PRODUCTION AND MARKETING OF BANGALORE RED ROSE ONION IN CHIKKABALLAPURA DISTRICT OF KARNATAKA

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UNIVERSITY OF AGRICULTURAL SCIENCES
BANGALORE - 560 065**

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Project Report submitted to the

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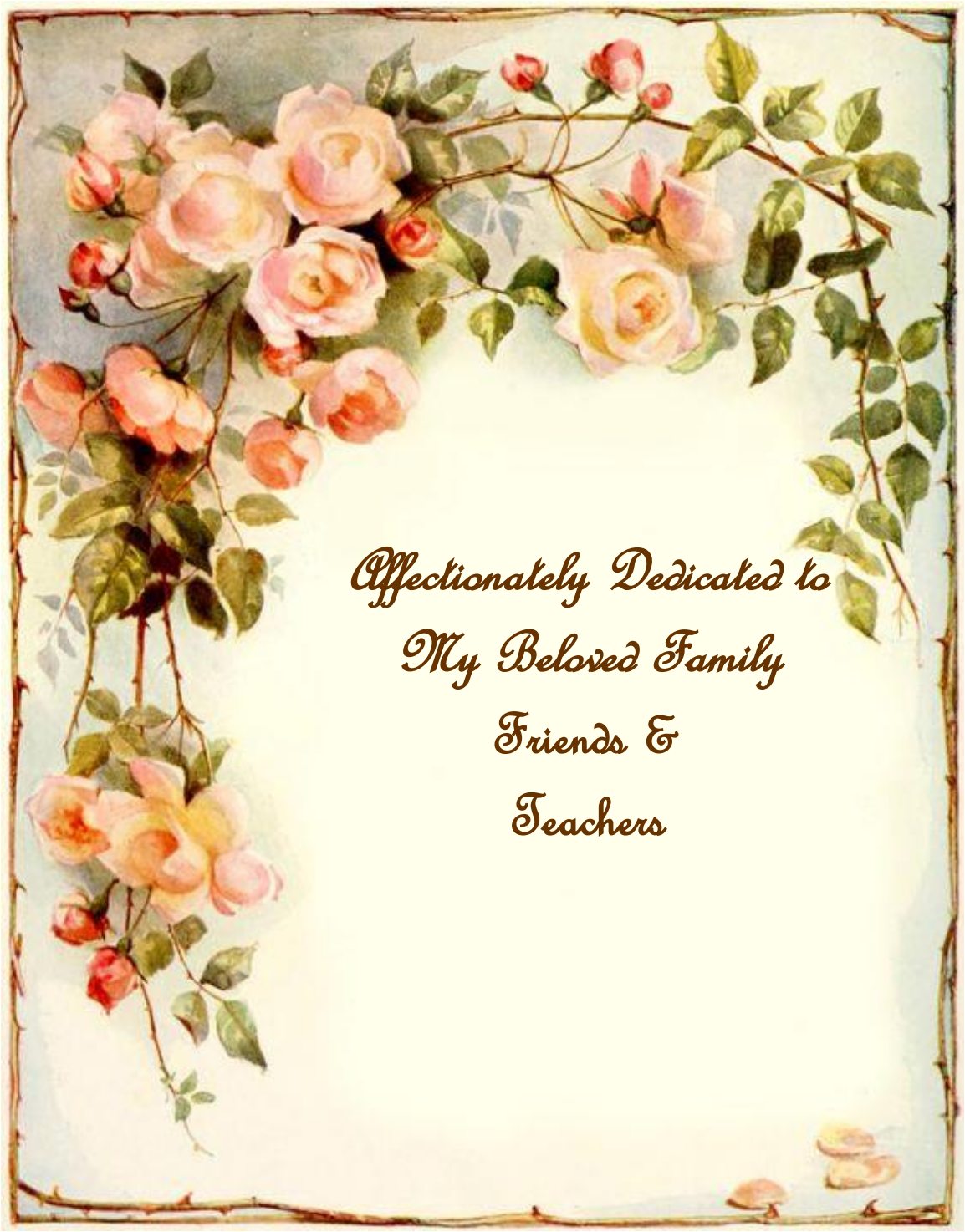
Affectionately Dedicated to
My Beloved Family
Friends &
Teachers

DEPARTMENT OF AGRICULTURAL MARKETING, CO-OPERATION AND BUSINESS MANAGEMENT UNIVERSITY OF AGRICULTURAL SCIENCES BANGALORE

CERTIFICATE

This is to certify that the Project Report entitled **"PRODUCTION AND MARKETING OF BANGALORE RED ROSE ONION IN CHIKKABALLAPURA DISTRICT OF KARNATAKA"** submitted by **Mr. KANAKARAJA, G. N., ID. No. MBAL 8006,** in partial fulfillment of the requirements for the degree of **MASTER OF BUSINESS ADMINISTRATION (AGRIBUSINESS MANAGEMENT)** to the University of Agricultural Sciences, GKVK, Bangalore is a bonafide record of research work done by him during the period of his study in this university, under my guidance and supervision and the project work has not previously formed the basis of award of any degree, diploma, associateship, fellowship or other similar titles.

Bengaluru
August 2021

M. S. GANAPATHY
Major Advisor

Approved by:

Chairman: _____
(Dr. M. S. GANAPATHY)

Members: 1. _____
(Dr. B. M. SHASHIDHARA)

2. _____
(Dr. G. ANANDA MANEGAR)

3. _____
(Dr. MAHIN SHARIF)

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Place: Bengaluru
Date: August,2021 ***(Kanakaraja, G.N)***

PRODUCTION AND MARKETING OF BANGALORE RED ROSE ONION IN CHIKKABALLAPURA DISTRICT OF KARNATAKA

KANAKARAJA, G. N.

ABSTRACT

The present study was conducted to examine the costs and returns in production, price spread in different marketing channels of Bangalore red rose onion. The study was conducted by using a random sample of sixty cultivators and twenty market intermediaries from Chikkaballapura and Chennai export markets. The primary data was collected by personal interview method with help of pretested and structured schedule during 2019-20 crop season. The major findings of the study revealed that cost of cultivation per acre and cost of production per tonne of Bangalore red rose onion was Rs. 70,847 and Rs. 4,167.47 respectively. The average yield per acre was 17 tonnes with a gross return of Rs. 2,72,000 per acre and net returns of Rs. 2,01,153. The return per rupee of investment was Rs. 2.83. About 78.40 per cent of the farmers sold through Channel-I (Producer → Village level trader → Commission agent → Exporter → Foreign importer → Consumers), about 15.00 per cent in channel-II (Producer → Contract trader → Exporter → Foreign importer → Consumers) and about 6.60 per cent in channel-III (Producer → Trader in APMC → Exporter → Foreign importer → Consumers). The price spread was higher in Channel-I (Rs. 9,600) compared to Channel-II (Rs. 8,800) and channel-III (Rs. 9,150) due to more number of intermediaries. With a marketing efficiency index of 3.15, channel-II was the most efficient channel followed by channel-III (2.78) and channel-I (2.59) according to Shepherd's method. Scarcity of labour, expensive Inputs, scarcity of FYM, lack of availability of seedlings were the major constraints faced by farmers in production of Bangalore red rose onion. The major constraints related to marketing were frequent price fluctuations, limited market information and intelligence, poor harvesting practices, sudden ban on exports, long distance to market, inadequate transportation facilities and absence of domestic market. With the above facts, this study shows that growing of Bangalore red rose onion is profitable to the farmers.

August, 2021

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Dr. M. S. Ganapathy
(Major Advisor)

ಕರ್ನಾಟಕದ ಚಿಕ್ಕಬಳ್ಳಾಪುರ ಜಿಲ್ಲೆಯ ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿ ಉತ್ಪಾದನೆ ಮತ್ತು ಮಾರಾಟ ಕುರಿತು ಅಧ್ಯಯನ

ಕನಕರಾಜ, ಜಿ. ಎನ್.

ಸಾರಾಂಶ

ಪ್ರಸ್ತುತ ಅಧ್ಯಯನವು ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿಯ ಉತ್ಪಾದನಾ ವೆಚ್ಚ ಮತ್ತು ಆಧಾಯ ಹಾಗೂ ಮಾರುಕಟ್ಟೆಯ ವಿವಿಧ ಚಾನೆಲ್(ಸಂಪರ್ಕದಾರಿ) ಗಳಲ್ಲಿ ಹರಡಿರುವ ಬೆಲೆಯನ್ನು ಕಂಡುಹಿಡಿಯಲು ಚಿಕ್ಕಬಳ್ಳಾಪುರ ಜಿಲ್ಲೆಯ ಅರವತ್ತು ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿ ಬೆಳೆಗಾರರಿಂದ ಹಾಗೂ ಚೆನ್ನೈ ರಫ್ತು ಮಾರುಕಟ್ಟೆಯ ಇಪ್ಪತ್ತು ಮಧ್ಯವರ್ತಿಗಳಿಂದ ಮಾಹಿತಿಯನ್ನು ಪಡೆಯಲಾಗಿದೆ. ಪ್ರಸ್ತುತ ಅಧ್ಯಯನವು 2019–2020 ನೇ ವರ್ಷದ ಋತುವಿನಲ್ಲಿ ಬೆಳೆದ ಬೆಳೆಯ ಮಾಹಿತಿಯನ್ನು ಪೂರ್ವಭಾವಿ ಮತ್ತು ರಚನಾತ್ಮಕ ವೇಳಾಪಟ್ಟಿಯ ಸಹಾಯದಿಂದ ವೈಯುಕ್ತಿಕ ಸಂದರ್ಶನದ ವಿಧಾನದಿಂದ ಪಡೆಯಲಾಗಿದೆ. ಅಧ್ಯಯನದ ಪ್ರಮುಖ ಆವಿಷ್ಕಾರಗಳೆಂದರೆ ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿಯು ಎಕರೆಗೆ ಸಾಗುವಳಿ ವೆಚ್ಚ ಮತ್ತು ಪ್ರತಿ ಟನ್‌ಗೆ ಉತ್ಪಾದನಾ ವೆಚ್ಚ ಕ್ರಮವಾಗಿ ರೂ. 70,847/– ಮತ್ತು ರೂ. 4,167/– ಆಗಿರುತ್ತದೆ. ಎಕರೆಗೆ ಸರಾಸರಿ 17 ಟನ್ ಇಳುವರಿ ಇದ್ದು, ಇದರ ಒಟ್ಟು ಆಧಾಯ ಎಕರೆಗೆ ರೂ.2,72,000/– ಮತ್ತು ನಿವ್ವಳ ಆಧಾಯ ರೂ. 2,01,153/– ಹಾಗು ಒಂದು ರೂಪಾಯಿ ಹೂಡಿಕೆಯ ಲಾಭ ರೂ. 2.83 ಎಂದು ಅಧ್ಯಯನದಲ್ಲಿ ತಿಳಿದು ಬಂದಿದೆ. ಸುಮಾರು ಶೇ. 78.40 ರಷ್ಟು ರೈತರು ಮಾರುಕಟ್ಟೆಯ ಚಾನೆಲ್–1 (ರೈತ→ ಗ್ರಾಮ ಮಟ್ಟದ ವ್ಯಾಪಾರಿ→ ಆಯೋಗದ ದಳ್ಳಾಲಿ→ ರಫ್ತುದಾರ→ ವಿದೇಶಿ ಆಮದುದಾರ→ ಗ್ರಾಹಕರು) ಮೂಲಕ ಮಾರಾಟ ಮಾಡಿದ್ದರೆ, ಶೇ. 15 ರಷ್ಟು ರೈತರು ಚಾನೆಲ್–2 (ರೈತ→ ಗುತ್ತಿಗೆ ವ್ಯಾಪಾರಿ→ ರಫ್ತುದಾರ→ ವಿದೇಶಿ ಆಮದುದಾರ→ ಗ್ರಾಹಕರು) ಮೂಲಕ ಮಾರಾಟ ಮಾಡಿದ್ದಾರೆ ಹಾಗೂ ಉಳಿದ 6.6 ರಷ್ಟು ರೈತರು ಚಾನೆಲ್–3 (ರೈತ→ ಎಪಿಎಂಸಿ ವ್ಯಾಪಾರಿ→ ರಫ್ತುದಾರ→ ವಿದೇಶಿ ಆಮದುದಾರ→ ಗ್ರಾಹಕರು) ಮೂಲಕ ಮಾರಾಟ ಮಾಡಿದ್ದಾರೆ. ಬೆಲೆ ಹರಡುವಿಕೆಯು ಚಾನೆಲ್–2(ರೂ. 8,800/–) ಮತ್ತು ಚಾನೆಲ್–3 (ರೂ. 9,150/–) ಗಿಂತ ಚಾನೆಲ್–1 (ರೂ. 9,600/–) ರಲ್ಲಿ ಅಧಿಕ ಮಧ್ಯವರ್ತಿಗಳ ಸಂಖ್ಯೆಯಿಂದ ಹೆಚ್ಚಾಗಿರುತ್ತದೆ. ಅಧ್ಯಯನದಲ್ಲಿ ಶೆಫರ್ಡ್ ವಿಧಾನದ ಪ್ರಕಾರ ಮಾರುಕಟ್ಟೆ ದಕ್ಷತೆಯ ಸೂಚ್ಯಂಕವು ಚಾನೆಲ್–1(2.59) ಮತ್ತು ಚಾನೆಲ್–3(2.78) ಗಿಂತ ಚಾನೆಲ್–2 (3.15) ರ ಅನುಪಾತವು ಅತ್ಯಂತ ಪರಿಣಾಮಕಾರಿ ಮಾರುಕಟ್ಟೆಯ ಚಾನೆಲ್ ಎಂದು ತೋರಿಸುತ್ತದೆ. ಅಗತ್ಯವಿದ್ದಾಗ ಕಾರ್ಮಿಕರ ಕೊರತೆ, ದುಬಾರಿ ಕಚ್ಚಾ ವಸ್ತುಗಳ ವೆಚ್ಚ, ಕೊಟ್ಟಿಗೆ ಗೊಬ್ಬರದ ಅಭಾವ, ಮೊಳಕೆ ಅಲಭ್ಯತೆ ಕೊರತೆಗಳು ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿಯ ಉತ್ಪಾದನೆಯಲ್ಲಿ ರೈತರು ಎದರಿಸುತ್ತಿರುವ ಪ್ರಮುಖ ನಿರ್ಭಂದನೆಗಳಾಗಿವೆ ಹಾಗೂ ಆಗಾಗ್ಗೆ ಬೆಲೆ ಏರಿಳಿತಗಳು, ಸೀಮಿತ ಮಾರುಕಟ್ಟೆಯ ಮಾಹಿತಿ ಮತ್ತು ತಂತ್ರಜ್ಞಾನದ ಬುದ್ದಿವಂತಿಕೆ, ಕಳಪೆ ಕೋಯ್ಲು ಪದ್ದತಿಗಳು, ರಫ್ತು ಮೇಲೆ ಹಠಾತ್ ನಿಷೇಧ, ಸಾರಿಗೆ ಹಾಗೂ ಶೇಕರಣಾ ಘಟಕದ ಕೊರತೆ ಮತ್ತು ದೇಶೀಯ ಮಾರುಕಟ್ಟೆ ಕೊರತೆಗಳು ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿಯ ಮಾರುಕಟ್ಟೆಯ ಸಮಸ್ಯೆಗಳೆಂದು ಅಧ್ಯಯನದಲ್ಲಿ ತಿಳಿದಿರುತ್ತದೆ ಹಾಗೂ ಮೇಲಿನ ಸಂಗತಿಗಳಿಂದ, ಬೆಂಗಳೂರು ಕೆಂಪು ಗುಲಾಬಿ ಈರುಳ್ಳಿಯನ್ನು ಬೆಳೆಯುವುದು ರೈತರಿಗೆ ಲಾಭದಾಯಕವಾಗಿರುತ್ತದೆ.

ಆಗಸ್ಟ್, 2021

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ಕೃ.ವಿ.ವಿ. ಬೆಂಗಳೂರು – 560065

ಡಾ. ಎಂ. ಎಸ್. ಗಣಪತಿ
(ಪ್ರಮುಖ ಸಲಹೆಗಾರರು)

Production and Marketing of Bangalore Red Rose Onion in Chikkaballapura district of Karnataka

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INTRODUCTION

Bangalore red rose onion, locally called gulabi eerulli, and is a variety of onion grown in and around Bangalore in Karnataka. These onions are not cultivated in any other place in India. The onions of this variety have bulbs with flat base and are spherical. The other characteristics, which make them unique, are their deep scarlet red colour, anthocyanin, phenols and high pungency.

They are also known to contain higher levels of protein, phosphorus, iron and carotene. The ideal conditions for growing rose onion are soil with pH between 6.5 and 7, atmospheric humidity of 70 to 75% and average temperature of 25 °C to 30 °C. As these conditions are found around the Bangalore region, the variety is grown exclusively there. It is high in nutrients and is great for weight loss, it can also control blood pressure as it contains potassium. The presence of antioxidants keeps your arteries healthy and prevents a heart attack.

OBJECTIVE

To analyse the trend in area, production, productivity and marketed value of Bangalore red rose Onion in Chikkaballapura district

METHODOLOGY

Study area:

The present study was conducted in Chikkaballapura district of Karnataka.

Source of data:

The secondary data was collected from Chikkaballapura district horticulture office about area , productivity and value of the crop over the last twelve years to know the trend pattern of Bangalore rose onion production and marketing.

Tools and techniques:

Descriptive analysis was used for analysing trend in Bangalore red rose onion in Chikkaballapura district of Karnataka

Fig. 1: Map depicting the study area

RESULTS AND GRAPHS

Table 1: Trend of Area, productivity and value of Bangalore red rose onion in Chikkaballapura District

Sl. No.	Year	Area (in Hectares)	Production (M. tons)	Productivity (Yield in tons/acre)	Value (in Rs. Lakhs)
1	2009	1177	23557	20.01	1884.56
2	2010	1227	24518	19.98	1519.55
3	2011	1201	24281	20.22	1343.09
4	2012	1204	24340	20.22	1367.09
5	2013	1349	25348	18.79	1923.68
6	2014	1367	27418	20.06	2028.57
7	2015	1313	23521	17.91	1977.78
8	2016	1312	23580	17.97	2067.69
9	2017	1261	27093	21.49	2715.24
10	2018	1390	28811	20.73	2764.79
11	2019	1072	22871	21.33	2219.43
12	2020	1250	28359	22.69	4035.50
	CAGR (%)	-0.90	-0.89	-0.90	-0.81

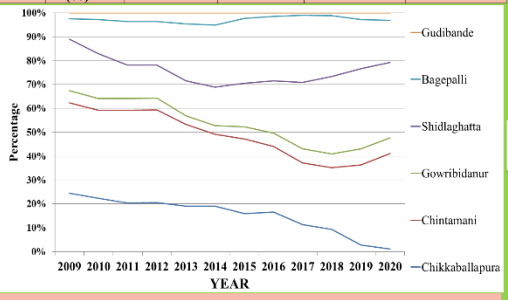

Fig. 2: Area trend of Bangalore red rose onion in Chikkaballapura district of Karnataka

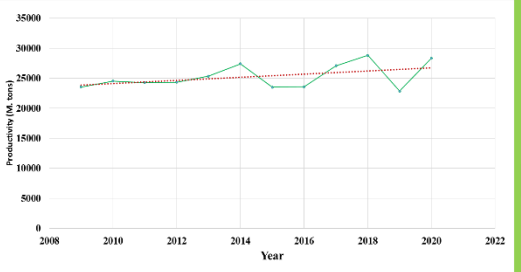

Fig. 3: Production trend of Bangalore red rose onion in Chikkaballapura district of Karnataka

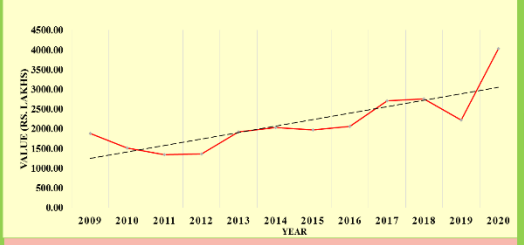

Fig. 4: Marketed value trend of Bangalore red rose onion in Chikkaballapura district of Karnataka

DISCUSSION

We can observe that in the table 1, that is over the last twelve years there is an increase and decrease in all four aspects of the objective according to CAGR.

in the area of rose onion, increased in area of cultivation and decreased later due to price fluctuations and ban on exports.

in the production we can observe fluctuations due less demand in domestic market and if Govt. impose ban on exports the production falls down. In the year 2020 highest production was recorded because of the demand increased in other countries when inflation of onion occurred in India and ban on exports of onion in the year 2019 the farmers produced more with the increase in productivity.

In the depicted table 1, we can observe that the value of the crop doubled compare to previous years with the year 2020 because Government of India removed export ban and sold for high value according to the demand.

Bangalore rose onions don't have domestic market due to high cost value crop and have very good medicinal value the foreign countries demands more.

PHOTOGRAPHS

SUMMARY

The study reveals that the area, production, productivity and value are varies according to the Govt. export policies. Since, these onion don't have domestic market Govt. should exclude the ban on these onions by comparing with normal onions, because rose onions have very good medicinal properties. The study shows that increase or decrease in area and production due to fluctuations in market and there is a demand in other countries and cultivation of this crop is profitable.

ADVISORY COMMITTEE

Chairperson: Dr. M. S. Ganapathy

Members : Dr. B. M. Shashidhara
Dr. G. Ananda Manegar
Dr. Mahin Sharif

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I INTRODUCTION

Agricultural development with respect to crops, fruits and vegetables as well as livestock and other allied activities plays very important role in the development of economy of our country as its population is increasing at a rapid rate, leading to an expanding demand for agricultural production. Already it has made a significant contribution to the economic prosperity of developed countries and its role in the development of economy in less developed countries is of vital importance. The agriculture sector is the backbone of our economy, which facilitates the basic ingredients to mankind and provides raw material for industrialization since, agricultural production is not an easy and continuous process; it bristles with a number of hurdles. Thus, industrial and agricultural advancements are not an alternative but are complementary and are mutually supporting each other with respect to both inputs and outputs. It is seen that increased agricultural output tend to contributes substantially to an overall economic development of the country. It is observed that the top leading industrialized countries of today once predominantly dependent on agriculture. While the developing economies still have dominance of agriculture and it largely contributes to national income. In India, 18 per cent of national income comes from the agricultural sector.

The agricultural system, land use system, input usage, marketing, and most importantly monetary rewards are all undergoing incremental changes in Indian agriculture. On other hand, due to urbanisation, the amount of land accessible for agriculture is shrinking, while the need for increased productivity and returns from cultivable land is fast increasing. All of these variables have created excellent conditions for large diversification trends, particularly in favour of horticultural crops like fruits, vegetables, spices, plantation crops, and ornamental crops. India is blessed with a diverse range of soil types and agro-climatic conditions, allowing it to cultivate a wide range of horticultural and other crops such as Mango, banana, papaya, orange, mosumbi, guava, grape, apple, pineapple, sapota, ber, pomegranate, strawberry, litchi, and vegetables like onion, potato, tomato, okra, chilli, brinjal, green peas, cabbage, cauliflower, carrot, radish, turnip, pumpkin, squash, gourd, cucumber, and french beans are among the most

commonly grown fruits and vegetables in India. Fruit and vegetable demand has been continuously rising over the years.

Horticulture has emerged as a lively sector and an important component of agriculture in India in recent years, providing potential for crop diversification, increased returns per unit area, improved land and water usage efficiency, as well as potential for employment creation. The wide range of horticultural crop varieties affords numerous chances to use multi-layer cropping to increase income while lowering the chance of crop failure. For profitable and increased production, effective onion growing necessitates a balanced and efficient use of modern inputs. Farmers require a large amount of capital to employ contemporary technologies for resource management before allocating land for onion growth, and they must be familiar with the various types of expenditures incurred and returns acquired from each crop. The growth of horticulture, particularly the production of fruits and vegetables, which are an important aspect of India's Dietary System (IDS), would be prioritised.

The onion (*Allium cepa L.*) is most important horticultural crop, increasing farmer income and playing an essential role in the Indian economy. It is a member of the Amaryllidaceae family. Bangalore red rose onion, also known as gulabi eerulli, is a Karnataka onion type grown in and around Bangalore. There is no other site in India where these onions are grown. This onion cultivar produces spherical bulbs with a flat base. Their intense scarlet red colour, anthocyanin, phenols, and extreme pungency are also distinguishing traits. Protein, phosphorus, iron, and carotene are all known to be greater in them. Rose onion grows best in soil with a pH of 6.5 to 7, 70 to 75 percent relative humidity, and an average temperature of 25℃ to 30℃ [Because these circumstances are only present in the Bangalore area, the variety is only grown there]. It is high in nutrients and is excellent for weight loss; it also contains potassium, which helps to lower blood pressure. Antioxidants help to keep your arteries healthy and avoid heart attacks.

World scenario

The onion (*Allium cepa L.*) is one of the oldest cultivated species, containing inscriptions from ancient Egypt, Rome, Greece, India, and China. In Apastamba Dharmasuthra (dated 800BC to 300BC), the Sanskrit counterpart "Palandu" is noted, demonstrating that onions were available in India fairly early. The onion, a pungent food item, is one of the oldest produced crops. It is regarded as a high-quality flavouring and seasoning food. China leads the way in onion production, followed by India, the United States, Turkey, Pakistan, Russia, Indonesia, Vietnam, and Myanmar. China is accounts for 28 percent of world land area and 32 percent of global demand. India is the world's second-largest onion producer, with 17 percent of the overall acreage and 10 percent of the overall production. South Korea produces the most onions per hectare (60.33 tonnes/ha). The following five countries (13.65 tonnes/ha) were Austria, Japan, the United States, China, and India during in the year 2018.

Indian scenario

In India, onion production and area have expanded throughout time. Maharashtra has the world's largest onion-growing area and production, accounting for 28 percent of overall production, followed by Gujarat (16 %), Uttar Pradesh (9.5 %), Orissa (8.21 %), Rajasthan (6 %), Karnataka (5 %), Madhya Pradesh (5 %), Bihar (4.49 %), Haryana (4.49 %) Andhra Pradesh (3.74%) and Tamil Nadu (3.74%) are the two states with the highest percentages (3.32%). The maximum onion productivity is found in Maharashtra (20.62 tonnes/ha), followed by Gujarat and Haryana. On the other side, onion is grown on around 60,000 hectares of land in Karnataka, with a 360,000-tonne annual production.

Varieties in rose onion

1. Arka bindu

The Indian Institute of Horticulture Research (IIHR) has developed an enhanced this onion variety. These onions are consistent in size (2.3 – 3.0 diameter), weigh about 30-50 grams, and are deep red in colour. They have a higher reserve capacity (45 months), a shorter crop length (110-120 days), and a higher yield (25 t/ha).

2. Agrifound rose

The National Horticultural Research and Development Foundation (NHRDF) developed this type of cultivar. This onion cultivar has a deep red coloured skin with a consistent diameter of 3-4 cm, soluble solid particles of around 16%, and a productivity range from 17.5 to 22 tonnes per hectare.

3. Bangalore red rose onion

This type is commonly known as a local variety. The staggered blossoming of branch tubers is a distinguishing trait of this onion variety; quality is low, and there will be differences in colour and size. This onion variety produces 17-20 tonnes per hectare.

Bangalore red rose onion got the Geographical Indication tag in the year 2015. This allowed the Bangalore red rose Onion Grower's Association to headquartered in Chikkaballapura district to get patent rights to cultivation of this variety. These areas have deep fertile mekkalu soil (alluvial soil) and sand mix of red soil with good drainage and pH ranges between 6.5 to 7, an atmospheric humidity of 70 to 75 percent and temperatures ranging from 25℃ to 35℃ which is ideally suited for growing of Bangalore red rose onion. Undoubtedly, the climatic factors and soil conditions defines the distinctive quality, pungency, taste and physical characteristics of this onion from other varieties. The growth period is from 110-120 days and yields about 17-20 tonnes per hectare with annual production of 60,000 tonnes and 90 percent of production is exporting.

This variety's unique feature is its high pungency as compared to other types, which makes it quite popular in global markets. It is a pickling variety with flattish circular bulbs that are deep crimson red in colour and range in size from 2.5cm to 3.5cm diameter. Because of their spicy flavour, these onions are excellent for pickling. It has a high export potential, which is the ultimate goal for farmers. This cultivar is rarely consumed on the domestic market (maximum 10 percent of the production) While the Rabi season accounts for 70 percent of production, the Kharif season accounts for 10 percent and the summer crop accounts for the remaining 20 percent. This variety is

currently exported to Southeast Asian nations such as Singapore, Malaysia, Bangladesh, Bahrain, Sri Lanka, Maldives, Indonesia, UAE, Thailand, Singapore, and Taiwan, where it is used in seasoning, pickling, and as a dehydrated powder.

On the other hand, the difficulty is that the Bangalore red rose onion production pattern has been shifting. Consumer preferences, urbanisation, rising incomes, demographic and sociological variables, and variations in onion productivity have all contributed to changes in onion consumption and demand patterns. Government export policy, price factor, level of production technology, and resource usage pattern all influence the production pattern of these onions. Various studies have shown that onion yield is directly influenced by the level of technology used for production, or, to put it another way, the impact of technological development in Bangalore red rose onion production and adoption in increasing total production and productivity of Bangalore red rose onion has been acknowledged. However, there is a significant disparity in technical performance between progressive farmers' fields and the fields of other farmers. Due to contemporary onion production technology, the operating restriction is more on capital investment, and the needs to invest more in yield-attributing inputs such as seed, fertilisers, and plant protection measures, among other things. Farmers required additional capital expenditure due to high input costs and a widespread lack of knowledge about new methods and technologies. In this regard, the question of whether investment in contemporary technology increased output and net returns correspondingly needs to be investigated and verified in the respective growing regions of Bangalore red rose onion. As a result, there is plenty of opportunity to evaluate the cost of production of Bangalore red rose onion.

In Karnataka, the Chikkaballapura district is known for its own agricultural and horticultural crops. This region is dominated by small and medium-sized farmers. Small-sized land owners are poor, but medium-sized and large land owners do better than small land owners. Bangalore red rose onion is a very important commercial and cash bulb crop, with a high average productivity in the area and an excellent marginal substitution for the low-value crops that grow there. The onion has long been a staple of the Indian diet, and demand for it has risen year after year. There has been a steady increase in the

production and area of cultivation of onion in Chikkaballapura district over the years due to adoption of advanced and improved technology.

The states of Maharashtra, Gujarat, and Uttar Pradesh produce the majority of India's onion. Rose onion, on the other hand, is only grown in and around the Chikkaballapura District in Karnataka. In 2018-19, red rose onion production in Karnataka was 23789.15 metric tonnes, with a cultivated area of 1390.25 hectares. With regard to the economics of rose onion production in Karnataka, farmers should be aware of its profitability and the pattern of resources used in cultivation, especially in the Chikkaballapura district, where Bangalore red rose onion farming is becoming increasingly popular due to increased demand in foreign countries.

Based on the foregoing, it can be concluded that production and productivity are not the only requirements for the development of Bangalore red rose onion cultivation. Farmers always want to acquire a better price for their goods, but they are unable to do so because to a lack of fair marketing functionaries, market efficiencies, and marketing systems. In remunerative agricultural output, particularly cash crops like onion, the marketing mechanism and its efficiency are critical. Farmers in the current condition of affairs are primarily concerned with the production system, and they pay little attention to the various aspects of marketing. They spend the entire year for producing, but the system does not take marketing into account. In fact, marketing has traditionally been maintained separately from farmer production. As a result, the producers' share of the consumer's price is minimal. Efficient marketing aids in the efficient transfer of farm products and inputs from producers to consumers at the lowest possible cost, yet rose onions have a very small domestic market. Such a situation is extremely tough for both producers and consumers. As a result, the efficiency of onion marketing was also investigated.

Various organisations involved in Research, Development and Promotion of Bangalore red rose onion for exports in India

A) Karnataka State Agricultural Produce Processing and Export Corporation Limited (KAPPEC)

Small and large farmers have been growing Bangalore red rose onions to export to Southeast Asian countries with great success. Over the years, the export of these onions has increased. However, due to a lack of proper pre-harvest and post-harvest management, the potential has yet to be fully realised. The steering committee has approved an Agri-Export Zone (AEZ) to solve a variety of concerns in the value chain.

Government of India sanctioned an Agri-Export Zone (AEZ) for Bangalore red rose onion with effect from 1st July 2002.

Promotion of Bangalore red rose onion (KAPPEC)

Karnataka State Agricultural Produce Processing and Export Corporation Limited (KAPPEC) is the only nodal agency for implementation of this Agri-Export Zone (AEZ). Accordingly, KAPPEC itself engaged in many farmer's welfare programmes to maximize the export this type of onion thereby, creating an opportunity to earn more and more foreign exchange both to the country.

KAPPEC has a research project financed by APEDA with a budget of Rs. 25.74 lakhs that has been given to the Indian Institute of Horticulture Research (IIHR) in Bangalore to increase and enhance Bangalore red rose onion productivity and export quality. Many seminars and symposiums featuring renowned scientists from IIHR and the University of Agricultural Sciences, Bangalore (UASB) were held in Bangalore and rose onion-growing areas for the benefit of farmers to train them in pre- and post-harvest management measures.

It procures good quality certified Bangalore red rose onion seeds at subsidised rates from the National Horticultural Research and Development Foundation (NHR&DF) in order to improve the quality and productivity of this onion cultivar. To strengthen and broaden the market base for this kind of onion in the worldwide market, the university

has worked to establish common infrastructure facilities such as processing facilities, godown facilities, and pack houses in growing areas for the benefit of farmers and exporters.

Standards for the tubers in international market:

1. The tubers should have a pungent odour and be uniform in size, shape, and colour.
2. The tubers should be fully formed, with the tuber's outer skin adhering rigidly to the tumour.
3. The bulbs should be thoroughly dried and conditioned.
4. Dust, inert matter, and undesirable particles should not be present in the bulbs.
5. The bulbs should be devoid of disease and pests, as well as rotting, damaged, and branch tubers.
6. The bulbs should be free from big top tubers and flowers.
7. The extra weight of around 5 percent allowed for more larger tubers than regular tubers.

According to accessible literature, 65-70 percent of total production accounts with bulb sizes more than 2.7 – 3.5 cm were supplied to Malaysia, Singapore, and the United Kingdom, among other countries. The bulbs with a diameter of less than 2.7 cm were sent to Sri Lanka, Bangladesh, and Pakistan, among other countries, while the rest were sold at low costs in India's east coast area.

Chintamani, Bagepalli, Gudibande, Chikkaballapura, Gauribidanur, and Sidlaghatta are the primary rose onion growing taluks of Chikkaballapura district, according to the data obtained. Bangarpet, Sreenivaspura, Kolar, Mulabagilu, and Malur are taluks of the Kolar district. These two districts account for about 80-90 percent of overall production and 70-80 percent of total area respectively.

Special feature of this study

The main aim of this research is to determine how well farmers in Chikkaballapura district use their resources in the cultivation of the Bangalore red rose onion crop, and how much more money they make compared to ordinary crop production. The results of profitability and cost efficiency in onion production at various sizes and with various production technologies will show that there is room to expand their area, production, and productivity, as well as to use resources and critical inputs more wisely. In light of the shifting cropping pattern, an attempt should be made to assess the economics of production and price structure, i.e. produce marketing.

In the absence of necessary infrastructures, such as transportation and storage facilities, the rose onion crop's great production potential has an impact on orderly marketing. Existing marketing entities scoop up a substantial portion of the consumer's rupee, decreasing producer profits. This situation needs a study of the numerous market channels for rose onion, as well as the price spreads in each channel, so that farmers can choose the most efficient method of selling their goods.

Keeping in view above facts the study was conducted with the following specific objectives:

1.1 Specific objectives of the study

1. To estimate cost and returns of Bangalore red rose Onion
2. To analyse the trend in area, production, productivity and marketed value of Bangalore red rose Onion in Chikkaballapura district
3. To document the constraints in Production and Marketing of Bangalore red rose Onion

1.2 Hypotheses:

1. Bangalore red rose onion cultivation is profitable enterprise
2. Bangalore red rose onion area under cultivation is increasing
3. Premature bolting is major problem in production and price fluctuations in marketing

1.3 Presentation of the study

The study has been organized into six chapters.

Sl. No.	Title of the Chapter	Details covered
I	Introduction	Deals with status of Bangalore red rose onion production, objectives and hypotheses
II	Review of literature	Pertain to review the literature relating to topic of the research
III	Methodology	The methods utilised in measuring variables, the selection of respondents, the research method used, and the statistical tools used to analyse the data are all covered in the third chapter.
IV	Results and Discussion	Deals with the presenting of the study's major findings through tables and discussion.
V	Summary	Deals with summary and policy implications of the study
VI	References	This chapter deals with lists literature referred for the present study.

Limitations of the study

The study is based on primary and secondary data. The primary data was collected from farmers through personal interview method using a pre-tested schedule. Therefore, some amount of recall bias is bound to be associated with the collected data since the farmers do not maintain any records of use of farm implements, tractor, irrigation, fertilizers and chemicals. The farmers hesitate in giving correct information regarding yield of crop. Similarly, primary data on constraints regarding to production and marketing were also collected from farmers.

The trend analysis done by using last twelve years of area, production and productivity of red rose onion in Chikkaballapura district of Karnataka. However, efforts were made to minimize them through cross checks at the time of data collection.

II REVIEW OF LITERATURE

Review of the research work done earlier pertaining to the present study on "Production and marketing of Bangalore red rose onion in Chikkaballapura district of Karnataka" is presented, but the reviews on economics of this crop are very much limited. Hence, in this chapter, the most related and relevant literature made on economic analysis, marketing channels and constraints in brinjal production and marketing were reviewed and presented below keeping in view the objectives of the study.

2.1 Costs and return structure

2.2 Trend analysis

2.3 Constraints in production and marketing

2.1 Costs and return structure

Sidhu *et al.* (2010) conducted a study with a sample of 50 onion and cauliflower vegetable growers in the Rajpura block of Patiala district in Punjab, and found that the overall cost of cultivation for onion was Rs.49,563/- per ha and Rs.34,840/- per ha. The net returns for onion (Rs.74,597/- per ha) were found to be higher than those for cauliflower (Rs.38,072/- per ha). The majority of these vegetables were sold to commission agents/wholesalers (more than 90%), then to retailers, and finally to consumers directly. The performance of these market networks could be improved by introducing competition from organised retail chains and updating the state's vegetable market system.

Yakasai *et al*. (2010) calculated the cost and returns of cassava production in Nigeria's Wudil Kano province. Cassava production costs accounted for 55 per cent of total costs, suggesting that it was a labour-intensive process. Farmers incurred a total expense of Rs.2,33,924/- per hectare, with a gross return of Rs.4,49,353/- per hectare.

Bhat *et al*. (2012) studied the economics of ginger production in Karnataka's Uttara Kannada district. The total cost of ginger cultivation for small farmers was Rs. 89,435.17/-, medium farmers Rs. 87,203.30/-, and large farmers Rs. 87,015.34/-. In

small, medium, big, and pooled farms, the gain cost ratios were 4.78, 5.13, 5.34, and 4.92, respectively. Small (Rs. 89,435/-) farmers faced higher cultivation costs than medium (Rs. 87,203/-) and big (Rs. 87,015/-) farmers. The cost of cultivation, on the other hand, did not vary significantly between small, medium, and large farmers. The high cost of rhizome material was a major factor.

Bala *et al*. (2011) calculated the costs and returns structure for the production of major off-season vegetables in Kullu, finding that tomato had the highest per hectare cost, followed by cabbage, cauliflower, and peas, and peas had the lowest. Peas, on the other hand, had the highest cost of cultivation, followed by cauliflower, tomato, and cabbage. Plant conservation costs were the largest component of cost A1 in all crops, led by seed and fertiliser costs. Vegetables, as labor-intensive crops, incurred substantially high human labour costs, ranging from Rs.13,200/- to Rs.15,600/- per hectare. Tomato had the highest gross and net returns per hectare, followed by cauliflower and cabbage.

Chandraprabha (2012) studied the Production and marketing dynamics of tomato in Karnataka. According to the study, the cost of tomato cultivation per acre for small, medium, and large farmers was Rs. 86,658/-, Rs. 86,676/-, and Rs. 90,573/-, respectively. The variable cost for small, medium, high, and pooled farm categories was Rs.72,351/-, Rs.70,591/-, Rs. 70,395/-, and Rs. 71,111/-, respectively, out of total cost. The advertisement cost was the most significant expense, accounting for 24 percent of the overall cultivation cost. In small, medium, and large farms, the average tomato yield was 251, 254, and 269 quintal per acre, respectively. For small, medium, and large growers, the average gross returns per acre of tomato were Rs.1, 55,871/-, Rs.1, 60,020/-, and Rs.1, 55,871/-, respectively.

Hile *et al.* (2012) conducted a study on economics of production and marketing of summer capsicum in Nasik District of Western Maharashtra. At the overall stage, the analysis found that the cost of cultivation per hectare was Rs.76,299.80/- and that the yield per hectare was 108.83 quintal. Large size farmers had the highest yield per hectare (112 quintals), followed by medium (107 quintals) and small size farmers (105 quintals), respectively. The net income per hectare was highest in the large size category, and the

cost per quintal was lowest. At total cultivation cost, the gain cost ratio was 1.71 at the overall stage. The large-scale category had the highest gain expense ratio at variable cost and fixed cost, which was 4.14 and 2.45, respectively.

Ogunniyi *et al.* (2012) worked out the efficiency index of cassava production in Nigeria. Results shown that fertilizer had the highest performance index (15.7), followed by field size (10.8), labour (4.0), cassava cuttings (1.6), and herbicide (1.6). Since the efficiency index was less than one, farm scale, labour, fertiliser, and cassava cuttings were underutilised. This meant that by using more of these inputs, more money could be made from cassava processing. Since the efficiency index was found to be greater than one, there was an overuse of herbicide. As a result, reducing herbicide use could result in increased revenue.

Maikasuwa *et al.* (2013) worked out the cost and returns in the production of yam per ha in Nigeria and found that the variable cost accounted for 64.42 percent of the total cost, while the fixed cost accounted for 35.58 percent of the total cost. This meant that, in comparison to fixed costs, the variable cost was the most significant cost in yam production in the study region. Labor accounted for 45.97 per cent of the overall cost in the variable cost category. This meant that the most significant variable cost item in yam production was labour. The MVP/MFC ratio test showed that the yam-producing woes were underutilizing farm size, fertilisers, and farm labour.

Sunny *et al.* (2013) studied the total cost of cultivation among the selected vegetables and it ranged from Rs.1,12,955 per hectare for cauliflower to Rs.80,867/- per hectare for potato. Cauliflower was found to be the most expensive of the vegetables tested, with prices ranging from Rs.79,453/- to Rs.1,12,955/-. In the case of potatoes, prices rose from cost A1 (Rs.57,245/-) to cost C2 (Rs.80,867/-). Cauliflower had the highest benefit-to-cost ratio, while potato had the lowest.

Bajkani *et al.* (2013) concluded the economic analysis of vegetables in districts Loralai, Bolan and Killa Saifullah of Balochistan with the aim of determining production costs, existing production systems, input-output ratios, and weaknesses in farm practises,

and then recommending ways to close these gaps. A total of 109 people from all districts were interviewed. In the major vegetable growing areas, additional data was collected on farm size, average cost of production of vegetables, which was divided into four categories: fixed costs, capital costs, labour costs, and marketing costs. The findings revealed that all vegetable growers in the study region irrigated their crops 15-20 times. The majority of farmers indicated that production had decreased as a result of poor management, power outages, and other issues.

Kamal *et al.* (2014) conducted the economic analysis of commercial organic and conventional vegetable farming in Kathmandu Valley of Nepal. They found that the average investment in traditional vegetable production was around NPR 1,000,000/-, according to their findings. For a ropani year, the average investment in organic farming was significantly lower (NPR 70,000/-). In traditional farming, the gross return was higher (NPR 135,000/-), while in organic farming, it was around NPR 1,00,000/-. When comparing organic and traditional farming, organic farming had a higher benefit-cost ratio (1.47:1) than conventional farming (1.35:1).

Lokapur *et al.* (2014) analyzed cost and returns structure of major vegetables in the Belgaum district. which had a high concentration of vegetable-growing area Potato farms used the most human labour per hectare (78.77 man days), followed by onion farms (70.25 man days), tomato farms (66.37 man days), and green chilli farms (66.37 man days) (48.13 man days). When compared to onion (Rs.31,240.2/- per ha), green chilli (Rs. 25,797.37/- per ha), and tomato (Rs.27,532.42/- per ha), the overall cost incurred by farmers on potato cultivation was high (Rs.47,299.86/- per ha). The high seed rate was blamed for the high cost of potatoes. Potato (Rs.1, 30,410.60/- per ha) had the highest gross returns, followed by onion (Rs.1, 24,518.60/- per ha), tomato (Rs.64, 969.70/- per ha), and tomato (Rs.64, 969.70/- per ha).

Mohammed *et al*. (2016) studied profitability in chili pepper production in Kaduna state of Nigeria. They used a multistage sampling protocol to obtain primary data from 200 chilli pepper growers. According to them, 72 percent of chilli growers are not members of any cooperative societies. The cost of fertiliser accounted for approximately

59 percent of the overall cost. The overall revenue was approximately ₦ 111,857, with a total expense of approximately ₦ 49,000. The highest benefit-to-cost ratio was 3.9:1, indicating that chilli production was more profitable. The co-efficient of education was found to be positively linked to profitability and had a significant relationship with profitability at the one percent level, with an R^2 of 0.52.

Jorwar *et al*. (2017) studied the economics of production and marketing of tomato in Amravati district. The study revealed that the per hectare cost of cultivation of tomato was highest in the large group i.e. Rs. 1,48,613/- followed by medium group Rs. 1,42,777/- and small group Rs. 136110/-. The average yield and gross returns per hectare increased with the increase in size of farms. Cost of cultivation at overall level, variable cost, fixed cost and labour cost were Rs. 97,994/-, Rs. 1,28,462/- and Rs. 1,41,028/-, respectively. The net return at labour cost in small, medium and large size group were Rs. 6,300/-, Rs. 14,110/-, and Rs. 24,202/-, respectively. An input-output ratio for overall size groups at variable cost, fixed cost and labour cost were 1.56, 1.19 and 1.09, respectively.

Salve *et al.* (2017) studied on cultivation and production cost of cumin in Banaskantha district of North Gujarat. According to the report, the average total cost of cumin cultivation was Rs. 48,905/- per hectare, with a net income of Rs. 39,852/- per hectare. Seed, human labour, and fertiliser cost 33.09 percent of the overall cost of cultivation, which was 8.60, 20.34, and 4.15 percent, respectively. The cost of cumin cultivation was higher for small farmers than for medium and large farmers.

2.2 Trend analysis

Nagaich (1981) studied the potato production potential in India. He concludes that India's potato production has been steadily increasing over the past two decades. Potato production increased from 1.5 million tonnes in 1949 to a record high of over 10 million tonnes in 1978-1979. The area under potato has increased threefold, production has increased sixfold, and the average yield per hectare has increased from 6.6 to over 12.8 tonnes. One of the many options for proper potato disposal has been suggested: exporting potatoes to other countries.

Singh and Mathur (1994) studied growth and instability in production and prices of potato in India. They noticed that potato production and region were both unstable due to potato production's response to the price of competing crops and the introduction of modern technology, respectively. Potato production increased and decreased in response to increases and decreases in the prices of competing crops.

Jain and Kumar (1999) examined the potential and export performance of vegetables in India with reference to potato and onion. They observed that India only exported 21 thousand tonnes of potato in 1995-96, accounting for only 0.12 per cent of total output. India exported 386 thousand tonnes of onion in 1995-96, accounting for 9.55 percent of its annual production volume. In comparison to the share of total food products exports or total agricultural exports from India, the overall export output of potato was deplorable, while that of onion was commendable.

Grover *et al*. (2003) studied the present status and export potential in India. They found that India's potato exports had been very volatile throughout the year (2003) and to various countries. From 1994 to 2002, the coefficient of variation in exports of potato seeds and fresh potatoes was 126 to 215 per cent and 48 to 148 per cent, respectively. India's future share of global potato trade is on a small scale. Punjab's potato production was comparable to that of other countries with a leading role in the global potato market, such as the United Kingdom, which generated 220.8kg/day. According to the report, India fetched a higher price per kg for potato seed production for export, but it requires regular investment in the export potential of Punjab, where an agri-export zone has been created.

Jyothi *et al*. (2003) studied that the export performance of onion and potato from India. According to the report, India's onion and potato exports grew at a positive and growth rate of 6.27 and 4.38 percent per year, respectively. Over the same time, onion and potato export earnings and unit value realisation grew at substantial positive rates of 16.70, 12.28, 9.74, and 7.45 percent, respectively. From 1970 to 2000, the coefficient of variation for onion and potato export quality was 29.66 percent and 102.13 percent,

respectively. In both onion and potato, the unit value of exports was found to be constant as compared to quantity and export earnings, according to the findings.

Kumar *et al*. (2005) studied the effect of establishment of WTO on export of potatoes from India. During the pre-WTO era, India's potato exports grew at an extremely fast pace. In potatoes, this was as high as 34.7 percent in terms of quantity and 31.5 percent in terms of weight. However, the global growth rate for potato exports was moderate (around 3.6 percent) in terms of volume and around 6.06 percent in terms of value. India has had a negative growth rate in both quantitative and value terms since the WTO (-9.7% and -18.78% respectively). In quantitative terms, however, global potato exports grew modestly (1.7%), but in value terms, they grew at a negative rate of -5.43 percent. During the pre-WTO era, India exported 7639.7 tonnes of potatoes and received approximately 1047.7 thousand US dollars. During the post-WTO era, however, it exported 15547.86 tonnes of potatoes and received $2177.2 thousand US dollars. In quantitative terms, the coefficient of variation in Indian potato and frozen potato exports was found to be 72.8 and 40.25 percent during the pre-WTO period and 42.38 and 64.84 percent during the post-WTO period. This indicates that the coefficient of variation in potato exports was very high during the post-WTO era, indicating that there was a high level of volatility in potato exports from India.

Singh (2006) studied growth rate of production of potatoes and its export prospects in Indore district of Malwa region. He noticed that the rate of growth of potato arrivals in T. Choithram Mandi, Indore, and their export potential over the base year 1999-2000 did not show a clear pattern between 2000 and 2004. For the year 2003-04, a growth rate of 87.80% in potato arrivals and 88.85% in exports was projected over the base year 1999-2000.

Kumar *et al*. (2008) studied production and marketing of potato in Banaskantha district of Gujarat. They revealed that the district's potato area had been growing at an annual compound growth rate (ACGR) of 10.96 percent, but yield had been decreasing at an ACGR of 0.48 percent. As a result, the district's overall potato production has been growing at an annual rate of 10.48 percent. However, in Gujarat, the area and

productivity have been growing with ACGRs of 4.32 and 4.20 percent, respectively, while the yield has been decreasing with an CAGR of 0.12 per cent. They concluded that development in Gujarat, as well as in the Banaskantha district, had been increasing solely due to land expansion.

Singh (2010) analysed the trends in area, production, yield and export of potato during 1950-51 to 2006-07 in India. In comparison to any sub-period or entire period of the study, annual compound growth in area, production, and yield was lowest in the post-WTO period (1997-2006), and in export, the share of potatoes, fresh or chilled, and potatoes other than seed potatoes, fresh/chilled, declined, while the share of flakes, granules, and pellets of potatoes increased substantially during 2003-07.

Scott and Suarez (2011) investigated potato growth in India and its implications for the industry. They discovered that the growth of harvested area had a sequence of peaks and valleys, and that as yields per hectare continued to rise, productivity growth came to a halt. In India, potato production produced over 32 million t in 2007-09, more than ten times the 2.8 million t harvested nearly half a century earlier in 1961-63. In 2007-09, India alone harvested 10 per cent of global potato output, accounting for nearly 25 per cent of the overall increase in potato production in developing countries over the previous five decades. In India, annual potato harvesting area increased from 384,000 ha in 1961-63 to nearly 1.8 million ha in 2007-09. During 2007-09, average potato yields in India were 18.2 t/ha. Compound annual yield growth rates have fallen sharply in recent years, also going negative from 2000 to 2009.

De *et al*. (2012) studied the trends in production and export of vegetables in India. During the post-WTO regime, onion production increased by 31.8 percent, tomato production increased by 22.8 percent, and potato crop growth decreased by -11.3 percent. India produces roughly 13 percent of the world's total vegetable production. Potatoes account for 27.6 percent of total vegetable production in India, followed by onions at 10.6 per cent and tomatoes at 8.9 per cent. In the last decade, India's vegetable exports have grown at a remarkable rate of 9.8 per cent per year. When comparing the potato and tomato crops to the onion crop, the quantum share of exports to total production was

found to be extremely poor. They looked at the coefficient of variation (CV) to see if there was any volatility in India's tomato and potato exports. The CV in fresh tomato and potato exports has decreased in the post-WTO era compared to the pre-WTO period, indicating that tomato and potato exports from India have become more stable in the post-WTO period compared to the pre-WTO period. However, in contrast to the rest of the world, India's export stability was rapidly declining during both times. This high level of volatility may be attributed to the presence of mostly small private traders with a short-term interest in the market in order to benefit during periods of high international prices.

Saxena and Mathur (2013) studied the production performance and yield variability of potato in India. They noticed this in India over the last six decades. At the national level, mash and potato production increased by 1.10 percent and 5.98 percent per annum, respectively. Bihar (12.74%) had the highest area increase, followed by Gujarat (12.74%) (9.53%). When compared to region, the contribution of yield to increasing output was significantly low (11.76%) at the national level (82.62%).

Dastagiri *et al*. (2013) studied the production trends, market efficiency and export competitiveness of vegetables in India. The study covered 20 crops and was conducted throughout India in all eight states. They discovered that total vegetable cultivation area is growing at a rate of 4.12 percent, and production is growing at a rate of 6.48 percent. The development of Indian vegetables reflected a glorious past and a bright future. Fresh vegetable exports increased by 18.3 percent and 22.2 percent respectively between 2001-02 and 2010-11, according to the trends. They discovered that the area under potato cultivation grew at a rate of 4.57 percent per year, with a production growth rate of 6.07 percent. Potato exports have risen by 49.5 percent in recent years, according to market trends.

Kumarasamy and Sekar (2014) studied the growth and instability in export of both fresh and frozen potatoes in India by using compound growth rate and instability index. He discovered that the growth rate of both fresh and frozen potato export quantity (16.97 percent and 10.07 percent, respectively) and export value (K15.08 and 15.27

percent, respectively) was positive and important from 1990 to 2013. The value of fresh and frozen potato exports was highly volatile.

Jain and Kalpana (2014) studied compound growth rate of area, production and productivity for potato in Madhya Pradesh and India. She noticed that the area of potato planted in Madhya Pradesh and the country as a whole increased by 48 and 57 percent, respectively, over time. While potato production increased in Madhya Pradesh, it did not match the increase in area because productivity fell by 10.879 percent, causing production to suffer. Among the study areas, Madhya Pradesh had a notable output in annual potato production, which increased from 0.514 million tonnes in 2010-11 to 1.024 million tonnes in 2011-12. This equates to a 1.189 percent annual increase in demand. Potato productivity in Madhya Pradesh peaked at 13.880 tonnes per hectare TE in 1995-96 and dropped to 12.370 t/ha TE in 2011-12. In the reference period, productivity growth was 1.069 percent per year, which was lower than the previous year. India's annual yield growth rate increased by 0.950 percent. This may be attributed to the growth and acceptance of yield-increasing varieties, as well as improved technical advancements.

Pal *et al*. (2015) studied the export competitiveness of vegetable crops in Gujarat. To assess the export potential and competitiveness of various vegetable crops in Gujarat, they used tabular analysis and the Nominal Protection Coefficient. Vegetable export has a greater potential because of its rising output and productivity trend. Gujarat's potato and onion crops have shown to have a higher export potential. Exports of various vegetables, such as cabbage, potato, tomato, and onion, were found to be competitive with those of other countries. During 2010-11, potato area, production, and productivity all increased by 3.3 percent, 44 percent, and 27.35 percent, respectively.

Elawady *et al.* (2015) studied the growth in area, production, productivity and export of Egyptian potatoes and found out the determinants of growth in export of Egyptian potato. They observed that Egypt's average potato exports increased by 20 percent between 2001 and 2013, accounting for about 14 per cent of the total value of agricultural exports. A 6 percent increase in area, demand, and productivity was discovered. 5.7 percent and 2 percent of the population, respectively. This can be due to

increased potato-growing area as well as the production of high-yielding new potato varieties.

Sreepriya (2016) studied the trends in area, production and yield, trends in arrivals and prices, price discovery mechanism and market integration of potato India. Potato production has increased in all major producing states and at the national level over the last 30 years due to increased ii area under the potato and crop yield. From 1984-85 to 2013-14, the area under the crop increased by 3.06 percent and yield increased by 1.3 percent, resulting in a 4.39 percent increase in production across India. Madhya Pradesh and Bihar have the highest variability in production, which has been linked to the highest growth in production, especially in the last decade. In the selected markets of Agra, Patna, Burdwan, Indore, Jalandhar, and Ahmadabad, the price of potato was found to be lowest during the peak harvest period, i.e. when the most people arrived. Over the last decade, the price of potatoes has shown a significant positive exponential trend.

Patil and Yeledhalli (2016) studied growth and instability in area, production and productivity of different crops in Bengaluru Division. The CAGR of potato for area, processing, and productivity in Bengaluru urban was -7.57, -8.97, and -1.52, respectively, while the CAGR in Bengaluru rural was -4.33, -5.11, and -0.81. In Bengaluru urban, the instability index for area, output, and productivity was 19.95, 43.45 and 32.86 respectively, and in Bengaluru rural, it was 13.67, 35.12, and 24.59 respectively.

Suresh and Mathur (2016) studied the growth in area, production, productivity and export of agricultural commodities in India. They found that exports of guargum and other resins increased by 41.5 percent, meat and offals by 27 percent, meat and meat products by 26.6 percent, sugar and spices by 24-25 percent, and cereals by 16.4 percent. In the case of fish and marine items, tea, and coffee, the rate of growth was slow. Changes in the composition of exports also resulted from differential trend growths. They also reported a significant rise in the export share of cereals (3.3 to 6.9%), guargum and other resins (1.0 to 7.5%), cotton (14.1% to 17.3%), spices (2.3% to 3.3%), and sugar (2.3% to 3.3%) (3.9% to 4.3%). On the other hand, in certain goods, such as fish and marine products (14.0 to 7.6%), fruits and nuts (6.1 to 3.5%), and coffee and tea, the

share has decreased (5.4% to 3.5%). Exports increased by 26.1 percent, while location, demand, and productivity increased by 4.82, 5.44, and 0.58 percent, respectively.

Gyanendra *et al* (2017) studied financing agriculture value chain in India. The Coppock's instability index is used to assess the variability and consistency of Indian potato exports. They split the study period into three parts: 1996-97 to 2005-06, 2005-06 to 2014-15, and 1996-97 to 2014-15 as a whole. They found that the quantity of exports increased by 12.42, 12.72, and 16.92 per cent, respectively, and the corresponding export prices increased by 9.11, 29.74, and 23.27 percent in the three periods.

Kumari *et al*. (2017) studied the growth rate of area, production and productivity of potato in Sriganganagar district and Rajasthan. They noticed that the location, demand, and productivity growth rates were all positive and non-significant. Area, production, and productivity growth rates in Sriganganagar were 8.00, 4.10, and 3.20 percent per year, respectively, and 8.20, 8.30, and 0.1 percent in Rajasthan state. In Rajasthan, the CGR of potato area and development was positive and important. The CGR in the Sriganganagar district, on the other hand, was found to be insignificant. Both the state and the district had negative productivity.

Singh *et al*. (2017) studied the market arrival and price behaviour of potato in Agra district of Uttar Pradesh. They discovered that the Compound Annual Growth Rate (CAGR) for both potato area and production in the district was positive and important at the one percent level of significance. For region, the CAGR was 7.7 per cent, and for potato production, it was 7.1 percent. In the last ten years, the region under potato has nearly doubled. Potato production has also increased dramatically. The ACGR for efficiency, on the other hand, was found to be negative (-0.6%) but negligible. This suggested that the increase in annual production was primarily due to an increase in the district's potato-growing sector.

Wankhede *et al*. (2018) studied the performance potato in Nagpur APMC market. The study was based on data gathered over a 20-year period, from 1996-97 to 2016-17. The value of potatoes increased by 0.33 percent per year in the first decade, then

decreased by 0.06 percent per year in the second decade, which was non-significant. The value increased by 0.28 percent per year over the course of the era. In the first decade, the model price of potatoes increased by 0.41 per cent per year. The second period saw a noticeable rise of 0.47 percent per year. The model price increased by 0.48 percent per year over the course of the entire era. In the first decade, second decade, and overall time, the coefficient of variation in price of potatoes in APMC Nagpur market was 39.86, 43.66 and 54.53 per cent per annum, respectively.

2.3 Constraints in production and marketing

Dhaka and Poonia (2010) identification of constraints encoutred by the farmers in production and marketing of vegetables in bundi district of Rajasthan revealed that vegetable production is hampered by a lack of information about best practises, a high occurrence of pests and diseases, and high input costs. Perishability of crops, limited quantities of produce, and price fluctuation of vegetables are also major barriers to vegetable marketing.

Nath and Biswas (2011) studied the constraints in vegetable cultivation in West Tripura. The study revealed that lack of knowledge of scientific crop production ranked first (79.52%), followed by a lack of frequent visits by extension personnel to villages (76.67%), and poor soil fertility (72.38%), occurrence of pests and diseases (64.76%), crop damage due to early monsoon (54.28%), and poor seed germination due to low soil moisture ranked third (72.38%). Less cultivable land ranked first (92.86 percent), non-availability of quality seed ranked second (90.48%), and non-availability of manufacturing industries (value addition) ranked third (85.2 percent).

Goyal and Singh (2012) studied the production related problems of vegetable growers in Punjab. In this study, the biggest issue facing vegetable growers was discovered to be vegetable failure at the farm stage, which was revealed to be a concern for 69 percent of growers. It was followed by the high cost of labour, which was mentioned by 46.67 per cent of all vegetable growers. In the case of marginal, small, medium, and large vegetable growers, the respective figures for vegetable loss at farm level and high labour costs were 58.33, 66.67, 50.00, 43.75, 47.62, 28.57, 38.46, and

15.38 per cent. Similarly, compared to large farmers, marginal farmers faced a big problem with high seed costs and a shortage of high-quality seed in vegetable cultivation.

Shennewad and Shelke (2013) studied on constraints and suggestions of papaya growers in Marathwada region of Maharashtra state. Growers of papayas face significant marketing challenges because their fruits are perishable. The high rate of commission charges was cited by 28.33 per cent of respondents, while the high rate of commission charges was cited by 98.33 per cent of respondents. Fifteen percent of farmers registered fruit damage during transportation. The high cost of transportation, on the other hand, was cited by 83.33 per cent of farmers as a major constraint. Approximately 91.66 per cent of the sample growers believed they were not receiving a fair price. Around 60.20 per cent of the growers in the study complained about a lack of information about fruit processing. Other issues with papaya marketing included the lack of cooperative marketing, market intelligence, and grading facilities.

Farida and Fariya (2014) reported the lack of credit has the lowest mean score, and it is the most important problem that tomato farmers are facing, followed by high input costs, pest and disease problems, high land rent, and finally, water costs. 1.62, 2.50, 2.54, 4.07, and 4.28 are their mean ratings, respectively. The farmers' main development issue is a lack of access to credit. With mean scores of 1.82, 1.93, 2.83, and 3.42, respectively, the farmers' main issue is the lack of a stable market, followed by low prices, market queens' stealing, and the processing factory's lack of funds.

Matsane and Oyekale (2014) analyzed the factors affecting marketing of vegetables among small-scale farmers in Mahikeng local municipality, North West Province, South Africa. They noticed that agricultural produce from small-scale farmers was often lost after production due to a slew of marketing challenges, which made it difficult for small-scale farmers to fully exploit market opportunities and reduced incentives to participate in formal (commercial) or high-value markets. Lack of credit, lack of storage facilities, lack of market knowledge, lack of farming finance, poorly established village markets, weak producer prices, high perishability of produce, low patronage, inadequate access roads, limited transport size, and high transport cost.

Maru and Gibramu (2014) reported the main onion production constraints according to the report, onion disease was the major constraint for 59.00 per cent of respondents, water shortage was the major constraint for 32.00 per cent of respondents, climatic suitability was the major constraint for 6.00 per cent of respondents, and marketing of onion bulb was the major constraint for 3.00 per cent of respondents.

Shreedevi (2014) tried to review vegetable grower's production and marketing constraints in Karnataka. She revealed that high transportation costs (54.00%), a high wage rate (19.76%), a high incidence of pests and diseases (39.61%), a shortage of qualified labour (36.84%), a high cost of maintenance (35.12%), and a lack of technological guidance were the major issues that farmers faced in the marketing of vegetables (69.71%). Other issues faced by vegetable growers included unsafe weighing practises, delays in sale and payment, and a lack of successful market control.

Dhurwey *et al.* (2015) studied constraints faced by farmers in production and marketing of major cole vegetable crops in Bemetara district of Chhattisgarh state. According to the survey, the lack of timely labour was the biggest issue for 80.00 per cent of farmers who responded. 75.00 per cent of farmers, on the other hand, recorded losses due to pests and diseases, followed by 56.00 per cent due to a lack of proper preparation, 49.00% due to technical expertise, and 35.00 per cent due to a lack of soil testing facilities. Furthermore, they faced 32.00 per cent non-availability of timely input and 31.00 per cent lack of funding at a fair interest rate. In terms of marketing, the lack of proper harvesting methods (72.0%) was the most significant constraint, while the second most significant constraint stated by farmers was lack of information regarding grading and standardization and the post-harvest management 52.00 per cent.

Roopa and Sameer (2015) analysed the problems in production and marketing of cauliflower in Belgaum district of Karnataka. The study found that the most common problems faced by farmers in cauliflower production were labour shortages, which received the highest Garrett's score (77.83), accompanied by a high occurrence of pests and diseases (70.17), and the high cost of plant defence chemicals (66.50). According to 60.00 percent of sample farmers, high yielding varieties' seeds are typically expensive.

Farmers also mentioned non-availability of organic manure (59.11), erratic power supply (54.56), and pesticide and insecticide non-availability during peak season (43.15) as other issues with cauliflower output.

Anap *et al.* (2016) studied constraints faced by banana growers in the production of banana in Wardha District of Maharashtra. According to the report, 93.33 percent of banana growers experienced load shading in electricity as a result of various types of problems they faced. Furthermore, a large percentage of respondents (76.66%) experienced losses as a result of the hot weather. It is accompanied by high fertiliser prices (71.11%), high labour salaries, and inefficient labour in the workplace (71.11%). More than 61.11 per cent of respondents reported constraints such as high initial drip irrigation costs and delays in government subsidy, while 52.22 per cent reported constraints such as a lack of suckers in large quantities and of good quality. And 45.55 per cent of respondents listed a restriction such as initial drip irrigation costs are very high, and the government has been slow to provide subsidies, according to 52.22 percent of respondents, who also reported constraints such as a lack of suckers in large quantities and of good quality. And 45.55 per cent of respondents said they had a problem with timely labour availability, while 42.22 per cent said they had a problem with insufficient technical assistance.

Ashok and Aski (2016) studied constraints faced by cabbage growers and nature of marketing in North Karnataka. According to the report, 57.50 percent of cabbage growers get market knowledge from those who visit the market, with mobile (32.50%) and directly visiting the market (10.00 percent) following closely behind. Exactly the same number of respondents (40.00%) used a mini tempo or a truck as a mode of transportation. Pest and disease problems in processing, as well as market price fluctuations in marketing, were the first constraints faced by cabbage growers.

Daundkar *et al.* (2017) studied on problems of rabhi potato production and marketing in Pune district of Maharashtra. Farmers' problems, according to the survey, have included lack of low-interest loans at the time of sowing (54.17%), a lack of good quality seed (73.00%), and a high seed price, which was recorded by 65 per cent of

farmers. Another big issue was the high cost of living (60.00%), Transportation was a huge stumbling block to effective potato marketing. Approximately 70.00 per cent of farmers complained about high transportation costs. Price fluctuations emerged as a major issue, with 66.37 per cent of farmers expressing their dissatisfaction. High commission charges were an issue for about 63.00 per cent of farmers.

Mohan *et al.* (2017) conducted a study on constraints in production and marketing of papaya in Kadapa district of Andhra Pradesh. According to the findings, the majority of papaya farmers expressed concern about the severity of virus attacks (100%), labour intensiveness (92.50%), and the lack of improved insect and virus resistant varieties (91.25%) for papaya cultivation. Other issues included a lack of extension programmes (87.505), insufficient institutional credit (76.25%), non-availability of quality seedlings (71.25%), high seedling costs (68.75 percent), and high fertiliser costs (68.75%) (60.00%). Although all respondents opined that large price fluctuations were a major problem in papaya marketing, over 90.00 per cent of farmers opined that insufficient demand awareness was another major problem.

III METHODOLOGY

To satisfy the research objectives, a sound research methodology with proper tools of analysis is fundamental to draw a significant inference from the study and for the generalization of the findings of research. A general description of the study area, sampling techniques, tools and techniques used to achieve the objectives of the research is presented in this particular chapter. It has been presented under the following headings:

3.1 Description of the study area

3.2 Sampling framework

3.3 Nature and sources of data

3.4 Analytical tools and techniques

3.1 Description of study area

3.1.1 Location

Chikkaballapura is a district located in the state of Karnataka. It was formed on August 23, 2007, from the pre-existing Kolar district, which was Karnataka's fourth largest district before split. The district is 4,244 square kilometres in size (1638.618 sq. miles). Chikkaballapura district is located in southern part of Karnataka, roughly between 13.43° North and 77.72° East longitudes.

The district is part of the agro-climatic zone ‘Eastern dry zone (Zone 5)'. The Chikkaballapura district is located in a semi-arid, drought-prone region and is bordered on the south by the Bangalore rural districts and on the north by the Ananthpur district of Andhra Pradesh. On the east, the Andhra Pradesh district of Chittoor surround it, while on the west, the Karnataka district of Tumkur surrounds it. Chikkaballapura is itself the district headquarters. The district is primarily agricultural, and it is well-known for its silk and milk production.

3.1.2 Demography

Table 3.1 shows the total population and literacy rate of Chikkaballapura district. According to 2014-15 figures, Chikkaballapura district has a total population of 12.54 lakhs, with 6.37 lakh males and 6.16 lakh females. The literacy rate was 81.57 percent, with male literacy (77.00 %) outnumbering female literacy (61.50%). Only one revenue division, Chikkaballapura, exists in the district, and it is divided into six taluks: Bagepalli, Chikkaballapura, Chintamani, Gauribidanur, Gudibande, and Sidlaghatta. There are 157 mandals in the district, under six taluks. In the Chikkaballapura district, there were 972 females for every 1000 males.

Table 3.1 Demographic information of Chikkaballapura district

Sl. No.	Particulars		Chikkaballapura District
1	**Geographical area (sq. km)**		4,244
2	**Population**	Male	6,37,504 (50.70)
		Female	6,16,873 (49.30)
		Total	12,54,377 (100.00)
3	**Literacy rate (%)**	Male	77.00
		Female	61.50
		Total	81.57
4	**No. of villages**		1515
5	**No. of Hobli's**		26
6	**No. of panchayats**		157
7	**No. of Revenue divisions**		1
8	**Sex ratio**	Male	1000
		Female	970

(Source: Chikkaballapura district at a glance-2014-15. Government of Karnataka.)

Note: Figures in parentheses indicate percentages to total

Fig. 1: Map showing the study area of Bangalore red rose onion

3.1.3 Topography

Chikkaballapura is roughly 56 kilometres from Bangalore [India's silicon city]. Climate and rainfall have a significant impact on agriculture, and agriculture is heavily reliant on these factors. The district has a pleasant and temperate climate, with a high temperature of 32℃ in May and a minimum temperature of 21℃ in December. The district's typical humidity levels are around 79 percent (maximum) and 45 percent (minimum).

In the region, there are three distinct agricultural seasons: Kharif (June to September), Rabi (October to January), and summer (February to May). The South West Monsoon and the North East Monsoon are the two major rainy seasons in the district. The district receives an average of 677 mm of rain annually.

The district's topography ranges from undulating to flat. The district's middle and eastern regions, which forms the Palar Basin valley are well-cultivated. The district's northern half forms a depression that leads to the North Pinakini River valley and Gauribidanur. The elevation ranges from 800 to 911 metres above sea level.

Chikkaballapura district soils are found on a variety of landforms, including hills, ridges, pediments, plains, and valleys. Red loamy soil, red sandy soil, and lateritic soil are among the soil types found. Around 73 percent of the entire area is good for agriculture and horticulture; about 3 percent for forestry and pasture; and the remainder area is ideal for quarrying, mining, and wildlife habitat.

3.1.4 Land utilization

Land utilization is an important indicator of agricultural conditions as it gives an outline of land use, available fallows and net area sown as well as consequent economic contributions for the growth of the area. Land utilization details (Table 3.2) pertaining to the year 2015-16 is as follows.

The net sown area of the district is 1,97,674 hectares of the total geographical area 4,24,400 hectares. It comprises of 68,432 hectares of forest land, and net irrigated area 46,512 hectares.

Table 3.2: Geographical and demographic profile of the study area

Sl. No.	Particulars		Chikkaballapura
1.	Geographical area (ha)		4,24,400
2.	Forest cover (ha)		68,432
3.	Net sown area (ha)		1,97,674
4.	Net irrigated area (ha)		46,512
5.	Area under mulberry (ha)		15,676.45
6.	Livestock (numbers)	Cows	2,36,605
		Buffaloes	24,381
		Sheep	1,24,870
		Goats	80,740
		Poultry	81,65,758
		Pigs	6,052
7.	Taluk (numbers)		6
8.	Villages (numbers)		1,515
9.	Population (numbers)	Male	6,37,504
		Female	6,16,873
		Total	12,54,377
10.	Density of population (per sq. km)		298
11.	Literacy rate (%)		81.57
12.	Annual rainfall (mm)		677
13.	Temperature	Maximum	32^0 C
		Minimum	21^0 C

Source: District Statistical Office, 2015-16

The total geographical area of the study area, viz., Bagepalli, Chikkaballapura, Chintamani, Gauribidanur, Gudibande and Sidlaghatta was 939 sq. Km, 638 sq. Km, 891 sq. Km, 889 sq. Km, 227 sq. Km and 670 sq. Km respectively.

3.2 Sampling framework

The study was carried out in Chikkaballapura district of Karnataka State. In Chikkaballapura district six taluks namely, Chintamani, Chikkaballapura, Bagepalli, Gouribidanur, Gudibande and Sidlaghatta were selected for the study based on the highest area under Bangalore rose onion.

From each taluk, 10 farmers with Bangalore rose onion cultivation were selected for the study. Thus, the total sample size comprised of 60 farmers selected and market intermediaries were also randomly selected for the study (Table 3.3).

Table 3.3: Distribution of sample farmers

Sl. No.	Taluks	No. of farmers Table: Distribution of sample farmers
1.	Chikkaballapura	10
2.	Chintamani	10
3.	Bagepalli	10
4.	Gouribidanur	10
5.	Gudibande	10
6.	Sidlaghatta	10
Total sample farmers		**60**

3.3 Nature and sources of data

Primary data was obtained from sample respondents by personal interview approach using a pre-tested and organised schedule in order to evaluate the study's unique objectives. The information was gathered from respondents during the months of January-February 2020, and it covers general information about Bangalore red rose

onion cultivator's family size, age, education, occupation, and land holding. Details on the numerous inputs used, as well as details on the cost of cultivation, yield, returns, and mode of sale.

The primary data for marketing channels engaged in rose onion, such as purchase price, selling price, marketing costs, and marketing margin, were acquired from marketing intermediaries via a survey of sample respondents.

3.4 Analytical tools and techniques

The following analytical methods and approaches have been used to analyse the objectives in order to attain specific objectives based on the nature and extent of data availability.

3.4.1 Descriptive analysis

3.4.2 Garrett's ranking technique

3.4.1 Descriptive analysis

For this study, descriptive statistics like mean, percentages, and frequency distribution were applied to determine the socio-economic characteristics of sample farmers as well as compute costs and returns structure.

The cost-return analysis was performed to analyse the economics of Bangalore red rose onion cultivation. This section explains the various cost and return ideas employed in the study.

It should be emphasised that farmers were more familiar to quantifying land area in acres rather than hectares. As a result, all calculations relating to the economics of Bangalore red rose onion production were done per acre in the current study.

Cost concepts

The total costs were divided into three broad categories:

a. Variable costs

b. Fixed costs

c. Marketing costs

a. Variable costs: Variable input costs include seed/seedling costs, farm yard manure (FYM), fertilisers, insecticides, human labour, and interest on working capital. The following are the computations for various terms of variable cost components:

i. Seeds/ seedlings: The cost of purchased seedlings was calculated using the farmer's actual payment.

ii. Farm yard manure: The worth of farmyard manure produced on the farm was estimated using the current price per tractor load.

iii. Fertilizers and plant protection chemicals: Fertilizer and plant-protection-chemical costs were calculated using actual price paid by the farmer.

iv. Labour: During the study period, the cost of hired labour was determined using the prevalent wage rates paid per day (8 hours) in the study area for men, women, and machine labour.

v. Interest on working capital: The cost of human labour, machinery labour, seedlings, farmyard manure (FYM), fertilisers, and plant protection chemicals are all included in working capital. Working capital interest was estimated at 7 percent per year, which is the rate at which commercial banks advance short-term loans.

b. Fixed costs: Depreciation on farm implements and machinery, land revenue, and management costs are all examples of these.

i. Depreciation charges: The straight-line technique was used to compute depreciation on each component of capital equipment and machinery owned by the farmers, depending on the purchase price. Thus, the

$$\text{Annual depreciation} = \frac{\text{Purchase value- Junk value}}{\text{Useful life of the asset}}$$

The depreciation was calculated using the average life of an asset as stated by each farmer. Based on the values provided by the respondents, the average value of an asset after its usable life (economic life) was calculated. The crop was assigned the depreciation cost of each piece of equipment depending on its percentage utilisation.

ii. **Land revenue:** Revenue from land was levied at the government's rates.

iii. **Rental value of land:** is taken based on yearly basis and based on the type of crop sown.

c. **Marketing costs:** Actual marketing costs incurred by respondents in the promotion of Bangalore red rose onions were considered. Packing, loading, and unloading expenses, transportation costs, spoilage, and miscellaneous expenses are all included in these marketing expenditures. All of this added up to the Bangalore red rose onion's marketing expense. By dividing the amount of individual expenditures by the entire quantity of goods sold, the average marketing cost per tonne of Bangalore red rose onion was calculated.

3.4.1.1 Cost of cultivation: it is the sum of variable costs and fixed costs and expressed on per acre basis.

3.4.1.2 Total cost (TC): total cost is the sum of total variable cost (TVC) and total fixed cost (TFC).

i. **Gross returns (GR):** per acre gross returns were calculated by using the below formula.

$$\text{Gross Returns (GR)} = \text{yield} \times \text{price}$$

ii. **Net returns over variable costs:** it is the gross returns minus variable costs.

$$\text{Net returns over variable costs} = \text{GR-TVC}$$

iii. **Net returns over cost of cultivation:** it is the gross returns minus variable costs plus fixed costs.

$$\text{Net returns over cost of cultivation} = GR - (TVC + TFC)$$

iv. **Returns per rupee of investment:** worked out by taking the ratio of gross return divided by total cost.

$$\text{Returns per rupee of investment} = \frac{\text{Gross returns}}{\text{Total cost of cultivation}}$$

3.4.1.3 Some of the terms and concepts used in the present study are explained below:

a. **Commission agent**: He is the individual who sells the farmer's produce to other market intermediaries on behalf of the farmer and receives a commission from the farmer.

b. **Wholesaler**: A wholesaler is someone who purchases goods from producers, commission agents, and village traders and then sells them to retailers.

c. **Retailer**: The individual who buys produce from wholesalers/commission agents and then sells it to consumers.

d. **Village trader**: A Village trader, on the other hand, is a grocer with a specific place who buys products from farmers and sells it to wholesalers/commission agents.

e. **Marketing channel**: it consists of agencies that perform the various marketing functions in sequence as the produce moves from the producers to the ultimate consumers

f. **Marketing margin:** After deducting marketing costs imposed by the intermediaries for handling the produce, this refers to the net share of the various market intermediaries in a certain produce.

Marketing Channels of Bangalore red rose onion

Bangalore red rose onions are a distinctive type of onion grown mainly in the Chikkaballapura district of Karnataka, as well as in some parts of the Kolar region. These onions have no domestic market demand; hence the entire crop is exported to various countries, with the exception of grade rejections. Bangalore red rose onion exporters are situated in Chennai, Tamil Nadu. Only the growers in the production belts are concentrated.

A marketing channel is a system or action that is required to transfer ownership of products/commodities and convey items from the point of production to the point of consumption. It includes all institutions and marketing activities involved in the marketing process. In the study area, there were three main marketing channels identified in the marketing of Bangalore red rose onion. The identified marketing channels were as follows.

Evolution of marketing system

The different market functionaries such as village level traders, commission agents, contract traders, traders in APMC, exporters and foreign importer were randomly selected from the market in the area under study. The data collected from the different market functionaries were analysed to estimate the marketing costs and margins through important marketing channels.

Marketing pattern of Bangalore red onion

Information regarding the marketing pattern/channels of red rose onion were collected from the producers and marketing agencies involved in the marketing of Bangalore red rose onion through different channels. Information was also obtained from the market intermediaries involved in the purchase of Bangalore red rose onion within the village and in the market.

Marketing margins and costs

To find out the marketing margins and costs for different channels five village traders, commission agents, contract traders, traders in APMC and exporters were selected in the market, the foreign importers and consumer were contacted through online. The relevant data were collected with the help of pre-tested schedule and online forms. Information regarding marketing aspects of Bangalore red rose onion was collected from the producer and the other marketing intermediaries in order to find out the producer's share in the price paid by the consumers. The main channels in the marketing of Bangalore red rose onion were studied to workout the price spread. To estimate the marketing costs and margins through important marketing channels were used for computing the marketing margins. From the gross margins, the costs incurred by the concerned agencies were deducted to arrive the net returns.

Marketing margins refers to the difference between values of physical quantity equivalent at different levels of marketing. These are represented by the spread between the prices paid and received by any specific marketing agency. Marketing costs refers to the costs which the marketing functionaries have to incur while conducting their business. The marketing efficiency of different marketing channels was worked out by using the following method.

Marketing efficiency

(a) Shepherd's Method $ME=RP \div MC$

Where,

RP = Retailer's sale price or consumer's purchase price

MC = Total marketing costs

(b) Acharya's method (Acharya and Agarwal, 2011) $MME=FP \div (MC+MM)$

Where,

FP = Net price received by farmer

MC = Total marketing costs

MM = Total net margins of intermediaries

(c) Conventional method (Acharya and Agarwal, 2011) $ME = [O/I] \times 100$

Where,

O = output is the value added

I = input is the real cost of marketing

ME = marketing efficiency

Onion Growers

After harvesting the Bangalore red rose onion, the growers dry the onions in the drying yard or in the open field for three months.

For the procurement of Bangalore red rose onions, village traders have contracted producers or Bangalore red rose onion growers. Because they reside in surrounding villages or the same village, the producer and village level trader have known one other for a long time. They would communicate on a regular basis, not only for the purpose of purchasing and selling the Bangalore red rose onion, but also for social purposes. It was discovered that 78.40 percent of respondents sold Bangalore red rose onions to village level traders, 15 percent of respondents sold Bangalore red rose onions to pre-contract dealers, and the remaining 6.6 percent of respondents sold Bangalore red rose onions through APMC dealers.

Village level traders

The village level traders are part-time businesspeople and full-time farmers who consolidate a small amount of marketable surplus in addition to their produce. These dealers put their own money down to buy onions. Village dealers have been recorded purchasing and selling Bangalore red rose onions to exporters through wholesalers.

Village level traders acts as middlemen for purchasing goods on behalf of the exporter. They negotiate the buying price with onion growers, as well as the weighting, packing, loading, and dispatching of the lots to exporters via wholesalers.

Village level traders have paid to producer sellers and have received remuneration from exporters in the form of a rupee per kilogramme of rose onion handled. It has also

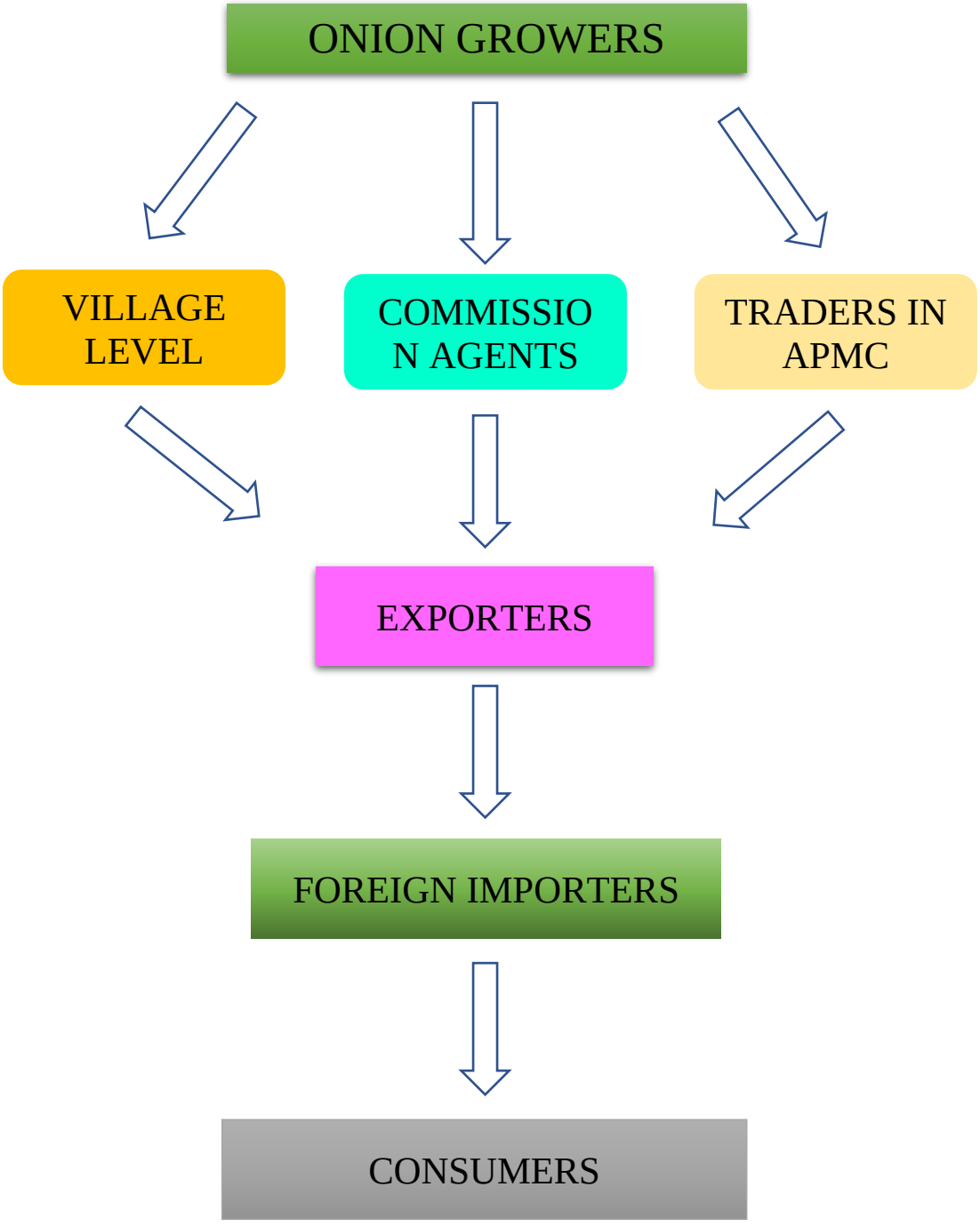

Fig. 2: Different marketing channels of Bangalore red rose onion

been found that the village level trader has borrowed money from the exporters in advance, which will be adjusted when the rose onions are delivered to the exporters. Not licenced traders from the concerned APMCs are acting as traders for the exporters.

Licensed trader in APMC

The traders are APMC licenced market functionaries who deal with rose onion in the market yard. The traders who bought the rose onions from the producer-seller in the APMC yard and sold them to Chennai-based exporters based on purchase orders from these exporters.

Chennai based Exporters

The Bangalore rose onion exporters are operating from Chennai. They have huge infrastructure facilities to handle rose onion like storage sheds, grading facilities, drying sheds and packing facilities.

The exporters purchase rose onion directly from the network of village level traders in growing belts of south India and they declare the purchases in the respective regulated markets.

The exporters have also purchased rose onions from traders in APMC yards. Only few exporters established handling centres for rose onion in the production belts with the provision for drying, cleaning, grading, packing, labelling and for storage. The exporters purchase the onions based on the import orders from the importing countries.

3.4.2 Garrett's ranking technique

Basically, it converts the ranks of limitations and benefits into numerical scores. When contrasted to a standard frequency distribution, the main advantage of this methodology is that the constraints and benefits are organised according to their relevance to respondents. As a result, the same number of respondents may have received different ranks for two or more limitations. The following is Garrett's formula for translating ranks to percentages,

Per cent position=100*(Rij-0.5) / Nj

Where,

Rij= rank given for i^{th} factor by j^{th} individual

Nj= number of factors ranked by j^{th} individual.

According to Garrett's table, the percent position of each rank was then transformed into points. Individual respondent scores were totalled together for each factor and divided by the total number of respondents for whom scores were added. The mean scores for all of the criteria were organised in descending order, with ranks assigned and the most significant limitations highlighted.

Plate 1 &2: Primary data collection from the farmers

Plate 3: Harvesting of Bangalore red rose onion

Plate 4: Village level traders are packing and storing the produce

IV RESULTS AND DISCUSSION

The results of the study are discussed in this chapter under the following heading in accord with the purpose of the study. The aim here is to shed lime light on some of the factors responsible for the major findings. The following headings are used to discuss the findings while keeping the study's goals in mind:

4.1 Socio-economic characters of Bangalore red rose onion farmers

4.2 To estimate the costs and returns of Bangalore red rose onion cultivation

4.3 To analyse the trend of area, productivity and value of Bangalore red rose onion

4.4 To document constraints in production and marketing of Bangalore red rose onion

4.1 Socio-economic characters of Bangalore red rose onion farmers

This section explains the socio-economic characteristics of sample respondents, such as age, family size, literacy level, occupation, land holdings, irrigation sources, farm inventory and livestock ownership, participation in various farm related activities, and investment decisions.

4.1.1 Age of the farmers

The study comprised of 60 Bangalore rose onion farmers spread over six taluks of Chikkaballapura district of Karnataka. From Table 4.1, it could be seen that a majority (60.00 %) of the respondents were moderately aged (36 – 50 years) followed by old age (>50 years) group (25.00 %) and young group who were less than or equal to 35 years (15.00 %) of age.

The results show that majority were middle aged group of farmers have combined with enough experience and enthusiasm for farming to try out new techniques.

4.1.2 Family Size

The classification of sample households in the study area depends on family size and it showed that the highest number (48.33%) of respondents were under the size of

less than four members, followed by the family size under five to eight members (43.33%) and more than eight members (8.33%), respectively (Table 4.1).

The results revealed that majority of the respondents are less than four members, approximately each family group have at least one male and two females involved in farming, so it helps to reduce the cost involved in hiring labour and removes the uncertainty with timely supply of labour force.

4.1.3 Literacy levels

Results pertaining to education indicated that majority (35.00 %) of the respondents were illiterate followed by SSLC (23.33 %), secondary education (15.00 %), primary education (13.33 %), PUC (8.33 %), (3.34 %) of the respondents had education up to degree level, while, just (1.67 %) of the respondents had up to Post graduation level (Table 4.1).

The level of education required to gain access to new crop cultivation technologies and market knowledge is critical. The study found that the majority of the farmers in the sample are literate (65%), with formal education varying from primary to post-graduation.

4.1.4 Occupation

The study shows that respondents with agriculture as a primary occupation (88.33%) and as a secondary occupation (11.67%) are both represented in the report (Table 4.1). It was found that the respondents of families relied on agriculture for their livelihood and that only a few farmers practised agriculture as a sub-sidary occupation.

4.1.5 Landholding and sources of irrigation

Table 4.2 presents the landholdings and sources of irrigation of Bangalore rose onion cultivators. It was observed that the average size of a land holding was found to be 2.6 acres. There was an average rain-fed area of 0.7 acres and an average irrigated area of 1.9 acres among them. Borewell irrigation was used by all Bangalore rose onion farmers, with only four producers claiming an open well that is no longer used for irrigation.

Table 4.1: Socio Economic characteristics of sample farmers

(n=60)

Sl. No.	Particulars	Number	Percentage
I	**Age of farmers**		
1.	Young age (< 36 years)	9	15.00
2.	Middle age (36 – 50 years)	36	60.00
3.	Old age (> 50 years)	15	25.00
	Total	**60**	**100**
II	**Family size (No./household)**		
1.	Less than four members	29	48.33
2.	Five to eight members	26	43.33
3.	More than eight members	5	8.33
	Total	**60**	**100**
III	**Educational status (Percentage to total)**		
1.	Illiterate	21	35.00
2.	Primary	8	13.33
3.	Secondary	9	15.00
4.	SSLC	14	23.33
5.	PUC	5	8.33
6.	Graduation and above	2	3.34
7.	Post-graduation	1	1.67
	Total	**60**	**100**
IV	**Occupation**		
1.	Agriculture as the main occupation	53	88.33
2.	Agriculture as a subsidiary occupation	7	11.67
	Total	**60**	**100**

Table 4.2: Landholding and sources of irrigation of sample farmers

(n=60)

Sl. No.	Particulars		Total area	Percentage
1.	**Landholding (acre/farmer)**	Rain fed	0.7	26.92
		Irrigated	1.9	73.08
		Total	2.6	100.00
2.	**Source of irrigation (number of respondents)**	Open well	4	6.66
		Borewell	60	100.00

The farm holdings were dispersed, with a variety of enterprises such as crop, dairy, cattle, backyard poultry, and so on. The average size of a land holding was found to be 2.6 acres. It seems that the majority of respondents are small and medium-sized farmers.

4.1.6 Status of farm inventory

The status of farm inventory of Bangalore rose onion cultivators is presented in Table 4.3. The table demonstrates that 38.33 per cent of cultivators had farm house, all the respondents had pump set and drip irrigation (100 %), followed by (86.66%) hand spray/ power sprays, (26.67%) tractor, (30%) of farmers have bullock cart, respectively.

Table 4.3: Status of farm inventory of sample farmers

(n=60)

Sl. No.	Particulars	Number of respondents	Percentage of total
1.	Farmhouse	23	38.33
2.	Pump set	60	100.00
3.	Drip/sprinkler irrigation set	60	100.00
4.	Tractor	16	26.67
5.	Hand spray/power sprayers	52	86.66
6.	Bullock cart	18	30.00

The majority of respondents owned a bore well, irrigation pump set, sprayer, and drip system when it comes to non-land fixed assets. It is concluded that ground water is exploited because most of the farmers' crops are irrigated.

4.1.7 Livestock

The detail of livestock with the respondents is presented in Table 4.4. The table indicates that the total sample (60 farmers) maintained sheep (98), followed by (87) cows, goats (40), bullock pair (36) and Buffaloes (9).

Chikkaballapura is one of the dry districts in the state Karnataka, most of the farmers dependent on livestock as a source of sustainable income. The number of livestock maintained by respondents is partly depended on the quantity of fodder required and family labour availability. The (Table 4.4) revealed that, most of the farmers maintained milch animals and few farmers with sheep, bullock pair and buffalo.

Table 4.4: Livestock assets of sample farmers

(n=60)

Sl. No.	Particulars	Number of households	Number
1.	Bullock (pair)	26	36
2.	Cow	53	87
3.	Buffaloes	4	9
4.	Sheep	10	98
5.	Goat	8	40

4.2 Cost of cultivation

The average value of different inputs used and their values per acre of sample respondents are presented in the Table 4.5.

It was observed that the cost of cultivation of Bangalore rose onion per acre was Rs. 70,847/- out of this, 82.68 per cent was variable cost. The major variable cost were of human labour i.e., Rs. 15,050/- (21.46%) followed by farm yard manure (FYM) cost Rs.

11,750/- (16.58%), interest on working capital Rs. 8,625/- (12.17%), seedlings Rs. 4,250/-(5.60%), marketing cost Rs. 4,200/- (5.92%), machine labour Rs. 4,050/-(5.71%), fertilizers Rs. 4,050/- (5.71%), plant protection chemicals Rs. 1,800/- (2.76%), Irrigation cost Rs. 3,500/- (4.94%) and bullock labour Rs.1,300/- (1.83%).

Table 4.5: Cost of cultivation of Bangalore red rose onion in Chikkaballapura district of Karnataka

(n=60) (Rs. / acre)

Sl. No.	Costs	Value (in Rs.)	Percentage
I	**Variable cost**		
	FYM	11,750	16.58
	Seedlings	4,250	5.60
	Fertilizer	4,050	5.71
	PPC	1,800	2.76
	Human labour	15,050	21.46
	Bullock labour	1,300	1.83
	Marketing cost	4200	5.92
	Machine labour	4,050	5.71
	Interest on working capital @ 7.00 %	8,625	12.17
	Irrigation cost	3,500	4.94
	Total variable cost (TVC)	**58,575**	**82.68**
II	**Fixed Cost**		
	Depreciation	412	0.58
	land revenue	20	0.03
	Interest on fixed capital @ 9.5%	11,840	16.71
	Total fixed cost (TFC)	**12,272**	**17.32**
III	**Total cost of cultivation**	**70,847**	100.00

Results indicated that the share of variable cost to the total cost was high. This may be the attributed to use of more labour by the respondents. Bala *et al*. (2011) In their study on cost and returns organised for the production of major off-season vegetables in kullu, concluded that vegetables were labour-intensive crops with a high cost of labour.

The other major components of variable cost are the marketing cost, pesticides and fertilizers. It was due to the long distance between the point of production and the point of sale, the high commission fee, and the fact that different markets have different Bangalore rose onion packaging specifications.

Cost of the farm yard manure (FYM) was another component of variable cost which was 16.58 per cent to the total cost. The farmers in the study area apply well processed pathogen specific free FYM before sowing the crop. Due to lack of availability this FYM which incur high cost for transportation and labour charges for broadcasting the FYM to soil equally to all parts of the land used for cultivation.

The interest on working capital @ 7.00 per cent cost accounts about 12.17 per cent to the total cost. The working capital is the money available to meet current and short-term obligations. Bangalore rose onion cultivation requires high investments since it is exported crop. This working capital will be added to the total cost at 7 per cent interest rate.

The other variable costs are seedlings cost, fertilizer cost, marketing cost, plant protection cost (PPC) are high due to lack availability of quality inputs in local areas and machine labour cost, irrigation cost and bullock labour cost is due to lack of availability of human labour. Seedlings cost varies from season to season, marketing cost varies depends on the requirement of buyer which may be in type of grade of onion, type of package and storage and also depends on moisture level. Machine labour also depends on the availability and number of ploughing required. Fertilizer cost also varies sometimes depends on the diseases and stunt growth of plants, majorly in Bangalore rose onion cultivation top dressing is enough at regular interval to manage. Sprinkler irrigation is suggested and used most commonly in Bangalore rose onion cultivation to use water

effectively. Bullock labour is required only if we follow traditional method of sowing and most of the time we follow this method for better seed placement in furrows.

Bangalore red rose onion is crop which is less susceptible to pests and diseases. The major pests which may attack and causes less damages are root grubs, thrips and head borers, the major diseases are damping off, purple blotch and leaf blight. To control these pests and diseases farmers use less dose of pesticides and increase the number of sprays and the farmers will keep changing the chemicals for plant protection, for this reason only these pests are resistant against the pesticides they applied. The physiological disorders like bulb splitting, premature bulb bolting and watery scales due to unskilled chemical sprays and improper management. These damages can be reduced by good agricultural practices and management.

The average fixed cost per acre was Rs. 12,272/- which accounted for (17.32%) of total cost of cultivation. The major items of fixed costs incurred by the farmers were, depreciation charges of pump set and other implements accounted for Rs. 412/- (0.58 %) and land revenue Rs. 20/- per acre (0.03 %) [which is stated by farmers where they are paying to Gram panchayat in respected villages but according to The Karnataka Agricultural Income-Tax Act, 1957, no tax as land rental value if farmers have up to 15 acres agricultural land], managerial cost was taken at 9.50 per cent of the working capital i.e., Rs. 11,840.9/- per acre (16.71%) as the interest charged by the banks in the study area. No respondents were reported that land using for rent in the study area.

4.2.1 Yield and Returns

The average yield, gross and net returns per acre of Bangalore red rose onion among the sample farmers are presented in Table 4.6.

The average yield of Bangalore red rose onion was 17 tonnes per acre. Total cost (which include TVC+TFC) of Bangalore rose onion production was Rs. 70,847 per acre. The net returns were Rs. 2,01,153 due to higher yield and better management practices.

The analysis of costs and returns indicated that the net return per rupee of expenditure in Bangalore rose onion production was Rs. 2.83. As the ratio is above unity, the cost of cultivation could be considered as a profitable.

Table 4.6: Average yield and returns from Bangalore red rose onion cultivation

(n=60)

Sl. No.	Particulars	Values
1.	Yield (tons /acre)	17.00
2.	Price (Rs. /ton)	16,000
3.	Gross returns (Rs.)	2,72,000
4.	Total cost (Rs.)	70,847
5.	Net returns (Rs.)	2,01,153
6.	Production cost/quintal (Rs.)	416.74
7.	Benefit cost ratio	2.83

4.2.2: Marketing channels involved in marketing of Bangalore red rose onion

In the study area three marketing channels were identified, sellers and buyers were selected to understand the marketing channels of Bangalore rose onion. The sample respondents marketed rose onions through following channels.

a. **Channel I**: Producer → Village level trader → Commission agent → Exporter → foreign importers → Consumer

b. **Channel II**: Producer → pre-contract trader → Exporter → foreign importer → Consumer

c. **Channel III**: Producer → Trader in APMC → Exporter → foreign importer → consumer

Farmers in the study region choose different channels for marketing of Bangalore rose onion. The channels chosen by the farmers varies from season to season. In Chikkaballapura district three predominant types of marketing channels were identified.

In channel-I, village traders buy rose onions from farmers at the farm gate and sell them to a commission agent, who pays him a commission per kilogram of designated quality produce delivered. The exporter in Chennai determines the quality and form of grade that has a strong demand in importing countries, and the commission agent sorts the produce by grading and packing it before transporting it to the Chennai seaport in the necessary quantity. These commission agents will be paid after the product has been purchased by the exporter. Importers from other countries indent the quantity to a Chennai-based exporter, who then exports the rose onion after receiving his commission. Some of the produce will be sold to wholesalers and retailers in their local market before reaching customers, while the rest will go to the pharmaceutical industry. About 47 farmers (78.40%) sold through this channel as shown in table 4.7 This channel reduces the burden of transportation cost to farmers so majority of the farmers goes through this channel.

In the channel-II, Farmers sell their produce to a pre-contract trader who also works as a commission agent. These pre-contract traders communicate with farmers on a regular basis and assist them by providing inputs such as seeds, fertiliser, and other inputs. This mutual understanding develops after they sign a contract, with the farmer agreeing to sell his or her produce only to this pre-contract dealer at market prices. Pre-contract trader sorts the produce by drying, grading, and packaging it before supplying it to the exporter in the quality and quantity required, and he collects his commission from the exporter after deducting all of his costs, including transportation to the port. The exporter ships the product to countries with a large demand, and the product eventually reaches customers through wholesalers and retailers. As shown in the table 4.7, approximately 9 farmers (15%) in the study area sold via this channel. The majority of farmers are still unaware of this channel, which allows them to avoid village level traders. Since these village level traders are part-time workers and full-time farmers, they place more trust in them than pre-contract traders.

In the channel-III, Farmers sold their produce to a trader at the APMC near to them. If the produce meets the standards of the trader, the farmer earns the price quoted by APMC on that day; otherwise, the trader quotes a lower price than the market price.

Traders in the APMC always exploit the farmer without offering him a fair price because they have a common understanding and always quote a lower price.

Traders sort the produce according to the exporter's specifications and sells the produce to the exporter with a commission for processing and transportation. Foreign importers indent the orders and imports from the exporter and exporters get their full commission once produce reach the destination. Foreign importers distribute the produce to consumers through wholesalers and retailer and also to the pharmaceutical companies. About 4 farmers (6.60%) sold through this channel as shown in the table 4.7

Farmers usually not prefer the channel-III because of higher market costs like transportation, labour charges and farmers reported that most of the time traders in APMC exploited the farmer without fetching him remunerative price. This channel is used only when government changes its exports policies and announces ban on onion due to recession.

Table 4.7: Major marketing channels involved in marketing of Bangalore red rose onion

(n=60)

Sl. No.	Channels	Number of intermediaries involved	No of farmers sold through these channels	Percentage
1.	**I**	Producer → Village level trader → Commission agent → Exporter → Foreign importers → Consumer	47	78.40
2.	**II**	Producer → Contract trader → Exporter → Foreign importer → Consumer	9	15.00
3.	**III**	Producer → Trader in APMC → Exporter → Foreign importer → consumer	4	6.60
Total			60	100.00

Price spread of Bangalore red rose onion (/Quintal)

As noted the price spread was higher in the lengthy channel (involving village level trader, commission agents, traders in APMC, exporters and foreign importers) and lesser in shorter channels when producer marketed to contract trader and then realized shares upwards 16.99 percent of the consumer rupee. The producer's share of consumer's rupee for Bangalore red rose onion in the most common channels is summarized below in the table 4.8

Marketing efficiency

Table presented that the marketing efficiency of Bangalore red rose onion in different marketing channels for the year 2019-2020. Marketing efficiency according to Acharya's method (Modified Measure of Marketing Efficiency) under different marketing channels i.e. channel I, channel II and channel III were 0.16, 0.20, and 0.19 respectively. From the efficiency index, it was clear that channel II was the most efficient among all marketing channels. This was because of the fact in the channel II. Less number of intermediaries were involved and this channel was very efficient than other channels. Moreover, marketing efficiency increased with decreased in number of market intermediaries between producer and consumer. The marketing efficiency according to conventional method under different marketing channels i.e. channel I, channel II and channel III were 2.22, 2.61 and 2.31 respectively. From this efficiency index, it was evident that the channel II was the most efficient among all marketing channels. The marketing efficiency according to Shepherd's method under different marketing channels i.e. channel I, channel II and channel III were 2.59, 3.15 and 2.78 respectively. From the efficiency index, it ws concluded that channel II was the most efficient channel among all other marketing channels of Bangalore red rose onion.

Table 4.8: Price spread of Bangalore red rose onion (/Quintal)

Sl. No.	Particulars	Channel - I		Channel - II		Channel - III	
		Cost	% consumer price	Cost	% consumer price	Cost	% consumer price
1.	Producer sale price	1,600	14.29	1,800	16.99	1,850	16.81
	Market cost	120	1.07	60	0.56	200	1.81
	Producer net price	1,486	13.27	1,540	14.52	1,650	15.00
2.	Village level trader purchase price	1,600	14.28	-----	-----	-----	-----
	Marketing cost	300	2.67	-----	-----	-----	-----
	Market margin	400	3.57	-----	-----	-----	-----
3.	Commission agent purchase price	2,300	20.53	-----	-----	-----	-----
	Marketing cost	600	5.35	-----	-----	-----	-----
	Market margin	800	7.14	-----	-----	-----	-----
4.	Contract trader purchase price	-----	-----	1,800	16.99	-----	-----
	Marketing cost	-----	-----	350	3.31	-----	-----
	Market margin	-----	-----	1,200	13.32	-----	-----
5.	Trader in APMC purchase price	-----	-----	-----	-----	1,850	16.81
	Marketing cost	-----	-----	-----	-----	450	4.10
	Market margin	-----	-----	-----	-----	1,200	10.10
6.	Exporter purchase price	3,700	33.03	3,350	31.60	3,500	31.81
	Marketing cost	1,700	15.18	1,350	12.73	1,700	15.45
	Market margin	1,400	12.50	1,500	14.15	1,400	12.72
7.	Foreign importer purchase price	6,800	60.71	6,200	58.49	6,600	60.00
	Marketing cost	1,600	14.29	1,600	15.10	1,600	14.54
	Market margin	2,800	25.00	2,800	26.41	2,800	25.45
8.	Consumer price	11,200	100.00	10,600	100.00	11,000	100.00
	Producer share in consumer rupee	**1,600**	**14.29**	**1,800**	**16.99**	**1,850**	**16.81**

Table 4.9: Marketing efficiency of Bangalore red rose onion in different marketing channels

Sl. No.	Particulars	Unit	Channel - I	Channel - II	Channel - III
1.	Consumer purchase price (RP)	Quintal	11,200	10,600	11,000
2.	Total marketing costs (MC)	Quintal	4,320	3,360	3,950
3.	Total margins of intermediaries (MM)	Quintal	5,400	5,500	5,400
4.	Price received by farmer	Quintal	1,600	1,800	1,850
5.	Value added by the marketing system (1-4)	Quintal	9,600	8,800	9,150
Index of Marketing Efficiency					
A.	Acharya's method 4÷ (2+3)	Ratio	0.16	0.20	0.19
B.	Conventional method (5÷2)	Ratio	2.22	2.61	2.31
C.	Shepherds method	Ratio	2.59	3.15	2.78

Source: Derived from primary and secondary data

4.3 Trend analysis of Bangalore red rose onion in Chikkaballapura district

This study attempts to analysis the performance of the Bangalore rose onion with respect to area, productivity and marketed value in Chikkaballapura district of Karnataka.

4.3.1 Area trend of Bangalore red rose onion

Bangalore red rose onion area cultivation in Chikkaballapura district, we can observe how it is increased and decreased in the depicted table and figure.

The compound annual growth rate of Bangalore red rose onion area of cultivation is -0.90 per cent per annum and found to be statistically non-significant, because area of cultivation and production increased or decreased suddenly when the prices increase and decreases when demand of produce reduces vice-versa.

According to the data in the table 4.8, the cultivated area increased from 2013 to 2016 compared to previous years because people were more aware of the global demand due to the GI tag announced in 2015. Government export policies and export bans are primarily to blame for the increase and decrease in cultivation area. When common onion prices rise in the domestic market, the government imposes a ban on Bangalore rose onions, which are high-value onions with no domestic market due to their pungency and cost.

Table 4.10: Area trend of Bangalore red rose onion in Chikkaballapura District

Year	Area (in Hectares)	CAGR (percentage)
2009	1177	-0.90
2010	1227	
2011	1201	
2012	1204	
2013	1349	
2014	1367	
2015	1313	
2016	1312	
2017	1261	
2018	1390	
2019	1072	
2020	1250	

Source: District Statistical Office, 2019-20

4.3.2 Production trend of Bangalore red rose onion

Compound annual growth rate (CAGR) of Bangalore red rose onion production is -0.89 per cent per annum, which is significantly negative as shown in the table 4.9.

According to the data in the table, production increased from 2009 to 2014, from 23,557 to 27,418 metric tonnes, respectively. However, after 2014, production decreased and increased due to market price fluctuations and government export policies. We can see that in the year 2020, the rise was immediate because the government allowed the exports that had been imposed in the previous year due to inflation of onion. The table depicts the impact on production in 2019, which was the lowest production in the previous ten years.

Table 4.11: Production trend of Bangalore red rose onion

Year	Production (M. tons)	CAGR (percentage)
2009	**23557**	**-0.89**
2010	**24518**	
2011	**24281**	
2012	**24340**	
2013	**25348**	
2014	**27418**	
2015	**23521**	
2016	**23580**	
2017	**27093**	
2018	**28811**	
2019	**22871**	
2020	**28359**	

Source: District Statistical Office, 2019-20

4.3.3 Productivity trend of Bangalore red rose onion

Compound annual growth rate (CAGR) of Bangalore red rose onion productivity is -0.90 per cent per annum, which is significantly negative as shown in the table 4.9.

According to the data in the table, productivity per acre was increased from 2009 to 2012, from 20.01 tonnes to 20.22 tonnes, respectively. However, after 2013,

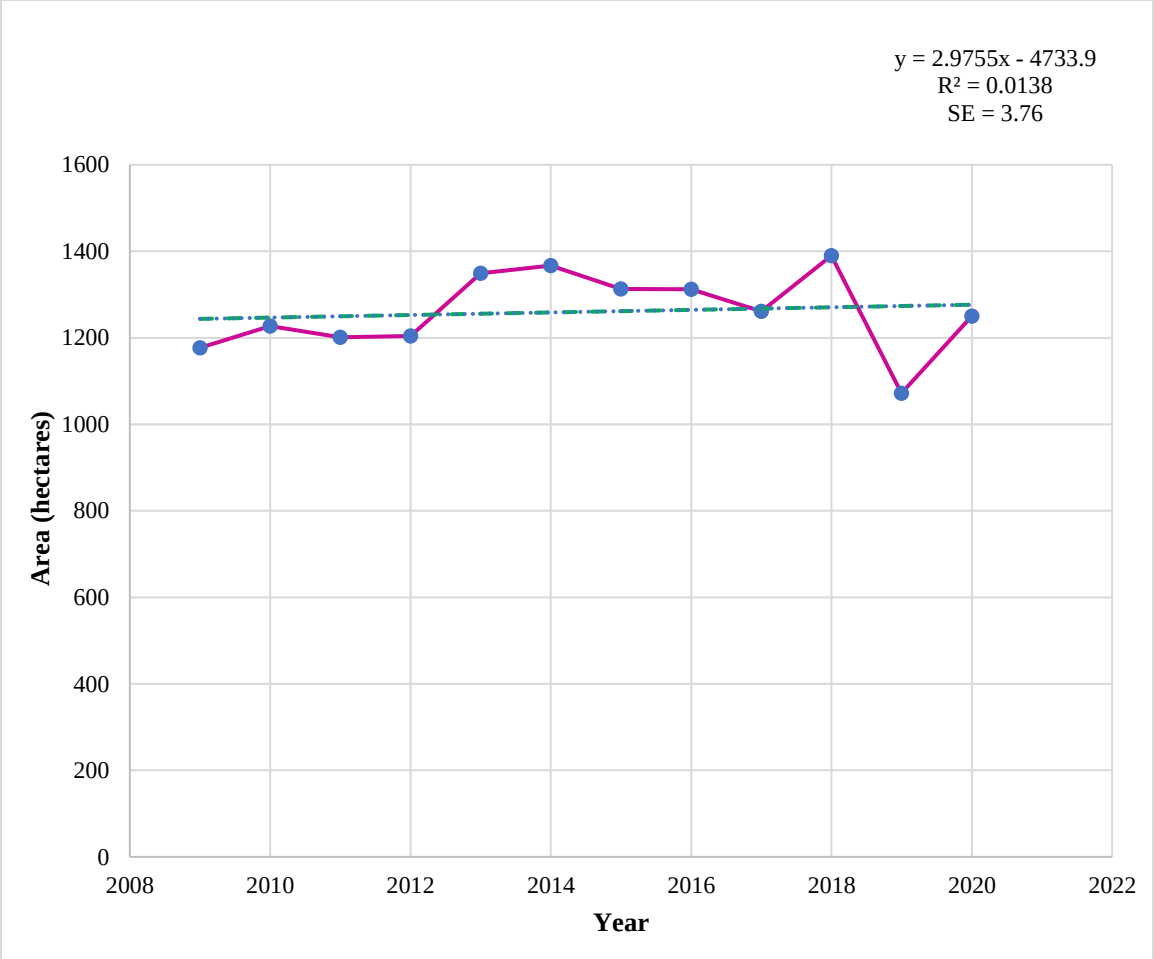

Fig. 3: Area trend of Bangalore red rose onion in Chikkaballapura district of Karnataka (in percentage)

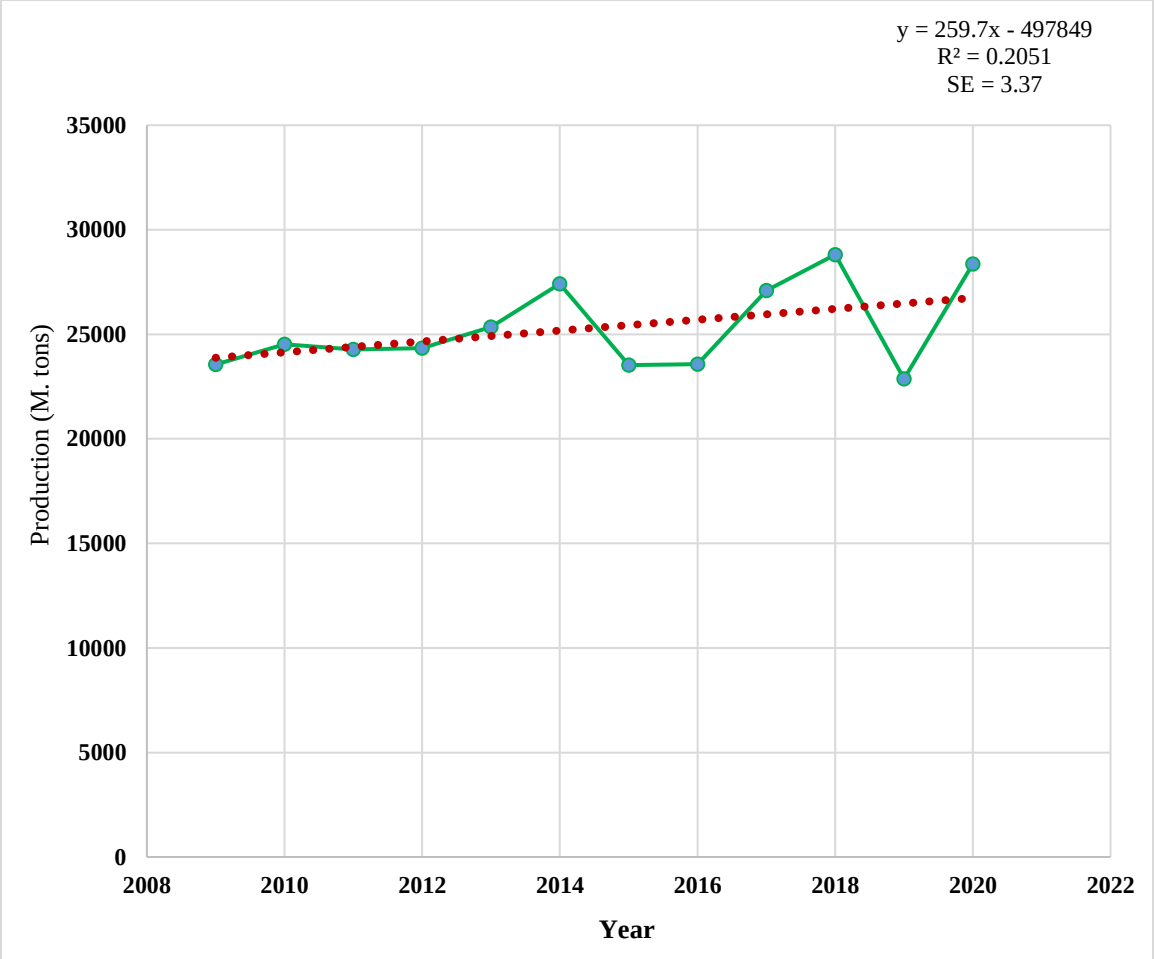

Fig. 4: Trend in production of Bangalore red rose onion in Chikkaballapura district of Karnataka (in M. tons)

productivity decreased and increased due to poor management practices and lack of awareness about good agricultural practices. During 2020, productivity increased because the farmers practiced good agricultural practices, they were aware about the government allowing the exports that had been imposed in the previous year due to inflation of onion which demand high value. The table depicts the good agricultural practices impact on productivity per acre in 2020, which was the highest productivity in the previous ten years.

Table 4.12: Productivity trend of Bangalore red rose onion

Year	Productivity (yield in tons/ acre)	CAGR (percentage)
2009	**20.01**	**-0.90**
2010	**19.98**	
2011	**20.22**	
2012	**20.22**	
2013	**18.79**	
2014	**20.06**	
2015	**17.91**	
2016	**17.97**	
2017	**21.49**	
2018	**20.73**	
2019	**21.33**	
2020	**22.69**	

Source: District Statistical Office, 2019-20

4.3.4 Value trend of Bangalore red rose onion

Value is amount which is marketed in Chikkaballapura district. Bangalore red rose onions are very high value onions, farmers gets their investment with very good profits in Bangalore red rose onion cultivation.

As shown in the table, we observe that CAGR is -0.81 per cent per annum which is significantly negative due to fluctuations in market price. In the year 2020 there is a sudden rise in marketed value about Rs. 4035.35 lakhs which is highest recorded value over the previous years.

In the previous year 2019 there was a scarcity of onion and Indian Government imposed ban on onion exports and the countries which are regular importers of Bangalore rose onions were under inflation in their national markets. These countries demand only these Bangalore rose onions, so when Government allows exports the market price was at the peak and reported that value is almost doubled in the 2020 compare to previous years.

Table 4.13: Marketed value trend of Bangalore red rose onion

Year	Value (in Rs. Lakhs)	CAGR (in percentage)
2009	**1884.56**	**-0.81**
2010	**1519.55**	
2011	**1343.09**	
2012	**1367.09**	
2013	**1923.68**	
2014	**2028.57**	
2015	**1977.78**	
2016	**2067.69**	
2017	**2715.24**	
2018	**2764.79**	
2019	**2219.43**	
2020	**4035.50**	

Source: District Statistical Office, 2019-20

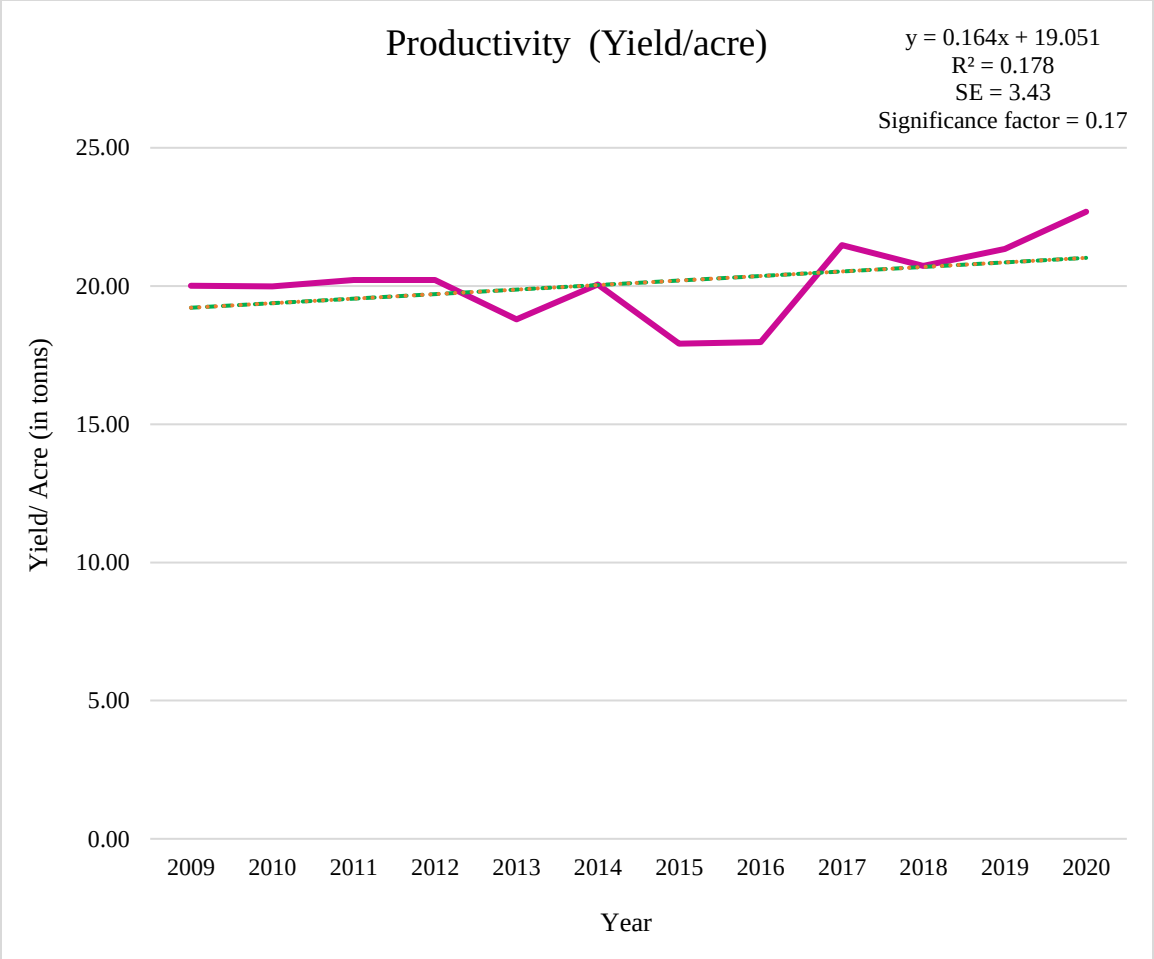

Fig. 5: Trend in productivity of Bangalore red rose onion in Chikkaballapura district of Karnataka (in tonnes/ acre)

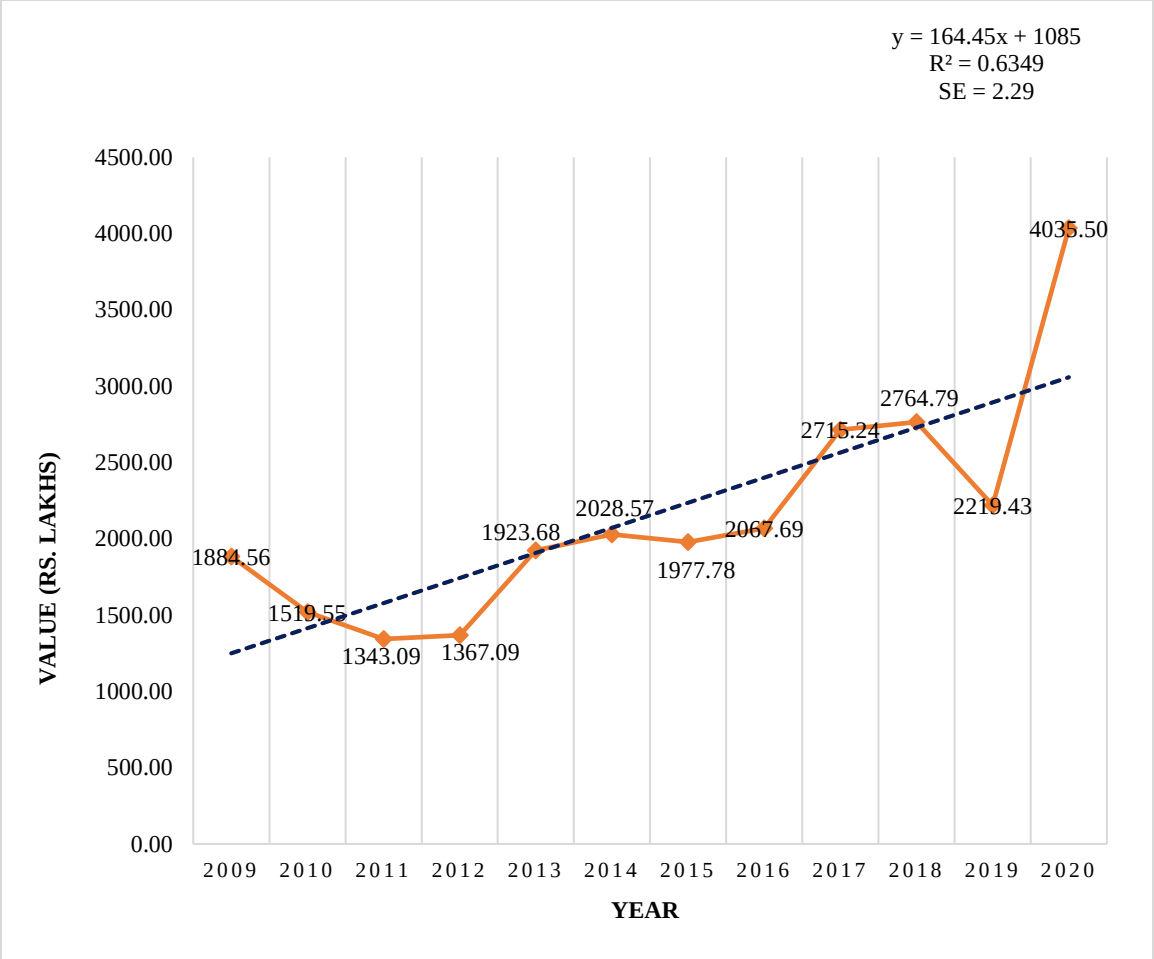

Fig. 6: Trend in marketed value of Bangalore red rose onion in Chikkaballapura district of Karnataka (in Rs. Lakhs)

4.4 Constraints in production and marketing of Bangalore red rose onion.

A study was conducted among the Bangalore red rose onion cultivation farmers to identify the constraints in the production and marketing of rose onion and the results have been displayed.

4.4.1 Constraints in Bangalore red rose onion production

The production constraints faced by farmers is presented in the table 4.11, It revealed scarcity of labour was the major problem with the mean score of 74.12 and followed by limited technical knowledge , information regarding crop cultivation with mean score of 59.40, scarcity of FYM (51.88), untimely availability of seedlings (46.82), expensive inputs (43.60), inadequate training facility to the farmer on crop management (32.38), damage due to disease and pests (24.35), uneven distribution of rainfall (6.80) respectively.

Scarcity of labour at required time was the major constraint faced by the sample respondent farmers, as cost of the labour also more and it affects the quality of the crop if not harvest at right time. Limited technical knowledge, information regarding crop cultivation and management practices like application of type fertilizers to get quality and pungent onion and chemicals to spray.

Scarcity of well processed FYM ranks third, that is free from fungal growth, insects like root grubs and from non-degradable waste like plastic. Untimely availability of seedlings is another problem where farmer is un aware of good quality seed materials and it ranks fourth. Expensive inputs with the fifth rank because of inputs and recommended plant protection chemicals availability and costs more.

Inadequate training facility to the farmer on crop management ranks sixth because farmers are unaware about good agricultural practices (GAP) to trade themselves to the exporters with grading and packaging. Damage due to disease and pests ranks seventh, these are manageable but still affects the crop. and uneven distribution stands eight rank since Chikkaballapura district drought area farmers quoted at last and farmers are depending on borewells.

Table 4.14: Constraints in production of Bangalore red rose onion in Chikkaballapura district

(n=60)

Sl. No.	Constraints in production	Mean Garret's score	Rank
1.	Scarcity of labour	74.12	I
2.	Limited technical knowledge, information regarding crop cultivation	59.40	II
3.	Scarcity of FYM	51.88	III
4.	Untimely availability of seedlings	46.82	IV
5.	Expensive inputs	43.60	V
6.	Inadequate training facility to the farmer on crop management	32.38	VI
7.	Damage due to diseases and pests	24.35	VII
8.	Uneven distribution of rainfall	6.80	VIII

4.4.2 Constraints in Bangalore red rose onion marketing

The constraints faced by the farmers in marketing of Bangalore red rose onion and the results are depicted in the table 4.12.

As opined by the most of the respondents, frequent price fluctuations due to seasonal glut was the major problem with mean score of 77.00 followed by lack of awareness about market information and intelligence (63.88), inadequate/ poor harvesting practices (53.32), inadequate transportation and storage facilities (51.98), sudden ban exports (49.83), long distance to market (45.28), less consumption in domestic market (32.18), delay in payment (28.52) respectively.

Frequent price fluctuation due to seasonal glut are the major problem expressed by the sample respondents was ranked first among the marketing constraints. At the time of ban on exports market prices usually decreases because these rose onions have no domestic consumption and market and it causes lower income to farmers. Lack of

awareness about market information and intelligence is another problem which stands seconds rank, where respondents are unaware about the market daily market prices and main farmers are not at all aware about demand in international market for these rose onions because of lack of market intelligence which plays most important role in crop production in advance.

Inadequate / poor harvesting practices ranks third, because while harvesting the onions labours are not trained about how to lift from the soil and cut the fine bulbs which very important to get good price and mainly more physical damages occur while handling. Inadequate transportation and storage facilities stands fourth, because farmers don't want to transport and their produce from to market they expect it from trader and respondents reported that they don't have bulk storage facilities near to them. Sudden ban on export is also main reason which causes price fall due to Government export policies.

Long distance to market is also one of the main reasons as they want to sell the produce at farm gate itself. Less consumption in domestic market due to its pungency level which stands seventh and finally delay in payment stands eighth rank, the village level traders made half of the amount while purchasing and remaining payment will be after they receive commission from commission agent. In a study conducted by Mohan and Reddy (2017) in the Kadapa district of Andhra Pradesh, the majority of farmers reported that low prices and distance to market were the most significant constraints in papaya production and marketing.

Table 4.15: Constraints in marketing of Bangalore red rose onion in Chikkaballapura district

(n=60)

Sl. No.	Constraints in marketing	Mean Garrett's score	Rank
1.	Frequent price fluctuations	77.00	I
2.	Limited awareness about market information and intelligence	63.88	II
3.	Inadequate/ poor harvesting practices	53.32	III
4.	Inadequate transportation and storage facilities	51.98	IV
5.	Sudden ban on exports	49.83	V
6.	Long distance to market	45.28	VI
7.	Less consumption in domestic market	32.18	VII
8.	Delay in payment	28.52	VIII

V SUMMARY

Indian agriculture is undergoing gradual change, particularly in the cropping system, land use system, input utilisation, marketing, and, most importantly, monetary returns. On one hand, due to urbanisation, the amount of land accessible for agriculture is shrinking, while need for increased in productivity and returns from cultivable land is fast increasing. All of these variables have combined to create excellent conditions for substantial diversification trends, with horticultural crops such as fruits, vegetables, spices, plantation crops, and ornamental crops dominating.

India has a vast range of soil types and agro-climatic conditions, allowing it to cultivate both horticultural and non-horticultural crops. Among the main important fruits grown in India are mango, banana, papaya, orange, mosumbi, guava, grape, apple, pineapple, sapota, ber, pomegranate, strawberry, litchi, and vegetables such as onion, potato, tomato, okra, chilli, brinjal, green peas, cabbage, cauliflower, carrot, radish, turnip, pumpkin, squash, gourd, cucumber, and French beans. Fruit and vegetable demand has gradually increased over time.

Vegetables are the sources of vitamins and minerals, proteins, dietary fibres, micronutrients, antioxidants, and phytonutrients, all of which are important in our daily diet. The country's vegetable production has risen substantially throughout the years, especially after the green revolution. The thorough study of improved vegetable varieties/hybrids, combined with farmer acceptance and government developmental programmes resulted in the tremendous increase in vegetable acreage, production, and productivity. Increased per capita income, health consciousness, urbanisation, farmers switching to high-value vegetables due to increased income, a favourable income elasticity of demand, and an annual growth rate for domestic demand are all factors in ensuring vegetable growth in the country.

After China, India is the world's second largest producer of onions, followed by Egypt, the United States, Iran, Turkey, Russia, Pakistan, Bangladesh, Brazil, Mexico, and Sudan. Maharashtra is the leading onion producer in India, followed by Karnataka,

Madhya Pradesh, Bihar, Gujarat, Rajasthan, Haryana, Andhra Pradesh, Telangana, and Uttar Pradesh.

In Karnataka Chikkaballapura district is well-known for its fruits and vegetables production. Most common crops in the area were the Tomatoes and potatoes, followed by beetroot, rose onion, and beans. Farmers in the district are forward-thinking, imaginative, and quick to introduce new kinds, hybrids, and technology because the soil is good for producing a variety of vegetables, and the soil is great for growing a variety of vegetables.

5.1 Specific objectives of the study

1. To estimate cost and returns of Bangalore red rose Onion
2. To analyse the trend in area, production, productivity and marketed value of Bangalore red rose onion in Chikkaballapura district
3. To document the constraints in Production and Marketing of Bangalore red rose Onion

5.2 Methodology

The study incorporated data from both primary and secondary sources. Six taluks in the Chikkaballapura district of Karnataka were chosen for research based on high value crop and area under production, and the important primary data was acquired from 60 Bangalore red rose onion farming farmers. In addition, constraints regarding production and marketing, these farmers samples were also taken. and marketed intermediaries. For gathering data on trend aspects contacted district horticulture department. The primary data of the year 2019-20 was gathered from the respondents who had been chosen and market intermediaries through a personal interview using a pre-tested structured schedule intended for the study purpose.

Secondary data such as general information about the Chikkaballapura district, land use patterns, rainfall, and area under Bangalore red rose onion were collected from

the district official website and by visiting Karnataka state Dept. of Horticulture, Chikkaballapura district at a glance 2018.

5.3 Major findings of the study

1. The average age of Bangalore red rose onion growers in area of the study was 36 to 50 years old (60.00%), with majority of the farmers families consisting of less than four individuals (48.33%) and agriculture as their primary occupation. It was also compiled from the responses of a small group of onion growers (65.00 %) were literates, with educational levels spanning from primary to post-secondary.
2. Farmers in the research field had an average land holding of 2.6 acres per farmer (0.9 acre rainfed and 1.9 acre irrigated)
3. The most expensive variable cost is human labour, accounting for Rs. 15,050 per acre (21.46%), followed by second most expensive variable cost is farm yard manure (FYM).
4. The Bangalore red rose onion's cost per acre in overall fixed cost was Rs. 12,272 with the interest on fixed capital at 9.5 percent accounting for Rs. 11,840. (16.71%).
5. The sample respondents in the study area produced an average of 17 tonnes per acre, with gross returns of Rs. 2,72,000 per acre, and net returns of Rs. 2,01,153 per acre.
6. The B:C ratio of 2.83 means that, for every rupee invested by farmer, he will receive 2.83 rupees in return, which is profitable.
7. In the study area, there were three marketing channels for marketing of Bangalore rose onion.

Channel-I: Producer → Village level trader → Wholesaler → Exporter → foreign importers → Consumer

Channel-II: Producer → Pre-contract trader → Exporter → foreign importer → Consumer

Channel-III: Producer → Trader in APMC → Exporter → foreign importer → consumer

8. The majority of producers (78.40 %) sold their produce through channel-I, with the majority of the rest (15.00 %) selling through channel-II and with the channel-III (6.60%).
9. The trend in rose onion is significantly negative in terms of CAGR in percent in area (-0.90), production (-0.89), productivity (-0.90), and value (-0.81).
10. Scarcity of labour, inadequate technical knowledge and information on crop cultivation, scarcity of FYM, untimely availability of seedlings, and expensive inputs were all major production restrictions for Bangalore red rose onion production.
11. Major marketing constraints included frequent price fluctuations, a lack of awareness about market information and intelligence, inadequate/poor harvesting practices, a lack of market intelligence, as well as insufficient transportation and storage facilities. Exports are abruptly prohibited by the government, and the distance to the market is quite long.

5.4 Suggestions from the study

1. It was revealed that Bangalore red rose onion cultivation is profitable, as evidenced by its cultivation. Farmers in Bangalore should receive training on good agricultural practises in rose onion cultivation to address the issues of labour scarcity, limited technical knowledge and information about crop cultivation, and the scarcity of FYM.
2. According to the study, Bangalore red rose onion farmers can invest in farm mechanisation to reduce labour intensity and costs while increasing output. As a result, their operating costs would be reduced, resulting in a higher return on investment.
3. An adequate training programme is required to build capacity in the areas of grading, packing, post-harvest steps, and market intelligence.
4. Farmers are being exploited by village level merchants in order to gain more profits. The onion producers who sells their produce in a regulated market via a co-operative marketing society can avoid this.

5. Bangalore red rose onion is a high-value crop with no domestic market; therefore, the government should think about it and look into and allow to export this type of onion in comparison to other types of onions.

6. As a result of the outcomes of the study, value of the red rose onion is increasing, regardless of the fact that the CAGR is lower than the area, production, and productivity. It demonstrates that the cultivation of Bangalore red rose onions is profitable.

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