Chapter I

INTRODUCTION

1.1 Introduction:

Grapes are one of the most popular and palatable fruits in the world. Grapes can be crimson dark blue, yellow, green, orange and pink in colors. White grapes are actually green in colour, and are evolutionarily derived from the purple grapes. Mutations in two regulatory genes of which grapes turn of production of antho cyanins, white are responsible for the colour of purple grapes. Antho cyanins and other pigment chemicals of the larger family of polyphenols in purple grapes are responsible for the varying shades of purple. In red wines grapes are typically an ellipsoid shape resembling a prolate spheroid.

The many countries in the world produce grapes. India is one of the countries that produce the grapes in many clusters. Maharashtra, Tamilnadu, Karnataka are the major grapes producing states in India. In Maharashtra mainly Nashik, Sangli, Solapur districts and Bijapur district of Karnataka are cultivating grapes.

Presently the grape industry in the country is facing problems in marketing of produce in both domestic and international markets. In this situation, optimal benefit from the grape cultivation can be derived by establishing the products like raisin, juice, wine, squash, syrup, jam, jelly, vinegar, pickles chocolates, tartaric acids, oil, cattle feed, tannin etc. These products have market potential for both domestics and international markets.

In India, presently, 78 percent of grapes are used for table purpose, nearly 20 percent grapes are used for raisin production, and less than 2 percent of grapes are used for making juice and wine.

In the traditional grape growing countries, more than 80 percent of the produce is processed in the form of raisin, wine and juice, but in India processing of fruit is nearly 22 percent which is very less as compared to other countries.

The raisin producing countries in the world are India, USA, Turkey, Iran, Chile, Greece, South Africa, Belgium, Argentina, Germany, Russia, Canada, Japan, France Netherland etc.

The USA and Turkey are the largest raisin producing countries in the world. These two countries together contribute to around 80 percent of the global production.

Raisin is prepared from the sound dried seedless grapes of the varieties having the characteristics of vitis vinefera L. This variety of grapes is processed in an appropriate manner to from a marketable raisin with or without coating with optimum ingradients.

In India the Thomson seedless and it's clones like Sonaka seedless, Manic Chaman, Tas A Ganesh, and Sharad Seedless are used to produce the raisins.

In India, raisin is mainly produced in Sangli, Nashik and Solapur districts of Maharashtra and Bijapur district of Karnataka. In India Tasgaon Tahsil of Sangli district of Maharashtra is famous for cultivating grapes and producing raisins.

The place "JUNONI" in 'Sangola' tahsil of Solapur district in Maharashtra has been selected by the raisin producers, for the establishment and promotion of grape drying units on large scale based on its appropriate geological and whether conditions.

This place is more suitable in terms of latitude, longitude, rainfall, temperature, humidity, air velocity for drying the grape in natural way. A barren land in JUNONI, is presently leading the raisin activities. There by JUNONI is turned in to Industrial hub.

After the raisins are produced, the farmers sell the product in the nearest market on assigned days, declared by a market committees. In market the raisins are sold by the Open Auction Method used by market committee. By this method the prospective buyers gather at the shop of the commission agent, around the heap of the produce, examine the produce and offer bids loudly. The produce is given to the highest bidder after taking the consent of the seller farmer. In this process the producer gets the price for his produce according to the grade and quality. The price of the produce depends on the supply and demand of the produce. Thus the producer does not know when his produce should be sold so that he can get optimal price for his produce. For this difficulty we have formed a fuzzy model for marketing of raisin and currant which will suggest to the producer when to sell his produce for getting maximum price according to the grading and quality.

1.2 Research project:

The title of the research project is “A STUDY OF FUZZY MODEL FOR MARKETING OF RAISIN AND CURRANT.”

1.3 Objective of the Study:

The objectives of the study are explained below. The project have been undertaken

1) To study the raisin production is Sangli district of Maharashtra.

2) To Study the manufacturing process of the raisin.

3) To study the marketing process of the raisin in Sangli district.

4) To collect the data from different marketing committees and analyze it using various Mathematical tools.

5) To formulate the fuzzy model for price determination of raisin.

6) To suggest the recommendations about the factors affecting the price of raisin for the benefit of producers.

1.4 Methodology:

The market research is based on the systematic research design to meet the objectives of the study.

1. Study Region:

For research study we have selected Sangli district of Maharashtra which includes raisin markets situated at Sangli and Tasgaon in Sangli district.

Sangli:

The Sangli is a district place in the western region of the Maharashtra state and is located between $16^0$45’ and $17^0$22’ North latitudes and $73^0$42’ and $75^0$40’ East latitudes. The length of east to west is 250 km and width of north to south is 97km. The total area of Sangli district is 8572 sq.km. There are10 tahsils in Sangli district. KRUSHI

UTPANNA BAJAR SAMITI, SANGLI i.e. Agricultural produce market committee is situated in Sangli.

Tasgaon:

Tasgaon is one of the tahsil of Sangli district. It is located at $17^0$03' north and $17^0$06' east. It has elevation of 560 meters. Tasgaon is a famous tahsil of Sangli for the production of good qualities of grapes and raisins. Grapes of Tasgaon are imported mainly to Asian Countries, UAE, Singapur, Hongkong, Shri Lanka, Bangaladesh. KRUSHI UTPANNA BAJAR SAMITI, TASGAON i.e. Agricultural produce market committee, is situated at Tasgaon.

2. Data Collection:

For the collection of data we have used two sources.

a) Primary Data b) Secondary data

a) Primary Data:

Survey method is used to collect the primary data. The survey is conducted in the following two agricultural market committees.

i) Agricultural produce market committee, Tasgaon

ii) Agricultural produce market committee, Sangli

This method will include the understanding of buying and selling process of raisin through direct observation at the point.

b) Secondary data:

The study is based on the reports of the market committees. Other sources like information articles published in news papers, magazines, internet, journals, annual reports, research papers, books etc. are used as secondary data.

3. Analysis:

1) Collected data is analyzed by using the basic Mathematical tools.

2) Fuzzy model is formulated to determinate the price of raisin based on grading of green and yellow raisins and currants.

1.5 Literature Review:

For the research study the following books and research papers are referred .

1) L. A. Zadeh, B.R. Gaines; Fuzzy sets and decision Analysis.

2) Zimmermann, Fuzzy sets, Decision making and Expert systems (1987)

3) Klir, Yuan, Fuzzy Sets and Fuzzy logic (2002)

4) Bellman R. E. Zadeh ; Decision Making in Fuzzy Environment Management Science (1970)

5) H. M. Nielsen ; W. paul ; Modeling Image Processing Parameters and Consumer Aspects for Tomato Quality Grading (1997)

6) M. S. Bapat, S. N. yadav ; Fuzzy Sets On Sugarcane Industry Decision (2009)

7) R. Srinivasan : Case Studies In Marketing The Indian Content (2014) PHI , India

8) M.S. Bapat ,S. N. yadav, S. R. Bhosale, An Introduction Of Type – 2 Fuzzy Relation For Qualitative Assessment Of Personality, Proceeding of National Conference on Fuzzy Logic and Applications, Karad, Feb 2014.

1.6 Chapter-wise Summary:

This project report is divided in to eight chapters. First chapter is introductory and it explains the origin of the problem "A study of Fuzzy Models for Marketing of Raisin and Currant." The objectives of the study are also stated along with the methodology used. The literature referred for study is given.

The second chapter is devoted for the basic concepts related to agricultural marketing.

The third chapter is accounted for the grapes which is a primary fruit for raisins. It includes the history of the grapes, and accounts the grape producing countries and various states of India. Also the health benefits of the grapes are stated.

The fourth chapter is main part of the project which is devoted to the raisins. The detailed procedure of production of raisin is explained. Also the health benefits of raisin are stated.

In chapter five different price indices are given and fuzzy set theory is explained. Based on the fuzzy logic fuzzy quality price index is introduced.

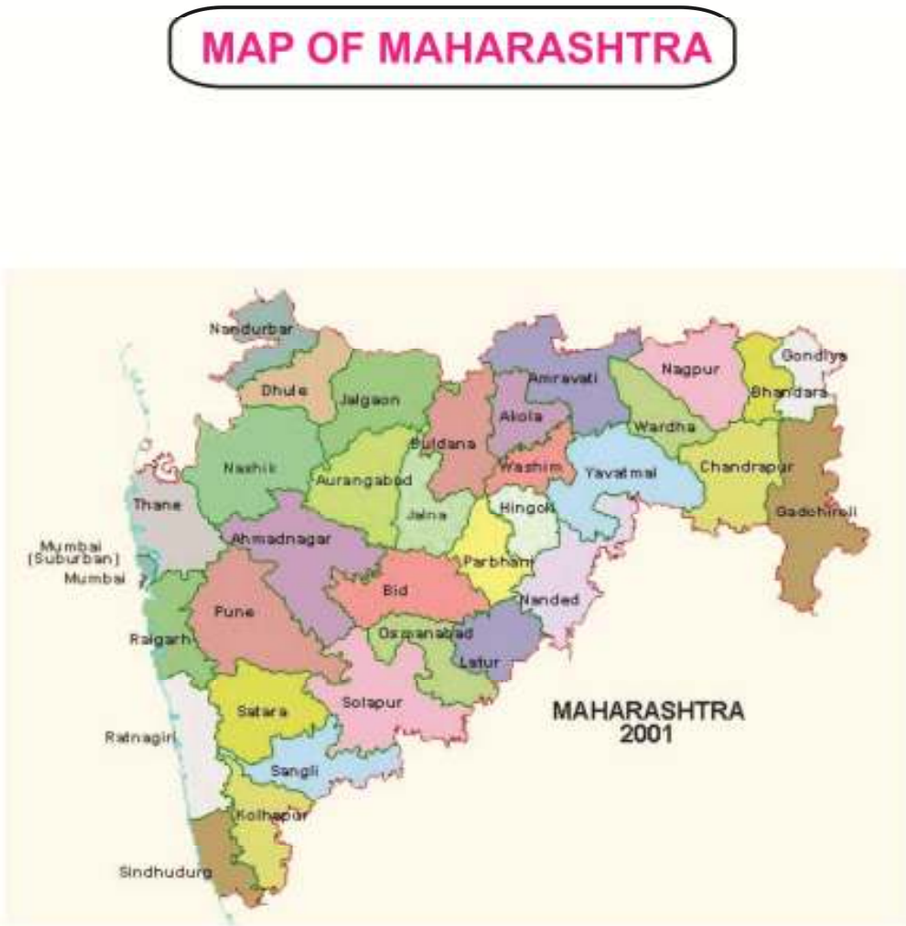
The chapter six is Data collection : The data about the raisin is collected by using the primary and secondary sources. The data from the two market committees namely Agricultural produce market committee, Sangli and Agricultural produce market committee, Tasgaon are collected.

The seventh chapter is Data Analysis. In this chapter the collected data is analyzed by using the basis mathematical tools. And a Fuzzy model is formulated to determine the price of raisin based on qualities of raisin.

In chapter eight conclusions, recommendations and limitations of the study are stated.

Finally the project ends with list of publications and bibliography.

MAP - 1


MAP OF MAHARASHTRA
Nandurbar
Dhule
Jalgaon
Amravati
Nagpur
Gondiya
Bhandara
Akola
Wardha
Buldana
Nashik
Washim
Yavatmal
Chandrapur
Aurangabad
Thane
Hingoli
Gadchiroli
Jalna
Ahmadnagar
Mumbai (Suburban)
Mumbai
Parbhani
Bid
Nanded
Pune
Raigarh
Osmanabad
Latur
Satara
Solapur
MAHARASHTRA
2001
Ratnagiri
Sangli
Kolhapur
Sindhudurg

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MAP OF SANGLI DISTRICT

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Chapter II

Basic Concepts

2.1 Introduction:

One of the most crucial problems in many decision-making methods is the precise evaluation of the pertinent data. Very often in real-life decision-making applications data are imprecise and fuzzy. A decision maker may encounter difficulty in quantifying and processing linguistic statements. Therefore it is desirable for decision-making methods to use fuzzy data. It is equally important to evaluate the performance of the fuzzy decision making method. Hence, the development of useful fuzzy decision-making methods is really the need of the hour.

Agricultural marketing in a broader sense is concerned with the marketing of farm products produced by farmers. The study of agricultural marketing system is necessary to understand the complexities involved and the identification of crucial problems for providing efficient services in the transfer of farm products to consumers. An efficient marketing system minimizes marketing cost and benefits all the sections of the society. The expectations from the system vary from group to group and generally the objectives are in conflict. Therefore fuzzy logic, which is a tool to study complexities and resolves the situations, can be a very useful tool. It tries to provide maximum share to the producer and required quality to the consumers at the lowest possible price.

Indian agriculture has attained a good degree of commercialization due to increase in production and social development by providing production incentives and distributing the benefits of growth. But still there are many problems in marketing of

agricultural produce in India. The seasonal glut of the agricultural produce and consequent slump in prices at the of harvest, scarcity during lean period, low productivity, erratic rainfall, scarcity of quality seeds, non-implementation of production technology by farmers, exploitation of producers by middlemen and big trading companies, lack of knowledge about grading and storage are some of the major hurdles in marketing of agricultural produce.

There is a large variation in the quality of agricultural products, which makes their grading and standardization somewhat difficult. In this project various methods are discussed for determining the price of the agricultural produce. Depending on the quality, fuzzy quality price is introduced. This model of pricing can be applied to any agricultural produce having similar marketing facilities. This helps in determining the expected price based on the quality and available previous information.

In India the marketing of agricultural produce has been promoted through regulated markets for the benefit of producers most of whom are illiterate or unaware of modern marketing activities. Most of state governments have enacted legislations to generate local agricultural committees. The purpose of the state regulations is to protect farmer's interests and to avoid the exploitation from intermediaries and organized traders. Also these local agricultural committees assure better price and timely payments for their produce. The producer or farmer wants to sell farm produce or processed farm produce at a satisfactory price. The prices of the agricultural produce vary from place to place to place, time to time and also with the quality and quantity. Also market information is an important part in the marketing system. Accurate adequate and timely availability of market information both the buyers and sellers. The market authorities declares the prices, arrivals and changes in the market on daily basis. Normally the prices of the produce are declared in the form of price intervals i.e. maximum price to minimum price.

From this information it becomes difficult for a farmer to guess about the possible price he will get in the market for his produce. The price of the produce mainly depends on the quality of the produce.

2.2 Market:

There are so many definitions for market some definitions of market are as follows:

1) A market is a place or building where commodities are bought and sold.

2) A market is a sphere within which price determining forces operate.

3) A market is on area within which the forces of demand and supply converge to establish a single price.

Regulated Market:

The market in which business is done in accordance with the rules and regulations formed by the statutory market organization representing different section involved in markets. The marketing cost in such markets are standardized and practices are regulated.

Agricultural marketing:

According to Thomson, agricultural comprises all the operations and agencies conducting them, involved in the movements of farm produced foods, raw materials and their derivative from the farm to the find consumers and effect of such operations on farmers, middlemen and consumer

Agricultural markets are established and regulated under the state Agricultural Produce Marketing Committee [APMC] act.

The responsibilities of AMPC are

1) Ensuring complete transparency in pricing system and transactions taking place in market area.

2) Providing market led extension service to farmers.

3) Ensuring payment for agricultural produce sold by farmers on the same day.

4) Promoting agricultural processing including activities for value addition on agricultural produce.

5) Publishing date on arrival and rates of agricultural produce brought on to market area for sale.

In India the organized marketing of agricultural commodities has been promoted through a network of regulated markets. Many state governments have enacted legislations to provide for the regulation of agricultural produce markets.

The purpose of the state regulation of agricultural markets was to protect from the exploitation of intermediaries and traders and to ensure better prices and timely payments for their produce.

Marketing strategy:

There are stockiest at all major trading centers who buy large quantities as and when required and then sell it to retailers in smaller lots. Normal demand is witnessed for raisins throughout the year and it picks up during festival and marriage seasons. The restaurants, star hotels, caterers, sweet makers are the major consumers.

The Sangli, Tasgaon, Nashik, Pandharpur centers of Maharashtra and Bijapur in Karnataka supply bulk quantities of raisin to central, western and northtern parts of India and some part of the middle east.

Grading:

The produce in market be graded according to the AGMARK standards.

Effects of grading:

i. Grading before sale enables to get higher price for produce

ii. Grading makes it possible to the producer to get proper market information

iii. Grading reduces the cost of marketing by minimizing the expenses.

2.3 Buying and Selling:

Buying and selling is one of the activities in the marketing process. The buying activity involves the purchase of the right goods, at the right place, at the right time, in the right quantities. It involves the problem of the of what buy, when to buy, from where to buy, how to buy and how to settle the parcel and the terms of purchase.

The selling activity involves impersonal assistance, a prospective buyer to buy a commodity. The objective of a selling is to dispose of the goods at a satisfactory price. The prices of agricultural commodities vary from place to place, from time to time and with the equality to be sold. Therefore selling involves the problem of when to sell, where to sell, through whom to sell and whether to sell in one lot or in parts.

Methods of buying and selling:

Many methods for buying and selling of farm products are considered in India.

1) Under cover of a cloth (Hath system)
2) Private Negotiations.
3) Quotations and sample taken by commission agent.
4) Data sale method.
5) Mogham sale method.
6) Open auction method.
7) Close tender system.

(A) Roster Bid system of open Auction Method:

For selling the raisins in the markets under consideration "Roster Bid system of open Auction" method is followed whose procedure is as follows.

1) Bidding starts from a first point in the market at a notified time about which the prospective buyers are given information in advance.

2) Buyers come at the produce, examine it, and offer bide loudly. The produce is given to the highest bidder after taking the consent of the seller farmers.

3) The bidding party (buyers or Traders) after the auction of the produce at first point moves to the second point in a clockwise or anticlockwise direction till the auction of the produce at all points of the market is over.

4) The auction is supervised by the auction clerk nominated by the market committee. This method ensures, fair dealing to all parties and farmers with a superior quality of produce received at a higher price.

(B) Close Tender System Method:

This method is similar to the open auction method, except that bids are invited in the form of a close tender rather than by open announcement. The produce displayed at the shop of the commission agent is allotted lot numbers. The prospective buyers visit the shops, inspect the lots, offer a price for the lot which they want to purchase on a slip of paper, and deposit the slip in a sealed box lying at the commission agent's shop. When the auction time is over, the slips are arranged according to the lot number, and the highest bidder is informed by the commission agent that his bid has been accepted and that he should take delivery of the produce. Some of the regulated markets have adopted this method of sale, which is time-saving and involves the minimum physical labour. There is no possibility of collusion among the buyers because each has quoted the price on the basis of his individual assessment of profit margins, taking into consideration the price prevailing in terminal and other secondary markets. The smooth functioning of this method depends on the efficiency of, and the supervision exercised by, the market committee officials.

The methods employed for the sale of agricultural commodities in Indian market differ from market to market and also from commodity to commodity. However, in regulated markets, either the open auction or the close tender system is prevalent.

In Tamil Nadu the buyers have adopted the close tender system which, it is claimed, is quicker and tends to give a higher price to the farmer than in the open auction system.

Chapter III

Grapes: Primary Fruit for Raisin

3.1 Introduction:

- Grapes are basically a subtropical fruit. (crop)
- A grape is a fruiting berry of deciduous woody vines of the botanical genus vitis.
- Grapes are typically an ellipsoid shape resembling a prolate spheroid.
- Grapes are high in water content and good for hydration.
- Grapes provide essential nutrients
- Grapes are available in black, dark blue, yellow, green, orange, pink, and white, colors.
- Grapes are perishable.
- There are many byproducts, made from the grapes e.g. rasin, wine, juice, jam, jelly, vinegar, grape seed oil, squash, syrup, pickles, chocolates, tartaric acid, cattle feed, tannin etc.
- There are different varieties of grapes in India.

1) Thomson seedless
2) Sonaka
3) Sharad seedless
4) Tas A ganesh

5) Manic chaman , etc.

- Thomson seedless grapes are known as Sultana Thomson

3.2 History of Grapes

The cultivation of the domesticated grape began 6000-8000 years ago in the east. The earliest rheological evidence for a dominant position of wine making in human culture dates from 8000 years ago in Georgia east.

Grapes cultivating countries:

Grapes cultivating countries are India, Spain, France, Iran, Turkey, United States, Iran, Portugal, Argentina, Chile, Australia, China, South Africa.

Grapes producer states in India:

The following states are the producer of grapes in India

1) Maharashtra
2) Karnataka
3) Tamilnadu
4) Panjab
5) Andra Pradesh
6) Hariyana.

3.3 Grapes in Maharashtra

Maharashtra is a leading in India in production of grapes. Sangli and Nashik districts are at a forefront in the Maharashtra to grapes production. Farmers of Sangli and Nashik districts produces the grapes in scientific manner. The grapes produced in sangli and Nashik districts are famous all over the India. Apart from these districts grapes are grown in the districts of Pune, Satara, Solapur, Ahmednagar, Osmanbad, Latur etc.

Catchment Areas of Market.

Sr.No.	**State**	**District market**	**Blocks**
1	Maharashtra	Sangli	Tasgaon, Kavathemahankal, Jath, Miraj, Atpadi, Walva, Khanapur, Shirala, Palus, Kadepur
		Nashik	Satana, Kalvan, Sinnar, Yeola, Dindori, Malegaon, Furgana, Igatputi, Niphad, Nandgaon,
		Pune	Baramati, Indapur,

			Saswad, Daund, Bhor, Ambegaon, Junner, Wadgaon, Sirur, Rajgurunagar, Mulshi, Ghod, Welhe, Purandhar,
		Solapur	Pandarpur, Akalkot, Sangola, Barsi, Karmala, Mohol, Malsiras, Madha, Mangalweda,
		Satara	Karad, Khatav, Koregaon,Khandala, Patan, Phaltan, Wai, Mahbaleshawar
		Ahmednagar	Shirgonda, Karjath, Parner, Nevasa, Pathardi, Rahuri, Akola, Srirampur, Sangamner

3.4 Classifications of Grapes

Grapes are classified into two categories.

1) Eaten raw grapes (table grapes)

2) Wine grapes.

1) Table Grapes :

1) They are large in size.

2) They are seedless fruits.

3) They have thin skin.

2) Wine Grapes :

1) They are smaller in size.

2) They are seedless fruits.

3) They have thick skin.

In India about 78% of grapes are used for table purpose, 20% grapes are used for raisin production, 1.5% grapes for farming juice and 0.5% grapes for manufacturing wine are used.

3.5 Varieties of Grapes in Maharashtra

1) Thomson seedless

2) Sonaka

3) Sharad seedless

4) Tas-A-Ganesh

5) Manic Chaman

Description of Grapes

Sr. No.	Name of the variety	Shape of berry	Color	T.S.S. of fresh grapes(0 brix)	Acidity%
	Thomson	Oval shape and	White	18to22	0.5 to 0.7

	Seedless	Elongated			
	Sonaka	Cylindrical and Elongated	Amber	22	0.4 to 0.7
	Sharad Seedless	Elliptical shape	Bluish black	18 to 21	0.5 to 0.7
	Tas-A-Ganesh	Avid shape	Green	20to22	0.5 to 0.65
	Manic Chaman	Cylindrical and Elongated	white	18 to 20	0.5 to 0.6

3.6 Availability Period of Grapes in the Market.

Sr. No.	State	Availability period
1	Maharashtra Karnataka Andra Pradesh	December to May
2	Tamilnadu	December to April
3	Panjab Hariyana	June

1) Harvesting period of grapes in Maharashtra is in the month of February to March

2) Wholesale markets available for grapes in India are Mumbai, Calcutta, Delhi, Bangalore, Chennai, Ahmadabad, Pune, Nagpur etc.

3.7 Health Benefits of Grapes

Grapes contain mainly potassium, fiber and antioxidants known as polyphones along with other minerals.

The many studies of research have shown that the consumption of grapes reduces to risk of 1) cancer 2) heart diseases 3) blood pressure 4) kidney stone 5) constipation.

1) Cancer :

Grapes contain antioxidants which prevent many types of cancer diseases.

2) Heart diseases :

Fiber and potassium in grapes, support to reduce the heart diseases.

3) Blood Pressure :

Grapes contain polyphones which reduces blood pressure.

4) Kidney stone :

Potassium in grapes reduces the risk of stokes and reduces the formation of kidney stone.

5) Constipation :

Fiber in grapes minimizes the Constipation. Grapes contain water hence it keeps grapes consumer hydrated and hence bowel movements become regular.

- Standard are established on the basis of certain characteristics such as weight, size, color, appearance, texture, moisture content, staple length, amount of foreign matter, ripeness, sweetness, chemical content etc. these characteristics on the basis of which products are standardized are termed as grade standard.

- Grading means the sorting of the unlike lots of the produce in to different lots according to the quality specifications laid down. Each lot has sub statically the same characteristics in so for as quantity is concerned.

- It is a method of dividing products in to certain lots or groups according with predetermined standard.

Plate - 1

GRAPES

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Chapter IV

Manufacturing Process of Raisin

4.1 History of raisin

It is conceived that ancestors came upon fallen fruit which had dried in the sun, and after testing, it's sweetness is discovered and thus the technique of drying fruit was discovered by an accident. Evidence has shown that raisins are produced by the Egyptian as early as 2000 B.C.

The word raisin comes from the French word Resinek.

4.2 Introduction

1) Raisin is a dried grape, which is also known as kishmish, Bedana, Manuka.

2) Raisin is a high energy and law fat snack.

3) Raisins are available throughout the years.

4) A sultana was originally a raisin from sultana grapes of Turkish known as Thomson seedless in United States.

5) Sultana is a golden colored dried grape.

6) The countries of the worl India, Greece, China, Japan, France, Russia, Germany, Australia and South Africa etc. produce the raisins.

7) India is producing the raisins since 1983.

8) The main areas of raisin production in India are Maharashtra and Karnataka.

9) In India raisin is mostly produced in Sangli, Solapur and Nashik districts of Maharashtra and Bijapur district of Karnataka and some places of Tamilnadu, Andhra pradesh and Punjab.

10) The place Junoni in Sangola taluka of Solapur district in Maharashtra has been selected for the establishment and promotion of grape drying units on large scale for its proper geological and weather conditions.

11) Sangli, Nashik and Solapur districts of Maharashtra grow the large quantities of grapes and growers supply it for producing the raisins.

12) In Maharashtra the main trading centres for raisins are Sangli, Tasgaon, Nashik and Phandharpur.

13) Raisins are used for eating purpose. Also raisins are used for cooking, baking and brewing purposes.

14) Raisins are used in Ice-creams.

15) Raisins are used in some herbal medicine preparation

16) Raisins are used for making farsan items and desserts.

17) Restaurants, star hotels, caterers and sweet makers are the major consumers of the raisins.

18) In India raisins are processed by drying varieties of grapes such as Thomson seedless, Sonaka, Sharad seedless, Tas-A Ganesh, Manic Chamman etc.

19) The technology of production in India is mostly based on the dipping of the clean, sawed grapes in Australian dip emission process which contains the

proper mixture of water, potassium carbonate and ethyl oleate oil and then drying the grapes.

20) The important methods for drying the grapes are

i) shade drying ii) sun drying iii) mechanical drying iv) solar drying etc.

21) In Maharashtra mostly shade drying method is used.

22) Raisin is processed for different size, color and textures.

23) In Maharashtra different colored raisins are manufactured. In Sangli districts mostly green, yellow, and black raisins are processed. In Nasik districts mostly golden raisins are processed. After drying raisins are treated with Sulphur dioxide to obtain golden color.

In India green raisins have general acceptance among the consumers.

24) A currant is a black dried seed grape.

25) Black Corinth are zante currant are miniature raisins. They are much darker and have a tart, tangy flavor. They are called currant.

4.3 Nutrition in raisin:

Raisins are composed of food elements as sugars, fruit acids and mineral salts.

1) Raisin contains up to 72% sugar by weight in terms of fructose and glucose which is a good source of carbohydrate.

2) Raisin contain fruit acids which as oleanolic, folic acid and pantothenic acid which are essential for the growth of the body.

3) Raisins contain the minerals as Calcium, Magnesium, Phosphorus, Iron, Copper, Potassium, Zinc, Sodium etc.

4) Raisins also contain vitamin B6 and vitamin C, protein and fiber.

5) Raisins are antioxidants.

6) Raisins are free from cholesterol.

7) Raisins have no fat.

Hence raisin is healthy snack.

4.4 Health benefits of raisin:

Raisin is a healthy snack food and best source of quick energy. It contains many vitamins and minerals. It has high nutritions; hence it has many health benefits as -

1) Raisin contains fructose, glucose, proteins and vitamins and hence raisin helps in body building system.

2) Raisin is the source of antioxidants which contains polyphones and it reduces blood pressure and also prevents the cancer diseases.

3) Raisin contains oleanoic acid which protects the mouth diseases.

4) Raisin contains potassium and magnesium, which reduces the risk of kidney stones and heart diseases.

5) Raisin contains Iron and Calcium, and hence it increases the bones strength and prevents the development of osteoporosis.

6) Raisin contains fiber and water which helps for regular bowel movements and minimizes the constipation.

7) Raisin is helpful to protect the eyes from eye diseases and to increase the eyes efficiency in anemia diseases.

4.5 Production of raisins:

1) Raisin production in the world –

United kingdom, Turkey and South Africa are the largest raisin producers in the world. Also India Greece, Australia, Iran, China, Russia, Afghanistan, Chile, Germany, Canada, Japan, France, Netherlands, Argentina are also raisin producer countries.

2) Raisin production in India –

Presently in India 78% of grapes are used for the table purpose. About to 17 to 20 % grapes are dried for raisin production. 1.5% grapes are used for making juice and 0.5% grapes are used for manufacturing wine.

In India raisin is mostly produced in Sangli district, Solapur district and Nashik district, Tasgaon tahshil in Sangli district of Maharashtra state and Bijapur district in Karnataka state.

At Junoni, in Sangola taluka of Solapur district in Maharashtra has been selected for the establishment and promotion of grape drying units on large scale based on its appropriate geological and weather data and proved the place most suitable in terms of latitude, longitude, rainfall, temperature, humidity of air, velocity etc. for drying the grape in natural way ‘ Junoni’ a barrun land is presently leading the raisin activities in the

country and has now turned into industrial urban town. The place Bijapur in Karnataka is also selected for production of raisin.

3) Raw material for raisin -

A raisin is dried grape. The raw material for processing raisin is the grape. To make 1kg of raisin approximately 4kg grapes are required. These grapes must have good and uniform appearance qualities in order to produce quality raisin as –

i. Grapes must be ripen early.

ii. Grapes have green and white color.

iii. Grapes have smooth texture.

iv. Grapes must be seedless.

v. Grapes have a placing flavor.

vi. Grapes have more pulp content.

vii. Grapes must be free from injuries.

viii. Grapes must be free from stick.

4) Grape verities for making raisin.

Raisin is prepared from the sound dried grape. Major production of raisin about 90% in the world is from Thomson seedless grapes. Other white and colored seedless varieties of grapes are also used for raisin production.

In India Thomson seedless and its mutants viz. Sonaka, Sharad seedless, Tas-A Ganesh, Manic Chamman etc. are mainly used for raisin production.

Thomson seedless grapes –

Thomson seedless grape was developed in 1872 by William Thomson. He created it by taking cutting from an English seedless grape and grafting them a Muscat grape vine, then resulting plant produced the first Thomson seedless grapes. All such sub sequent Thomson seedless vines came from original grafting.

The Thomson seedless is white in color and thin skinned grape. Its small berries are oval and elongated. It has high sugar content. Thomson seedless grapes ripen early in the season and do not stick to each other during the shipping; hence they are used mostly for raisin production.

4.6 Technology of raisin production –

It contains three steps

A) Dipping of grapes

B) Drying of grapes.

C) Post drying of dried grapes.

A) *Dipping of grapes.*

Select the grapes of good and uniform appearance qualities to produce the quality raisins.

In Maharashtra following three dipping treatments have been used.

1) For first dipping 1000kg grap berries a solution containing 2400 gm of potassium carbonate, 1800 ml dipping oil (ethyl oleate oil) in every 100 lt. water having temp 35^0c to 41^0c, has been formed. Then grape bunches have been dipped into the

formed solution for 3 minutes to increase the rate of water removed at the rate of 1.4 mg/cm^2. The dipping duration affected the moisture content, color, intensity and other quality attributes.

2) For second dipping after 3days the solution of 10 lt. water + 160 gm Potassium Carbonate + 120 ml dipping oil is sprayed on the grape berries by considering 1lt. solution for 40 kg grapes.

3) For third dipping after 5days the solution of 10 lt. water + 80 gm Potassium Carbonate + 80 ml dipping oil is sprayed on the grape berries by considering 1lt. solution for 80 kg grapes.

B) Drying of grapes-

Drying process has to be selective to remove the water from grapes without affecting the outer skin structure and arrangement of wax plates.

There are 4 main methods used in raisin production in different parts of the world depending upon cultivation conditions. The methods are as –

i. Shade drying
ii. Sun drying
iii. Mechanical drying
iv. Solar drying

The method of shade drying is used in Sangli, Solapur, Nashik districts of Maharashtra and Bijapur district of Karnataka. The shade drying method is as follows.

Shade Drying Method:

1) The location of shade be considered at the place where day time temperature is in the range of 35^0c to 41^0c with minimum humidity or dry whether media. Shades of 60 feet length and 20 feet width and height of 10 feet with fabricated iron structure is made. They are having South-North orientation and flow of air from West to East and shades are covered from top by black plastic sheet.

2) The rows of racks are generally spaced apart from at a distance of 2 feet to 5 feet.

3) In a shade, 6 to 12 shelves are formed with inter space varying from 9 inches to 15 inches.

Manufacturing process:

Harvesting of grapes period is from January to May every year. In manufacturing process, fully grown, ripped and good quality grapes are separated and have been put on drying racks. After first dipping the grapes are spread on racks. For drying purpose in this process around 1kg of grapes are spread over 1 sqr. feet area. The drying period will be 12 to 15 days approximately depending on actual temperature. During the drying period after 3 days second dipping will be done and after 5 days third dipping will be done. Then after 12 to 15 days, drying process will be completed and grapes be converted into raisins.

In process the time period to dry the grapes is governed by the physical characteristics of grapes and environmental conditions.

C) *Post drying of dried grapes:*

After the drying process has been completed, the raisins are sent to processing plants where raisins are cleaned with water to remove the foreign materials such as dust, sandy soil, steams and off grade raisins, through multiple washing. This leads to rehydration. Then second drying is completed in order to control the amount of the moisture content. Separation of raisins from the rack is done manually.

4kg grapes yield around 1kg of raisin of three different quantities which depend on size color and texture of raisins.

Using the chemical process on raisins they are formed with different colored as green raisins, yellow raisins, and black raisins and golden raisins.

4.7 Steps for making raisin

Step I - Select the fresh seedless, riped clean grapes.

Step II- Remove the larger stems from grapes. Wash the grapes in the proper mixture of water, Potassium Carbonate and ethal oleate thoroughly.

Step III- Then collect the grapes on the plastic containers from which air can be circulated around the grapes and use the first dipping procedure.

Step IV- Place the grapes on the iron racks, which are situated at sunny place, when the weather is dry and warm.

Step V- Rotate the grapes everyday. The process will be repeated after 3 to 4 days until the grapes become dry.

Step VI- Then use second and third dipping procedure after 3 and 5 days respectively.

Step VII- After 12 to 15 days grapes will be converted into dry fruits as raisins.

Step VIII- Remove the raisins and store them in the dry airtight container in a cool place or storage.

4.8 Dried grape quality:

The quality raisin depends on operating, pretreatment, processing and storage conditions. The quality of raisins is evaluated in terms of appearance (color), nonstick, texture, cleanliness, flavor and nutritional value. The texture of raisin is influenced by environment factors, cultural, physiological and genetic factors. The color of raisin be influenced by the state of the fresh grape. The marketability of raisins depends on size color and texture of the raisins.

4.9 Varieties of raisins:

Raisin varieties depend on the types of grapes used, size and color. The raisin varieties are made in different size. The raisin of different colors are formed by using the chemical procedure of sulphur dioxide.

Generally the verities of raisins are

i. Green raisin
ii. Yellow raisin
iii. Black raisin
iv. Golden raisin
v. Brown raisin

vi. Sun dried brown raisin

vii. Mixed raisins

viii. Industrial grade raisins

In Sangli district generally green, yellow, and black raisin are produced.

In Nashik district generally golden raisins are produced.

Indian green raisins have general acceptance among the consumers.

4.10 Packing and storage:

Final packing of raisins is done in card board boxes of 15 kg capacity and stored at cold storage at low temperature 4^0C to preserve the original color of raisins.

MAP - 4

MAP OF SANGOLA TAHSIL

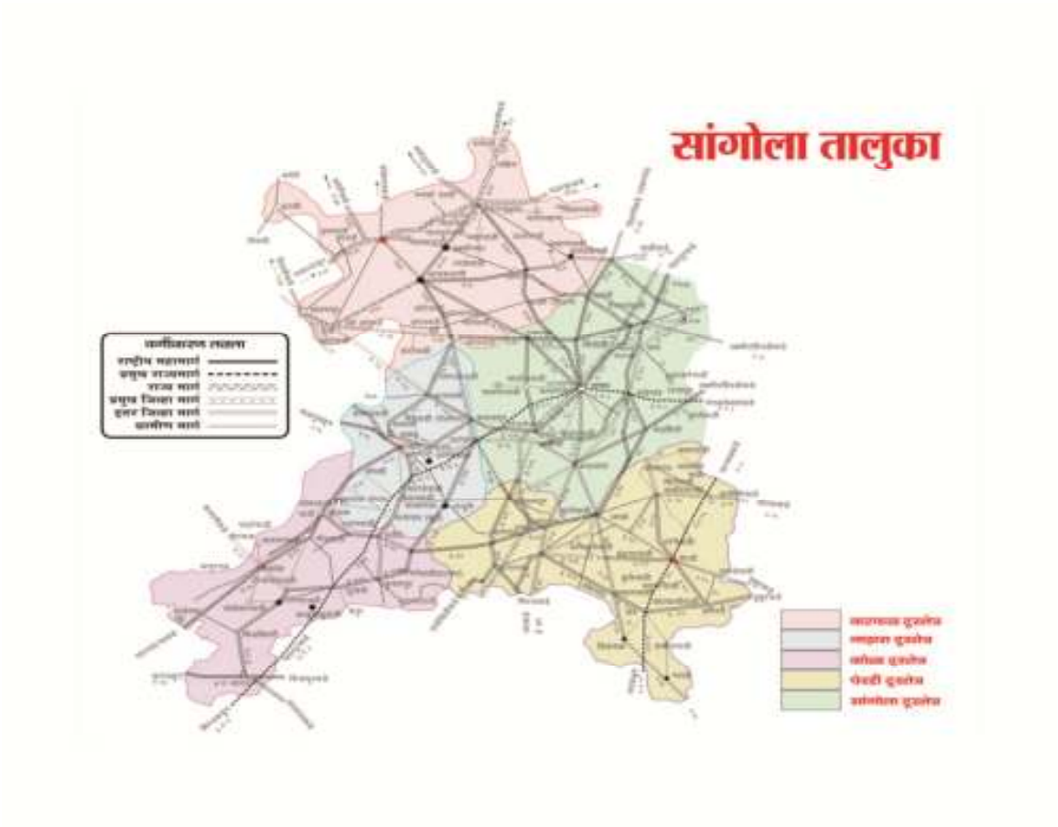

Plate - 2

NAGAJ JUNONI - RAISIN-HUB

सांगली- सोलापूर पट्टा झालाय 'बेदाणा हब'

तासगावची बाजारपेठ

नागज-जुनोनी परिसर 'बेदाणा हब' म्हणून विकसित झाला आहे.

Plate - 3

GREEN RASIN

Plate - 4

YELLOW RAISIN

Plate - 5

GOLDEN RAISIN

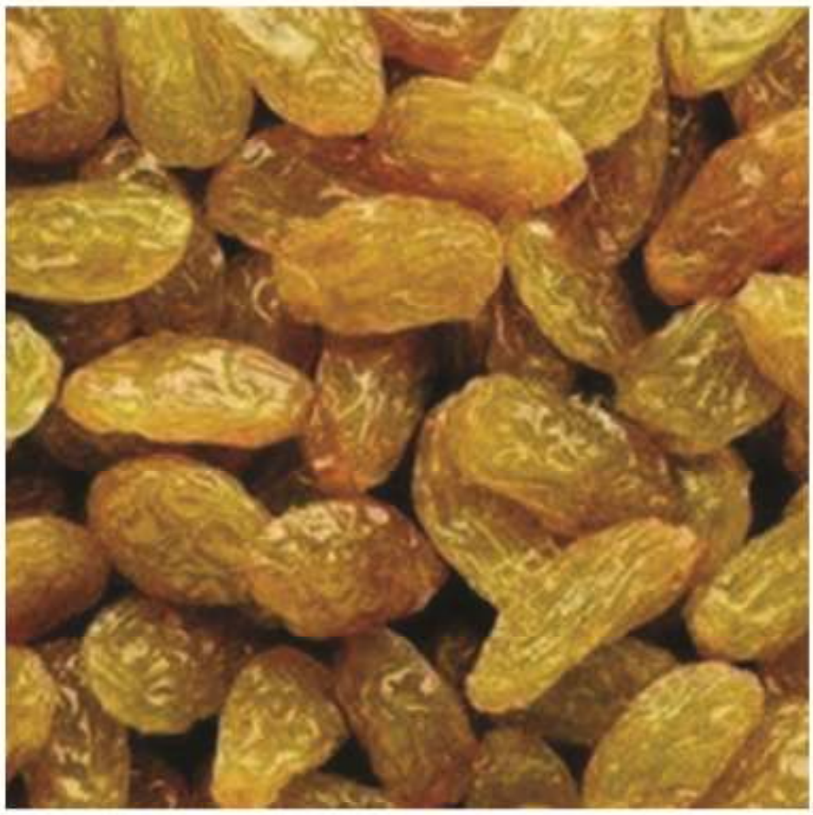

Plate - 6

CURRANT - 1

Plate - 7

CURRANT - II

PLATE - 8

COLD STORAGE

तासगाव परिसरातील शीतगृहामुळे बेदाणा साठवणुकीची चांगल्या प्रकारे सोय झाली आहे.

CHAPTER V

PRICE INDICES

5.1 Introduction:

In India, the organized marketing of agricultural commodities has been promoted through a network of regulated markets. Exporters, processors and retail chain operators cannot procure directly from the farmers as the produce is required to be channelized through regulated markets and licensed traders. In the process, there is an enormous increase in the cost of marketing and farmers end up getting a low price for their produce. In these regulated markets the individuals bring their commodity according to some standards (weight or size). According to quality of agricultural produce producer gets the price i.e. the price of the agricultural produce depends on the quality of the produce. The market value of the produce also depends on the past information of the prices of the produce i.e. the rates in previous days, weeks or months.

5.2 Price Indices

A price offered for a particular commodity for a specific period is called a price index. We define the following terms

- Let X be an *agricultural commodity* to be sold in the market.
- A commodity of a single farmer with similar quality is called a *block*.
- Different blocks *weigh* differently.

- Each block gets different *rate*

Let $x_1, x_2, ..., x_n$ be the n blocks. Let $w_1, w_2, ..., w_n$ be the weights. Let $r_1, r_2, ..., r_n$ be the prices offered for these blocks.

Price Interval (I_r)

It is a normal practice that prices declared by the market committees are in the form of range i.e. minimum rate to maximum rate. We call this as price interval and denote it by I_r. Thus $I_r = [r_l, r_u]$, where $r_l = \min\{r_1, r_2, r_3, ..., r_n\}$ and $r_u = \max\{r_1, r_2, r_3, ..., r_n\}$.

Average Price (r_a)

If maximum and minimum values of the rates are available then arithmetic mean of the two values is the average rate r_a .Thus,

$$r_a = \frac{(r_l + r_u)}{2}.$$

Mean price (r_m)

$$r_m = \frac{(r_l + r_2 + ... + r_n)}{n}.$$

Weighted Mean Price (r_w)

Since rate interval or value of average rate does not indicate the exact behavior of market, weighted rate value is introduced. If $x_1, x_2, ..., x_n$ are n blocks with $w_1, w_2, ..., w_n$ are weights then weighted rate value is given by

$$r_w = \frac{r_1 w_1 + r_2 w_2 + \ldots + r_n w_n}{w_1 + w_2 + \ldots + w_n}.$$

Interval Weighted Price $r_w(Q)$

Usually rates of agricultural produce are decided by the quality of the produce. It is convenient to divide the produce in three or four parts and then rate can be determined according to quality of produce.

We divide the rate interval in three parts according to the quality I, II, III and denote it by $Q_I = (r_{u-t}, r_u], Q_{II} = [r_{i+t}, r_{u-t}], Q_{III} = [r_l, r_{i+t})$. Quality I is good quality, quality II is medium quality and quality III is the poor quality of the produce.

Then for the different qualities Q_I, Q_{II} and Q_{III} the weighted mean prices are given by,

$$r_w(Q_I) = \frac{r_{i_1} w_{i_1} + r_{i_2} w_{i_2} + \ldots + r_{i_\alpha} w_{i_\alpha}}{w_{i_1} + w_{i_2} + \ldots + w_{i_\alpha}},$$

$$r_w(Q_{II}) = \frac{r_{j_1} w_{j_1} + r_{j_2} w_{j_2} + \ldots + r_{j_\beta} w_{j_\beta}}{w_{j_1} + w_{j_2} + \ldots + w_{j_\beta}},$$

$$r_w(Q_{III}) = \frac{r_{k_1} w_{k_1} + r_{k_2} w_{k_2} + \ldots + r_{k_\gamma} w_{k_\gamma}}{w_{k_1} + w_{k_2} + \ldots + w_{k_\gamma}}.$$

Where α, β and γ are the number of blocks whose price lies in the respective price intervals Q_I, Q_{II} and Q_{III}

5.3 Fuzzy Sets

A fuzzy subset A of a set X is a function $A: X \to I$ .If $\alpha \in I$ then the set $\{x \in X \mid A(x) \geq \alpha\}$ is called α-level cut or in short α-cut and is denoted by A_α . The strict α-level cut of A is the Support of A is the set $A_{0+} = \{x \in X \mid A(x) > 0\}$. If $A(x) = 1, \text{for some } x \in X$, then A is called normal fuzzy set.

Fuzzy number

A fuzzy number is a fuzzy set A: R $\to$ L which satisfies at least the following three properties,

i) A is upper semi-continuous

ii) A(x) = 0 outside some interval [c, d]

iii) There are real numbers a, b, c and d such that c $\leq$ a $\leq$ b $\leq$ d for which

1. A(x) is monotonic increasing on [c, a]
2. A(x) is monotonic decreasing on [b, d]
3. A(x) = 1, a $\leq$ x $\leq$ b

Triangular fuzzy number

A fuzzy number A on $R \in (-\infty, +ve]$ is defined to be a fuzzy triangular number if their memberships function A: $R \to$ [0, 1] is equal to

$$A(x) = \begin{cases} \frac{1}{m-l}x - \frac{l}{m-l}, & x \in [l,m] \\ \frac{1}{m-u}x - \frac{u}{m-u}, & x \in [m,u] \\ 0 & \text{otherwise} \end{cases}$$

Where, $l \leq m \leq u$, and l and u stands for the lower and upper values of the support of the fuzzy number *A*, respectively, and m for the model value.

Standard operations on fuzzy set:

Define three fuzzy subsets A, B and C in the universe X. For given $x \in X$, we have the following operations.

1. *Union*: $(A \cup B)(x) = A(x) \vee B(x)$. ($\vee$ = max (or sup.))

2. *Intersection*: $(A \cap B)(x) = A(x) \wedge B(x)$. ($\wedge$ = min (or inf.))

3. *Complement:* $A^c(x) = 1 - A(x)$.

The operations 1 through 3 are generalization of the corresponding classical set theoretic operations.

5.4 Fuzzy quality Price (r_f)

In this method a fuzzy quality function is designed depending on the quality of produce. The quality of particular block x_i is determined according to some measure. If this measure is in percentage then accordingly its fuzzy quality value is obtained. The value of the block x_i is then obtained by multiplying the highest rate r_u by this fuzzy quality value $Q(x)$. We define a percentage function $P : X \to [0,100]$ where X

is set of different blocks of produce under consideration and $P(x_i) = p_i \ \ (i = 1, 2, ..., n)$ means quality of the block x_i is p_i percent.

We define the fuzzy quality Q by the function $Q : [0,100] \to [0,1]$ by

$$Q(x) = \begin{cases} \dfrac{x^2}{2\beta^2} \ for \ \ 0 \le x \le \beta \\ 1 - \dfrac{(x-100)^2}{2(100-\beta)^2} \ for \beta \le x \le 100 \end{cases}$$

Where β is a parameter which depends on quality of the produce and the past information about the prices.

Fuzzy quality Price r_f for the block x_i is given by

$$r_f = (Q \circ P)(x_i) r_u .$$

Chapter 6

Data Collection

6.1 Introduction :

In Maharashtra State of India the grapes are cultivated and then processed to produce rasin and currant. The primary data of green raisin and currant is collected from the Tasgaon Agriculture Market Committee for the specific period. And the primary data of the yellow raisin is collected from the Sangli Agriculture committee for the specific period.

6.2 Green Raisin :

Grapes are cultivated largely and processed to produce green raisin at Tasgaon tahasil situated in Sangli district of Maharashtra. Grapes produced there are well known worldwide for its quality and taste. The data is collected from the Tasgaon Agriculture Market Committee. For the specific period table 1 below depict the sample of primary data of different blocks of green raisin. Each block contains different number of boxes. Each box contains 15 kg of raisin.

For specific period in Tasgaon Raisin Market of Sangli District (M.S.) table 1 below depict the primary data of 73 blocks of green raisin.

Table:1

(primary data of 73blocks of green raisin)				
Block labeling (x_n)	**Quantity of boxes(b_n)**	**Total quantity of raisin $W_n=15(b_n)$**	**Price per kg** $(r_n)Rs.$	**Total price** $(w_n r_n)Rs.$
1.	17	255	229	58395
2.	28	420	240	100800
3.	19	285	220	62700
4.	21	315	257	80995
5.	29	435	253	110055
6.	20	300	257	77100
7.	31	465	251	116715
8.	62	930	263	244590
9.	31	465	262	123225
10.	31	465	248	115320
11.	56	840	260	218400
12.	19	285	250	71250

13.	30	450	252	113400
14.	42	630	235	148050
15.	21	315	260	81900
16.	34	510	265	135150
17.	31	465	256	119040
18.	76	1140	261	297540
19.	34	510	260	132600
20.	46	690	256	176640
21.	26	390	235	91650
22.	33	495	247	122265
23.	10	150	230	34500
24.	28	420	241	101220
25.	45	675	210	141750
26.	26	390	272	106080
27.	48	720	256	184320
28.	35	525	234	1221855
29.	36	540	255	137700

30.	24	360	220	79200
31.	55	825	220	181500
32.	32	480	230	110400
33.	27	405	242	98010
34.	24	360	254	91440
35.	47	705	250	176250
36.	55	825	240	198000
37.	35	525	235	123375
38.	18	270	249	67230
39.	43	645	228	147060
40.	25	375	240	90000
41.	26	390	244	95160
42.	33	495	243	120285
43.	21	315	229	72135
44.	19	285	246	70110
45.	20	300	237	71100
46.	44	640	234	149760

47.	55	825	220	181500
48.	30	450	214	96300
49.	49	735	230	169050
50.	70	1050	231	242550
51.	30	450	210	94500
52.	25	375	225	84375
53.	18	270	217	58590
54.	35	525	213	111825
55.	36	540	227	122580
56.	44	640	236	151040
57.	40	600	214	128400
58.	18	270	220	59400
59.	25	375	220	82500
60.	421	6315	228	1439820
61.	24	360	220	79200
62.	22	330	240	79200
63.	13	195	234	45630

64.	21	315	215	67725
65.	12	180	233	41940
66.	42	630	232	146160
67.	28	420	220	92400
68.	15	225	205	46125
69.	27	405	230	93150
70.	15	225	234	52650
71.	5	75	205	15375
72.	36	540	210	113400
73.	13	195	210	40950

6.3 Yellow Raisin :

In the regulated market run by Sangli District Market Committee, the individual farmers bring their agricultural produce according to some standards (weight or size). Market committee follows the Roster Method of Open Auction System. According to quality of agricultural produce producer gets the price. In this region yellow raisin is produced by processing some special quality of grapes. This is one of the famous markets for buyers and sellers of yellow raisin which is well known worldwide for its quality and taste. For specific period of yellow raisin market in Sangli district (M.S.) table 2 below

depict the primary data of different blocks of yellow raisin. Each block contains different number of boxes and each box contains 15 kg of yellow raisin

Table. 2

(primary data of 16 blocks of yellow raisin)				
Block labeling (x_n)	**Quantity of boxes (b_n)**	**Total quantity of raisin $W_n=15(b_n)$**	**Price per kg** $(r_n)Rs.$	**Total price** $(w_n r_n)Rs.$
1.	25	375	191	71625
2.	26	390	180	70200
3.	13	195	140	27300
4.	37	555	190	105450
5.	14	210	140	29400
6.	10	150	110	16500
7.	36	540	181	97740
8.	23	345	110	37950
9.	15	225	185	41625
10.	20	300	192	57600
11.	15	225	103	23175

12.	24	360	120	43200
13.	12	180	105	18900
14.	01	15	170	2550
15.	40	600	200	120000
16.	39	585	200	117000

6.4 Currant :

The grapes are cultivated largely and processed to produce currant in Tasgaon. The data is collected from the Tasgaon Agriculture Market Committee. For specific period in Tasgaon Currant Market of Sangli District (M.S.) table 3 below depict the sample of primary data of different blocks of currant. Each block contains different number of boxes. Each box contains 15 kg of current.

Table: 3

(primary data of 13 blocks of currant)				
Block labeling (x_n)	**Quantity of boxes b_n**	**Quantity of current in kg.** $w_n = 15 \times b_n$	**Price per kg** $(r_n) Rs.$	**Total price** $(w_n r_{n.}) Rs.$
1	11	165	81	13365
2	20	300	100	30000
3	21	315	85	27775
4	16	240	90	21600
5	7	105	60	6300
6	9	135	70	6450
7	13	195	75	14625
8	25	375	84	31500
9	23	345	89	27705
10	30	450	80	36000
11	38	570	96	54720
12	34	510	78	39780
13	16	240	100	24000

Chapter 7

Data Analysis

7.1 Data Analysis of Green Raisin :

Table 1 below depicts the primary data of different blocks of green raisin.

Table:1

(primary data of 73blocks of green raisin)				
Block labeling (x_n)	**Quantity of boxes(b_n)**	**Total quantity of raisin $W_n=15(b_n)$**	**Price per kg** $(r_n)Rs.$	**Total price** $(w_n r_n)Rs.$
1.	17	255	229	58395
2.	28	420	240	100800
3.	19	285	220	62700
4.	21	315	257	80995
5.	29	435	253	110055
6.	20	300	257	77100

7.	31	465	251	116715
8.	62	930	263	244590
9.	31	465	262	123225
10.	31	465	248	115320
11.	56	840	260	218400
12.	19	285	250	71250
13.	30	450	252	113400
14.	42	630	235	148050
15.	21	315	260	81900
16.	34	510	265	135150
17.	31	465	256	119040
18.	76	1140	261	297540
19.	34	510	260	132600
20.	46	690	256	176640
21.	26	390	235	91650
22.	33	495	247	122265
23.	10	150	230	34500

24.	28	420	241	101220
25.	45	675	210	141750
26.	26	390	272	106080
27.	48	720	256	184320
28.	35	525	234	1221855
29.	36	540	255	137700
30.	24	360	220	79200
31.	55	825	220	181500
32.	32	480	230	110400
33.	27	405	242	98010
34.	24	360	254	91440
35.	47	705	250	176250
36.	55	825	240	198000
37.	35	525	235	123375
38.	18	270	249	67230
39.	43	645	228	147060
40.	25	375	240	90000

41.	26	390	244	95160
42.	33	495	243	120285
43.	21	315	229	72135
44.	19	285	246	70110
45.	20	300	237	71100
46.	44	640	234	149760
47.	55	825	220	181500
48.	30	450	214	96300
49.	49	735	230	169050
50.	70	1050	231	242550
51.	30	450	210	94500
52.	25	375	225	84375
53.	18	270	217	58590
54.	35	525	213	111825
55.	36	540	227	122580
56.	44	640	236	151040
57.	40	600	214	128400

58.	18	270	220	59400
59.	25	375	220	82500
60.	421	6315	228	1439820
61.	24	360	220	79200
62.	22	330	240	79200
63.	13	195	234	45630
64.	21	315	215	67725
65.	12	180	233	41940
66.	42	630	232	146160
67.	28	420	220	92400
68.	15	225	205	46125
69.	27	405	230	93150
70.	15	225	234	52650
71.	5	75	205	15375
72.	36	540	210	113400
73.	13	195	210	40950
$n = 73$	$\sum b_n = 2682$	$\sum w_n = 40230$		$\sum w_n r_n = 8211375$

For the primary data in table 1 the following results were observed.

i.Price Interval(I_r) = [205, 272]

ii.Average Price(r_a) = 283.50

iii.Mean Price (r_m) =236.28

iv.Weighted Mean Price(r_w) = 204.110

v.Interval weighted Price($r_w(Q)$)

The interval [205, 272] is subdivided into three sub-price intervals according to the qualities of the raisin box

Q_I = (251, 272], Q_{II} = [228, 250], Q_{III} = [205, 227).

Therefore, for these qualities the weighted prices are given by $r_w(Q_I) = 258.89838$, $r_w(Q_{II}) = 236.41$, $r_w(Q_{III}) = 217.143$.

vi. Fuzzy Quality Price

Calculation of β

In present model we assume that for 50% quality of green raisin producer will get minimum price r_l . Further we assume that there is no block of green raisin having quality less than 50% .

Therefore for $x = 50\%$ and $Q(x) = r_l = 205$ and $r_u = 272$ Q is defined by

$$(Q \circ P)(x) = \begin{cases} \dfrac{x^2}{2\beta^2} \; for \; 0 \le x \le \beta \\ 1 - \dfrac{(x-100)^2}{2(100-\beta)^2} \; for \beta \le x \le 100 \end{cases}$$

$$\therefore \mathrm{r}_l = \left[1 - \frac{(x-100)^2}{2(100-\beta)^2} \right] r_u \; for \; \beta \le x \le 100$$

$$205 = \left[1 - \frac{(50-100)^2}{2(100-\beta)^2} \right] 272 \; for \; 50 \le x \le 100$$

$$\therefore \beta = 28.72 \approx 29.$$

For $\beta = 29$ the fuzzy quality price is given in the table 2 below

Table 2

Sr. No	**Quality of Box** $x_i(\%s)$ $P(x_i) = x_i\%$	**Fuzzy Quality Price** $(r_f)Rs.$
1	50	205
2	60	228
3	70	248
4	80	261
5	90	269
6	100	272

These results show that the price of the raisin depends on the quality or grading of the product.

7.2 Data Analysis of Yellow Raisin :

Table 3 below depicts the primary data of different blocks of yellow raisin.

Table. 3

Primary data of 16 blocks of yellow raisin				
Block labeling (x_n)	**Quantity of boxes (b_n)**	**Total quantity of raisin $W_n=15(b_n)$**	**Price per kg** $(r_n)Rs.$	**Total price** $(w_n r_n)Rs.$
1	25	375	191	71625
2	26	390	180	70200
3	13	195	140	27300
4	37	555	190	105450
5	14	210	140	29400
6	10	150	110	16500
7	36	540	181	97740
8	23	345	110	37950
9	15	225	185	41625
10	20	300	192	57600

11	15	225	103	23175
12	24	360	120	43200
13	12	180	105	18900
14	01	15	170	2550
15	40	600	200	120000
16	39	585	200	117000
$n=16$	$\sum b_n = 350$	$\sum w_n = 5250$		$\sum w_n r_n = 880215$

For the primary data in table 3 the following results were observed.

i.Price Interval(I_r) = [103, 200]

ii.Average Price(r_a) = 151.50

iii.Mean Price (r_m) = 157.31

iv. Weighted Mean Price(r_w)= 167.66

v.Interval weighted Price(r_w(Q).

The interval [103, 200] is subdivided into three sub-price intervals according to the qualities of the raisin box.

Q_I = (169, 200], Q_{II} = [136, 168], Q_{III} = [103, 135).

Therefore, for these qualities the weighted prices are given by $r_w(Q_I) = 190.7364$, $r_w(Q_{II}) = 140$, $r_w(Q_{III}) = 110.8928$.

vi) Fuzzy Quality Price(r_f)

Calculation of β

In present model we assume that for 50% quality of yellow raisin producer will get minimum price r_l. Further we assume that there is no block of yellow raisin having quality less than 50%.

Therefore for $x = 50\%$ and $Q(x) = r_l = 103$ and $r_u = 200$ Q is defined by

$$Q(x) = \begin{cases} \dfrac{x^2}{2\beta^2} \; for \; 0 \le x \le \beta \\ 1 - \dfrac{(x-100)^2}{2(100-\beta)^2} \; for \beta \le x \le 100 \end{cases}$$

$$\therefore r_l = \left[1 - \frac{(x-100)^2}{2(100-\beta)^2} \right] r_u \; for \; 50 \le x \le 100$$

$$103 = \left[1 - \frac{(50-100)^2}{2(100-\beta)^2} \right] 200 \; for \; 50 \le x \le 100$$

$$\therefore \beta = 49.24 \approx 49.$$

For $\beta = 49$ the fuzzy quality price is given in the table 4 below

Table. 4

Sr. No	**Quality of raisin block** $x_i \quad P(x_i) = x_i\%$	**Fuzzy Quality Price** $(r_f)Rs.$
1	50	103
2	60	138
3	70	169
4	80	184
5	90	196
6	100	200

These results show that the price of the raisin depends on the quality or grading of the product.

7.3 Data Analysis of Currant :

Table 5 below depicts the primary data of different blocks of currant.

Table:5

primary data of 13 blocks of currant				
Block labeling (x_n)	**Quantity of boxes** $\mathbf{b_n}$	**Quantity of current in kg.** $w_n = 15 \times b_n$	**Price per kg** $(r_n) Rs.$	**Total price** $(w_n r_{n.}) Rs.$
1	11	165	81	13365
2	20	300	100	30000
3	21	315	85	27775
4	16	240	90	21600
5	7	105	60	6300
6	9	135	70	6450
7	13	195	75	14625
8	25	375	84	31500
9	23	345	89	27705
10	30	450	80	36000
11	38	570	96	54720
12	34	510	78	39780
13	16	240	100	24000
$n = 1$	$\sum b_n = 263$	$\sum w_n = 3945$	$\sum r_n = 1088$	$\sum w_n r_n = 335820$

For the primary data in table 5 the following results were observed.

i.Price Interval I_r = [60, 100]

ii.Average Price r_a = 80

iii.Mean Price r_m = 83.69

iv.Weighted Mean Price r_w = 85.13

v.Interval weighted Price $(r_w)(Q)$.

The interval [60, 100] is subdivided into three sub-price intervals according to the qualities of the currant box

Q_I = (88, 100], Q_{II} = [73, 88], Q_{III} = [60, 73).

Therefore, for these qualities the weighted prices are given by $r_w(Q_I) = 91.46$, $r_w(Q_{II}) = 80.619$, $r_w(Q_{III}) = 65.625$.

vi. Fuzzy Quality Price(r_f)

Calculation of parameter β

In present model we assume that for 50% quality of currant producer will get minimum price r_l. Further we assume that there is no block of currant having quality less than 50%.

Therefore for $x = 50\%$ and $Q(x) = r_l = 60$ Q is defined by

$$(Q \circ P)(x) = \begin{cases} \dfrac{x^2}{2\beta^2} \; for \; 0 \le x \le \beta \\ 1 - \dfrac{(x-100)^2}{2(100-\beta)^2} \; for \beta \le x \le 100 \end{cases}$$

$$\therefore \mathrm{r}_l = \left[1 - \frac{(x-100)^2}{2(100-\beta)^2} \right] r_u \; for \; \beta \le x \le 100$$

$$60 = \left[1 - \frac{(50-100)^2}{2(100-\beta)^2} \right] 100 \; for \; 50 \le x \le 100$$

$$\therefore \beta = 44.10 \approx 44.$$

For $\beta = 44$ the fuzzy quality price is given in the table 6 below

Table 6

Sr. No	**Quality of Currant** $x_i(\%s) \; P(x_i) = x_i\%$	**Fuzzy Quality Price** $(r_f)Rs.$
1	50	60
2	60	74.40
3	70	85.60
4	80	93.60
5	90	98.41
6	100	100

These results show that the price of the currant depends on the quality or grading of the product.

CHAPTER VIII :

CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

8.1 Conclusions :

The data analysis and it's interpretations leads to the following conclusions.

i. The study will enable to the raisin producers to understand the problems regarding the forming good quality raisins.

ii. The study will help, raisin producer to understand the importance of producing the raisin according to the grading and standardization based on agricultural produce act.

iii. The study will help raisin-producers to understand the importance of quality of raisin for getting an idea about the price of the raisin.

iv. The fuzzy quality price model will help in determining the expected price based on quality and available previous information.

v. The fuzzy quality price model can be applied to any agricultural produce having similar marketing facilities.

8.2 Recommendations :

Based on the study we recommend the following suggestions to the producers (farmers) to obtain the optimal price for raisin and currant.

i In every trading market of raisin, there must be a single trading center instead of many marketing centers.

ii At the time of trading the raisin boxes are opened. A lot of quantity of raisin is mishandled by the merchants, so it accounts the wastage of raisin. Hence there must be the facility of the conveyer belt for the boxes, so that wastage will be reduced.

iii. At the trading place there must be display board to know the prices of the raisin.

iv. There must be the online facility for knowing the information about the trading of raisins.

v. It is necessary to have fixed grade standards for raisin which are universally accepted and followed by all the trading partners according to Agricultural Produce Act which is determined on the basis of characteristics as weight, size, color, appearances, ripeness, sweetness texture, moisture content, taste, chemical content etc.

vi. The government should arrange the workshops, seminars, training programs to the raisin producers to manufacture the raisin according to the Agricultural Produce Act, related to grading and standardization which will effect to export the raisin in other countries also. It benefits to obtain the optimal price to the raisin producers.

vii. The Roster Bid System of Open Auction Method is a very time consuming process, because of the variation of the quality and quantity of different lots. According to open announcement, raisin producers can get, same what low price for higher quality. Hence we suggest that the Agricultural Market Committees should adopt Closed Tender System method. This method is quicker and gives a higher price to the producers than the Open Auction Method.

8.3 Limitations :

We have worked under some limitations. Some of the key limitations are as given below.

(1) The date of collected data is kept unknown.

(2) Information may be outdated.

(3) It may be difficult to determine the accuracy of the secondary data.

(4) Some market committees are reluctant to give any information for research. Hence convenient data is used for conducting the research.

(5) The survey and research has been done only on the data collected from Tasgaon and Sangli market committees. Therefore the results show the market position of Tasgaon and Sangli in Maharashtra. Therefore results maynot be applied to all raisin trading centers of Maharashtra.

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