attention to the quality of products during this period. Now a day, "Adulteration is health menace". Thus, food adulteration takes many forms: mixing, substitution, abstraction, concealing the quality sale of decomposed foods and using false labels. The pity is that the so-called modernization has brought with it, the evils of adulteration. Somehow, the Indian consumer has become

accustomed to live with adulteration. Even educated consumers do not pay attention to the menace of adulteration.

Roday (2002) tested food samples at various Public Health Laboratories in the state of Maharashtra during the year 1993. According to him he found that in small cities Jalgoan, Nanded and Jalna the percentage of adulteration is very high compared to bigger cities viz. Nagpur, Pune, Amaravati, Solapur etc.

According to lab test conducted by Food Technology and Quality Control Department, over 66 per cent of the samples were found contaminated. It said that 40 per cent of ghee in the market was contaminated with vegetable fat and high concentration of fatty acids, while 27 per cent of ghee in the market was contaminated due to the use of low quality raw materials. The review thus reveals that the research work on enhancing awareness of consumers related to adulteration and its detection are sporadic. Although efforts have been made to detect the percentage of food adulteration in number of cities big and small, none of the study deals with knowledge and awareness of women (homemaker) about food adulteration. That is why investigator found it is necessary to generate awareness among the homemakers about the existing food adulteration practices of the retailers and manufacturers and equip them with simple household test for detecting adulteration.

Wadekar *et al.* (2011) collected the milk samples from government milk scheme, Nanded in three different seasons viz., summer, rainy and winter. A total number of 120 samples were collected and analyzed for different adulterants. Twenty per cent in summer,12 per cent in rainy and 3 per cent in winter samples were

found to be adulterated with sugar, 2 per cent milk samples during rainy season were found to be adulterated with starch, 8 per cent in summer,4 per cent in rainy and 3 per cent in winter samples were found to be adulterated with salt, 8 per cent in summer,18 per cent in rainy and 7 per cent in winter samples were found to be adulterated with carbonates or bicarbonates and 12 per cent in summer,10 per cent in rainy and 2 per cent in winter samples were found to be adulterated with formaldehyde. None of the milk samples were found to be adulterated with urea, fertilizers and hydrogen peroxide.

Pal (1963) conducted a survey in Ludhiana city and observed that 15.90 per cent adulteration as out of 4597 samples of milk.

Tariq *et al.* (2008) reported that preservatives like hydrogen peroxide, formalin and various antibiotics are also added to preserve milk. He also mentioned that urea adulterated milk is very harmful to the girls as it hastens up the puberty.

Loudon and Irvine (1986) said that milk used by the people for consumption is adulterated to such an extent that there is very less nutritive value in it and may also be toxic for public health.

Lateef *et al.* (2009) said that milk dealers maximize their profit margin by three ways dilution, extraction of valuable components like milk fat which is removed as cream, addition of cheap substances like starch to increase the value of total solids up to a level which is acceptable by the consumers. In our country raw milk is distributed by a traditional system which involves

middlemen called Gawalas. These middlemen (Gawalas) used to adulterate milk to maximize their profit.

Haasnoot *et al.* (2004) stated that milk adulteration, poor hygiene, malpractices, lack of preservation technology, cooling facilities and sanitation conditions are the main causes of losses in quantity and poor quality of milk.

Tariq (2001) reported that urea adulterated milk is very harmful to the girls as it hastens up the puberty.

Walker *et al.* (2004) said that some adulterants like detergents are used to enhance the cosmetic nature of milk. When water is added in milk its foamy appearance diminishes, so to give milk a foamy appearance artificially detergents are added in it. Hair removing powders and urea are added for whitening milk and giving it a genuine look. Only few grams of urea are enough to bring milk in its original state.

Gale and Hu (2007) conducted study in China milk dealers watered down milk due to high demand and limited supply. Then added synthetic powders to increase the protein value, hydrogen peroxide and gentamycin as preservatives, vegetable oils to increase the fat value. Microbial contamination of milk was also high because only 20 per cent of the small scale backyard farmers use disinfectants priorer to milking. This decreases the shelf-life of milk. This adulterated milk increased the number of patients with kidney stones.

Ahmad (2009) collected three hundred milk samples from three different localities in Sudan and observed for adulteration with water, starch and the values of their total solids were also determined. It was found that more than 95 per cent

samples were found adulterated with water and 35.5 per cent with starch. None of milk sample has total solids according to standard values.

Wangala and Wafula (2007) stated that in Kenya pasteurized and raw milk samples were analyzed for adulteration of antibiotics and hydrogen peroxide. About 23.5 per cent pasteurized milk samples were found positive for H_2O_2 and 23.7 per cent for antibiotics. In raw milk samples, 5.58 per cent for H_2O_2 and 19.3 per cent for antibiotics were positive.

Afzal (2010) stated that various utensils are used in dairy farming but buckets and cans are more commonly used in collection of milk.

Gwin *et al.* (2009) reported the chemicals which are being used as adulterants in milk have the following effects on the health of consumers. Formalin causes vomiting, diarrhea and abdominal pain. Larger doses may cause decreased body temperature shallow respiration, weak irregular pulse and unconsciousness. It also affects the optic nerve and cause blindness. It is one of the potent carcinogens.

Ali *et al.* (2005) reported that hydrogen peroxide damages the stomach cells, which can lead to gastritis and inflammation. The octylphenol and nonylphenol parts of detergents cause effect on sperm production.

Baumgartner *et al.* (2005) said urea causes pain in lower abdomen, irregular heartbeat, muscle cramps, numbness and weakness in hands and feet, chills and shivering fever. Urea also causes increase in bleeding from uterus.

According to Rideout *et al*. (2008) high amounts of starch may cause diarrhea due to the effects of undigested starch in colon. Its accumulation in the body may prove very fatal for the diabetic patients. High amounts of carbonates/bicarbonates in the body potentially disrupt hormones signals that regulate development and reproduction.

See *et al*. (2010) noticed that boric acid causes nausea, vomiting, diarrhea, kidney damage, acute failure of circulatory system and even death.

Sharma and Poonia (2012) illustrated a number of ways to detect adulteration in milk using urea, detergent, starch, formaldehyde, cane sugar, sodium chloride etc. to the trainees. They demonstrated the different ways in which one could use the mini kit available at various companies as well as NDRI for detecting milk adulterants.

It is cited, food is a major source of hazards to human health and food-borne disease is globally the single most common illness. In India, it is estimated that 20 per cent of deaths among children under five are caused by diarrheal disease (WHO 2006), 70 per cent of these being associated with unsafe food or water (Unnevehr and Hirschhorn, 2000). In most developing countries, food safety systems are dysfunctional and, despite increasing concern from consumers, India is not exception. A recent internet discussion pointed out that regulation isn't working, adulteration is widespread, testing inadequate, corruption rampant, rules not effective or followed and there are major hygiene and safety problems in all areas of food production and retailing (Anonymous, 2008).

According to Garg (2009) every fifth sample taken from sweet shops this year had been found adulterated in India. He said that samples failed the test were of milk, *khoa*, cheese and curd. In all these cases, the department has launched legal proceedings against owners of the sweet shops, he added. The data is related to samples taken since January. Ten samples taken in November failed. He said, some of the dairies and sweet shops that provided such samples enjoy a lot of consumer trust. A UT official stated that a distinction needed to be made between adulteration by way of adding harmful elements and acts like mixing water in milk.

Afzal *et al.* (2011) reviewed adulteration and microbial quality of milk transported by gawalas to consumers and processing plant in Pakistan and he observed they don't follow proper clean and hygienic condition during transportation, they also adulterated milk by several chemicals. In addition to this various preservatives were added in milk to increase its perishability.

2.7 Milk Marketing

Deka and Patwari (2006) studied that the key market agents that involved in milk marketing are milk vendors, wholesalers, retailers, milk collection centers, sweet manufacturing unit, dairy plants, chilling plants etc. The traditional market agents/milk vendors are the dominant players in the marketing of milk and milk products in Assam with a minor presence of organized sector.

Kumar (2007) reported that the producer's share in consumer's rupee (where milk marketing agencies involved) was observed to be highest and the price spread was lowest in case of

milk marketing channel- Producer-*Halwa*i-consumer, and hence, this channel was considered to be most efficient where milk-marketing agencies were involved in Rajasthan. It was found that the urban population of Karnal is making more than half of the per capita expenditure on milk and milk products on value added dairy products (VADPs).

Kumar (2007) reported the economics of milk marketing in Jaipur District of Rajasthan. It was observed that 45 per cent retained milk was converted into ghee and remaining 35 per cent and 20 per cent consumed as liquid milk and converted into curd, respectively. The unorganized sector was dominating and collecting 77.77 per cent of the total marketed surplus whereas in organized sector, milk producer's co-operatives societies procured only 20.23 per cent of total marketed surplus. The producer's share in consumer rupee was highest in direct sale of milk to consumer due to absence of milk marketing agencies. The producer's share in consumer's rupee (where milk marketing agencies involved) was observed highest and the price spread was lowest in case of channel- Producer-*Halwa*i-consumer, and hence, this channel was considered to be the most efficient where milk-marketing agencies are involved. Among different milk marketing agencies, milk vendors were preferred by the households as they picked up milk from their door step and gave advance/loan to the producers as and when required. There was special preference for *Halwai*s to sell milk because of maintaining a good relation with households. The households preferred to sell milk to the dairy cooperative societies and the direct consumers because they got higher prices.

Kumar (2007) also presented the economic analysis of milk products manufacturing units in Haryana. The analysis of data revealed that the average total investment by the ice-cream manufactures in Eastern zone was made to the tune of ₹ 4, 96,450, which was lower than that in the Western zone (₹ 9, 29,267). The highest investment was worked out on machinery followed by small equipments and furniture and fixtures in both the zones. The average investment of creameries was worked out to be ₹ 43,806 in Eastern zone and ₹ 30,572 in Western zone. The highest amount of investment was made on machinery followed by small equipments and furniture and fixture in both the zones of Haryana. The cost of manufacturing a litre of ice cream was worked out and varied for different varieties of ice cream between ₹ 18.68 to ₹ 22.89 in Eastern zone and between ₹ 24.70 to ₹ 29.32 in Western zone. The variation in the cost of manufacturing was mainly due to the variation in the price and quality of different types of flavours used in different varieties of ice cream. The raw material cost was the highest in the total cost of manufacturing ice cream, which, ranged from 81 to 84 per cent. The share of variable costs was worked out in the range of 97.16 to 97.68 per cent and the share of overhead expenses ranged from 2.32 to 2.84 per cent in different verities of ice cream. The total cost of manufacturing one kilogram of *Ghee*, Butter, *Paneer*, *Dahi* and *Khoa* in the Eastern zone was worked out as ₹ 93.89, ₹ 60.19, ₹ 70.81, ₹ 14.37 and ₹ 56.81, respectively. The cost of manufacturing *Ghee* was worked out to be ₹ 137.59/kg. The profitability of dairy products was the highest in case of *Ghee* (59.77 %) followed by *Khoa* (49.62 %) and the lowest in *Paneer*

(20.03 %) in Eastern zone. The returns from *Ghee* in western zone were only 16 per cent.

2.8 Milk and milk product hygiene and safety

Milk hygiene means making sure milk is clean and safe for consumption.

Grace *et al.* (2009) reported that food safety is a major problem and of increasing concerned in developing countries. They presented a case-study from Assam, North East India, illustrating 3 key elements of risk-based approaches in the context of the informal dairy sector. In Assam, the last step of the pathway (house-to-house vendor to consumer) was where risk increased most for raw milk; while, for milk sweets the holding time of the prepared sweet was critical. Participatory risk analysis posits that building on indigenous knowledge will be more effective than top-down solutions and we looked at indigenous risk management that is the existing practice that reduces risk. They found a range of good practices among all actors. Consumers had the highest level of good practice. They also examined the relation between good practice and low bacterial counts and were able to identify the practice most associated with safe production. This case study shows that risk-based approaches can be usefully applied in informal markets in developing countries.

Grace *et al.* (2009) stated that the physical quality of milk was assessed using an ultrasonic analyzer, which measured added water, fat, and solids non-fat. Milk safety was assessed by total plate counts and total coliform counts using dehydrated media. Total plate counts are a non-specific measure of poor milk

handling while the presence of coliform bacteria indicates milk has been contaminated by human or animal faeces.

Grace *et al.* (2009) surveyed and found numerous good practices used by actors in each step in the milk value chain. Some practices were used by the majority of actors (e.g. wash hands before milking; discard milk unfit for human consumption). Other good practices were used only by a minority, (e.g. wash hands between milking; sieve milk to remove gross contamination). Conventional hygiene assessment tends to focus on what is being done rather than what is being done well and participatory learning and action theory shows that this is less effective than taking the starting point of people's knowledge and competencies and building on this. Indigenous practices and technologies can often be quite effective at decreasing risk and have the added advantage of being 'pre-adapted' for the context in which they are used. When different groups of actors are compared it can be seen that consumers have the highest observance of good hygienic practices and farmers the lowest. However, this reflects a greater number of practices identified for other actors and more homogeneity of practice within the consumer group. Interestingly, nearly all consumers boiled milk before consumption. This will eliminate risk due to living bacteria, which cause many serious milk-borne diseases including brucellosis and tuberculosis.

Grace *et al.* (2009) reported that sweet shops also varied considerably in the number of good practices followed. A total of 73 good practices were observed and grouped under: personal hygiene, food preparation, cold holding, food storage, cleaning and sanitizing, utensils and equipment, garbage management and pests

and hygiene of sweet-selling area. Shops which produced sweets of good or moderate quality had a median score of 42 per cent while those producing sweets of poor quality scored 20 per cent; the difference was highly significant, despite the small sample size (10 shops), indicating a powerful influence of hygienic practice on safety of milk sweets (p=0.04). Comparing shops with good food safety outcomes and those with poor showed greatest difference in the areas of selling area hygiene, ingredient storage, cold storage and cleaning regime, suggesting efforts to improve sweet-safety and focus on these control points.

Grace *et al.* (2009) assessed risk-amplifying practices: and revealed that one of the most important being nearly all milk (95 %) is boiled before consumption. Also able to identify those practices which had most impact on food-safety outcomes, allowing the development of risk-based extension messages.

Das *et al.* (2011) studied the consumption pattern of milk and milk products of Indian people and their importance in human diet for the overall development and well being. Milk products are consumed by 77.5 per cent of rural and 88.7 per cent of urban households. The average monthly per capita expenditure on milk and milk products is ₹ 60 and ₹ 107 in rural and urban areas, respectively (NSS 64th round). The demand for milk and its variants in India is increasing rapidly due to population growth, rising income and urbanization and the increased output is mostly absorbed within the country itself. However, the quantum and forms of consumption vary significantly due to the differences in the purchasing power of different socio-economic classes, their taste and food habits, resource endowments and milk availability in an area over time.

3. MATERIAL AND METHODS

Research methodology is the description, explanation and justification of various methods of conducting research. It may be understood as a science of studying how research is done scientifically. In it, we study the various steps that are generally adopted by a researcher in studying the research problem along with the logic behind them.

3.1 Locality of study

3.2 Sample and sampling technique

3.3 Development of data collection instrument

3.4 Collection of data

3.5 Variables and their empirical measurements

3.6 Operationalization, scoring and categorization of independent variables

3.7 Statistical technique used for analysis of data

3.1 Locality of study

The Western Maharashtra representing one of the leading regions for milk and milk production in Maharashtra, and comeing under the jurisdiction of Mahatma Phule Agricultural University, Rahuri was purposely selected for study. Among the western region of Maharashtra six districts, which covered wide geographical area viz., Kolhapur, Satara, Pune, Ahmednagar, Nasik and Jalgaon were selected for the present study.

3.1.1 Kolhapur

The district is located in south western Maharashtra. This is located between 16°42’ north latitude and 74°16’ east longitude. It has an elevation of 569 metres (1867 ft). By road,

Kolhapur is 228 km south of Pune, 615 km north-west of Bangalore and 530 km west of Hyderabad.

3.1.2 Satara

The Satara district of Maharashtra occupied an area of 10,484 km². The district is located between 17°42' north latitude and 74°02' east longitude. The district of Pune bounds it to the north, Raigad bounds it to the North-West, Solapur the east, Sangli to the south, and Ratnagiri to the west.

3.1.3 Pune

Pune district is located between 18°31' north latitude and 73°55' east longitude. It is bounded by Thane district to the northwest, Raigad district to the west, Satara district to the south, Solapur district to the southeast, and Ahmednagar district to the north and northeast.

3.1.4 Ahmednagar

Ahmednagar district lies between 19°05' north latitude and 74°48' east longitude. It is situated partly in the upper Godavari and partly in the Bhima basins. The district has boundaries of Nasik district on the north, Aurangabad district on the north-east, Beed and Osmanabad districts on the east, Solapur district on the south and Thane district on the south-west. Total geographical area of Ahmednagar district is 17, 412 Sq. Km which contributes to 5.54 percent of the total geographical area of Maharashtra state.

3.1.5 Nasik

Nasik district lies between 20°02' north latitude and 73°50' east longitude. Nashik is located in northern Maharashtra at 600m (1968 ft) from the mean sea level. Nashik or Nasik is a city in

Maharashtra, India. Nashik is the fourth largest city in Maharashtra as well as the fourth fastest developing city of India and 16th fastest growing city of the world. It is located in the northwest of Maharashtra; district has an area of 15,530 Sq. Km. It is bounded by Dhule district to the north, Jalgaon district to the east, Aurangabad district to the southeast, Ahmadnagar district to the south, Thane district to the southwest, Valsad and Navsari districts of Gujarat to the west, and The Dang district to the northwest.

3.1.6 Jalgaon

This district lies between 21°05' north latitude and 75°40' east longitude. It is bounded by Madhya Pradesh state to north and by the districts of Buldhana to east, Aurangabad to the south, Nashik to the south west and Dhule to the west. The total geographical area of Jalgaon is 11, 765 Sq. Km.

3.2 Sampling technique

The Western Maharashtra representing one of the leading regions for milk and milk production in Maharashtra, and coming under the jurisdiction of Mahatma Phule Agricultural University, Rahuri was purposely selected for study.

Thereafter, 360 sweet makers (*Halwai*) were selected randomly by adopting disproportionate sampling technique i.e. 60 from each district. While selecting the *Halwai*, criteria was fixed to select such *Halwai* who had completed minimum 5 years period of business. The rationale behind it was to achieve the main objective of study. The study aims to assess the socio economic status of *Halwai*s, and also to inspect the type of manufacturing technology adopted by them for preparation of products, the way of procuring

the milk or source of milk, types of packaging source/material, storage, marketing strategies followed by them. In consequence, the present study constitutes 360 *Halwai* as a sample composition.

Table 3.1 Distribution of milk sweet makers according to their locality

Sr. No	District	Survey area						*f* (N=360)
		Urban		Semi-urban/ Town/Tahasil		Rural		
		f	%	*f*	%	*f*	%	
1	Jalgaon	20	33.33	29	48.33	11	18.33	60
2	Nashik	33	55.00	19	31.66	08	13.33	60
3	Ahmednagar	20	33.33	31	51.66	09	15.00	60
4	Pune	35	58.33	16	26.66	09	15.00	60
5	Satara	25	41.66	30	50.00	05	8.33	60
6	Kolhapur	27	45.00	23	38.33	10	16.66	60
Total		160	44.44	148	41.41	52	14.44	360

3.3 Development of data collection instrument

There are number of methods and techniques used for data collection in social science. It includes interview schedule, participatory methods such as Key Informant (KI) Interviews and observations are used frequently to collect qualitative as well as quantitative data based studies. Mostly scientists are conducting domestic survey with the help of well designed interview schedule.

Therefore, by considering the objectives of study, a separate interview schedule was developed. The interview schedule so developed was discussed with the experts in dairy science, extension education, and the advisory committee members. Considering their valuable suggestion, appropriate amendments were incorporated wherever needed to bring out truthful responses. Appropriate instructions were also incorporated at required places

in the interview schedule to elicit the accurate responses. Besides, the interview schedule was converted into Marathi language, which ensures easy understanding of the milk sweet makers. Further, this schedule was pretested in non-sample area. The data was thoroughly examined to exclude ambiguous words, vagueness and complexity of questions. Accordingly, necessary changes were made in the schedules and same were used for final data collection from sample.

3.4 Collection of data

The Chairman of Advisory Committee issued the letters for giving co-operation and appropriate response to this research endeavor. The researcher contacted personally to each milk sweet maker (respondents). The respondents were asked to give their honest, sincere and non-biased responses to each and every question in the schedule. The interview of respondents was conducted in two parts. The first part content questions related to personal and scio-economic characteristics of respondents such as age, education, occupation, training, annual income etc. Second part contained questions related to the documentation of technology used for manufacturing of milk sweets, role of government, their prospects and constraints faced by them. The actual data collection was carried out from January to September 2011. The data was collected through personally interviewing the owner, manufacturer and members of shop.

3.5 Variables and their empirical measurements

The variables selected for this investigation were on the basis of a critical review of literature on the topic, in consultation with the experts of Dairy Science and Extension Education and

keeping in view, the objectives of this study. All independent variables that determine the socio-economic status of milk sweet maker selected for the present study have been depicted in Table 3.2 along with their empirical measurement.

Table 3.2. Variables and their empirical measurements

Sr. No.	Independent variables	Empirical measurement
A	**Personal characteristics**	
1	Age	The chronological age in completed years of individual respondent at the time of data collection
2	Education	The standard of formal education accomplishment by individual respondent
3	Sex	Quantification of sex was done only at nominal level of measurements. i.e. only two categories such as male and female
4	Family background	Whether the individual comes from rural farming/non-farming and urban farming/non-farming family. Also the native place of the respondent.
5	Occupation	Sweet making as a main business or allied business
6	Socio-economic status	Scale developed by Thakare and Ingle (2007) was used to measure this variable
B	**Information about Man power in Shop**	
1	Age	Age of main hired labour working in shop
2	Education	Formal education of main hired labour working in shop
3	Training received	Training received or taken by the hired labour during the span of sweet making business
8	Total sweet making experience	Total length of sweet making experience of main hired labour in completed years
C	**Situational characteristics**	
1	Infrastructural facility	The infrastructure facility score was workout.
2	Manufacturing space	Manufacturing space located in shop or away from shop
D	**Dependent variables**	
1	Prospects	Different types of business opportunities perceived by individual respondents.
2	Income	Total annual income of respondents obtained through all sources. It was measured in terms of ₹

3.6 Operationalization, scoring and categorization of independent variables

The operational definitions, procedure adopted for scoring and categorizations of independent variables have been described in this section. These parameters were measured at nominal statistical measurement. The score allotted was just for statistical tabulation. It does not indicate greater or less value. The score was given for converting qualitative data into quantitative form for further analysis.

3.6.1 Personal characteristics

3.6.1.1 Age

In operational terms age refers to the chronological age of the individual respondent in completed years at the time of data collection. A score of 1 was assigned to each completed years.

On the basis of age, the respondents were grouped into following categories.

Sr. No	Age category
1	Young (18 to 35 years)
2	Middle (36 to 50 years)
3	Old (above 51 years)

3.6.1.2 Education

Education in the present study was operationalized as the standard of formal educational accomplishment of the individual respondents. The standard of formal schooling passed was considered as individual education score. Hence, five categories were framed as here.

Sr. No	Category	Score
1	Illiterate	0
2	Primary School (1-4th Std.)	1
3	Secondary School (5-10th Std.)	2
4	High School (11-12th Std.)	3
5	College	4

3.6.1.3 Sex

This is the dichotomized variable only two categories i.e. male and female were framed. Quantification of this variable was done only at nominal level of measurement.

Hence, to identify the respondents on this variable, a score of 1 was given for male and 2 for female.

Sr. No.	Category	Score
1	Male	1
2	Female	2

3.6.1.4 Family background

The variable family background was operationalized as whether the orientation of individual from rural or urban farming or non-farming family before entering into the profession of sweet making.

Sr. No.	Category	Score
1	Urban non-farming family	1
2	Urban farming family	2
3	Rural non-farming family	3
4	Rural farming family	4

3.6.1.5 Distribution of milk sweet makers according to their occupation

Sr. No	Occupation	Score
1	Sweet making as a main business	2
2	Sweet making as a allied business	1

3.6.1.6 Skilled labour

3.6.1.6.1 Training received

For the purpose of this study, training received is operationalized as the training received by the respondents during the span of his business. It was worked out in years and a numerical score of one was assigned for one year of training, undergone by the respondent. The score obtained in respect of the years of number of trainings received by him were summed up to present his received training score.

On the basis of minimum and maximum score range obtained, the respondents were categorized as follows.

Sr. No	Training
1	Training received
2	Training not received

3.6.1.6.2 Total sweet making experience

The total service experience has been operationally defined as the total length of sweet making experience in completed years rendered by individual respondents in the sweet making business. A numerical score of 1 was assigned to each completed year of service.

On the basis of minimum and maximum obtained score the respondents were categorized into the following categories.

Sr. No.	Category
1	Upto 10 years
2	11 to 20 years
3	21 years and above

3.6.1.6.3 Experience on present shop

It is referred to the total length of service on the post presently held by an individual respondent in sweet shop. The completed year of experience on present shop was taken as individual score.

On the basis of minimum and maximum obtained score the respondents were categorized as follows.

Sr. No.	Category
1	Up to 2 years
2	3-4 years
3	5 years and above

3.6.1.4 Socio-economic status

It was operationalized as an economic and sociological combined total measured of an individual's or family's economic and social position in relation to their social and economic factors. It was measured with socio-economic status scale developed by Thakare and Ingle (2007). On the basis of cumulative weightage individuals were grouped in to following categories.

Sr. No.	Category	Score
1	Very low	up to 05.21
2	Low	05.22 to 08.37
3	Medium	08.38 to 11.52
4	Medium High	11.53 to 14.67
5	High	14.68 and above

3.6.2 Situational characteristics

3.6.2.1 Manufacturing space

For the present study, it is referred to the actual distance of manufacturing space from the shop.

On the basis of minimum and maximum score obtained the respondents were categorized as follows.

a.	Manufacturing space
1	Adjoining
2	Separate from shop

3.6.2.2 Infrastructure facility

Infrastructure facility means the number and extent of availability of requisite facilities for successful performance of the job by an individual respondent. Facilities are the pre-requisites for successful performance of sweet makers.

The extent of availability of the infrastructure facilities for sweet making work were ascertained on three point continuum as easily available, available with difficulty and not at all available with assigning a numerical score of two, one and zero, respectively. The score obtained by each respondent on all these facilities were

summed up and this score was considered as the infrastructure facility score for each respondent.

Sr. No	Shop size (Sq. ft)
1	Small (Up to 500)
2	Medium (501 to 1000)
3	Large (more than 1000)

3.7 Statistical techniques used for analysis of data

For analysis of data, the following statistical tests and procedure were used in this investigation.

3.7.1 Frequency distribution and percentage

Frequency and percentage were used for making simple comparisons. The frequency of particular category was multiplied by hundred and divided by total number of respondents to get percentage.

3.7.2 Chi square test

The test of chi-square was carried out in Department of Agricultural Statistics, by using recommended software (SPSS). The purpose of test was to trace out the influence of independent parameters on dependent prospects. The said statistical test was non-parametric test.

It is a test which explains the magnitude of difference between observed frequencies and the frequencies expected under certain assumption. With the help of this test, it is possible to find out whether such differences are significant or insignificant and could have arisen due to fluctuation of sampling. It will be helpful to decide the dependency of the attribute studied viz. age, education, occupation, total investment, size of shop, manufacturing space of shop, number of labour trained, age of

labour, education of labour, total milk volume and total income with the degree of prospects. (Panse and Sukhatme, 1985).

The list of prospects was worked out in consultation with faulty members and Members, Advisory Committee. The responses of respondents were collected on Two point scale i.e. Yes or No. Score of 1 was allotted for Yes and 0 was for No response. Based on their response, they were categorized on the basis of Mean+/- SD. This was arrived as Low, medium, high. On this basis, Chi-square analysis was carried out to reach the valid

H_0 = Two attributes are independent.

$$\chi^2 = \sum_{i=1}^{n} \frac{(Oi - Ei)^2}{Ei} \sim \chi^2_{(n1-2)(n2-2)} \quad i = 1 \ldots\ldots n$$

4. RESULTS AND DISCUSSION

The results emerged out of the analysis of collected empirical facts from the present study with relevant discussion thereon have been presented in this chapter. The data obtained from the respondents have been suitably organized and analyzed by taking into account the study objectives, hypothesis and the theoretical orientation guiding the study. The results obtained from the analysis of data are presented in the subsequent pages.

4.1 Locality

The data on distribution of milk sweet makers according to their locality in this study are presented in Table 1.

Table 1. Distribution of milk sweet makers according to their locality

Sr. No.	District	Survey area						*f* (N=360)
		Urban		Semi-urban/ Town/Tahasil		Rural		
		f	%	*f*	%	*f*	%	
1	Jalgaon	20	33.33	29	48.33	11	18.33	60
2	Nashik	33	55.00	19	31.66	8	13.33	60
3	Ahmednagar	20	33.33	31	51.66	9	15.00	60
4	Pune	35	58.33	16	26.66	9	15.00	60
5	Satara	25	41.66	30	50.00	5	8.33	60
6	Kolhapur	27	45.00	23	38.33	10	16.66	60
Total		**160**	**44.44**	**148**	**41.41**	**52**	**14.44**	**360**

Table 1 shows the distribution of respondents (milk sweet makers/*halwai*). The milk sweet makers from urban areas counted 44.44 per cent and 41.41 per cent from semi urban areas. District and area wise distribution showed that, 58.33 per cent of

milk sweet makers were from Pune, 55 per cent from Nashik, 45 per cent from Kolhapur, 41.66 per cent from Satara and 33.33 per cent each from Ahmednagar and Jalgaon urban areas. In concern with semi- urban areas, 51.66 per cent respondents were from Ahmednagar, followed by Satara (50.00 %), Jalgaon (48.33 %), Kolhapur (38.33 %), Nashik (31.66 %) and 26.66 per cent from Pune district areas. It is seen from Table 1 that, fewer respondents were from rural areas, in Jalgaon (18.33 %), Kolhapur (16.66 %), Ahmednagar and Pune each (15.00 %), Nashik (13.33 %) and Satara (8.33 %) district. In rural areas less frequency/number of respondents was interviewed in comparison to semi- urban and urban areas, because of frequency of milk sweet shops was limited in rural area.

This might be due to the scope of milk and milk product being wide considering fast growing urban population demand, continuous awareness towards human nutrition and acquisition of modern technology in dairy production system. This is related to the socio- economic status of consumers. Changing life style like ready to eat, health consciousness, purchasing power, demand of consumer and easy or available, the infrastructure like electricity, water, fuel, per unit area population etc. force favoured *halwais* to establish their business in urban areas compared to rural.

In addition to this, it was noted that the raw material (milk) originates in rural area but, it is shifted to urban for sweet making. Being a perishable and voluminous commodity it leads to various problems of preservation, transportation, adulteration etc. while shifting milk from rural to urban area. Therefore the policy should be such that it promotes milk sweet manufacturing

business at the site of its raw material (milk) production. Such policy will be beneficial since it will the fetch premium price to milk, reduce processing cost of milk sweets, as such it will lead to reduce price to be paid by the consumers.

4.2 Age

Age is normally an indicator of maturity, experience and depth of knowledge of milk sweet makers. Therefore, the distribution of milk sweet makers has been evaluated according to their age and the frequency percentage are tabulated in the Table 2 and depicted by Fig. 3.

Table 2. Distribution of milk sweet makers according to their age

Sr. No.	Age category	*f* (N=360)	%
1	Young (18 to 35 years)	102	28.33
2	Middle (36 to 50 years)	234	65.00
3	Old (above 51 years)	24	6.67
	Total	**360**	**100.00**

A table values indicate that, about 65.00 per cent of milk sweet makers belonged to middle age of 36 to 50 years and 28.33 per cent were younger in age. Only few (6.67 %) sweet maker were found to be old aged i.e. above 50 years.

It is revealed from the table values that the middle age (36 to 50 years) respondents are more, the probable reason arose from the discussion was that the young age (18 to 35 years) sweet makers worked in sweet shop for acquiring the skills and experience of manufacturing of sweets for few year and after that they established their own sweet shop. Secondly younger

generation may engage themselves in some supporting assignments like procurement of raw materials, supervision of work i.e. behind the curtain.

These findings are in concurrence with the findings of Gupta and Panchal (2009) who observed that half of the respondents were between 31 to 50 years of age group.

4.3 Education

Education is expected to have direct or indirect bearing on the milk sweet making venture. Hence, the numerical data of the distribution of milk sweet makers according to their education are tabulated in Table 3 and graphically presented by Fig. 4.

Table 3. Distribution of milk sweet makers according to their education

Sr. No.	Category	*f* (N=360)	%
1	Illiterate	7	1.95
2	Primary School (1-4th Std.)	74	20.55
3	Secondary School (5-10th Std.)	109	30.28
4	High School (11-12th Std.)	114	31.67
5	College	56	15.55
	Total	**360**	**100**

According to Table 3 the higher number (31.67 %) of milk sweet makers were educated up to high school (11-12 Std.) level. This was followed by secondary school (30.28 %) and primary level (20.55 %). Whereas, 15.55 per cent of milk sweet makers were educated up to college level and very meager (1.95%) respondent were found to be illiterate.

Half of the respondents learned up to high school and above level. This group is in position to run the business independently. The remaining 50.00 per cent of the respondents

require training to take up business as per expectations of present era. Moreover, we observed that education level of sweet makers affected the cleanliness, hygienic and sanitary conditions of shop and products, using proper marketing strategy etc. to accelerate the profit and consumers satisfaction.

Similar observations were recorded by Hossain *et al.* (2005) who reported that 60.00 per cent of dairy farmers in Rangpur district learned to the level of school.

4.4 Occupation

The nature of occupation may influence extent of involvement of an individual in the business. The personal involvement in business depends on whether it is his main or subsidiary occupation. The data pertaining to this aspect is presented in the Table 4 and illustrated graphically by Fig.5.

Table 4. Distribution of milk sweet makers according to their occupation

Sr. No.	Occupation	*f* (N=360)	%
1	Sweet making as a main business	318	88.34
2	Sweet making as a allied business	42	11.66
	Total	**360**	**100.00**

In case of their occupation as recorded in Table 4, the majority of sweet makers (88.34 %) were engaged in main business of milk sweet making and remaining (11.66 %) sweet makers were running it as an allied business for their livelihood.

Most (88.34%) of the sweet makers were engaged in milk sweet making as main and single business, because they are migrated from other parts of country to the present site. Moreover,

they have limited scope to generate property as that of local people. On the other hand, the local sweet makers have their own farm lands and other business; therefore they might not take this enterprise seriously for earning money.

The findings are in line with results reported by Hossain *et al.* (2005) who showed that 53.00 per cent of the dairy farmers had taken dairying as a main business and the rest as side business.

4.5 The state of origin

Generally, it is assumed that the milk sweet making business is handled by the migrated people. In order to confirm this aspect, the efforts were made to collect the information on this aspect and numerical observations are recorded.

The data pertaining to the distribution of milk sweet makers according to their state of origin are presented in the Table 5 and by Fig. 6.

Table 5. Distribution of milk sweet makers according to their state of origin

Sr. No.	State of origin	*f* (N=360)	%	Rank
1	Rajasthan	231	64.16	I
2	Gujarat	59	16.38	II
3	Maharashtra	47	13.08	III
4	Madhya Pradesh	23	6.38	IV
	Total	**360**	**100.00**	

It is observed from Table 5 that the majority of sweet makers in study area migrated from various parts of India. The table indicates that two-third of milk sweet makers (64.16%) were

migrants from Rajasthan state. Less (16.38 %) per cent of milk sweet makers were from Gujarat and very few (6.38%) came from Madhya Pradesh. Only 13.05 per cent of the respondents belonged to Maharashtra state and engaged in milk sweet making business.

Thus, it can be said that majority of out state sweet makers targeted Maharashtra state for their business. The reason might be “easy and ample supply of milk” as raw material and less number of local competitors for milk sweet making business enabled them to take this business in this region. This indicates that there is lack of interest on the part of people of Maharashtra to process the milk that they have produced. There is a scope for people of Maharashtra to change their mind set and enter into milk sweet making (processing) as their own business. This is to be supported by policy makers.

Also, we observed that the local sweet makers do not perceive this enterprise seriously as a major enterprise. It might be due to the fact that they focus on production not on processing. There is needed to make them aware about this business.

4.6 Training received

Training is a process of acquiring specific knowledge and skills to perform better job. Also in service, it is one of the factors which plays a vital role and influences the overall activities of the employees. Therefore, the information on training received was collected and recorded in Table 6 and by Fig 7.

With respect to the present study, appealing observation was recorded i.e. none of the respondents received any scientific training required for their business (milk sweet manufacturing,

marketing etc.) All the respondents followed traditional practices based on their own experience.

Table 6. Distribution of milk sweet makers according to training received

Sr. No.	Training	*f* (N=360)	%
1	Training received	00	0.00
2	Training not received	360	100
	Total	**360**	**100.00**

Under the situation, the traditional process has some limitations. These may be improved by providing proper technical knowledge to them for milk sweet making as the requirement of present era. For this purpose the government/ private organization in this sector may take initiatives and promote them for clean and hygienic manufacturing of milk and milk products scientifically, marketing strategy etc.

These findings are in disagreement with the Rao and Esakkimuthu (2007) who stated that the food inspectors should be provided the credit for training and quality certification systems thereby making the units ready to meet the standards for the global market wherein the quality is the mantra.

4.7 Registration by agencies

The registration of shop is important for monitoring of standards and quality of milk products. The results in respect of distribution of milk sweet makers according to registration are presented in Table 7 and represented by Fig. 8.

Table 7. Distribution of milk sweet makers according to their registration by agencies

Sr. No.	Particulars	Registration according to PFA shop act		Registration according to shop act license	
		f **(N=360)**	**%**	***f*** **(N=360)**	**%**
1	Yes	291	81.00	360	100.00
2	No	69	19.00	00	0.00
	Total	**360**	**100.00**	**360**	**100.00**

It is revealed from Table 7 that all the sweet makers (100.00%) shops in study area are registered under shop act license and majority of them (81.00%) registered according to PFA Shop Act. Still, 19.00 per cent of sweet makers were coverd under PFA act. Therefore, it must be mandatory to register their business to all legal authorities meant for the purpose. This will help to check ill-legal practices and thereby protecting the interest of consumers, in regards of hygienically superior and safe food in the form of milk sweets.

Our findings aligned with Rajorhia (2012) who noticed that the Food Safety and Standards Authority of India (FSSAI) was constituted FSS act for enforcing the food security and standard.

4.8 Source of investment for establishment of shop

Distribution of milk sweet makers according to source of investment for establishment of shop is reported in the Table 8 and showed by Fig.9.

Table 8. Distribution of milk sweet makers according to type of investment for establishment of shop

Sr. No.	Source of finance	*f* (N=360)	%
1	Self investment	107	29.72
2	Self + Bank investment	210	58.33
3	Bank investment	43	11.95
	Total	**360**	**100.00**

It is observed from Table 8 that more than half of milk sweet makers have invested their own and bank borrowed capital for establishment of their business, while, 29.72 per cent of the respondents invested and relied on their own capital only. Remaining 11.95 per cent of respondents borrowed loan from bank for establishment of milk sweet making business.

Generally, it was observed that bank provides loan for production of milk, establishment of chilling centers, small scale processing unit etc. But banks did not support *halwais* for manufacturing of milk and milk products on priority basis. Proper scheme is needed to finance sweet maker for upliftment of their business. Indirectly, it may help to improve the quality of dairy products.

4.9 Source used for credit

The distribution of milk sweet makers according to source used for credit values are presented in the Table 9 and illustrated by Fig.10.

Table 9. Distribution of milk sweet makers according to source used for credit

Sr. No.	Sources	*f* (N=360)	%	
A	**Institutional sources**			
1	Nationalized banks	39	10.83	86.94
2	Commercial banks	94	26.11	
3	District Central Cooperative Bank	33	9.16	
4	Cooperative bank and society	147	40.84	
B	**Non-Institutional Sources**			
1	Relatives	28	7.77	13.06
2	Neighbours	03	0.84	
3	Friends	10	2.79	
4	Money lender	06	1.66	
5	Grant/ Subsidies/ NGOs	00	0.00	
6	Subsidies from state dairy federations	00	0.00	
7	Foreign aids	00	0.00	
	Total	**360**	**100**	

Table 9 shows the distribution of respondents according to milk sweet makers for establishment of their business. It was observed that the main source (86.94 %) of capital came from banks either nationalized, co-operative or commercial and credit societies. Whereas, very few (13.06%) of them had opted for non-institutional sources. The details are listed as follows, in case of institutional sources, maximum (32.5 %) of respondents (sweet makers) borrowed loan from commercial banks (26.11 %), followed by nationalized banks (10.83 %), and District Central Cooperative bank (9.16 %). Moreover, 40.84 per cent respondents borrowed loan from Co operative bank and society. In case of non institutional sources, the money were borrowed from the relatives

(7.77 %), money lenders (1.66%), neighbours (0.84%) and friends (2.79 %). Somehow none of the respondents received any kind of grant, finance or subsidies either from state dairy federation, NGO`s or foreign aid involved in this milk sweet making business. Therefore, it is the need of the time to support the sweet makers by providing financial assistance through subsidies for establishment of well equipped/modern infrastructure. This will benefit both sweet makers and consumers. The sweet maker will process the milk under clean and hygienic conditions with operational ease. While, consumers will get quality foods with less prices as they deserve.

4.10 Capital investment for sweet shop

The capital investment of the shop made by the respondent is given in the Table 10 and described by Fig.11.

Table 10. Distribution of milk sweet makers according to capital investment for sweet shop

Sr. No.	Capital investment	*f* (N=360)	%
A	**Shop**		
1	Own	172	47.77
2	Hired (Rental)	188	52.22
B	**Furniture**		
1	Own	337	93.62
2	Hired	23	6.38
C	**Equipments**		
1	Own	349	96.95
2	Hired	11	3.05

It was observed that 52.22 per cent milk sweet makers hired and 47.77 per cent of them owned shop. Majority of *halwais* purchased their own (93.62 %) and very few (6.38 %) used rental furniture. Also it was noticed, that most of milk sweet makers had their own equipment (96.95 %) and very few of them had rental equipment (3.05 %) for running the business.

They either own their shop or on rent basis but most of them are able to have their own furniture and equipments. Negligible respondents use rental furniture.

Similar observations are noted by Deka and Patwari (2006) they stated that the major costs involved in starting of a sweet manufacturing unit were construction of building (46 %) followed by cost of utensils (21 %) and furniture and equipments (24 %).

4.11 Size of shop

The values for distribution of milk sweet makers according to size of shop are presented in Table 11 and showed by Fig.12

Table 11. Distribution of milk sweet makers according to size of shop

Sr. No.	Size	*f* (N=360)	%
1	**Shop size (Sq. ft)**		
i	Small (Up to 500)	78	21.67
ii	Medium (501 to 1000)	259	71.95
iii	Large (more than 1000)	23	6.38
	Total	**360**	**100.00**
2	**Manufacturing space**		
i	Adjoining	267	74.16
ii	Separate from shop	93	25.84
	Total	**360**	**100.00**

From Table 11, it is observed that majority (71.95%) of milk sweet makers had medium shop size (501 to 1000 sq. ft). This was followed by small size shop (21.67%) up to 500 sq. ft. Limited (6.38%) sweet makers had large size (more than 1000 sq. ft.) sweet shops. Secondly it was observed that three fourth *halwai*s had manufacturing unit in the shop itself or adjoining to the shop. Remaining 25.84 per cent *halwais* manufactured/processed the milk sweets separately from the sale counter (shop).

4.12 Socio-economic status of milk sweet makers

The distribution of milk sweet makers evaluated on their socio-economic status is presented in the Table 12 and depicted by Fig. 13.

Table 12. Distribution of milk sweet makers according to their socio economic status

Sr. No.	Category	*f* (N=360)	%
1	Very low (up to 05.21)	7	01.94
2	Low (05.22 to 08.37)	21	05.83
3	Medium (08.38 to 11.52)	261	72.50
4	Medium High (11.53 to 14.67)	53	14.72
5	High (14.68 and above)	18	05.00
	Total	**360**	**100**

Table values indicate that 72.50 per cent of milk sweet makers belonged to medium category in respect to socio-economic status and 14.72 per cent were under medium to high category. Few sweet makers (7.77 %) were found under very low to low

category. This means majority of milk sweet makers belonged to medium level of socio-economic status.

4.13 Information of manpower working in milk sweet shop

The data on information of manpower working in milk sweet shop is presented in Table 13 and confirmed by Fig. 14.

Table 13. Information of manpower working in milk sweet shop

Sr. No.	Characteristics	*f* (N=360)	%
1	**Age**		
i	Young (18 to 35 years)	204	56.67
ii	Middle (36 to 50 years)	137	38.06
iii	Old (above 51 years)	19	5.27
2	**Education**		
i	Illiterate	31	8.62
ii	Primary School (1-4th Std.)	91	25.27
iii	Secondary School (5-10th Std.)	113	31.38
iv	High School (11-12th Std.)	79	21.95
v	College	46	12.78
3	**Training received**		
i	Yes	00	0.00
ii	No	360	100
4	**Experience in making sweet**		
i	Up to 5 Years	81	22.50
ii	6 to 10 Years	167	46.38
iii	11 and above Years	112	31.12

From the Table 13, it is noted that 56.67 per cent of main hired labours were younger (18 to 35 years) in age and 38.06 per cent belonged to middle age (35 to 50 years) and 5.27 per cent were found to be old age (above 50 years).

In respect to education, it is illustrated that nearly one third (31.38 %) of manpower was educated up to secondary school level, followed by rimary school level (25.27%) and high school level (21.95%). However, proportion of highly educated and illiterate was comparatively low.

The point of special consideration was that none of the workers/ respondents involved in manufacturing of milk sweets and even other activities did receive any formal training. They use their traditionally acquired and experienced base practices followed for making milk sweets.

The experience based data are recorded and presented in Table 13. Frequency distribution indicate that 46.38 per cent of labours have experience of 5 to 10 years of manufacture of traditional milk products, followed by 31.11 per cent of labours have experience of 11 years and above, and 22.50 per cent labours have experience up to 5 years. Moreover, while discussing with the people working in milk sweet shop regarding ownership, it was noticed most of the youngsters come forward as a self owner in future. Under the situation there is need to review the practices followed by them, eradicate the lacunae/ misconcepts if any supported by sound scientific/ technical knowledge but easy to accommodate. This is to be penetrated slowly.

4.14 Sources of milk for products making

The data pertaining to the sources of milk for products manufacturing by sweet makers are given in Table 14 and showed graphically by Fig.15

Table 14. Sources of milk for products by sweet makers

Type of milk	Source of milk								
	Producer			Retailer/Vendor			DCS		
	f	%	Price /lit (Rs)	*f*	%	Price /lit (Rs)	*f*	%	Price /lit (Rs)
Cow	102	28.27	25.40	62	17.27	26.81	00	0.00	00.00
Buffalo	145	40.27	37.08	215	59.72	37.91	00	0.00	00.00
Mixed	00	00.00	00.00	43	11.94	31.00	00	0.00	00.00
Other	00	00.00	00.00	00	0.00	00.00	00	0.00	00.00

Table values indicate that 28.27 per cent of sweets makers procured cow milk directly from producer and 17.27 per cent from retailer/vendor. Whereas, 40.27 and 59.72 per cent milk sweet makers procured buffalo milk from producer and retailer/vendor. While 11.94 per cent sweet makers used mixed milk procured from retailers/vendors as a source of milk. No any sweet maker procured milk from dairy cooperatives as a source for the manufacture of products.

As it was known, the buffalo milk is preferred for the manufacture of traditional dairy products in India. This is again confirmed by the present study wherein, it was recorded that more number of respondents used buffalo milk as a source for the manufacture of various milk products as compared to cow milk. It might be due to more fat/TS content in buffalo milk than cow milk. From procurement point of view the maximum milk was from retailer/vendor as compared to milk producers. Such situation

might have raised, as most of the producers are the members of dairy cooperative society/federation in their locality, and they deposit milk produced by them to their respective cooperatives.

It is commented here, channelizing of route of milk handling such as producer to milk sweet maker may be more beneficial to producers, processor and also to consumers.

The findings are analogous with the results reported by Sharma (2012) and Grace *et al.* (2009)

4.15 Milk handling capacity

The frequency percentage for this aspect is presented in Table 15 and graphically represented by Fig. 16.

Table 15. Distribution of sweet makers according to their milk handling capacity

Sr. No.	Volume of milk (Lit/day)	*f* (N=360)	%
1	Small (Up to 40)	306	63.00
2	Medium (41 to 60)	41	33.38
3	Large (61 and above)	13	03.62

Frequency distribution from Table 15 showed that 63 per cent of milk sweet makers procure milk in small volume (up to 40 lit/day) followed by 33.38 per cent of sweet makers belonging to medium category (41-60 lit/day) and a few (3.62 %) sweet makers included in big category (61 and above lit/day).

In general it was noted that the need and demand of milk was higher in urban than village/tahasil by sweet makers. The probable reason behind this may be population demand and the socio- economic status of the urban area which was higher than villages and semi urban areas.

Small volume of milk was needed for large number of sweet makers because they manufactured sweets in a lot, and processed as per the requirement in the market. They prepared sweets daily or on alternate day. So on average small volume milk fulfilled the requirements of milk sweet makers.

It was learnt from interviews that the large volume of milk is used by big/branded/famous sweet makers whose, daily demand of the milk product is higher than small and medium volume milk sweet makers. Because of their reputation and trust of consumers, their milk sweets demand in market is more as compared to small and medium.

If small and medium milk volume milk sweet makers give attention on quality and hygiene of sweets like branded *halwais* the milk sweets making industry will be in position to export their milk products in other countries and modernization may come up in traditional Indian milk products too.

It is possible to small and medium categories milk handler to pay proper attention towards hygiene and quality of products, to compete with big categories of *halwais.* Little modernization provides opportunities to these (small and medium) categories to enter into export market.

4.16 The system of milk procurement

The results on distribution of sweet makers by the system of milk procurement are presented in Table 16 and also illustrated graphically by Fig.17.

Table 16. Distribution of sweet makers by the system of milk procurement

Sr. No.	System	*f* (N=360)	%	Price (Rs/lit)	
				Cow	Buffalo
1	On the basis of volume (L)	218	60.56	25.40	37.08
2	On the basis of weight (Kg)	00	0.00	00.00	00.00
3	On the basis of fat/SNF	142	39.44	26.81	37.91
4	Other (If any)	00	0.00	00.00	00.00

It is revealed from the Table 16 that large group of milk sweet makers (60.56 %) procured milk on the basis of volume (Lit.).

Moreover the 39.44 per cent respondents procure milk considering fat percentage but actually they do not test fat content in milk, however they rely on the say of producer, vendor etc.

4.17 Use of water sources

The distribution of milk sweet makers according to use of water sources is documented and results thereof are presented in Table 17 and depicted by Fig. 18.

Table 17. Distribution of milk sweet makers according to use of water sources

Sr. No.	Sources	*f*	%
1	Tube well/well	21	5.83
2	Water supplied by Municipality / *Grampanchayat*	326	90.55
3	Tanker supply	03	3.88

Table 17 showed that 90.55 per cent of sweet makers used water for their use supplied by Municipality and

Grampanchayat as main source of water for their daily requirement. For remaining, tube well/well was the source of water (5.83 %) and very few (3.62 %) sweet makers used tanker supply for their daily water requirement.

Most of the respondents used the water supplied by Municipality and *Grampanchayat* which is a good sign from point of view of safety and health of consumers, as the water supplied by Municipalities and *Grampanchayat* is being potable. Awareness of water quality is needed to those respondents using well/ tube well water for their business.

4.18 Use of different fuel sources

The frequency distribution of milk sweet makers about the source of fuel used for processing of milk sweets is presented in Table 18 and shown in Fig. 19.

Table 18. Distribution of milk sweet makers according to use of different fuel sources

Sr. No.	Particulars	*f* (N=360)	%
1	Wood	41	11.38
2	Kerosene	33	9.16
3	Diesel	27	7.50
4	LPG	240	66.66
5	Electricity	19	5.27
Total		**360**	**100.00**

It is revealed that 66.67 per cent of milk sweet makers used LPG as main source of fuel for preparation of the milk sweets. Rest of them used fire wood (11.38 %), kerosene (9.17 %), diesel (7.51 %) and while only 5.27 per cent electricity for making the

traditional milk sweets. Ease in availability and handling was the reason for the use of LPG. LPG is safe, from the point of view of health and it safeguards pollution. Even work output is also satisfactory in case of LPG.

4.19 Types of equipment available with them

It is learned from the Table 19 and Fig 20 that the sweet makers are using old fashioned and traditional equipments. However satisfying thing is that some of them started to use the modern technology in making milk sweets. Some of them developed mechanized equipment based on need and experience for preparing milk sweets. It was low cost using household things. Under the situation, if they start to use advanced technology, it may enhance the quality, hygiene, nutritional value of sweets and ultimately get benefited. Because of mechanization they can save the time and man power.

Table 19. Distribution of milk sweet makers according to types of equipment available with them

Sr. No.	Equipment	*f* (N=360)	%
A	**Major**		
1	Refrigerator	310	86.11
2	Deepfreeze	202	56.11
3	Microwave oven	121	33.61
4	Dryer	00	00.00
5	Planetary mixer	305	84.72
6	*Pedha* shaping machine	23	3.38
7	Ball rolling machine	27	7.50
8	Cream separator machine	00	00.00
9	Ice-cream machine- Rotary hand operated	00	00.00
10	Ice-cream machine- -Electrical operated	00	00.00

Table 19 contd....

Sr. No.	Equipment	*f* (N=360)	%
11	Mechanical cutter	13	3.61
12	*Paneer* vat	61	16.94
13	Homogenizer	00	00.00
14	Packaging machine	315	87.50
15	Bulk Tank (Milk and water)	360	100.00
16	Milk weigh scale	00	00
17	Electrical/Digital	271	75.27
18	Manual	89	24.72
B	**Supplementary**		
1	Kettle (jacketed /Non-jacketed)	360	100.00
2	*Karahi* (open bowl with two handle)	360	100.00
3	*Khunti*	360	100.00
4	Blender	360	100.00
5	Aluminium or plastics cone	00	00.00
6	Earthenware pot (*Mataka*)	00	00.00
7	Aluminum milk can	159	44.16
8	Pouchet Crates for *Khoa, lassi* etc.	280	77.77
9	Washing tubs	360	100.00

4.20 Milk products manufactured by them

It is observed from the Table 20 and by Fig. 21 that *halwai* mainly prepared traditional heat desiccated products. It was followed by heat-acid coagulated and fermented products. Table values indicate that cent per cent of *halwais* prepared *khoa* and *khoa* based sweet viz *pedha* followed by *kalakand* (91.94 %), *burfi* (88.05%), *basundi* (83.61 %) and *rabri* (61.38 %).

Table 20. Distribution of sweet makers according to milk products manufactured by them

Sr. No.	Milk product	*f* (N=360)	%
A	**Heat desiccated**		
1	*Basundi*	301	83.61
2	*Rabari*	221	61.38
3	*Khoa*	360	100.00
4	*Pedha*	360	100.00
5	*Burfi*	317	88.05
6	*Gulabjamun*	277	76.94
7	*Kalakand*	331	91.94
B	**Heat acid coagulated**		
1	*Paneer*	179	49.72
C	***Channa based sweet***		
1	*Rasogulla*	241	76.66
2	*Rasmalai*	210	58.33
3	Other *channa* based	160	44.44
D	**Fermented**		
1	*Dahi*	117	32.5
2	*Lassi* (Seasonal)	101	28.05
3	*Shrikhand*	110	30.55

Further it is also observed that 76.66 per cent sweet makers manufactured *Channa* based sweets (Bengali sweets) and 49.72 per cent of them prepared *Paneer*. In addition to this fermented milk products viz. *shrikhand* (30.55 %), *dahi* (32.5 %), in summer *lassi* (28.05%) and *amrakhand* (16.38%) are prepared. It can be stated that the sweet makers under studies were manufacturing only traditional milk sweets with exceptions. Western types of milk products were not manufactured by them but marketed through their shop (e.g. Ice- cream).

4.21 The manufacturing technique for milk products

The distribution of milk sweet makers according to the manufacturing technique/procedure for different milk products were documented and results thereof are presented in Table 21 to 28.

4.21.1 Manufacturing technique for *khoa*

The values in Table 21 indicate that the majority (70.27 %) of milk sweet makers used buffalo milk for making *khoa.* Whereas, 29.72 per cent used cow milk. As the buffalo milk contained higher fat and total solids, yields were at higher level and it produce superior quality *khoa* compared to cow milk. Further, it is also seen that maximum (88.62 %) respondents used open pan and very few (11.38 %) used energy driven equipment for making *khoa*. While making *khoa* nearly cent per cent sweet makers were heating milk based on their own experience rather than following recommended temperature required for making *khoa*. All of the respondents used to cool the *khoa* at room temperature and used stainless steel or aluminium trays for storage of *khoa*. The storage ability of *khoa* prepared by this practice could be preserved and stated by them was 1, 2 and 3 days as reported by 31.38%, 49.73% and 18.89% respondents respectively.

In spite of this, it was noticed, that none of the sweet makers followed the practice of standardization of milk for fat/SNF content for manufacture of *khoa*. Also they did not acquire heating temperature during manufacturing of *khoa.* However, required quality *khoa* could be prepared based on ones` experience though such practice is not advisable. There is a need

to document and refine such practices in laboratory which will be more helpful to them for harnessing the quality of khoa.

Table 21. Distribution of sweet makers according to the manufacturing technique for *khoa*

Sr. No.	Technique	*f* (N=360)	%	Procedure standardized in laboratory
A	**Type of milk used**			
1	Cow milk	103	29.72	Buffalo milk/ standardized to 6 % fat
2	Buffalo milk	253	70.27	
3	Mixed	04	1.12	
B.	**Type of equipment used**			
4	Open pan	319	88.62	Jacketed kettle
5	Small machineries	41	11.38	
C	***Heat***			
6	By their experience	360	100.00	60-80 ^{o}C
D	**Cooling**			
7	Room temperature	360	100.00	Room temperature
8	Refrigeration temperature	00	0.00	
E	**Storage temperature**			
9	Room temperature	356	98.89	Room temperature
10	Refrigeration	04	1.11	
F	**Shelf- life (days)**			
11	One	113	31.38	Three to five days
12	Two	179	49.73	
13	Three	68	18.89	
G	**Packaging material utilized**			
14	Parchment paper	360	100	Parchment paper

Procedure for preparation of *khoa*

***Halwai* Method**	**Procedure standardized in laboratory**
Cow/ buffalo milk ↓ Milk is stirred continuously ↓ Constant evaporation of moisture ↓ semi solid pasty consistency ↓ Final product (*khoa*) is ready	Cow/ buffalo milk ↓ Milk is heated and stirred continuously ↓ Constant evaporation of moisture ↓ After coagulation of milk protein begins concentration becomes progressively insoluble in water ↓ In this stage there is change in colour and consistency, from semi solid pasty to dry ↓ Final product (*khoa*) is ready
	Anantakrishnan and Srinivasan (1964), Rangappa and Acharya (1974), De (1980), Aneja *et al.* (2002),

4.21.2 Manufacturing technique for *pedha*

Pedha is a *khoa* based sweet that has more acceptance and demand in the market. The reasons could be explained as (i) its better storage ability / keeping quality at room temperature (ii) easily available at any place (iii) religious worship by *Hindus* and (iv) to communicate good news to relatives by its distribution.

Table 22. Distribution of sweet makers according to their manufacturing technique for *pedha*

Sr. No.	Technique	*f* (N=360)	%	Procedure standardized in laboratory
A	**Type of *khoa* used**			
1	*Pindi*	311	86.38	*Pindi*
2	*Dhap*	49	13.62	
3	*Danedar*	00	0.00	
B	**Form of sugar**			
4	Crystalline	313	86.95	Crystalline
5	Powder	47	13.05	
6	Syrup	00	00.00	
C	**Percentage of sugar addition @ of *khoa***			
7	20-30	240	66.66	30 %
8	31- 40	107	29.72	
9	41- 50	13	3.61	
D.	**Heating temperature**			
10	By their experience	360	100	50 to 60 ^{O}C
E.	**Stage of sugar addition**			
11	Milk boiling	24	6.67	Pat formation
12	Dough stage	96	26.67	
13	Pat formation	143	39.73	
14	Raw *Khoa*	97	26.95	
F	**Stage of condiments addition**			
15	Milk boiling	23	6.38	Raw *khoa*
16	Dough stage	67	18.62	
17	Pat formation	121	33.61	

Table 22 contd....

Sr. No.	Technique	*f* (N=360)	%	Procedure standardized in laboratory
18	Raw *khoa*	149	41.38	
G	**Stage of colour addition**			
19	Milk boiling	19	5.27	Raw *khoa*
20	*Rabri*	70	19.44	
21	Pat formation	133	36.94	
22	Raw *khoa*	139	38.61	
H	**Stage of dry fruit/additives addition**			
23	Milk boiling	30	8.33	Raw *khoa*
24	Dough stage	44	12.22	
25	Pat formation	81	22.50	
26	Raw *Khoa*	205	56.94	
I	**Manufacturing procedure**			
27	Manually	317	88.05	Machine / manually
28	Machine	43	11.95	
J	**Storage condition**			
29	Room temperature	356	98.89	Room temperature
30	Refrigeration	04	1.11	

Table 22 contd....

Sr. No.	Technique	*f* (N=360)	%	Procedure standardized in laboratory
K	**Shelf- life (days)**			
31	One	113	31.38	Up to 14 days
32	Two	179	49.73	
33	Three	68	18.89	
L	**Packaging material utilized**			
34	Paper card board / paper corrugated box	360	100	Paper card board / paper corrugated/ laminated box

It is learnt from the numerical values given in Table 22 that majority (86.38 %) of the respondents (sweet maker) were using *pindi* type *khoa* for *pedha* manufacturing. occasionally *dhap* type *khoa* was also used but not *danedar*. These observations are on par with the practices recommended by research laboratories. Same trend has been observed in case of form of sugar added. It was noted that about 87 per cent respondents adopted the practice to add crystalline sugar in *pedha* making.

The level of addition of sugar recorded was varied. Wherein, 66.66 per cent of them were added sugar as per recommendation ($\simeq$ 30 %) which is desirable from consumers' point of view. Remaining respondents used to add sugar more than 30 per cent and some time up to 50 per cent. This should be discouraged. Moreover, it is learnt during the discussion and

interview, that higher level of sugar in *pedha* is liked by the consumers from rural area.

With regards to heating temperature, no specific criteria were followed, and it was learnt that, degree of heating is based on their own experience. There is need of refinement of this aspect to have nutritionally enriched *pedha*. Otherwise there are chances to convert assimiable nutrient into undigestible form. In such cases there is loss of valuable food nutrients.

When the point of stage of addition of sugar was raised variable responses have been received, which are recorded and reported in Table 22.

Incase of added colour, condiments, fruits additives etc. very similar trend of stage of addition was recorded.

Further it is learnt that still majority (88.05 %) of the sweet makers were using practice of preparing *pedha* manually. There is need and scope to introduce mechanical operations in *pedha* making. This will lead to uniformity in the lots of *pedha* and quality also.

It is learnt from the table values that most of the *pedha* stored and marketed at room temperature. This is lie of the huge market demand and short shelf-life of these milk products. When question of shelf-life was raised, variable responses were received and noted. The shelf-life ranged from 1-7 days. We can store *pedha* up to 7 days under laboratory conditions.

Procedure for preparation of *pedha*

***Halwai* Method**		**Procedure standardized in laboratory**
Pindi khoa ↓ Heating (by experience) in a shallow pan (iron *karahi*) ↓ Add sugar (@20- 50 % of *khoa* at pat formation/ raw *khoa*) ↓ Kneading (Temp. by experience) ↓ Addition of flavouring ingredients (Cardamom, *kesar* or saffron) and other additives ↓ Moulding/shaping ↓ *Pedha*	Buffalo milk ↓ Filtration ↓ Boiling in open *karahi* ↓ Continuous stirring cum scraping ↓ Addition of *jaggery* in concentrated milk ↓ Continuous stirring, scraping and rubbing with stirrer and wooden ghota on low flame ↓ Heating stopped when contents start to leave the Sides of *karahi* (pat formation stage) ↓ Cooling at room temperature ↓ *Kandhi pedha* (making flat rounded balls)	*Pindi khoa* ↓ Heating to 90°C in a jacketed kettle/*karahi* ↓ Add sugar (@ 30 % of *khoa*) ↓ Kneading at 50°C ↓ Addition of flavouring ingredients (Cardamom, *kesar* or saffron) and other additives ↓ Moulding/shaping ↓ *Pedha* ↓ Packaging
		(Anantakrishnan and Srinivasan (1964), Rangappa and Acharya (1974), De (1980) and Aneja *et al.* (2002)

There is a vast scope to develop attractive package for *pedha* because still all of them are using cardboard package at delivery points. In general, *pedha* marketed by *halwai*s was not prepared as per procedure standardized in laboratory.

4.21.3 Manufacturing technique for *burfi*

The manufacture of *burfi* is mainly restricted to private traders (milk confections) i.e. *halwais*. As was indicated in Table 23 majority (93.37 %) of milk sweet makers used *pindi khoa* for making *burfi* and few (6.63 %) milk sweet makers used *dhap khoa*. None of the milk sweet makers used *danedar khoa* for making *burfi*.

Table 23. Distribution of milk sweet maker according to their procedure used for manufacturing of *burfi*

Sr. No.	Technique	*f* (N=277)	%	Procedure standardized in laboratory
A	**Type of *khoa* used**			
1	*Pindi*	296	93.37	*Pindi*
2	*Dhap*	21	6.63	
3	*Danedar*	00	0.00	
B	**Form of sugar addition**			
4	Crystalline	289	91.16	Crystalline
5	Powder	28	8.84	
6	Syrup	00	0.00	
C	**Percent of sugar addition @ of *khoa***			
7	25-35	187	59.00	30 %
8	36- 45	73	23.01	
9	46- 55	57	17.99	
D	**Heating temperature**			
10	By their experience	360	100	60^0C
E	**Stage of sugar addition**			
11	Milk boiling	9	2.84	Pat formation
12	Dough stage	11	3.47	
13	Pat formation	38	11.98	
14	Raw *khoa (*completely homogenous and smooth mass)	259	81.71	

Table 23 contd.....

Sr. No.	Technique	*f* (N=277)	%	Procedure standardized in laboratory
F	**Stage of flavour/ essence addition**			
15	Milk boiling	00	00.00	Raw *khoa*
16	Dough stage	36	11.35	
17	Pat formation	70	19.44	
18	Raw *khoa*	211	66.56	
G	**Stage of colour addition**			
19	Milk boiling	15	2.22	Raw *khoa*
20	*Rabri*	30	11.99	
21	Pat formation	97	26.94	
22	Raw *khoa*	218	60.55	
H	**Percentage addition of fruit pulp @ of *khoa***			
23	5.00	267	84.22	10 %
24	10.00	33	10.41	
25	15.00	17	5.36	
I	**Stage of fruit pulp addition**			
26	Milk boiling	00	00.00	Raw *khoa*
27	Dough stage	73	23.02	
28	Pat formation	223	70.34	
29	Raw *khoa*	94	26.11	

Majority (91.16 %) of sweet makers used crystalline form of sugar for making *burfi* and 8.84 per cent sweet makers prepared *burfi* by using powdered form of sugar. The level of addition of sugar varied from respondent to respondent. It was observed that two third (59.00 %) milk sweet makers add sugar to the level of 25-35 per cent of *khoa*, which is considered as optimum level. Whereas, 23.01 per cent sweet makers use to add sugar to

the level of 35-45 per cent of *khoa*. Still there were considerable number (17.99%) of sweet makers who added unjustifiably higher level (45-55%) of sugar, which is not scientific and within the ethics of sweet making business. Cent per cent sweet makers heat the *khoa* by their experience. While studying the aspect of stage of addition, it was seen from the table values that majority of (81.71 %) sweet makers add sugar in raw *khoa.* In some cases (11.98 %) sugar was added at pat formation stage or dough stage (3.47 %). Very few (2.84 %) sweet makers add sugar at boiling stage of milk.

Similar trend has been observed for addition of flour, essence, colour, etc. The level of fruits addition was variable. About 84.22 per cent of sweet makers used to add fruits/nuts to the level of 5 per cent, 10.41 per cent added 10 per cent and 5.36 per cent added fruits/ nut up to 15 per cent level. No any satisfactory and justifiable cause was traced out in such cases. Therefore refinement of incorporation of additives is one of the issues of research, cost, consumer's desire etc. Furthermore, it is revealed that the 70.34 per cent of sweet makers add fruit pulp at pat formation stage followed by raw *khoa* (26.11%) and few (4.72%) sweet makers add fruit pulp at dough stage. Nobody add the fruit pulp at milk boiling stage. The type, levels and stages of incorporation of ingredients varied from respondent to respondent. After preparation, majority (97.16%) of sweet makers stored the *burfi* at room temperature. Very few (2.84%) used refrigerator. The shelf-life of *burfi* noted was one or two days as mentioned by the respondents. Till the time, cent per cent of sweet makers used paper card board box as packaging material for *burfi*.

Though there are no specific standards for *burfi* under the existing PFA act, BIS has recommended standards for *burfi i.e.* IS: 5550- specification 1970; requirement of 15.00 per cent moisture, 12.5 per cent milk fat and acidity maximum 0.35 per cent.

Procedure for preparation of *burfi*

***Halwai* Method**	**Procedure standardized in laboratory**
Khoa (Pindi) ↓ Heating (Temperature randomly by their experience) in a shallow pan Adding of sugar@ 25-55 % of *Khoa* ↓ Kneading (Temp randomly by their experience) ↓ Additives ↓ Transfer to shallow trays ↓ Cooling ↓ Forming ↓ Packaging	*Khoa* (*Pindi*) ↓ Heat (60°C) in a jacketed kettle adding of sugar@30 % of *khoa* ↓ Kneading (50°C) ↓ Additives (optional at pat formation) ↓ Transfer to shallow trays ↓ Cooling ↓ Forming/shaping ↓ Packaging
	(Anantakrishnan and Srinivasan (1964), Rangappa and Acharya (1974), De (1980) and Aneja *et al.* (2002)

4.21.4 Manufacturing technique for *gulabjamun*

Generally 95.67 per cent sweet makers used *dhap* type *khoa* for making *gulabjamun*. As was noted in Table 24 that all sweet makers used sugar syrup to make *gulabjamun* making. It was observed that 68.23 per cent sweet makers used 46-55 per cent sugar syrup preparation followed by (24.18 %) sweet makers used 35-45 per cent sugar and few (7.58 %) sweet makers used

syrup containing 56-65 per cent sugar. It was desirable and has come out from the interview that about 70 per cent of the respondents used the combination of *khoa, maida* and baking powder nearer to the levels recommended by the research laboratory (i.e. *khoa*- 75 %, *maida*- 25 % and baking powder- 5 %). Rest of the respondents had variable combination and it was recorded in Table 24.

Higher number of (74.73%) respondents used 30 ml rose water/kg for making *gulabjamun*, which is beyond the level recommended by research laboratory. To our mind and reason this could be explained by the fact is that such higher level use of rose water can mask off flavour/ odour if any. Cent per cent of milk sweet makers used dry fruits in *gulabjamun* after ball preparation. Most of them (89.90%) used *vanaspati* ghee for frying *gulabjamun*. It is the practice that *gulabjamun* was stored at room temperature by the *halwais* and it was confirmed from this study. The maximum shelf-life of *gulabjamun* noted was 7 days (week). However, in some cases it was mentioned as 1-2 days. Such situation may arise due to consumers demand, products availability for sale etc. Cent per cent milk sweet makers used plastic container for the packaging of *gulabjamun*.

Table 24. Distribution of sweet maker according to their manufacturing procedure used for *gulabjamun*

Sr. No.	Technique	*f* (N=277)	%	Procedure standardized in laboratory
A	**Forms of sugar**			
1	Crystalline	00	0.00	Syrup
2	Powder	00	0.00	
3	Syrup	277	100.00	

Table 24 contd....

Sr. No.	Technique	*f* (N=277)	%	Procedure standardized in laboratory
B	**Sugar syrup**			
4	35- 45 % Sugar	67	24.18	60 %
5	46- 55 % Sugar	189	68.23	
6	56- 65 % Sugar	21	7.58	
C	***Khoa* used**			
7	*Pindi*	12	4.33	*Dhap*
8	*Dhap*	265	95.67	
9	*Danedar*	00	0.00	
D	**Per cent Quantity of *khoa***			
10	75	211	76.17	75 %
11	80	47	16.97	
12	90	19	6.86	
E	**Per cent Quantity of *wheat flour/maida***			
13	20	189	68.23	25 %
14	25	67	24.18	
15	30	21	7.59	
F	**Per cent Quantity of baking powder**			
16	5	197	71.11	5 %
17	07	61	22.02	
18	10	19	6.86	
G	**Quantity of rose water/kg**			
19	20 ml	57	20.57	20 ml
20	30 ml	207	74.73	
21	40 ml	13	4.70	
I	**Stages of addition of condiment (cardamom)**			
22	Milk boiling	00	0.00	At the time of ball preparation
23	Dough stage	00	0.00	
24	Pat formation	00	0.00	
25	Raw *khoa*	00	0.00	
26	On ball preparation	277	100.00	
J	**Type of *ghee* used**			
27	*Vanaspati* (vegetable)	24	89.90	Edible oil
28	Desi *ghee*	28	10.10	
K	**Storage condition**			
29	Room temperature	277	100.00	Room temperature
30	Refrigeration	00	0.00	

Table 24 contd....

Sr. No.	Technique	*f* (N=277)	%	Procedure standardized in laboratory
L	**Shelf- life (days)**			
31	One	57	20.58	Up to 7 days
32	Two	91	32.86	
33	Seven	103	37.18	
34	For week	126	45.48	
M	**Packaging material utilized**			
35	Paper card board/ corrugated box	00	0.00	Plastic / aluminium tin
36	Plastic tin/aluminium tin	277	100.00	

Procedure for preparation of *gulabjamun*

***Halwai* Method**	**Procedure standardized in laboratory** (Parekh 2013)
Buffalo Milk ↓ Filtration / Clarification ↓ Open pan (milk heating by their experience) ↓ *Khoa* ↓ Mixing *khoa* with refined flour and other ingredients ↓ Making of balls ↓ Frying of balls in ghee ↓ Soaking in sugar syrup ↓ Packing of balls with sugar syrup ↓ Storage	Buffalo Milk ↓ Preheating ↓ Filtration / Clarification ↓ Standardization (6.0% fat, 9.0% SNF) ↓ In steam jacketed pan, 15 % TS of milk, is concentrated up to TS 70-72 % ↓ *Khoa* ↓ Mixing *khoa* with refined flour and other ingredients ↓ Kneading and portioning ↓ Frying of balls in ghee ↓ Soaking in sugar syrup ↓ Packing of soaked balls along with sugar syrup ↓ Storage

4.21.5 Manufacturing technique for *kalakand*

Buffalo milk is preferred for *kalakand* making. However, the quality need not be as fresh as required for *burfi* and *pedha*. Slightly substandard or returned milk having titratable acidity up to 0.18 per cent (no sour flavour) can be used for making *kalakand*.

The economic importance of *kalakand* making is the hidden issue which is not talked openly. However, the *kalakand* is prepared and marketed. *Kalakand* is the traditional milk product and also is studied in this research project. The technique adopted and reported by the *halwais* in their interviews is presented in table 25 and discussed as follows: the majority (86.71 %) of milk sweet makers used buffalo milk for making *kalakand*. All milk sweet makers used *danedar khoa* for making *kalakand*. Maximum milk sweet makers (90.33%) used crystalline, whereas, 9.67 per cent of milk sweet makers used powder form of sugar while making *kalakand*. None of them used sugar syrup. Moreover, 71.60 per cent of milk sweet makers used sugar at the level of 25-35 %. Cent per cent of milk sweet makers heated *khoa* by their experience for *kalakand* making.

Majority (80.06%) milk sweet makers add sugar at raw *khoa* stage and 19.94 per cent of milk sweet makers add sugar at dough stage. None of the milk sweet makers add sugar at pat formation stage and boiling stage. Further, 62.53 per cent of milk sweet makers add dry fruits at raw *khoa* stage and 34.46 per cent milk sweet makers add dry fruits at *rabri* stage. None of the milk sweet makers add dry fruits at boiling stage and pat formation stage. Generally cent per cent milk sweet makers stored *kalakand*

at room temperature. Nearly two third (58.92%) milk sweet makers stored *kalakand* for a day followed by 29.30 per cent of milk sweet makers stored *kalakand* for two days and 11.79 per cent of milk sweet maker's stored *kalakand* for three days. Cent per cent milk sweet makers used paper card board box for packaging of *kalakand*.

Table 25. Distribution of sweet maker according to their procedure used for manufacturing of *kalakand*

Sr. No.	Technique	*f* (N=331)	%	Procedure standardized in laboratory
A	**Milk used for *khoa* making**			
1	Cow	26	7.86	Cow/buffalo/mixed, slightly acidic, add citric acid (0.01 %)
2	Buffalo	287	86.7	
3	Mixed	18	5.43	
B	**Heating temperature**			
4	By their experience	360	100	60^0C
C	**Forms of sugar**			
5	Crystalline	299	90.33	Crystalline
6	Powder	32	9.67	
7	Syrup	00	0.00	
D	**Level of sugar @ of volume of milk**			
8	15-20 % sugar	94	28.39	30 %
9	21- 30 % sugar	237	71.60	

Table 25 contd....

Sr. No.	Technique	*f* (N=331)	%	Procedure standardized in laboratory
E	**Stage of sugar addition**			
10	Milk boiling	00	0.00	Partial concentration (2 fold)
11	Raw	265	80.06	
12	Pat formation	00	0.00	
13	Dough stage	66	19.94	
F	**Stage of dry fruit addition**			
14	Milk boiling	00	0.00	Pat formation
15	*Rabri*	124	37.46	
16	Pat formation	207	62.53	
G	**Storage conditions**			
17	Room temperature	331	100.00	Room temperature
18	Refrigeration	00	0.00	
H	**Shelf-life (days)**			
17	One	195	58.92	Up to 7 days
19	Two	97	29.30	
20	Three	39	11.79	
I	**Packaging material utilized**			
21	Paper card board / corrugated box	331	100	Paper card board / corrugated box

Procedure for preparation of *kalakand*

***Halwai* Method**	**Procedure standardized in laboratory** (Sawant *et al.*, 2007)
Buffalo milk ↓ Filtration ↓ Heating (by their experience) ↓ Addition of citric acid ↓ Stirring (till semisolid consistency) ↓ Addition of sugar and cardamom ↓ Heating with continuous stirring (Temperature by their experience) ↓ Pour in greasy trays ↓ Cool and store at room temperature ↓ *Kalakand*	Buffalo milk (6 % Fat) ↓ Filtration ↓ Boiling (20-25 minutes) ↓ Addition of citric acid @ 0.03 per cent W/V ↓ Stirring (till semisolid consistency) ↓ Addition of sugar @ 6 per cent, crushed cardamom @ 0.20 per cent and mix well ↓ Keep on low fire for five minutes with continuous stirring ↓ Pour in greasy trays ↓ Cool and store at room temperature ↓ *Kalakand*

4.21.6 Manufacturing technique for *channa*

The technique of *channa* making at *halwais* level and standardized in the research laboratory are cited in the Table 26 and discussed here. The maximum (81.32%) milk sweet makers used cow milk for making *channa*. Still nearly three fourth (73.44%) milk sweet makers used to heat milk by their experience. It was appreciable that at least 25.56 per cent of respondents heated milk to the temperature (71-80^{0}C) and which is on par with recommendations made by the research laboratories.

Also it was observed that 56.85 per cent of milk sweet makers cooled milk by their experience and 43.15 per cent of milk sweet makers cooled milk to the temperature 70^{0}C as pointed in the laboratory while making *channa*. The use of citric acid as coagulant was followed by 88.38 per cent of respondents. Remaining 11.62 per cent of them used lemon juice. It was observed that cent per cent milk sweet makers (67.21%) used muslin cloth for draining of whey. Nearly two third milk sweet makers preserve channa at room temperature while 32.79 per cent used refrigeration temperature. Further, cent per cent of milk sweet makers used plastic container for packaging of *channa.* More than half (58.50%) of the milk sweet makers stored *channa* for a day, 25.72 per cent stored for two days, 12.87 per cent stored for three days and remaining 2.91 per cent milk sweet makers stored *channa* for a week.

Table 26. Distribution of sweet makers according to procedure used for manufacturing of *channa*

Sr. No.	Technique	*f* (N=241)	%	Procedure standardized in laboratory
A	**Type of milk used**			
1	Cow milk	196	81.32	Cow milk
2	Buffalo milk	45	18.68	
3	Mixed	00	0.00	
B	**Heating temperature**			
4	By their experience	241	100.00	80 ^{0}C for 10 minutes
C	**Type of coagulant used**			
5	Citric acid	213	88.38	Citric/lactic/ whey 1-2 % at 70 ^{0}C
6	Lemon juice	28	11.62	
D	**Type of cloth used for draining of whey**			
7	Muslin cloth	241	100.00	Muslin cloth
E	**Storage conditions**			
8	Room temperature	162	67.21	Refrigeration
9	Refrigeration	79	32.79	
F	**Packaging material utilized**			
10	Plastic tin	241	100	Plastic tin, polythene bags/ cling films
11	Polythene bags/cling films	00	00	
G	**Shelf-life (days)**			
12	One	141	58.50	Up to 7 days
13	Two	62	25.72	
14	Three	31	12.87	
15	Seven	7	2.91	

Procedure for preparation of *channa*

***Halwai* Method**	**Procedure standardized in laboratory**
Cow milk ↓ Filteration ↓ Heating (by their experience) ↓ Addition of coagulant ↓ Straining ↓ Draining ↓ Cooling ↓ Packaging ↓ Storage	Cow milk ↓ Standardization (4.0%fat) ↓ Heating (to boil) ↓ Addition of coagulant at 82^{o}C (1-2%citric acid solution) ↓ Straining (Muslin cloth) ↓ Draining ↓ Cooling (at room temp.) ↓ Packaging ↓ Storage (4-6^{o}C)
	Anantakrishnan and Srinivasan (1964), Rangappa and Acharya (1974), De (1980), Aneja *et al.* (2002)

4.21.7 Manufacturing technique for *rasogulla*

Stepwise practice of making rasogulla and number of respondents adopted the practice are reported in Table 27. It is observed that large group (83.82 %) of milk sweet makers used cow milk whereas 16.18 per cent used buffalo milk for preparing *rasogulla*. None of them used mixed milk.

Generally cent per cent milk sweet makers carried the practice of filtration. After that 87.97 per cent of milk sweet makers heated milk randomly by their experience and 12.03 per cent of milk sweet makers heated milk up to boiling temperature. Cent per cent respondents used citric acid as coagulant. Also cent per cent follow the procedure of cooling of coagulum, draining/pressing, muslin cloth/ cotton cloth, *channa* (55-58 % moisture), kneading, balls making (8-10 g), cooking of balls (in 55-60 % sugar syrup for 15-20 min), soaking of sugar syrup and cooling. So far as storage is concerned 75.94 per cent sweet makers stored it at room temperature and about one fourth (24.06%) of them stored at refrigeration temperature. Cent per cent used plastic as packaging material. As regards shelf life of *rasogulla,* 80.92 per cent respondents stored it for only one day. While refrigerated stored product remain acceptable up to 5 to 7 days.

Table 27. Distribution of sweet makers according to their procedure used for manufacturing of *rasogulla*

Sr. No.	Technique	*f* (N=241)	%	Procedure standardized in laboratory
A	**Milk used for *rasogulla* making**			
1	Cow	202	83.82	Cow (3.5 % Fat)
2	Buffalo	39	16.18	
3	Mixed	00	0.00	
B	**Filtration**	241	100.00	Yes
C	**Heating temperature**			
4	Boiling of milk	29	12.03	80^0C
5	By their experience	212	87.96	
D	**Cooling temperature**			
7	60 -70 °C	00	0.00	70^0C
8	71-80 °C	10	4.14	
9	By their experience	231	95.86	
E	**Coagulant used**			
10	Citric acid (0.5-1.00 %)	241	100.00	Citric acid (0.5-1.00 %
11	Any other coagulant used	00	0.00	Lemon
12	Cooling of coagulum	241	100.00	Cooling
13	Draining/pressing	241	100.00	Draining
14	Muslin cloth/ cotton cloth	241	100.00	Muslin cloth
15	*Channa* (55-58 % Moisture)	241	100.00	55-58% moisture
16	Kneading	241	100.00	Kneading
17	Balls making (8-10 gm)	241	100.00	8-10 g balls

Table 27 contd...

Sr. No.	Manufacturing process	*f* (N=241)	%	Procedure standardized in laboratory
18	Cooking of balls (55-60 % sugar syrup for 15-20 Min)	241	100.00	Cooking of balls (50-60 % sugar syrup for 15-20 min.
19	Soaking in sugar syrup	241	100.00	Soaking
20	Cooling	241	100.00	Cooling
F	**Storage conditions**			
22	Room temperature	183	75.94	Room temperature
23	Refrigeration	58	24.06	
G	**Packaging material utilized**			
24	Plastic	241	100.00	Plastic
H	**Shelf-life (days)**			
25	One	195	80.92	1-2 days
26	Two	27	11.20	
27	Three	13	5.39	

Procedure for preparation of *rasogulla*

***Halwai* Method**	**Procedure standardized in laboratory**
Cow milk ↓ Filtration ↓ Heating (Temp by their experience) ↓ Cooling (Temp by their experience) ↓ Coagulation ↓ Draining/Pressing ↓ Cooling of coagulum ↓ Draining ↓ *Channa* ↓ Kneading ↓ Balls making (size by their experience) ↓ Cooking of balls ↓ Soaking in sugar syrup ↓ Cooling ↓ Storage	Cow milk ↓ Standardization (3.5 %fat) ↓ Heating (80^{o}C) ↓ Filtration ↓ Cooling (70^{o}C) ↓ Coagulation (0.5 – 1.0 % citric acid solution) ↓ Draining/Pressing ↓ Cooling of coagulum ↓ Draining ↓ *Channa* (55-58%moisture) ↓ Kneading ↓ Balls making (8-10g each) ↓ Cooking of balls (50-60 %syrup for 15-20 min) ↓ Soaking in syrup ↓ Cooling ↓ Storage
	Anantakrishnan and Srinivasan(1964), Rangappa and Acharya (1974) De (1980), Aneja *et al.* (2002)

4.21.8 Manufacturing technique for *paneer*

Paneer is the heat acid coagulated milk product which is also prepared by the halwais, especially in semi-urban and city area. It was tried to know the technique of *paneer* making by the *halwais* and the data generated through questionnaire is presented in Table 28, wherein variable results are obtained. Table values (Table 28) showed that majority (84.35%) of milk sweet makers used buffalo milk for making of *paneer*; 15.65 per cent were intended to use lemon juice and allowed to set the coagulum. Cent per cent used muslin cloth for draining of whey. Majority (76.66%) milk sweet makers preserved *paneer* at room temperature and rest (22.34%) of them used refrigeration. On questioning of shelf life more than half (51.96%) of respondents said that the sale of *paneer* was effected within two days. This is why values of store condition and shelf-life correlate to some extent. Cent per cent sweet makers packed *paneer* in paper cardboard box.

Table 28. Distribution of sweet maker according procedure used for manufacturing of *paneer*

Sr. No.	Manufacturing procedure	*f* (N=179)	%	Procedure standardized in laboratory
A	**Milk used for *paneer* making**			
1	Cow	28	15.65	Buffalo milk/ standardization 6 % fat
2	Buffalo	151	84.35	
3	Mixed	00	0.00	
B	**Heating temperature**			
4	By their experience	179	100.00	90^{O}C for 5 to10 min.
5	Draining	179	100.00	

Table 28 contd....

Sr. No.	Manufacturing procedure	*f* (N=179)	%	Procedure standardized in laboratory
C	**Cooling temperature**			
6	By their experience	179	100.00	70 ^{O}C
D	**Coagulant used**			
7	Citric acid (0.5-1.00 %)	157	87.71	Citric / Lactic acid (1.00 %)
8	Lemon juice	22	12.29	
9	Setting of coagulum (Time)	179	100.00	5 to 10 min
10	Muslin cloth used for draining of whey, application of artificial pressure , cooling,	179	100.00	Draining with help of muslin cloth, application of artificial pressure (2-3Kg/Sq cm), deep in chilled water, remove water,
E	**Storage condition**			
11	Room temperature	139	77.66	Refrigeration
12	Refrigeration	40	22.34	
F	**Shelf-life (days)**			
13	One	93	51.96	Up to 5 days
14	Two	27	15.08	
15	Three	15	8.37	
	For Week	04	2.23	
G	**Packaging material utilized**			
16	Paper card board /corrugated box	179	100.00	Polyethylene pouches/ wax coated parchment paper
17	Polyethylene	00	00	

Procedure for preparation of *Paneer*

***Halwai* Method**	**Procedure standardized in laboratory**
Buffalo milk ↓ Filteration ↓ Heating (Temp by their experience) ↓ Cooling (Temp by their experience) ↓ Addition of coagulant ↓ Coagulation ↓ Draining ↓ Hooping ↓ Pressing ↓ Dipping in chilled water ↓ Packaging ↓ Storage	Buffalo milk ↓ Standardization(6 % fat) ↓ Heating (90^0C) ↓ Cooling (70^0C) ↓ Addition of coagulant ↓ Coagulation (70^0C) ↓ Draining ↓ Hooping ↓ Pressing ↓ Dipping in chilled water (5-6^0C) ↓ Packaging ↓ Storage
	Anantakrishnan and Srinivasan(1964), Rangappa and Acharya (1974), De (1980), Aneja *et al.* (2002)

4.22 Quality control measures followed by milk sweet makers

Platform tests are for quick assessment quality of raw milk to decide the acceptance or rejection of milk for further processing. With this in view the respondents covered were asked whether they carry out platform tests or otherwise. The results

obtained in respect to quality control measures are tabulated in Table 29.

Table 29. Quality control measures followed by milk sweet makers

Sr. No.	Particulars	*f*	%
A	**Platform test**		
1	Organoleptic evaluation	360	100.0
2	Clot on Boiling Test (COB)	00	00.00
3	Specific gravity	00	00.00
B	**Adulteration test**		
1	Starch	00	00.00
2	Urea	00	00.00
3	Sugar	00	00.00
4	Sodium carbonate (caustic soda)	00	00.00
5	Sodium bicarbonate	00	00.00

According to the information generated (Table 29), all sweet makers follow organoleptic evaluation and none of them conduct COB, specific gravity test etc. Also they were not carrying any test for detection of adulteration.

All sweet makers rest on organoleptic evaluation for the quality of raw milk. And they carried this operation on their own experiences. Addition to this they are not interested or aware of carrying adulteration tests or any other platform test for assessing the quality of milk procured by them. It may be plausible cause behind the adulteration blow-out.

4.23 Hygienic practices followed by milk sweet makers

The information on hygienic practices followed by milk sweet makers is tabulated in Table 30 and graphically presented by Fig. 22.

Table 30. Hygienic practices followed by milk sweet makers

Sr. No.	Hygienic practices	Yes		No	
		f	%	*F*	%
1	Location and surroundings away from polluted and slum area	351	97.50	09	2.50
2	Proper layout and design of sweet shop	219	60.84	141	39.16
3	Cleaning and sanitization of equipments	311	86.38	49	13.62
4	Infrastructural facility				
i	Potable water supply	360	100	00	0.00
ii	Drainage and waste disposal	327	90.84	33	9.16
iii	Wash basin and toilet	211	58.62	149	41.38
iv	Air quality and ventilation	197	54.73	163	45.27
V	Lighting	360	100	00	0.00
5	Food operations and controls				
i	Procurement and storage of raw materials	321	89.16	39	10.84
ii	Milk processing	360	100	00	0.00
	Taking precautions against contaminants and cross-contamination	257	71.38	101	28.05
iii	Use of non-toxic and safe packaging material	289	80.27	71	19.73
iv	Documentation and records	113	31.38	247	68.61
6	Sanitation and maintenance of shop				
i	Cleaning and maintenance	277	76.95	83	23.05
ii	Pest control systems	97	26.95	263	73.05
7	Personal hygiene of *Halwai* /Cook /Labour				
i	Health status	129	35.84	231	64.16
ii	Personal cleanliness and behavior	257	71.39	103	28.62
iii	Use of hand gloves while preparing and packaging of products	31	8.62	329	91.38
iv	Wearing of clean cloths	269	74.73	91	25.27

The result showed that 97.50 per cent of respondents established their shop away from polluted and slum area. Two-

third (60.84 %) of them monitored suitable layout and design of shop. They were careful towards cleaning and sanitization of equipments. Also, they all got available potable water supply and maximum (90.84 %) respondents adopted the practice of drainage and waste disposal.

In the jurisdiction of surveyed sweet makers, their location and surroundings were away from pollution and slum which was good sign from public point of view. Now a days general public / consumers are very much conscious about quality particularly in respect of safe and hygienic food. Under the situation, if the shop situated or located in the slum area people avoid purchasing any consumable items (sweets) from that shop. This might be possible reason that *halwai* located their shops away from polluted and slums surroundings.

Here we noted that 60.84 per cent of milk sweet makers provide attention towards the proper layout and design of sweet shop. Whereas, remaining 39.16 per cent did not pay proper attention. The reason would be (i) the *halwai* may not be aware of the proper layout and design needed for construction of shop. (ii) they planned the shop as per land availability and their view etc. (iii) Likewise they have not seen positively in the direction of the ventilation and sanitation practices or other aspects. (iv) Also in semi- urban and urban areas due to lack of space, they have to layout and design according to available space.

Majority of them followed the cleaning and sanitization of equipments in or out of their shop.

In infrastructural facility, all surveyed sweet makers had good potable water supply and lightings. If the good quality of

potable water is not available in premises of shop, it can directly affect the quality of milk products and bad impression on the mind of consumers. This indicates that shop owners were aware of at least supply of potable water. Also in problems studied, many of them told us, the electricity is one of the major constraints faced by them. In the maintenance of drainage and waste disposal 90.84 per cent of sweet makers maintained proper effluent systems. According to data, 58.62 per cent of milk sweet makers have attached or separate wash basin and toilet. And 54.73 per cent of milk sweet makers kept proper care for maintaining freshness of air in shop. If proper ventilation is not with the shop, it may adversely affect on the flavour or odour in the shop and products also.

Regarding hygienic practices when we asked them about processing of milk, all explained the following practices followed, they procure milk on fat content or *khoa* prepared from one litre of milk, filtration, boiling of milk and then refrigeration, which are minimally required.

In respect of procurement and storage of raw materials, 89.16 per cent of milk sweet makers buy or purchased milk from wholesale market, and stored properly under refrigeration conditions. Larger group (80.27%) used non-toxic and safe packaging material, like paper corrugated box, tins, plastic material etc.

Out of total sweet makers from surveyed area, about 31.38 per cent of sweet makers kept, daily records or daily diary of input/output i.e. incoming milk and outgoing milk products in the shop.

With regard to sanitation and maintenance of sweet shop, following practices are followed by milk sweet makers.

About three fourth (76.95 %) of milk sweet makers maintain or discipline the cleaning and maintenance, and 26.95 per cent of milk sweet makers followed pest control systems in their sweet shops. It was observed that remaining of milk sweet makers not aware of pest control practices or services.

Personnel hygiene plays major role in quality production, in this case following observations were noted,

Nearly three fourth (74.73 %) milk sweet makers adopted personal hygiene practice like, wearing of clean cloths and we witnessed that in some milk sweet shops all labours including cook are also seen in particular clean dress code. When we discussed with milk sweet makers about personal cleanliness and behaviour, 71.39 per cent of *halwai* told that they strictly follow it.

When we discussed with them about health status and regular health check-up they were reluctant to do this aspect. Very few (8.62%) milk sweet makers follow the appropriate practices like, use of hand gloves during processing while preparing and packaging of products. The notable point we noted that milk sweet makers was not aware about TQM, GMP, GHP etc. There is need to educate them to accelerate the quality production.

4.24 Heat desiccated/concentrated milk sweet products manufactured in the milk sweet shop

Investigations were carried out to know the types of heat desiccated/concentrated milk sweet products manufactured in the milk sweet shop, accordingly the data in this aspect is recorded in Table 31 and depicted by Fig. 23.

Table 31. Heat desiccated/concentrated milk sweet products manufactured in the milk sweet shop

Sr. No.	Products	*f*	Market rate (Rs)	
			Average	Range
A	***Burfi***			
1	Mawa / plain	317	231.61	240-340
2	Kesar mawa	309	243.67	250-360
3	Mango	221	327.60	260-420
4	Fig	113	280.12	280-380
5	Strawberry	47	332.80	320-410
6	Sapota	37	313.47	290-380
7	Orange	59	330.20	300-380
8	Apple	31	371.57	320-420
9	Coconut	21	281.65	260-380
10	Custard apple	29	291.25	250-390
11	Tricolor	41	311.45	290-380
12	Dry fruit	197	339.53	320-460
13	Cashew (kaju katali)	257	499.67	320-560
14	Almond	201	291.17	280-400
15	Gulkand	97	279.52	260-420
16	Date	19	361.85	320-420
17	Kesar badam	71	327.75	320-460
18	Chocolate	57	349.28	260-420
19	Pista	77	409.33	260-520
B	***Pedha***			
1	*Khoa*	351	266.22	200-360
2	Malai	343	316.97	260-360
3	Kesar malai	249	346.48	220-420
4	Kandi	79	289.82	210-380
5	Dry fruit	119	351.57	245-425
C	***Gulabjamun***	277	198	160-220
D	***Kalajamun***	229	218.62	160-240
E	***Kalakand***	331	231.61	240-340

It was learned through discussion with them that there was vast demand for bengali sweets in urban/ semi- urban area. The price of these sweets was higher as compared to *khoa* based sweets, sold in the village. As the value addition took place in the product selling price of that product was increased. Large flexibility or price variation was observed in cities as well as village also. Probable reason behind the price differences is the quality, demand, supply and seasonality.

4.25 Food inspector's visit to the shop of milk sweet makers

The frequency distribution regarding food inspector's visit to the shop of milk sweet makers is given in Table 32 and graphically represented by Fig.24.

Table 32. Food inspector's visit to the shop of milk sweet makers

Sr. No.	Frequency of visit	*f* (N=360)	%
1	Monthly	257	71.38
2	Quarterly	73	20.27
3	Half yearly	21	5.84
4	Yearly	9	2.50

On enquiry of involvement of government agency in this issue, our first impression was that shop keepers were reluctant to speak on this aspect. Moreover, our facial reading innate that they were not open to speak directly in this regard. Even then whatever data generated is recorded in Table 32. It was reported that majority (71.38%) milk sweet makers shops are visited monthly by the food inspectors. Some said that it was visited quarterly (20.27%), half yearly (5.84%) and very few (2.50%) *halwais* reported yearly.

There is somewhat confusing and controversial situation appeared. Here the majority of *halwais* told that food inspector visit per month regularly. But in another place controversial results are observed, majority of them (*halwai*) told that they are not aware of any government agency to inspect sweet meat quality. They are not aware of quality, hygiene, nutritional standards, or any advanced technology. It means the role of food inspectors is not uniform or doubtful in certain areas.

Table 33. Distribution of milk sweet makers according to the prospects for milk sweet making business

Sr. No.	Prospects	*f*	%	Rank
1	Expansion of business through branches	114	31.67	18
2	Improving quality of raw material	254	70.55	8
3	Establishing direct contact with consumers and retailers	74	20.55	20
4	Using standard quality packaging material	184	51.11	11
5	Improving self-life of milk and milk products	109	30.27	19
6	Reducing cost of investment and production	246	68.33	10
7	Increasing periphery of business	169	46.94	12
8	Increasing awareness about food rules/regulations	119	33.05	17
9	Get knowledge about government programs and schemes/subsidies	148	41.11	14
10	Capacity building of labour through training	288	80.00	6
11	Increasing benefit-cost (BC) ratio	310	86.11	4
12	Receiving quality inputs	147	40.84	15
13	Improving state of art through scientific facility in shop	247	68.62	9
14	Advertisement of specific brand through media in particular locality	345	95.84	2
15	Improving clean and hygienic condition	287	79.73	7

Table 33 contd....

Sr. No.	Prospects	*f*	%	Rank
16	Maintaining standards of basic nutrition and food requirement as per specification	324	90.00	3
17	Promote export of indigenous milk products	289	80.27	5
18	Creating storage facility in shop	126	35.00	16
19	Establishment of milk sweet makers federation at district and state level	168	46.67	13
20	Establishment of regulating authority/Apex body for technical guidance and policy support for unorganized milk sector	349	96.95	1

4.26 Prospects for milk sweet making business

It is learned from Table 33 and Fig 25 that a good number of (96.95 %) milk sweet makers were interested in establishment of regulating authority/ apex body for technical guidance and policy support for this sector. Secondly, 95.84 per cent of milk sweet makers would like to make advertisement of specific brand through media in particular locality, 90.00 per cent of *halwai* believe in maintaining standards of basic nutrition and food requirement as per specification, majority of *halwais* (86.11%) were interested in increasing benefit cost (BC) ratio. Only 20.55 per cent of milk sweet makers were in favour of establishing direct contact with consumers and retailers.

The results are of thought provoking and indicate the position of milk sweet maker's present status of traditional sweet making business and their prospects in near future. Ranking was allotted to the number of milk sweet makers according to the opinion on the particular prospect. Here we found some surprising opinion of the milk sweet makers regarding their business.

Table 34. Distribution of milk sweet makers familiar with rules and regulation of government

Sr. No.	Role of government	Yes		No	
		f	%	*f*	%
1	Government assigning registration number for establishment of sweet making shop	360	100.0	00	0.00
A	**Main criteria for registration of shop**				
1	Registration according to PFA shop act	291	81.00	69	19.00
2	Registration according to shop act license	360	100	00	0.00
3	Any difficulties while getting registrations	00	0.00	360	100
4	Registration for manufacture and sale of food items	360	100	00	0.00
5	Government agency helping for giving registration	360	100	00	0.00
6	Any quality control programme from government side for product manufactured by you	360	100	00	0.00
7	Any role of dairy development agencies in establishing, regulating and overall control in milk sweet making business	00	0.00	360	100
8	Awareness of novel technology coming in through Food Research Institutes, Agriculture University, and R&D of cooperative sector	00	0.00	360	100
9	Government institutes providing training for skill improvement in this business	00	0.00	360	100

Table 34 contd.....

Sr. No.	Role of government	Yes		No	
		f	%	*f*	%
B	**Awareness about research and training institutes**				
1	Anand, Gujrat	47	13.05	313	86.95
2	NDRI, Karnal	11	3.05	349	96.95
3	Agriculture universities	37	10.27	323	89.73
4	Krishi Vigyaan Kendra	13	3.62	347	96.38
C	**Criteria for fixing selling rate of product**				
1	Milk availability and milk prices	360	100	00	0.00
2	Raw material prices	313	86.95	47	13.05
3	Competition in the market	267	74.16	93	25.84
D	**Way to find out consumers demand for product**				
1	Regular purchasing	351	97.50	9	2.50
2	Demand of the specific product	311	86.38	49	13.62
E	**Check list for consumer's satisfaction about product**				
1	Feedback	317	88.05	43	11.95
2	Regular purchasing in same shop	323	89.73	37	10.27
3	Maintain standards of basic nutrition and food requirement as per specification of product	51	14.16	309	85.84
4	Knowledge of food rules/regulations	87	24.16	273	75.84

For instance, at first rank majority of *halwai* opined about the need of establishment of regulating authority/apex body for technical guidance and policy support for unorganized milk sector, means they are ready for organizing a system.

Next it is felt necessary and agreed upon the importance of advertisement of specific brand through print or electronic media in particular locality. Most of sweet makers opined that due to

advertisement strategy of marketing, there was notable increase in the customer numbers and ultimately the sell of products.

4.27 Rules and regulation of government

Table 34 and Fig 26 illustrated that, cent per cent of milk sweet makers were aware of the government policy of assigning registration number for establishment of sweet making shop, registration according to shop act license, registration for manufacture and sale of food items, government agency helping while giving registration and quality control programme for milk products manufactured by *halwais*. Also it was observed that, 81.00 per cent of milk sweet makers registered their shops under PFA shop act. Further, none of the milk sweet makers reported the difficulty while getting registration for sweet shop. Cent per cent of *halwais* reported that there was no any type of dairy development agency involved in establishing, regulating and keeping overall control in milk sweet making business.

Surprising result noted from Table 34, that none of the milk sweet makers are aware of newer technology coming from food research institutes, agricultural university, R&D of cooperative sector and also non government institutes providing training for skill development in this case. Also in respects to the research and training institutes, (96.95%) milk sweet makers were not aware of NDRI, Karnal, Krishi Vigyaan Kendra (96.38%), Agricultural Universities (89.73%) and Anand, Gujarath (86.95%).

In case of criteria for fixation of product selling rate, cent percent milk sweet makers considered, milk availability and milk prices in the market followed by raw material prices (86.95%).

The 74.16 per cent of milk sweet makers think of competition in the market.

In case of identification of consumers demand for milk sweet product, 97.50 per cent of milk sweet makers take into consideration the regular purchasing of milk product and (86.38%) on the basis of demand of the specific product .

Milk sweet makers judge the consumers demand on the basis of, regular purchasing by the consumer in the same shop (89.73%) and consumer's feedback about quality (88.05%). Also it was observed that only 14.16 per cent of milk sweet makers were aware of maintaining standards of basic nutrition and food requirement as per specification of the milk product and 24.16 per cent of milk sweet makers having knowledge of food rules and regulations.

4.28 Constraints faced by milk sweet makers

Data on constraints faced by milk sweet makers is recorded in Table 35 and depicted by Fig 27.

The issue of constraints faced by the sweet makers was raised with respondents and constraint wise numerical data are recorded in Table 35. It is indicated that cent per cent milk sweet makers informed that raw material price inflation was the major constraint faced by them. It was followed by electricity problem (96.38%), fluctuation in demand of milk product (93.61%), increase in market competitor (82.50%), availability of quality raw material (68.62%) and 61.38 per cent milk sweet makers reported lack of availability of skilled labourers.

Table 35. Distribution of milk sweet makers according to constraints faced by them

Sr. No.	Constraints	*f*	%
1	Lack of availability of skill labour	221	61.38
2	Electricity problem (load shedding)	347	96.38
3	Availability of quality raw material	247	68.62
4	Fluctuation and demand of milk product	337	93.61
5	Raw material price inflation	360	100.00
6	Increase in market competitors	297	82.50
7	Lack of consulting and counseling services	258	71.66
8	Unnecessary and stipulations of conditions in credit accessibility	211	58.61

According to the milk sweet makers the main constraint was, raw material price increase and lack of availability of quality raw material in the market. Due to increase in the prices of the raw material, the manufacturing cost of milk sweet product also increases. The rise in price we as consumer experienced, in market, the probable reason behind this is the increase in the prices of raw material.

It was observed that, items made of sugar and ghee are seeing a 10 per cent rise. Also prices of other raw material have increased, may it be oil, sugar or ghee and cost of raw materials. "Prices of allied items such as LPG and diesel have gone up too. This has increased production cost. The raw material like dry fruits, prices is increased and it ultimately affects on rise in milk

sweet prices. Also of packaging material, cost of the boxes has increased by Rs. 100/- at least.

Here is an example of renowned brand "*Chitale Bandhu*"; a popular chain of sweet shops across the Pune city has raised prices for most of their products this year. Our prices have risen approximately by 10 per cent in this season. This is because of the price rise of cooking gas, diesel, sugar and other basic raw materials. Prices of most of all ingredients have increased, so they have been forced to increase sweets prices, said Sanjay Chitale, partner of *Chitale Bandhu*. The price of cooking oil has also increased. Therefore it is not case of only the sweetmeats have been priced higher.

Second main constraint was the electricity problem. It has direct effect on the sweet making business. Due to this problem, there may be additional expenditure on diesel/petrol generator. But only the big sweet makers are able to purchase the generators or other replacement, not the small *halwai*. So it has direct effect on the production of milk sweets.

Due to inflation, regular customers and other individual buyers are the only drivers of sales. Companies may have cut down on orders, but Diwali is a family festival, and especially during *Padva* and *Bhau beej* festivals. Traditional items like *kaju katli, gulab jamun* etc are purchased at an individual level as said by owner of sweet shop.

The third main constraint was fluctuation in demand of milk products. Seasonality may also affect the milk fluctuation, because in summer due to lack of green forage and water scarcity problem, the milk production is decreased, it ultimately affects the

milk sweet production. In summer due to less production in milk and higher demand, the milk prices get increased. Ultimately it results in the rise of prices of milk products by the *halwais*.

The fourth main constraint was increase in market competitors and fifth is lack of consulting and counseling services. There is a need to train them with basic fundamentals of the quality, hygiene and sanitation, modern manufacturing techniques, adulteration tests, newer products, packaging and proper management practices. It may be supported by government institutes, KVKs, Agricultural Universities and Dairy Co-operatives. It may help sweet makers to gear up their business, and to supply quality milk products to the consumers.

The sixth constraint is lack of availability of skilled labour. Any food enterprise could not run successfully without the skilled technicians. Consumers prefer to purchase the quality product. If they get quality product, they trust on that particular sweet maker e.g., *Chitale, Kaka halwai, Haldiram* and *Brijwasi*... etc.

Labour issues remained another area of grief. On issues regarding the labouers as told by the owner of sweet shop, the problem get aggravated because of inflation. Workers agree to work with us only after an advance payment. Also they work only in particular season like *Diwali* for better income/wages.

We observed that most of the skilled labouers gave preference to start their own business after getting the experience. It may be the probable reason behind shortage or lacking of skilled labours.

The seventh main constraint was 'unnecessary and stipulations of conditions in credit accessibility.' It was seen that banks give finance only to the milk producers for dairy farming, dairy co-operatives, but there is no any scheme or policy by the financing institutes to uplift this (80.00%) unorganized sector which is mainly run by the *halwai*. If proper financing scheme or policy is implemented, definitely there will be qualitative and quantitative improvement in this business in India at each level of starting this business.

In case of fluctuation and demand of milk product, the following opinions from milk sweet makers are recorded. Generally, during *diwali* festivals, sale of sweets is not a problem, but on other days demand is limited. Individual customers also slowdown or reduce the demand due to increase in prices of their essential requirement. The middleclass income group tries to keep this festive season economical; due to which their business has been hit by 10 to 20 per cent at least.

The similar results were reported by Patil (2002), Deka and Patwari (2006) and Kulkarni (1979) in their studies.

4.29 Chi-square analysis

The efforts were made to know the profile of the sweet makers in terms of their age, education, occupation, total investment, size of shop, manufacturing space of shop, number of trained labourers, age of labourers, education of labourers, total milk volume handled and total income and data is presented in Table 36.

In view of dependency of the character with degree of prospects, it was found by the Chi- square test, that age (X_2=4.876), education (X_2=2.091), education of labour (X_2=5.39)

were independent with degree of prospects while other attributes viz. occupation (X_2=15.46), total investment (X_2=59.14), size of shop (X_2=18.22), manufacturing space of shop (X_2=19.78), number of labour trained (X_2=25.12), age of labour (X_2=62.24), total milk volume (X_2=167.1) and total income (X_2=118.94) were dependent with the degree of prospects.

However, the positive results of occupation, total investment, size of shop, manufacturing space, no of labour trained, age of labour, total milk volume, total income were made influence on degree of prospect. It means with increasing level of these factors may increase prospects of *Halwai* in western Maharashtra. In other words prospects of *Halwai* are solely depends on above factors.

It was observed that, 17.50 per cent of sweet makers were of young age (18-35 years), 75.00 per cent were middle age (36-50 years) and 7.50 per cent were old age (above 51 years). Chi-square test (4.870) suggests that age and degree of prospects were independent.

It is learned from the data; that milk sweet makers with their educational status at high school level and above were more (48.33%), followed by secondary school level (36.77%), primary school (13.06%) and very few illiterate (1.94%)

Considering the occupation, 88.33 per cent milk sweet makers are doing milk sweet making as main business, remaining respondent (11.67%) taking milk sweet making as allied business.

In respect to total investment, four investment groups were fixed in which 58.89 per cent milk sweet makers reported invested between 3,00,000 to 6,00,000 rupees followed by respondents investing Rs 50000 to 3,00,000 (33.33%) followed by

those (5.83%) investing more than 6,00,000 and lastly (1.94%) investing less than 50,000.

In viewing to the size of shop, 86.67 per cent milk sweet makers reported shop size <300 sq ft followed by respondents 8.33 per cent of shop size >300 sq ft and remaining 5 per cent milk sweet makers had shop size <150 sq ft.

In case of manufacturing space of shop 61.11per cent, 19.17 per cent, 16.11 per cent and 3.61 per cent respondents reported <350 sq ft, <150 sq ft, <500 sq ft and >500 sq ft space of the shop, respectively.

In case of trained labourers working in the milk sweet shop 56.11 per cent respondents mentioned 3 trained labourers working in the shop followed by 17.50 per cent of respondents reported more than 3 labour and 17.50 per cent of respondents reported 2 labourers and negligible 0.56 per cent of milk sweet makers reported that only one trained labour working in their shop.

In case of age of labourers, 79.72 per cent were below 45 years age followed by 17.78 per cent of respondents below 25 years age, very few (1.67%) respondents were less than 15 years and negligible (0.83 %) were above 45 years age.

Also in viewing the education of labourers it is seen from Table 36 that 46.67 per cent of respondents were below SSC, followed by HSC and Graduation 30.56 per cent of respondent, 10.00 per cent of respondent were below fourth standard and remaining 12.78 per cent were found to be illiterate.

In viewing the daily utilization of milk in sweet shop, 66.94 per cent of milk sweet makers used milk less than 40 litres followed by 26.94 per cent of respondents used less than 60 litres

of milk and a small number of (3.06%) respondents utilized milk, less than 15 litres and greater than 60 litres daily.

In case of income of milk sweet makers, 51.39 per cent of respondents mentioned their annual income less than 10,00,000 rupees followed by 38.89 respondent have income less than 50,000 rupees, 5.83 per cent of respondents have income more than 10,00,000 rupees and remaining 3.89 per cent of milk sweet makers reported their annual income was less than 20,000 rupees.

Table 36. Prospectus profile of milk sweet makers by chi-square analysis

Variables		Group		Degree of prospects						Chi square value
				Low		Medium		High		
		f	%	*f*	%	*f*	%	*f*	%	
Age	Young (18 to 35 years)	63	17.5	14	3.89	44	12.22	5	1.39	4.874
	Middle (36 to 50 years)	270	75.00	32	8.89	210	58.33	28	7.78	
	Old (above 51 years)	27	7.50	4	1.11	21	5.83	2	0.56	
Education	Illiterate	7	1.94	1	0.28	5	1.39	1	0.28	2.091
	Primary School (1-4th Std.)	47	13.06	7	1.94	35	9.72	5	1.39	
	Secondary School (5-10th Std.)	132	36.67	15	4.17	102	28.33	15	4.17	
	High School > (11-12th Std.)	174	48.33	27	7.50	133	36.94	14	3.89	
Occupation	Sweet Making as a main business	318	88.33	36	10	249	69.17	33	9.17	15.46**
	Sweet Making as a allied business	42	11.67	14	3.89	26	7.22	2	0.56	
Total investment	<50000	7	1.94	1	0.28	6	1.67	0	0	59.14**
	<300000	120	33.33	11	3.06	93	25.83	16	4.44	
	<600000	212	58.89	34	9.44	170	47.22	8	2.22	
	>600000	21	5.83	4	1.11	6	1.67	11	3.06	
Size of shop	<150	18	5.00	3	0.83	15	4.17	0	0	18.22**
	<300	312	86.67	46	12.78	240	66.67	26	7.22	
	>300	30	8.33	1	0.28	20	5.56	9	2.50	

Table 36 contd.....

Variables		Group		Degree of prospects						Chi square value
				Low		Medium		High		
		f	%	*f*	%	*f*	%	*f*	%	
Manufacturing space of shop	<150	69	19.17	10	2.78	50	13.89	9	2.50	19.78**
	<350	220	61.11	34	9.44	175	48.61	11	3.06	
	<500	58	16.11	6	1.67	39	10.83	13	3.61	
	>500	13	3.61	0	0	11	3.06	2	0.56	
Number of labour trained	1	2	0.56	0	0	0	0	0	0	25.12**
	2	63	17.50	9	2.50	54	15.00	5	1.39	
	3	202	56.11	32	8.89	170	47.22	25	6.94	
	>3	60	16.67	9	2.50	51	14.17	3	0.83	
Age of labour	<15	6	1.67	0	0	6	1.67	0	0	62.24**
	<25	64	17.78	4	1.11	39	10.83	21	5.83	
	<45	287	79.72	46	12.78	229	63.61	12	0	
	>45	3	0.83	0	0	1	0.28	2	0.56	
Education of labour	=0	46	12.78	3	0.83	36	10.00	7	1.94	5.39
	<4	36	10.00	4	1.11	28	7.78	4	1.11	
	<10	168	46.67	24	6.67	131	36.39	13	3.61	
	>10	110	30.56	19	5.28	80	22.22	11	3.06	
Total milk volume	<15	11	3.06	6	1.67	5	1.39	0	0	167.1**
	<40	241	66.94	44	12.22	194	53.89	3	0.83	
	<60	97	26.94	0	0	76	21.11	21	5.83	
	>60	11	3.06	0	0	0	0	11	3.06	
Total income	<200000	14	3.89	7	1.94	7	1.94	0	0	118.94**
	<500000	140	38.89	34	9.44	106	29.44	0	0	
	<1000000	185	51.39	9	2.50	154	42.78	22	6.11	
	>1000000	21	5.83	0	0	8	2.22	13	3.61	

*, **: Significant at 5 and 1% level of significance, respectively.

5. SUMMARY AND CONCLUSION

The present investigation entitled “Studies of status and prospects of milk sweet makers (*Halwai*) in Western Maharashtra” was undertaken with the following specific objectives as under.

i To study the socio-economic status of milk sweet makers.

ii Documentation of the technology used by milk sweet makers for preparation of indigenous milk products.

iii To study the prospects of milk sweet makers in Western Maharashtra.

iv To study the constraints faced by milk sweet makers.

5.2 Methodology

Keeping these objectives in mind, the research work was undertaken in six districts of Western Maharashtra viz; Jalgaon, Nasik, Ahmednagar, Pune, Satara and Kolhapur. Three hundred sixty respondents (milk sweet makers), sixty from each district were randomly selected for present study. The respondents were personally interviewed with the help of structured and pretested interview schedule. The collected data was analyzed by appropriate statistical tools like frequency, percentage and chi square test.

5.3 Findings

Profile of the milk sweet makers Locality

Nearly equal proportion of milk sweet makers were from urban areas (44.44%) and rural areas (41.41%). District wise distribution of respondents from urban area were 58.33 per cent of milk sweet makers from Pune, 55.00 per cent from Nashik, 45 per cent from Kolhapur, 41.66 per cent from Satara and 33.33 per cent

each from Ahmednagar and Jalgaon. As regards with semi- urban area 51.66 per cent respondents were from Ahmednagar, followed by Satara (50.00%), Jalgaon (48.33%), Kolhapur (38.33%), Nashik (31.66%) and 26.66 per cent Pune district. More to the point less respondents were from rural area, in Jalgaon (18.33%), Kolhapur (16.66%), Ahmednagar and Pune (each 15%), Nashik (13.33%) and Satara district (8.33%). Point to be noted was that very less milk sweet makers established their business in rural area.

Age

Majority of the respondents (65.06%) were found in middle age group (35 to 50 years) whereas 28.33 per cent were in younger age category. It is concluded that middle and younger aged respondents were running milk sweet shop in western parts of Maharashtra.

Education

Nearly, half (47.22%) of milk sweet makers were educated to higher secondary and college level.

Occupation

Over three-fourth of the sweet makers (88.34%) were engaged in milk sweet shop as main business of milk sweet making and remaining (11.66%) doing the sweet making as an allied business for their livelihood.

State of origin

About two third of milk sweet makers (64.16%) are drifted from Rajasthan state, less (16.38 %) from Gujarat and very few (6.38 %) from Madhya Pradesh. In response to this, only 13.05 per cent respondents are from Maharashtra engaged in milk sweet making business.

Training received

Notable findings were recorded that, none of the respondents received scientific training required for their business i.e. milk sweet manufacturing, marketing etc.

Registration by agencies

All sweet makers shops in study area had registered under Shop Act License and majority (81.00 %) of milk sweet makers registered according to PFA Shop Act.

Investment for establishment of shop

Over half (58.33) of the milk sweet makers have invested their own and bank borrowed resources for establishment of their business.

Source used for credit

Higher percentage (86.94%) of the respondents' main source of fund was from banks (nationalized, co-operative or commercial) and credit societies. Whereas very few (13.06%) of them depended on non-institutional sources.

Capital investment for sweet shop

Over half of the milk sweet makers had hired shop (52.22 %) and 47.77 per cent of them owned their shop. Majority of *halwais* purchased their own furniture (93.62%) and very few *halwai* (6.38%) used rental furniture. Also, most of the milk sweet makers had their own equipment (96.95 %) and very few of them had rental equipment (3.05 %) for running the business.

Size of shop

Majority (71.95 %) of milk sweet makers had medium shop size (501 to 1000 sq. ft). It was also observed that 74.16 per

cent *halwais* had manufacturing unit in the shop itself or adjoining to the shop.

Manpower working in milk sweet shop

Around 56.67 per cent of labours were younger (18 to 35 years) in age and educated up to secondary school level (31.38 %).

Source of milk

It was observed that 28.27 per cent of sweets makers procured cow milk directly from producer and 17.27 per cent from retailer/vendor. While, 40.27 and 59.72 per cent milk sweet makers procured buffalo milk from producer and retailer/vendor, respectively.

Milk handling capacity

Sixty three per cent of milk sweet makers were in small category, who procure milk in small volume (up to 40 lit milk/day) followed by 33.38 per cent of sweet makers falling in medium category (41-60 lit milk/day) and few (3.62%) sweet makers included in big category (>61 lit milk lit/day).

System of milk procurement

Over half of milk sweet makers (60.56%) procured milk on the basis of volume (Lit.).

Water sources

Mostly 90.55 per cent of sweet makers used water supplied by Municipality and *Grampanchayat* as main source of water for their daily requirement.

Fuel sources

Over two-third (66.67%) of milk sweet makers used LPG as main source of fuel for preparation of the milk sweet.

Equipment available with them

Sweet makers have used old fashioned and traditional equipments.

Milk products manufactured by them

All sweet makers (*halwais*) prepared *khoa* based sweets i.e. *pedha*. Next to *pedha* majority of them prepared *burfi* (88%) *kalakand* (85.83%), *basundi* (83.61%) and *rabri* (61.38%). Two third sweet makers (76.66%) manufacture *channa* based sweets (Bengali sweets) and 41.38 per cent of them prepared *paneer*. Fermented milk products like *shrikhand* (30.55%), *dahi* (32.5%), *lassi* (seasonal) 28.05 per cent and *amrakhand* 16.38 per cent were also prepared.

Manufacturing technique for *khoa*

Majority (70.27%) of milk sweet makers use buffalo milk for making *khoa* and *29.72* per cent use cow milk. It was also seen that maximum (88.62 %) respondents use open pan and very few (11.38 %) use energy driven equipment for making *khoa*. While making *khoa* nearly cent per cent of sweet makers used heat intensity based on their experience rather than following recommended temperature. All the respondents cool the *khoa* at room temperature. They use stainless steel/aluminum trays to store the *khoa*. The storage ability of *khoa* as stated by them was 1 day (31.38 %), 2 days (49.73 %) and 3 days (18.89 %).

Manufacturing technique for *pedha*

Higher percentages (86.38%) of the sweet makers use *pindi* type *khoa* for *pedha* manufacturing. Also, 87.00 per cent of respondents add crystalline form of sugar in *pedha* making, wherein 66.66 per cent add sugar as per recommendation (~30%).

Moreover, majority of the sweet makers prepare *pedha* manually. Most of the *pedha* is stored in the market at room temperature. The packages used are paper cardboard/paper corrugated/ paper cardboard laminated box.

Manufacturing technique for *burfi*

Majority (93.37 %) of milk sweet makers use *pindi khoa* for making *burfi* and few use *dhap khoa*. None of the milk sweet makers use *danedar khoa* for making *burfi*. Majority (91.16 %) of sweet makers use crystalline form of sugar for *burfi* and 8.84 per cent of sweet makers prepare *burfi* by using powder form of sugar. It was observed that two third (59.00 %) milk sweet makers added sugar to the level of 25-35 per cent of *khoa*, which is considered optimum level. All sweet makers heat the *khoa* by their experience. Majority of sweet makers (81.71 %) add sugar in raw *khoa.* Similar trend has been also observed for addition of flour, essence, colour, etc. The level of fruits addition is variable. About 84.22 per cent of sweet makers used to add fruits/nuts and to the level of 5 per cent. Most of the sweet makers (71.11 %) add fruit pulp at raw *khoa* followed by pat formation stage (24.16 %). It was observed that the burfi is packaged in paper cardboard/paper corrugated/paper laminated cardboard boxes.

Manufacturing technique for *gulabjamun*

Generally 95.67 per cent sweet makers use *dhap* type *khoa* for making *gulabjamun*. All sweet makers use sugar syrup for *gulabjamun* making. Two third 68.23 per cent sweet makers use 46-55 per cent sugar in syrup preparation followed by (24.18 %) sweet makers using 35-45 per cent sugar and few (7.58 %) sweet makers using 56-65 per cent of sugar for making syrup. It was

desirable and came out from the interview that round about 70 per cent of the respondents uses the combination of *khoa, maida* and baking powder nearer to the recommendations of research laboratory (i.e. *khoa*- 75%, *maida*- 25% and baking powder- 5 %). Point to be noted was that higher number of (74.73 %) of respondents used 30 ml rose water/kg for making *gulabjamun.* Most of them (89.90 %) used *vanaspati* ghee for frying *gulabjamun*. It is learnt and seen in this study, that marketed *gulabjamun* is stored at room temperature by the *halwais.* Cent per cent milk sweet makers used plastic container for packaging of *gulabjamun*.

Manufacturing technique for *kalakand*

Majority (86.71%) of milk sweet makers use buffalo milk for *kalakand*. Also, Cent per cent milk sweet makers use *danedar khoa* for making of *kalakand*. Maximum (90.33 %) milk sweet makers use crystalline sugar. Moreover, 71.60 per cent milk sweet makers use optimum level of sugar (25-35%). All milk sweet makers heat *khoa* by their experience for *kalakand* making. About 80.06 and 62.53 per cent milk sweet makers add sugar and dry fruits at raw *khoa*. Generally they store kalakand at room temperature. All of them use paper card board box for packaging and marketing.

Manufacturing technique for *channa*

Mostly cow milk (81.32 %) was used for making of *channa*. Nearly three fourth milk sweet makers heat the milk by their experience. It was appreciable that 25.56 per cent of them heated milk to the temperature 71-80^{0}C. Nearly, 56.85 per cent milk sweet makers cool milk by their experience. Moreover, 88.38 per cent of respondents use citric acid as a coagulant for *channa*

manufacture. All sweet makers use muslin cloth for draining of *channa*. Out of total respondents 67.21 per cent of milk sweet makers preserved *channa* at room temperature for a day. All sweet makers used plastic as a packaging material.

Manufacturing technique for *rasogulla*

Large groups (83.82%) of milk sweet makers use cow milk. Generally 87.97 per cent of milk sweet makers heat the milk randomly by their experience and 12.03 per cent of milk sweet makers heat the milk up to the boiling temperature.

Manufacturing technique for *paneer*

Majority (84.35%) of milk sweet makers use buffalo milk for manufacture of *paneer.* About 15.65 per cent of them use lemon juice as a coagulant and allow setting the coagulum. All of them use muslin cloth for draining. Majority (76.66%) milk sweet makers preserve *paneer* at room temperature. More than half (51.96%) respondents on questioning of shelf-life stated that the sale of *paneer* is affected within two days. All sweet makers packed paneer in paper cardboard box.

Quality control measures followed by milk sweet makers

All sweet makers are aware of organoleptic evaluation and none of them conducted COB, specific gravity test, etc. Also they do not carry out different tests for detection of adulteration. Addition to this they are not interested or aware of carrying adulteration tests of milk or any other platform test to assess the quality of milk procured by them.

Hygienic practices followed by milk sweet makers

Most of (97.50 %) respondents established their shop away from polluted and slum area. Two-third (60.84%) of them

monitored suitable layout and design of shop. They were careful towards cleaning and disinfection of equipment. Also they all got available potable water supply and maximum (90.84 %) respondents adopted the practice of drainage and waste disposal. Majority of them followed the cleaning the equipments in or out of their shop. In the maintenance of drainage and waste disposal 90.84 per cent sweet maker maintained proper effluent systems. According to the data 58.62 per cent milk sweet makers have the attached or separate wash basin and toilet. Around, 54.73 per cent milk sweet makers have taken proper care for maintaining freshness of air in shop. In concern to procurement of raw milk, about 89.16 per cent milk sweet makers procured/purchased it from wholesale market and stored it under refrigeration temperature. Larger group (80.27 %) used non-toxic and safe packaging material, like paper corrugated box, tins, plastic material etc.

Out of total sweet makers from surveyed area near about 31.38 per cent sweet makers kept their daily records or daily diary of inputs and outputs incoming milk and outgoing milk products in the shop.

With regards to sanitation and maintenance of sweet shop following practices are followed by milk sweet makers. More than three fourth (76.95 %) of milk sweet makers maintain or discipline the cleaning and maintenance, and 26.95 per cent milk sweet makers follow pest control systems in their sweet shops. It was observed that 73.05 per cent of milk sweet makers are not aware of pest control practices or services. Personnel hygiene plays major role in quality production; in this case following observations

were noted. Nearly three fourth (74.73 %) milk sweet makers adopted personal hygiene practice like, wearing of clean cloths and it was witnessed that in some milk sweet shop all labours including cook were seen in dress code. When we discussed with milk sweet makers about personal cleanliness and behaviour, 71.39 per cent *halwai* told that they strictly follow it. Very few (8.62 %) milk sweet makers follow the appropriate practices like, use of hand gloves during processing, while preparing and packaging of products. The important issue we noted was that milk sweet makers is not aware about TQM, GMP, GHP etc.

Heat desiccated/concentrated milk products manufactured in the milk sweet shops

It was learned through the discussion that there is vast demand for Bengali sweets in urban/ semi- urban areas. The prices of the Bengali sweets were higher as compared to *khoa* based sweets, which are mostly sold in the villages.

Food inspectors visit to the shop of milk sweet makers

Though it was reported that majority (71.38%) milk sweet makers said that food inspectors visited monthly, quarterly (20.27%), half yearly (5.84%) and very few (2.50%) *halwai*s yearly. However it was learnt by facial reading that they were not much open to answer such questions.

Prospects for milk sweet making business

Good number of (96.95%) milk sweet makers urged and were interested in establishment of regulating authority/ apex body for technical guidance and policy support for this sector. Secondly, 95.84 per cent of milk sweet makers would like to make advertisement of specific brand through media in particular

locality, 90.00 per cent of *halwai* believe to maintain standards of basic nutrition and food requirement as per specification, majority *halwai* (86.11%) interested in increasing benefit cost (BC) ratio. Few milk sweet makers (20.55%) were interested in establishing direct contact with consumers and retailers.

Rules and regulation of government

Enthralling result noted that none of the milk sweet makers is aware of newer technologies coming in from Food Research Institutes, Agricultural Universities, R&D of cooperative sector and non government organization providing training for skill improvement in this business. Moreover, 96.95 per cent milk sweet makers were not aware of NDRI Karnal, Krishi Vigyaan Kendra (96.38%), Agricultural Universities (89.73%) and Anand Gujarath (86.95), respectively. Also it was observed that only 14.16 per cent of milk sweet makers are aware of maintaining standards of basic nutrition and food requirement as per specification of the milk product. Whereas, only 24.16 per cent of milk sweet makers have knowledge of food rules and regulations.

Constraints faced by milk sweet makers

All of the milk sweet makers informed that raw material price inflation is the major constraint faced by them. It was followed by electricity problem (96.38%), fluctuation and demand of milk product (93.61%), increase in market competitor (82.50%), availability of quality raw material (68.62%) and 61.38 per cent of milk sweet makers reported lack of availability of skilled labour.

Chi-square analysis

The efforts were made to know the profile of the sweet makers in terms of their age, education, occupation, total

investment, size of shop, manufacturing space of shop, number of trained labour, age of labour, education of labour, total milk volume and total income.

It was evident that the 17.5 per cent of sweet makers were of young age (18-35 years), educated up to high school level and above (48.33%) and reported milk sweet making as main business. In respect to total investment, 58.89 per cent of milk sweet makers reported that they invested below 600000 rupees and 33.33 per cent invested Rs 300000. In viewing to the size of shop, 86.67 per cent of milk sweet makers reported shop size <300 sq ft and 61.11 per cent possessed <350 sq ft manufacturing space of the shop.

In case of experienced labourers working in the milk sweet shop 56.11 per cent of respondents mentioned 3 labour working in the shop and 17.50 percent respondents reported more than 3 labour working in their shop. In case of age of labour 79.72 per cent of milk sweet makers were below 45 years old and 46.67 per cent were educated below SSC. Majority (66.94%) of milk sweet makers used milk below 40 litres and 51.39 per cent respondents mentioned their annual income less than 1000000 rupees.

5.4 Conclusions:

- The findings of study may help administrators, policy makers, extension and technical workers, scientists and product manufacturers for accelerating the production of milk sweets.
- Milk and milk product manufacture process techniques and marketing systems were found to be traditional, under-developed, fragmented and inefficient. Thus, for strengthening

the status/profile of *halwais*, the government actions are required to license and inspect competing milk sweet makers (*halwai*) to ensure to achieve clean, hygienic and quality standards in order to facilitate the milk product processing and marketing.

- In the geographical area of the districts investigated, maximum milk sweet makers (self) and manpower worked in shops do not receive any type of scientific training for making various types of milk based sweets. It means none of milk sweet makers and manpower working in shops has any scientific knowledge about milk based sweets making. They follow their traditionally developed practices for making milk sweets.
- All sweet makers from study region prepare heat desiccated and acid coagulated milk products/sweets. Negligible sweet makers prepare fat rich dairy products and none of the sweet makers prepare fermented and frozen products in their sweet shops, but procure such products from branded franchise and sell in their shops.
- None of the sweet makers conduct adulteration test for milk and are some-times reluctant to use hand gloves while preparing and packaging of products also.
- Sweet makers urge to (i) establishment of regulating authority/apex body for technical guidance and policy support for unorganized sector. (ii) maintain standards of

basic nutrition and food requirement. (iii) increase benefit-cost (B:C) ratio and capacity building of labour through training for improving quality of milk products is the main prospects for milk sweet makers.

- Raw material price inflation is the major constraint faced by them. It was followed by electricity problem, fluctuation and demand of milk product, increase in market competitor, availability of quality raw material and lack of availability of skilled labour, lack of guidance etc should be overcome by creating awareness among them.

In addition to this, it may be hoped that the information from this study will lead to the improvement of status of *halwai* which contribute to: (i) an increase in the incomes of milk sweet makers (ii) an increase in the quality of locally produced milk and dairy products; (iii) an improvement of the safety and hygiene of milk and dairy products in sweet shops, and (iv) this will benefit consumers through getting quality products.

Suggestions:

The study was conducted in the region of six districts of western Maharashtra with restricted sample size. To confirm the results and to come out the same findings, it is imperative that the study should be extended to other parts of the Maharashtra state as well as other states of India.

In accordance with the findings of study, the scientific training programme should be arranged to acquire novel skills, methods and technology of manufacturing process of milk sweets. For orientation of newer technology some method and result

demonstrations should be conducted by different technical agencies, for mounting quality production of traditional milk sweets. Extension services (training) in line with improving processing of milk product (TQM, hygiene, quality), credit and market information were very weak also.

In the present study, the technology used, socioeconomic characteristics, constraints and prospects of milk sweet makers were studied and analyzed. It is necessary, to carry physico-chemical analysis of certain valuable technology developed by them and some major selling products.

6. LITERATURE CITED

Afzal, A., Mahmood, M.S., Hussain, I. and Akthar, M. (2011). Adulteration and microbial quality of milk (a review). *Pak. J. Nutr.,* 10 (12): 1195-1202.

Afzal, M. (2010). Re-designing smallholder dairy production in Pakistan. *Pak. Vet. J.,* 30: 187-190.

Ahmad, A. (2009). Milk adulteration by adding water and starch at Khartoum State. *Pak. J. Nutr.*, 8: 439-440.

Ali, N., John A. and Rehman, F. (2005). Corpse preservatives being used in unpacked milk. Daily Times, December 4, 2005.

Anantakrishnan, C.P. and Srinivasan, M.R. (1964). Milk Products of India, ICAR Publications. New Delhi.

Aneja, R.P. Neerja Rajkumar, Taneja, V.K., Bandyopadhyay, S.K. and Kumar, S. (2007). A text book of traditional milk products.

Aneja, R.P., Mathur, B.N., Chandan, R.C. and Banerjee, A.K. (2002).Technology of Indian Milk Products. A Dairy India Publications, Delhi.

Anonymous, (1987). Report on the national commission labour.www.google.com. pp. 597.

Anonymous (2001). Annual Report, 2000-01, Ministry of Food Processing Industry, New Delhi, (India). Pp: 174-175

Anonymous (2008). Solutions exchange food and nutrition security community.http://www.solutionexchange-un.net.in/ food/ cr/cr-se-food-02030901

Anonymous, (2009a). Wikipedia information of *Halwai*.www.google search.com.

Anonymous, (2009b). Food Safety and Standards Authority of India (FSSAI). Expert group on milk and milk products base working paper on strategy and action plan for ensuring safety of milk and milk products prepared by NDDB, Anand. pp: 3-4.

Anonymous, (2010a). Milk production of India in 2010. www.india milk products.com.

Anonymous (2010b). Public private partnership in Indian dairy industry. Initiating White Revolution–II. Gurgaon (National capital territory of Delhi), pp: 1-37. www.technopak.com

Anonymous, (2012). Milk and milk product adultration. www.google/adultration.com

Anuradha De, Tanuka Endow and Sourindra Ghosh (2010). Educational outcomes and poverty: Some findings from a household survey in Rajasthan and Madhya Pradesh. Collaborative Research and Dissemination (CORD) India, Working paper No. 32:10.

Baumgartner, M., Flock, M., Winter, P., Lu, W. and Baumgartner, W. (2005). Evaluation of flow injection analysis for determination of urea in sheep's and cow's milk. *Acta Vet. Hung*, 50: 263-271.

Bhalla, S.K. (2001). Quality - a necessity to face global challenges in dairy industry. National seminar on technology management for facing global challenge in dairy industry and alumni- convention, SMC College of dairy science, Anand, India, 9-10 June, pp: 61-64.

Chandra, M.B.B. (2005). Preservation of traditional sweet *Doodh pedha* by hurdle technology. M.Sc. thesis submitted to University of Mysore, Karnataka.

Das, G., Verma, N.K. and Jain, D.K. (2011). Consumption pattern of milk products across different socioeconomic groups of north Tripura district (Tripura). *J. Dairying, Foods & H.S.,* 30 (4): 230 - 238, 2011.

Dastagir, M. B. (2001). Demand for livestock products in India: current status and projections for 2020. Agricultural economics research review (conference proceedings), pp: 176-182.

De S. (1980). Text book on Outline of Dairy Technology, Oxford publication, New Delhi

Deka, R. and Patwari, P. (2006). The market study of dairy products in Assam. Assam agriculture competitiveness project for market study. NIAM. Kota road, Bambala, Jaipur.pp:19-22

Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S. and Courbois, C. (2001). Livestock to 2020: The next food revolution. Food, agriculture and the environment discussion paper 28. International Food Policy Research Institute, Washington, DC. pp: 42.

Food Safety and Standards Act (FSS Act, 2006). Food Safety and Standards Authority of India. Ministry of health & family welfare, FDA bhavan, Kotla road, New Delhi.

FSSAI, (2012). Quick test for some adulterants in food. Instruction manual part- I (common methods for detection at households). August, 2012. Pp: 3.

Gale, F. and Hu, D. (2007). Supply chain issues in China's milk adulteration incident. Economic Research Service U. S. Department of Agriculture Washington, DC.

Gandhi, V.P. and Mani, G. (1995). Average monthly per capita consumption expenditure, *Indian J. Agril. Econ.*, 50(3):283-293.

Ganguli, N. C. (1995). Indian dairy industry - retrospect and prospects, draft proceedings of seminar on indigenous Indian dairy desserts, December 18, Victoria University of Technology, Melbourne (Australia). pp: 8-13

Garg, R.K. (2009). The Times of India, Chandigarh: Every 5th sample adulterated. December 1, 2009. pp: 2.

Gayen, D. and Pal, D. (1991). Sensory, chemical and microbiological qualities of Delhi and Karnal market samples of *rabri*. and Studies on the manufacture and storage of *rabri*. *Indian J. Dairy Sci.*, 44(1): 80 – 88.

Grace, D., Baker, D. and Randolph, T. (2009). Innovative and participatory risk-based approaches to assess milk-safety in developing countries: a case study in north east India. Paper presented at the International Association of Agricultural Economists (IAAE) conference in Beijing, China.pp:1-10.

Gwin, M.C., Lienert, G. and Kennedy, J. (2009). Formaldehyde exposure and asthma in children. A systematic review. Environ. Health Perspect, 118:313-317.

Haasnoot, W., Smits, N.G.E., Kemmers-Voncken, A.E.M. and Bremer, M.G.E. (2004). Fast biosensor immunoassays in milk of ewes and goats. *J. Dairy Sci.,* 71: 322-329.

Hossain, M.M., Alam, M.M.. Rashid, M.M., Asaduzzaman M. and Rahman, M.M. (2005). Small scale dairy farming practice in a selective area of Bangladesh. *Pakistan J. Nutri.,* 4 (4): 215-221.

IS : 5550-1970 (Reaffirmed 1999). Indian standard specification for *burfi*. UDC. 664. 149 *Burfi*. Bureau of Indian Standards (BIS). Manak Bhavan, 9 Bahadur Shah Zafar, Marg, New Delhi 110002.

IS: 9617 (1980). Indian standard specification for *dahi*. Bureau of Indian Standards (BIS). Manak Bhavan, 9 Bahadur Shah Zafar, Marg, New Delhi 110002.

Jagdale, R.N. (2012). FDA Maharashtra commences special drive to ensure zero milk adulteration. Food Pro: News Letter of All India Food Processors' Association (AIFPA). July, 2012. pp: 3-4.

Kabir, M.A. (1995). An economic study of subsidized private dairy farming in selected area of Bangladesh. M.Sc. thesis submitted to department of agricultural economics, Bangladesh Agri. Uni., Mymensingh, Bangladesh, pp: 129-134.

Katre, S.P. (2001). Storage of dairy products. www.google.com

Khedkar, J.N., Desale, R. J., Sakate, R. J. and Kotade S.P. (2007). Use of fruit pulp in *burfi*. International conference on traditional dairy foods. NDRI, Karnal (India). November 14-17, 2007

Kulkarni, M.B. (1979). Collection of milk: Some lacunae and remedies, *Dairy Guide* 1(10): 31-34.

Kulkarni, S. and Murthy, M.K.R. (1997). A case for the review of present food laws relating to dairy products in India. *Indian J. Dairy Biosci.,* 8: 45-47.

Kulkarni, S. and Reddy, K. V. (2007). Ready mixes of traditional Indian dairy foods. An overview. Souvenir on international conference on traditional dairy foods NDRI, Karnal (India), pp: 7.

Kumar A. Deka, R. Patwari, P. (2006). Specialist livestock. Assam agriculture competitiveness project for market study (NIAM). Kota Road, Bambala, Jaipur.pp: 21-22. www.ccsniam.gov.in

Kumar S. (2007). Annual report. NDRI, Karnal. www.ndri.res.in pp: 1-173.

Kumar, A. and Staal, S. J. (2010). Is traditional milk marketing and processing viable and efficient? An empirical evidence from Assam, India. Quarterly *J. International Agriculture* 49(3): 213-225.

Kumar, P. (1998). Food demand and supply projections for India, agricultural economics policy paper 98-01, Division of Agricultural Economics, IARI, New Delhi.

Kumar, S. and Paul, S.C. (2007). Process standardization of *phirni* and development of *phirni* mix powder. Indian traditional dairy products: An overview. Souvenir on international conference on traditional dairy foods. NDRI, Karnal. pp: 83.

Kumaresan, A. and Srivastava, A. K. (2013). Sustainable dairy development for food and nutritional security. 41st Dairy

industry conference and IIDE2013 (Souvenir). 14-16 March, 2013.pp:12-13

Lateef, M., Faraz, A., Mustafa, M.I., Akthar P. and Bashir, M.K. (2009). Detection of adulterants and chemical composition of milk supplied to canteens of various hospitals in Faisalabad city. *Pak. J. Zool.,* 9: 139-142.

Loudon and Irvine, (1986). Deaths in childhoods from the eighteenth century to 1935. *Med. History*, 30: 1-41.

Mahalingaiah, L., Venkateshaiah, B.V., Kulkarni, S. and Rao, J. (2007). Development of technology for manufacture of *kunda* – effect of type of milk. Indian traditional dairy products: An overview. Souvenir on international conference on traditional dairy foods NDRI, Karnal. pp: 74-75.

Mudambi, R. and Rajgopal, M. (1985). Fundamentals of foods and nutrition Wiley eastern limited, New Delhi. pp: 196-228.

Nair, K. N. (1987). Animal protein consumption and the sacred cow complex in India. In Harris and Ross (eds.). *Food and evolution: Toward a theory of human habits*. Philadelphia: Temple University Press.

Nidhi Gupta and Priti Panchal (2009). Extent of awareness and food adulteration detection in selected food items purchased by home makers. *Pakistan J. Nutri.,* 8 (5): 660-667.

Pal, D. and Raju, N. (2007). Heat desiccated products: *khoa*, *Dahi* Indian traditional dairy products: an overview. International conference on traditional dairy foods. NDRI, Karnal (India). November 14-17. pp: 14-42.

Pal, R.N. (1963). Milk adulteration in Ludhiana city. *Indian J. Dairy Sci.* 16: 92- 97.

Panse and Sukhatme (1985). Text book of statistical methods. Sage publications, Meerat

Parekh J.V., 2013. Innovations in Traditional Indian Dairy Foods. 41st Dairy Industry Conference, IDA, 14-16 March, pp-21.

Patil, G.R. (2002). Present status of traditional Dairy products. *Indian Dairyman* 54(10): 35-43.

Radhakrishna, R. and Ravi, C. (1992). Effects of growth, relative price and preference of food and nutrition, Indian economic review, 27(Special Number):303-323.

Rai, D. C. (2012). The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18–20.

Rajorhia, G. S. (2012). Food safety regulations for traditional dairy products to promote exports and Hazard Analysis and Critical Control Points (HACCP) as Applied on Traditional Dairy Products of India The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18–20, pp:1-22

Rangappa, K.S. and Achayya, K.T. (1974). Indian Dairy Products. Asia Publishing House, New Delhi

Ranjan, R. and Bangabash, R. (2006). Emerging trends in business strategy. A success story of Mother Dairy. Research paper. Post Graduate Diploma in Management, Jaipuria institute of Management, Noida, pp: 15 Email: rajeevranjan99@gmail.com.

Rao, K. R. and Esakkimuthu, V. (2007). Financial institutions - role in dairy development for global markets. An overview. Souvenir on international conference on traditional dairy foods, NDRI, Karnal, pp: 23

Rideout, T.C., Liu, Q., Wood, P. and Fan, M.Z. (2008). Nutrient utilization and intestinal fermentation are differentially affected by the consumption of resistant starch varieties and conventional fibres in pigs. *Br. J. Nutr.,* 99: 984-992.

Rizvi, S.S.H. (2012). Basic principles of food preservation. . The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18–20, 2012. pp: 2

Roday, S. (2002). Food hygiene and sanitation, Tata Mc. Graw - Hill Publish in company Ltd., New Delhi, pp: 248-249.

Sawant, V. Y., Chauhan, D.S., Padghan, P.V. and Thombre, B.M. (2007). Formulation and evaluation of mango fruit kalakand .*J. Dairying, Foods & H.S.* 26 (2): 102-105.

Sawhney, I.K., (2007). Equipments for traditional Indian dairy foods – NDRI experience. An overview. Souvenir on international conference on traditional dairy foods, NDRI, Karnal, pp: 9

Saxena, R. (2000). Dynamics of demand for milk in this millennium, paper presented at the XXXth dairy industry conference, Calcutta. December 8-9, 2001, pp 32-47.

See, A.S., Salleh, A.B., Bakar, F.A., Yusof, N.A., Abdulamir A.S. and Heng, L.Y. (2010). Risk and health effect of boric acid. *Am. J. Applied Sci.,* 7: 620-627.

Sharma R. and Poonia A. (2012). Methods for detection of adulteration in milk and traditional dairy products (laboratory exercise). The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18–20, 2012.

Sharma R. and Rajput Y.S. (2006). Regulatory aspects of traditional dairy products. 21st short course on development in traditional dairy products. NDRI, Karnal, Dec. 10-30, pp: 26-27

Sharma, R. (2012). Chemical quality consideration in milk for sweet making and preventing chemical contaminants in traditional milk sweets. The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and

the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18–20, 2012. Pp: 1-22.

Sharma, U.P. and Zariwala, I.T. (1976). ICAR, (1982). Manual of dairy bacteriology. ICAR, publication.

Singh, D.S. (2012). Processing, value addition and health benefits of soybean. The training program for sweet makers and street food vendors was jointly organized by the Department of Animal Husbandry and Dairying and the Centre of Food Science and Technology, Institute of Agricultural Sciences (IAS), Banaras Hindu University (BHU). January 18-20, 2012.

Singh, H.L. and Kalra, K.K. (2004). Economic analysis of dairy business of *halwais* in Meerut district of UP. *Indian J. Dairy Sci.,* 57(5): 354-360.

Srivastava, A. K. (2011). NDRI Vision 2030. National Dairy Research Institute. Karnal, www. ndri.res.in

Staal, S. J., Pratt, A. N. and Jabbar, M. (2008). Dairy development for the resource poor part 3: Pakistan and India dairy development case studies. Pro-poor Livestock Policy Initiative (PPLPI), International Livestock Research Institute (ILRI). Working paper No. 44-3, pp: 42-60

Steven, J.S., Alejandro, N.P. and Mohammad, J. (2008). Dairy development for the resource poor part 3: Pakistan and India dairy development case studies. Pro-poor Livestock Policy Initiative (PPLPI), International Livestock Research Institute (ILRI). Working paper No. 44-3, pp: www.fao.org/ag/pplpi.htm

Sundaram, S. (1985). Consumer protection in India. B.R. publishing corporation, Delhi, pp: 66- 77.

Tariq, M., Mustafa, M.I., Iqbal, A. and Nawaz, H. (2008). Milk marketing and value chain constraints. *Pak. J. Agric. Sci.,* 45: 195-200.

Thakare, N.S., Khedkar C.D., Patil, M.R., Bajad, D.N. and Sarode, A. R. (2006). Studies on physico-chemical properties and incidence of pathogenic organisms in vendors milk of various tahesil in Yeotmal district. *J. Dairying, Foods & H.S.* 25 (3/4): 169-177.

Thakare, U.G. and P.O. Ingle. (2007). Development and standardization of socio-economic status scale. *Indian J. Extn. Edn.* 43(3 & 4) : 8-16.

Unnevehr, L. and Hirschhorn, N. (2000). Food safety issues in the developing world. World Bank Technical Paper No. 469. The World Bank, Washington DC, pp:72

Uppar, Y. (2007). A study on purchasing pattern, problems and awareness of welfare programmes among farm families of Gadag district. Thesis submitted to the University of Agricultural Sciences, Dharwad, Karnataka.

Vyas, B.M. (1997). A policy paper on the Indian dairy industry. *Indian Dairyman,* 49(5): 125- 133.

Wadekar, B. W., Chavan B. R. and Menkudale G. V. (2011). Survey on adulteration of the milk received from government milk scheme in Nanded town. IRA half yearly research J., 1(4):32-35.

Walker, G.P., Dunshea, F.R. and Doyle, P.T. (2004). Effects of nutrition and management on the production and

composition of milk fat and protein. *Austr. J. Agric. Res.*, 55: 1009-1028.

Wangala, S.T. and Wafula, G. (2007). Evaluation of microbiological quality and safety of milk marketed in Nairobi and Environs. Jomo Kenyatta University of Agriculture and Technology, Kenya.

World Health Organization, (2006). Core Health Indicators, www3/who/int/whois/core/core_ select_ process.cfm.

Zagade, M. (2012). FDA Maharashtra commences special drive to ensure zero milk adulteration. Food Pro: News Letter of All India Food Processors' Association (AIFPA). July, 2012. pp: 3.

8. VITA

KADAM VIKRAM SUKHADEV

A candidate for the degree
of
DOCTOR OF PHILOSOPHY (AGRICULTURE)
in
DAIRY SCIENCE
2013

Title of Thesis	**:**	Studies on status and prospects of milk sweet makers (*Halwai*) in Western Maharashtra
Major Field	**:**	Dairy Science
Biographical information	**:**	
*** Personal**	**:**	Born at Sangamner Tal- Sangamner Dist. Ahmednagar on 7th June 1983, Son of Sau. Jaya and Shri. Sukhadev Kadam.
*** Educational**	**:**	Passed B.Sc. (Agri.) Degree from College of Agriculture, Nivali, Dr. BSKKV, Dapoli in 2005.
	:	Passed M.Sc.(Agri.) degree in Dairy Science with First Class from PGI, Dr.BSKKV, Dapoli in 2007.
*** Address**	**:**	At/Post. Sangamner, Tal. Sangamner, Dist. Ahmednagar (M.S.)
*** E-mail**	**:**	vickykadam23@gmail.com.