SUPPLY CHAIN ANALYSIS FOR FRUITS AND VEGETABLES IN KHEROJ TALUKA OF SABARKANTHA DISTRICT

A PROJECT REPORT SUBMITTED

BY

PATEL NILKUMAR KALPESHBHAI

B.Sc. (HONS.) AGRICULTURE

(REGISTRATION NO. 2040619021)

IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE OF

MASTER OF BUSINESS ADMINISTRATION

(AGRI-BUSINESS MANAGEMENT)

UNDER THE GUIDANCE OF

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ANAND AGRICULTURAL UNIVERSITY

ANAND-388110

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ABSTRACT

India produces 191.7 million tons of vegetables (NHB report, 2019) and the total area under vegetable cultivation is around 10.3 million ha. Potato, tomato, onion, cabbage, and brinjal account for around 60% of the total vegetable production in terms of quantity. India's annual fruit production is 99 million tons (NHB report, 2019) and the total area under fruit cultivation is around 6.64 million ha. The major Indian fruits are mango, banana, citrus fruits, apple, guava, papaya, pineapple, and grapes.

Fresh fruits and vegetables play a vital role in the Indian context and their marketing works as an influencing force in the economy. Though retailing of fresh fruit and vegetables is a low-margin business, the market potential is very large in a country like India. This factor has attracted many corporates into this sector.

The SCM plays a crucial role in marketing fruits and vegetables. Supply Chain efficiency not only helps in increased production and per capita consumption but also contributes to the economic development of the country. As a result, SCM throws both challenges and opportunities in the marketing of fruits and vegetables. Efficient SCM in marketing, not only increases the profitability and efficiency of retailers but also adds value to different stakeholders like cultivators (farmers), consolidators and consumers.

The study titled "Supply Chain Analysis for Fruits and vegetables In Kheroj Taluka of Sabarkantha District" was conducted to know what is the overall condition of a farmer of Kheroj Taluka including demographic factors like age of farmers, education, years of experience, Annual income, source of income, and to identify existing supply chain, to know the Cropping pattern and Find out the Agronomic

challenges in Cultivating Fruits and Vegetables And Constraints faced by the farmers in Existing Supply Chain. Some of the important findings are mentioned below:

It can be concluded that the majority of the farmers in Fruits and Vegetable production were relative of younger age and the majority of the farmers in Fruits and Vegetable production were relative below the SSC Education level. In the land holding of the farmer the majority of the respondents belong to the small and medium category who jointly constitute about 84% of the total respondents. The majority of the farmer had above 10 years of farming experience. Majority of the respondents belong to the Annual income below the 2,00,000 who jointly constitute about 90% of the total respondents. The study concluded that most of the farmers (95) are cultivating Vegetables.72% farmers aware of the Primary Process Methods Like Grading Sorting, And Packaging. In Kheroj Taluka the existing supply chain consists in out of 100 farmers 35% of farmers sell the fruits and vegetables to SAFE FPC, 25% of farmers sell to Traders, 20% of farmers sell to local seller due to high price, 13% farmers sell to Regulated commission Agent, only 5% farmers sell to APMC due far-off location of APMC, and 2% farmers sold to pre-harvest contracts in case of potato growers. In Kheroj taluka the farmers have a good collaboration with SAFE Farmer producer Company.

The major Constraints faced by the farmer in the existing supply chain of Fruits and Vegetables are Far off location of selling unit, Transportation facility Inadequate/ Costly, Delay in payment and sale proceeds. It was found that major agronomic challenges in the cultivation of fruits and vegetables are the Lower price of vegetable, High price of inputs, Disease attack, Insect attack. In the Cropping Pattern of fruits and Vegetables in Kheroj the vegetable crops are growing more than the fruits. Most of the farmers are cultivating Tomato/Brinjal/Bottle gourd/Ridge gourd during Kharif Season. In Rabi season Farmers Cultivating crops like Potato/Onion/Tomato/Strawberry. And in the summer season the farmers cultivating crops like Okra/Tomato/Watermelon/Muskmelon/Papaya. The Production of vegetable Crops like Tomato, Potato, and Brinjal is very high in Kheroj.

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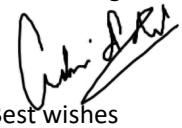
TO WHOM IT MAY CONCERN

This is to certify that Mr. Patel Nilkumar Kalpeshbhai (Registration No. 2040619021) pursuing MBA-ABM from International Agri-Business Management Institute, AAU, Anand, Gujarat has successfully completed a project internship with Impagro® Farming Solutions with a project entitled "Supply Chain Analysis For Fruits And Vegetables In Kheroj Taluka of Sabarkantha District" of 120 days from 18th January to 18th May, 2020 under the guidance and supervision of me and my colleagues. The assistance, guidance and help received during the course of investigation have been fully acknowledged.



Best wishes

Suhrid Patel

Co-founder

Impagro® Farming Solutions Private Limited

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CERTIFICATE BY GUIDE

This is to certify that the contents of this report entitled "**Supply Chain Analysis for Fruits and Vegetables in Kheroj Taluka of Sabarkantha District**" by Nilkumar K. Patel submitted to International Agri-Business Management Institute, AAU, Anand for the Award of Master of Business Administration (MBA-IABSem-4) is original research work carried out by him is under my supervision.

This report has not been submitted either partly or fully to any other university or institute for the award of any degree or diploma.

Place: Anand
Date:

Dr. Dilip Rasiklal Vahoniya
Assistant Professor & Head,
Department of Agri Entrepreneurship and Project Management,
IABMI, AAU, ANAND

DECLARATION

I hereby declare that the work incorporated in this report entitled **"Supply Chain Analysis for Fruits and Vegetables in Kheroj Taluka of Sabarkantha District"** in partial fulfillment of the requirements for the award of master of business Administration (MBA-IBM) is the outcome of the original study undertaken by me and it has not been submitted earlier to any other University or Institution for the award of any degree or Diploma.

Place: Anand **PATEL NILKUMAR KALPESHBHAI**

Date : **Reg. No:- 2040619021**

DECLARATION

I hereby declare that the work incorporated in this report entitled **"Supply Chain Analysis for Fruits and Vegetables in Kheroj Taluka of Sabarkantha District"** in partial fulfillment of the requirements for the award of master of business Administration (Agribusiness Management) is the outcome of the original study undertaken by me and it has not been submitted earlier to any other University or Institution for the award of any degree or Diploma.

Place: Anand **PATEL NILKUMAR KALPESHBHAI**

Date : **Reg. No:- 2040619021**

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Sometimes words fall short to show our gratitude to some people the same happened with me during my project work. The gigantic help and support received from IMPAGRO Farming Solutions overwhelmed me during the project work.

Through this acknowledgment, I express my sincere gratitude to all those people who have been associated with this assignment and have helped me with it and made it a worthwhile experience.

Firstly, I extend my thanks to the various people who have shared their opinions and experiences through which I received the required information crucial for my report. I would like to express my deep gratitude to Supply Chain Manager, Jaimin Vyas IMPAGRO Farming Solutions, for his scholastic guidance, constructive criticism, constant encouragement, and pertinent suggestions in the planning and execution of this project.

I have enormous pleasure in expressing my deepest sense of gratitude and humble indebtedness towards my college guide Dr. Dilip Rasiklal Vahoniya Assistant Professor & Head, International Agri-business Management Institute, AAU, Anand for his inspiration, expert guidance, painstaking effort, and keen abiding interest during the entire research work.

I am grateful to my parents for their constant motivation, support for my project to complete.

I am obliged to thank my Friends Mr. Harshil Valiya without their great support it would not be possible to complete this project successfully within the stipulated time.

Place: Anand **Patel Nilkumar K.**

Date: Reg. No: 2040618021

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1. INTRODUCTION

The Fruits and Vegetables (F&V) sector has been a driving force in stimulating a healthy growth trend in Indian agriculture. Given the rising share of high-value commodities in the total value of agricultural output and their growth potential, this segment is likely to drive agricultural growth in the years to come (ASSOCHAM, 2013). It plays a unique role in India's economy by improving the income of the rural people. Cultivation of these crops is labor-intensive and as such, they generate a lot of employment opportunities for the rural population. Thus, the cultivation of these crops plays a vital role in the prosperity of a nation and is directly linked with the health and happiness of the people.

F&V sector is perhaps the most profitable venture of all farming activities as it provides ample employment opportunities and scope to raise the income of the farming community. India is known as the fruit and vegetable basket of the world. It has the potential to be the world's largest food producer which is bestowed with one of the best natural resources in the world and several factors like Increasing urbanization, nuclear families, working women, disposable income, and changing lifestyles are gearing up the Indian food supply chains for a better future. Organized retail and Private label penetration, demand for functional food, and increased spend on health food are major drivers for the growth of this sector. As the population is increasing, the demand for such food is also increasing. To meet such demand and provide food in proper quality and nutrition, the Supply chain plays a very vital role in this sector and becomes even more important because of perishability and very short shelf life. In India F&V together constitute about 92 % of the total horticultural production in India.

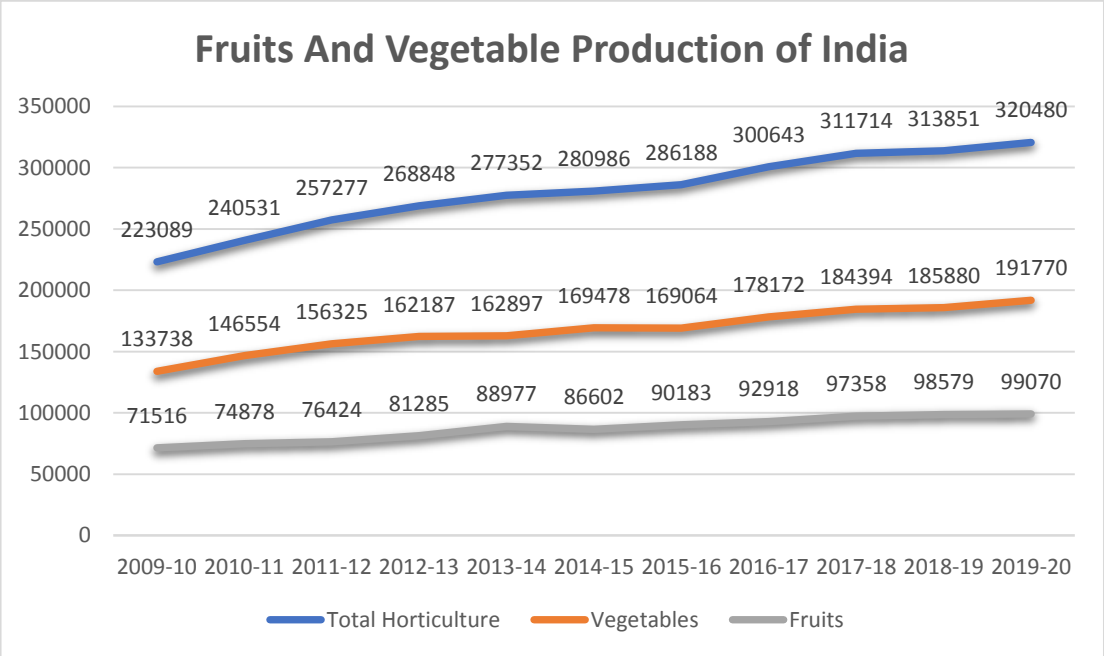
1.1 TRENDS IN FRUITS AND VEGETABLES PRODUCTION & PRESENT STATUS OF INDIA

During 2018-19, India’s contribution in the world production of F&V was 12.6 % and 14 % respectively. It is the second-largest producer of overall fruits and vegetable production in the world, after China and one of the centers of origin of fruits and vegetables with the total production of 99.70 million tonnes of fruits and 191.77 million tonnes of vegetables till the year-end 2019 (NHB, 2019). India is the largest producer of many F&V with the share in world production till the year-end 2016 as follows: 40.4% of Mango & Guava, 25.7% of Banana, 44.4% of Papaya, 62% of okra

(NHB, 2019). With a growing population and food accounting for a major share of the total private consumption expenditure, the F&V sector has a high potential for growth. India's share in the global market is still nearly only 1% (APEDA, 2014) and the processing levels in F&V sectors at around 2 % only, where it is 65%, 78%, and 23% in case of other countries like the USA, Philippines, and China.

1.1.1 Production

India has witnessed an increase in horticulture production over the last few years. Significant progress has been made in area expansion resulting in higher production. Over the last decade, the area under horticulture grew by 2.6% per annum and annual production increased by 4.8%. During 2019-20, the production of horticulture crops was 320.48 million Tonnes from an area of 25.66 million Hectares. The production of vegetables has increased from 133.7 million Tonnes to 191.77 million Tonnes from 2009-10 to 2019-20 and production



(Source: Horticulture statistics at a glance 2018)

Figure 1.1 Fruits and Vegetable Production of India

of fruits has increased from 71.5 million Tonnes to 99.07 million Tonnes since 2009-10 to 2019-20 as depicted in Figure-1.1.

The total horticulture production was highest in the case of Uttar Pradesh (392.48 Lakh Tonnes) followed byWest Bengal (324.2 Lakh Tonnes) may be seen in the following figure (1.2).

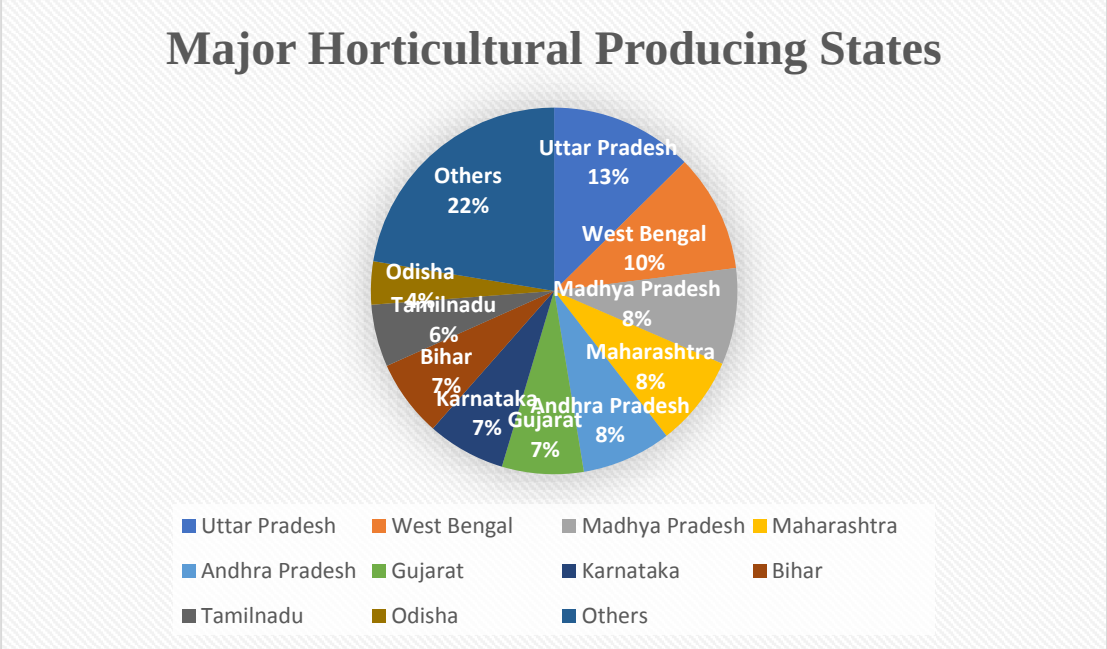


Figure – 1.2 Major Horticulture Producing states

As depicted in the following figure (1.3), the total production of fruits is highest in the case of Andhra Pradesh (152.15 Lakh Tonnes) followed by Maharashtra (117.28 Lakh Tonnes).

Table 1.1 Production Share of Leading Fruit Producing States for 2017-18

Sl. No.	STATES/UTs	Production (in'000 MT)	% Share
1	ANDHRA PRADESH	15215.85	15.63
2	MAHARASHTRA	11728.66	12.05
3	UTTAR PRADESH	10539.77	10.82
4	GUJARAT	8996.02	9.24
5	MADHYA PRADESH	7416.91	7.62
6	KARNATAKA	7133.94	7.40
7	TAMIL NADU	5680.52	5.83
8	BIHAR	5117.12	5.26
9	WEST BENGAL	3850.56	3.96
10	CHHATISGARH	2666.202	2.74
	OTHERS	19011.45	19.53
	All India Total	**97357.51**	**100.00**

(Source: Horticulture statistics at a glance 2018)

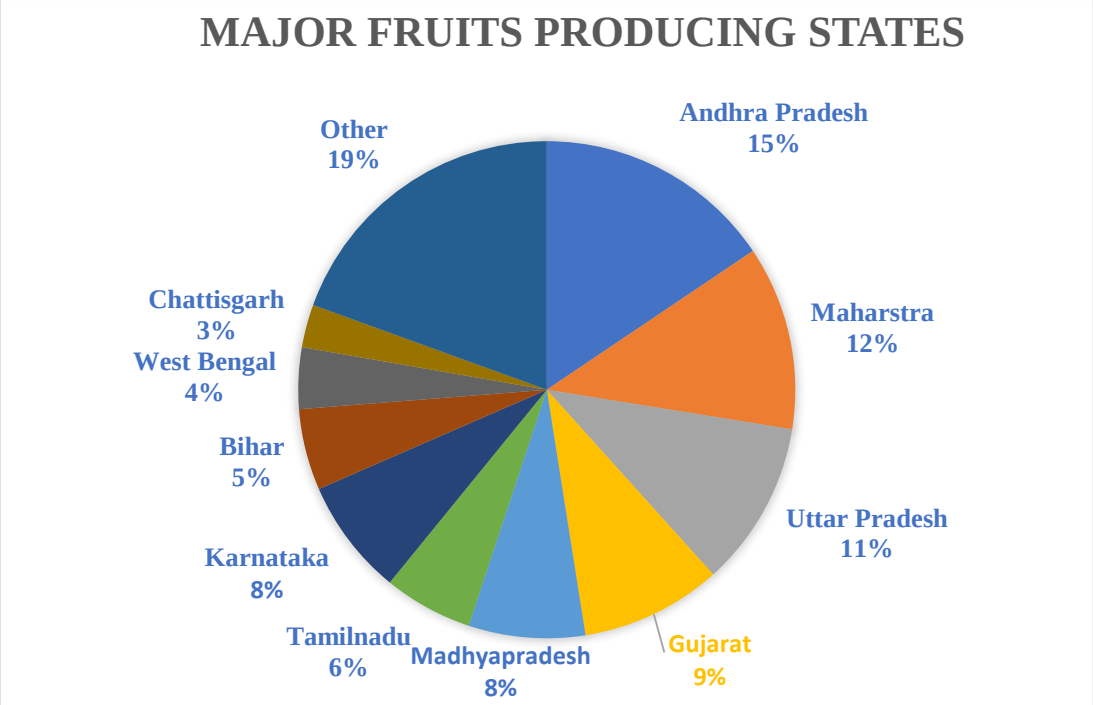
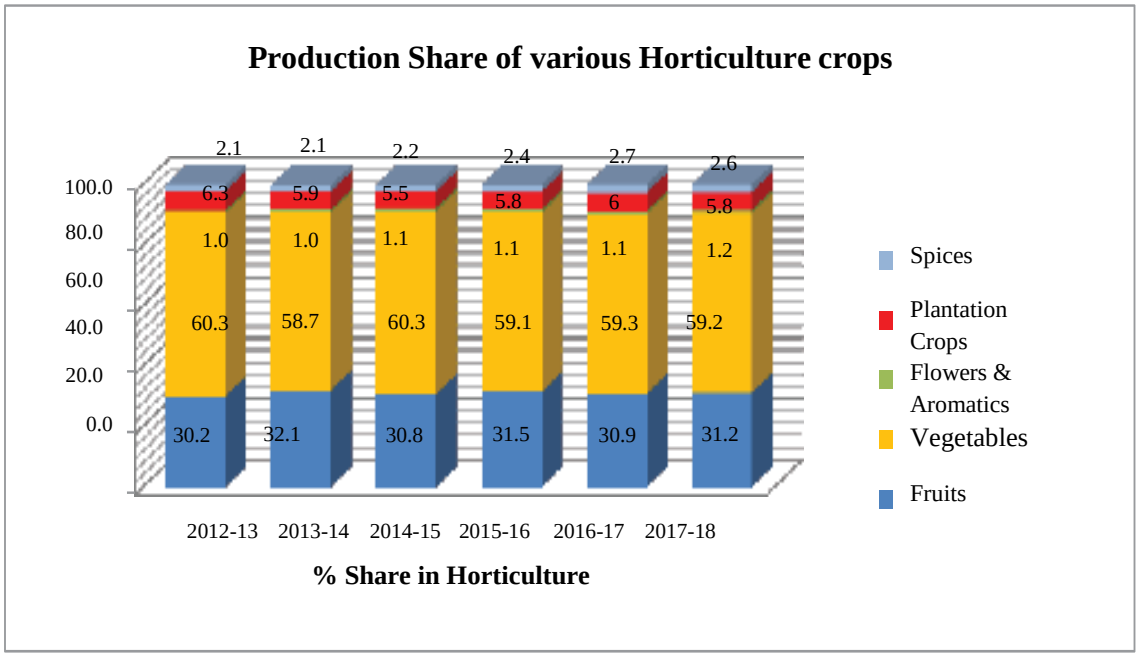


Figure 1.3 Major Fruits producing States

Apart from nutritional benefits, the production of vegetables improves the economy of a country as these are a very good source of income and employment. The contribution of vegetables remains highest (59 – 61%) in horticulture crop productions over the last five years as shown in Figure-1.4



(Source: Horticulture statistics at a glance 2018)

Figure-1.4. Production Share of various Horticulture crops

During 2017-18 the area under vegetables was 10.26 million Hectares with a production of 184.40 million Tonnes in India. For this period the total vegetable production was highest in the case of Uttar Pradesh (283.16 million Tonnes) followed by West Bengal (276.95 million Tonnes). The graphical representation of the production share of leading vegetables producing states in 2017-18 is shown in Figure-1.5.

Table 1.2: Production Share of Leading Vegetable Producing States for2017-18

Sl. No.	STATES/UTs	Production (in'000 MT)	% Share
1	UTTAR PRADESH	28316.45	15.4
2	WEST BENGAL	27695.29	15.03
3	MADHYA PRADESH	17545.48	9.52
4	BIHAR	15863.21	8.61
5	GUJARAT	12254.29	6.65
6	MAHARASHTRA	12306.96	6.63
7	ODISHA	8766.82	4.76
8	KARNATAKA	8394.15	4.55
9	HARYANA	7151.66	3.88
10	CHHATISGARH	7003.25	3.80
	OTHERS	39096.96	21.21
	All India Total	**184394.51**	**100**

(Source: Horticulture statistics at a glance 2018)

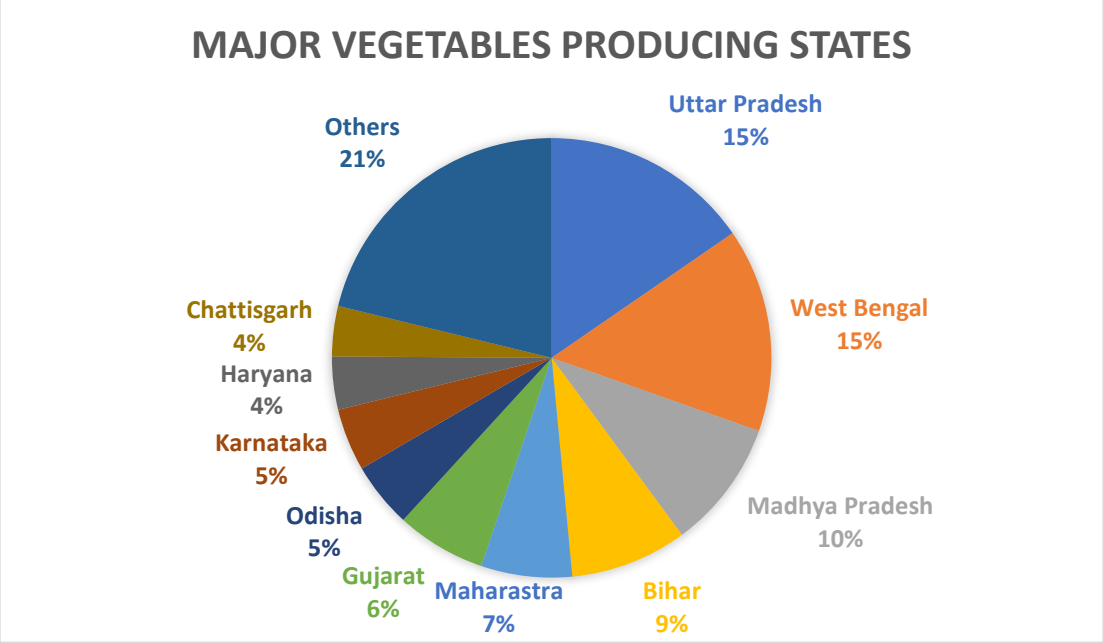


Figure-1.5 Major Vegetables Producing states

A large variety of F&V is grown in India like Banana, Mango, Apple, Papaya, Sapota, Citrus, Pine Apple, Grapes & Guava, etc. in Fruits and Potato, Tomato, Onion,

Brinjal, etc. in Vegetables. India has the potential to be the world's largest food producer which is bestowed with one of the best natural resources in the world and several factors like Increasing urbanization, nuclear families, working women, disposable income, and changing lifestyles are gearing up the Indian food supply chains for a better future. Organized retail and Private label penetration, demand for functional food, and increased spend on health food are major drivers for the growth of this sector.

F&V is also a rich source of vitamins, minerals, proteins, and carbohydrates, etc. which are essential in human nutrition. These are referred to as protective foods and assumed great importance as nutritional security of the people. As the population is increasing, the demand for such food is also increasing. To meet such demand and provide food in proper quality and nutrition, the Supply chain plays a very vital role in this sector and becomes even more important because of its perishability nature and very short shelf life. It not only helps to cut costs but also adds to maintain and improve the quality of products delivered, which are perishable in nature. Owing to the very short shelf life and perishable in nature, these items require proper transportation, handling, and storage facilities in order to reach in a fresh state to a customer. It also manages the relationship between businesses responsible for the efficient production and supply of fresh produce products from farm level to ultimate consumers, to reliably meet the requirements of the customer in terms of quality, quantity, and price. The whole supply chain is suffering from maximum inefficiency and facing various issues which motivated authors to identify the factors affecting the supply chain of the Fruits and Vegetable sector in India.

1.1.2 Infrastructure Availability

In India, because of imperfect coordination between supplies and demand, seasonality, and the perishable nature of horticulture crops, storage plays an important role in marketing. A chain of cold storage is set up in different states of our country. The State of Uttar Pradesh (2368) was having the highest number of cold storages followed by Gujarat (890) and Punjab (672).

1.1.3 Consumption

The nutritional intake from fruits and vegetables is higher among the urban population than that of the rural population. Along with the urbanization, people are likely to increase their calorie intake at a higher pace through fruits and vegetables -the increase in calorie intake is more than 10% in the urban area whereas it is merely 1.89% in a rural area over the period from 2004-05 to 2011-12. It is estimated that per capita

fruit availability in our country is 207.9 gms. per day which is far below the recommended quantity of 230 gms. per capita per day.

1.1.4 World Scenario

It is a matter of satisfaction; we are the second-largest producer of Vegetables and Fruits and our presence in the global market is significant. The different types of fruits are exported to the outside world. Grapes occupies the premier position in exports with 188.2 thousand Tonnes valued Rs. 1,89,994.86 Lakhs. Other fruits which have attained a significant position in exports are Banana and Mango. Fresh vegetable (e.g., Onion, Peas, Potato) exports have been on the rise.

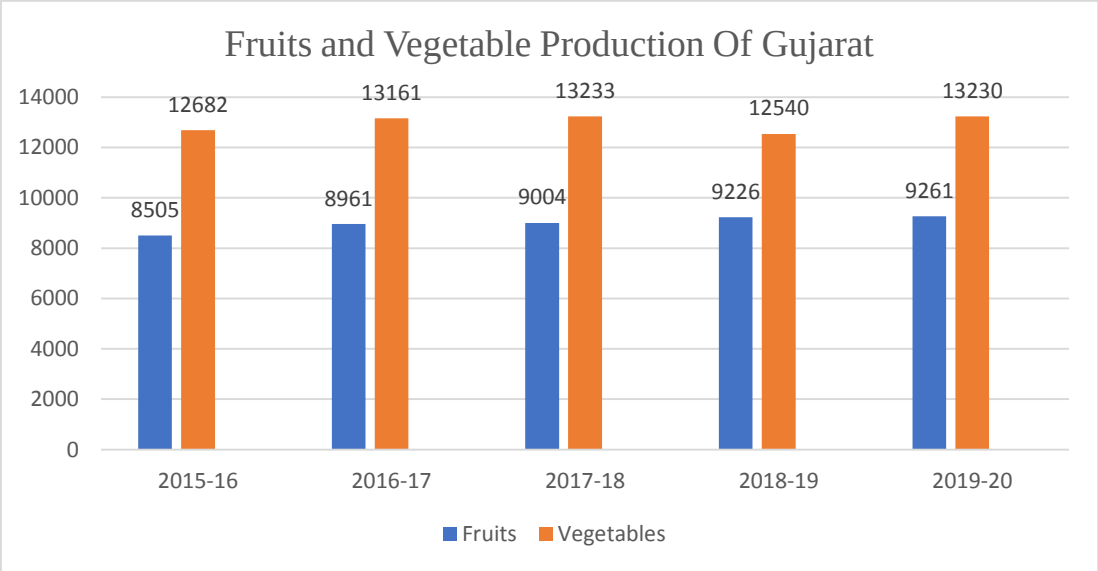
The development achieved in the horticulture sector is indicative of the fact that there is a growing demand for horticulture produce. The past experiences have been rewarding for enhanced output from the investment. Availability of timely robust information in this sector will certainly improve the socio-economic conditions of Indian citizens by providing self-reliance besides environmental protection.

1.2 TRENDS IN FRUITS AND VEGETABLES PRODUCTION & PRESENT STATUS OF GUJARAT

Gujarat has a wide variety of soils, rainfall patterns, temperature regimes, and irrigation availability. This diverse Agro-climatic situation across the state holds promise for the development of the horticulture sector in a big way. Gujarat has a tropical climate, with temperatures ranging from a minimum of 13^0 C to 27^0 C in January and a maximum of 48^0 C in May-June. However, there is a wide annual variation in rainfall, affecting the productivity of the crops. Increased investments in fruit and vegetable processing also portray a promising future of horticulture in the State. Horticulture crops have the inherent advantage of providing higher productivity per unit of land compared to other crops in Gujarat as well, resulting in higher income and higher rural employment generation (Mehta, 2012).

Various F&V like Guava, Lemon, Sapota, Mango, Custard apple, Watermelon, Musk melon, tomato, Potato, Onion, green leafy vegetables, etc. are widely grown in Gujarat. It is also one of the centers of F&V supply for plain areas and large food processing industries with a total production of 92.61 million tonnes of fruits and 132.30 million tonnes of vegetables till the year-end 2018(NHB, 2019). It is also one of the fastest-growing states of India where the economy grew more than 9% during the last decade. It is a land of opportunities; The F&V production scenario of Gujarat has been shown in Figure 1.6.

Gujarat has a strong contribution to the Indian horticulture sector. At the all-India level, the State contributes from 14 percent to 20 percent share in major fruit and vegetable crops like; Papaya, Sapota, Onion, Banana, and Lime. The state also enjoys a leading position (1st rank to 4th rank) at an all-India level in the productivity levels of major fruits and vegetables including onion, potato, banana, guava, tomato, lime, papaya, etc. The state is the world's largest producer of cumin, also has the highest productivity in custard and guava production in India.



(Source: https://doh.gujarat.gov.in)

Figure 1.6: Fruits and Vegetable Production in Gujarat

Table1.3 Estimated Area, Production & Productivity of Horticultural Crops (Gujarat)

Sr. No.	Year	Fruits		Vegetables	
		Area in '000' Ha.	Production in '000' M. T	Area in '000' Ha.	Production in '000' M. T
1	1994-1995	129	2326	121	1726
2	1995-1996	160	2129	170	2089
3	1996-1997	159	1949	230	2153
4	1997-1998	173	2301	143	2214
5	1998-1999	177	2341	189	3253
6	1999-2000	189	2491	216	2730
7	2000-2001	183	2349	206	3067
8	2001-2002	198	2662	237	3299
9	2002-2003	216	3063	248	3515
10	2003-2004	252	3663	325	4580
11	2004-2005	272	4133	331	4867
12	2005-2006	290	4818	380	6308
13	2006-2007	310	5494	366	6063
14	2007-2008	329	6020	412	7403
15	2008-2009	339	5997	395	6807
16	2009-2010	353	6985	407	7256
17	2010-2011	377	7473	516	9379
18	2011-2012	382	7763	517	10049
19	2012-2013	398	8531	538	10521
20	2013-2014	379	8028	582	11588
21	2014-2015	393	8328	605	12049
22	2015-2016	401	8505	626	12682
23	2016-2017	421	8961	644	13161
24	2017-2018	428	9004	650	13233
25	2018-2019	440	9226	626	12540
26	2019-2020	446	9261	654	13230

(Source: https://doh.gujarat.gov.in)

Table 1.4 Estimated Production and Area of Fruits and Vegetables of India

(Area in '000' Ha., Production in '000' M.T.)

Crops	**2018-19**		**2019-20**		**2019-20**	
			(1st Advance Estimate)		**(2nd Advance Estimate)**	
	Area	**Production**	**Area**	**Production**	**Area**	**Production**
Fruits						
Almond	10	11	10	9	10	9
Aonla /Gooseberry	92	1046	94	1089	95	1107
Apple	308	2316	308	2734	308	2734
Banana	866	30460	875	29649	878	31504
Ber	50	539	51	542	52	539
Citrus						
(i) Lime/Lemon	305	3482	314	3547	317	3717
(ii) Mandarin	469	6243	466	6111	480	6368
(iii) Sweet Orange (Mosambi)	187	3266	191	3110	190	3483
(iv) Others	67	412	67	416	67	407
Citrus Total	**1028**	**13404**	**1039**	**13183**	**1054**	13976
Custard apple	40	339	42	349	41	347
Grapes	140	3041	141	2151	140	3125
Guava	276	4253	286	4345	287	4304
Jackfruit	185	1764	191	1895	189	1835
Kiwi	5	13	5	13	5	13
Litchi	96	721	96	728	96	730
Mango	2296	21378	2309	21285	2291	20444
Muskmelon	57	1266	58	1261	59	1330
Papaya	149	6050	139	5648	142	6011
Passion Fruit	12	81	12	81	12	76
Peach	19	118	19	127	19	125
Pear	42	300	42	313	42	306
Peanut	1	0	1	0	1	0
Pineapple	104	1711	108	1781	107	1799
Plum	23	85	19	77	19	77
Pomegranate	253	2915	264	2329	261	2315
Sapota	89	1059	89	1070	83	1003

Strawberry	1	5	1	8	1	8
Walnut	108	299	107	296	107	296
Watermelon	100	2495	99	2498	110	2787
Others	248	2298	255	2281	255	2268
Total Fruits	**6597**	**97967**	**6660**	**95743**	**6664**	**99069**
Vegetables						
Beans	236	2356	217	2116	215	2080
Bitter gourd	99	1205	100	1244	101	1214
Bottle gourd	187	3011	185	3187	181	2977
Brinjal	727	12680	741	13000	736	12777
Cabbage	400	9127	403	9369	397	9207
Capsicum	34	497	34	515	33	514
Carrot	109	1893	112	2042	104	1838
Cauliflower	465	9083	472	9370	458	8840
Cucumber	105	1588	105	1673	104	1603
Chilies (Green)	377	3783	422	4097	364	3851
Elephant Foot Yam	33	817	32	816	32	808
Mushroom	0	182	0	205		201
Okra/Ladyfinger	513	6176	526	6460	519	6371
Onion	1220	22819	1293	24454	1434	26738
Pointed gourd	55	757	55	741	56	760
Peas	552	5562	564	5694	563	5703
Potato	2173	50190	2149	51947	2158	51300
Radish	200	3143	212	3316	204	3107
Pumpkin//Kaddu	94	2043	94	2037	99	2117
Sweet Potato	110	1156	116	1194	116	1186
Tapioca	163	4976	139	4046	164	5043
Tomato	781	19007	800	19328	812	20573
Others	1441	21118	1519	21156	1504	22962
Total Vegetables	**10073**	**183170**	**10292**	**188009**	**10353**	**191769**

(Source: Department of Agriculture, Cooperation & Farmers Welfare)

2. SUPPLY CHAIN MANAGEMENT IN FRUITS AND VEGETABLE SECTOR

2.1 SUPPLY CHAIN MANAGEMENT

The supply chain is the network of organizations that are involved, through the upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hand of the ultimate customer. In other words, a supply chain consists of multiple parties/firms, both upstream (i.e., supply) and downstream (i.e., distribution), and the final consumer. It is the planning and control of the flow of total material from suppliers to manufacturers to distributors and finally to the end-users. Supply chain refers to all those activities associated with the transformation and flow of goods and services, including their attendant information, flows, from the sources of raw materials to end-users. Supply chain management (SCM) may be defined as a set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed in the right quantities, to the right locations, and at the right time, in order to minimize system-wide costs while satisfying service level requirements.

2.2 SUPPLY CHAIN MANAGEMENT IN FRUITS AND VEGETABLES SECTOR

F&V constitutes a major part of the world economy and is the raw material for many industries. Among the agricultural produce, perishable food products like F&V have got the least attention. The SCM of perishable food produce constitutes the processes from production to delivery of the Agri-fresh produce, i.e. from the farmer to the customer. SCM of perishable food products is complex as compared to other SCMs due to the perishable nature of the produce, high fluctuations in demand and prices, increasing consumer concerns for food safety & quality, and dependence on climate conditions.

There are several players involved in fulfilling the needs of the consumer in the supply chain management of F&V like farmers, local traders, transporters, processors, retailers, etc. From a farm gate to a consumer, a horticulture product passed through six-seven different distribution channels. Perishable food produced in the farmer's field reaches the end consumer through a chain of intermediaries. These intermediaries carry out various functions, such as transfer of ownership of commodities, its movement,

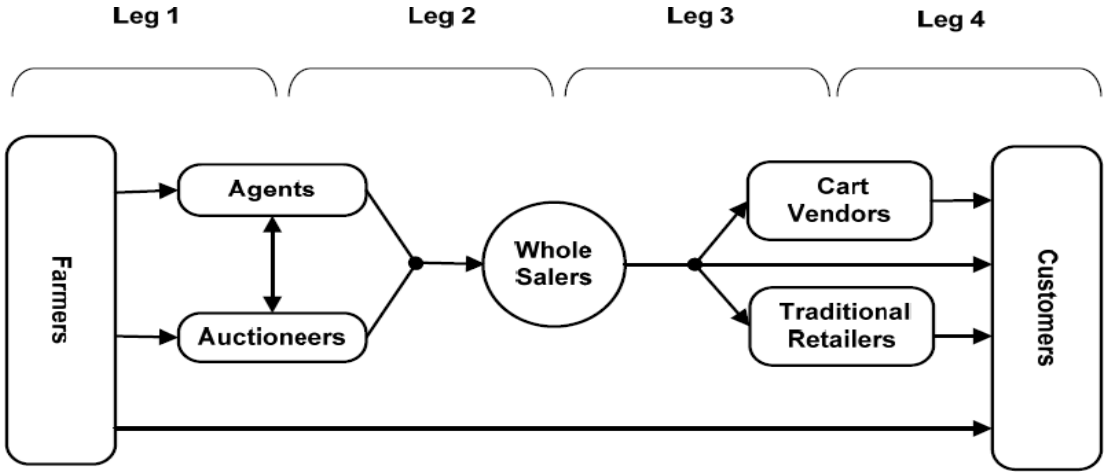
maintenance and preservation of quantity & quality, payment to the seller, and commodity delivery to the buyer. All the links from farmers to end-users of the commodity constitute the supply chain of the agricultural commodities.

2.3 SUPPLY CHAIN MODELS OF FRUITS AND VEGETABLES SECTOR IN INDIA

Generally, there are three types of models in the Supply Chain of F&V in India i.e. Traditional Supply Chain, Hub and Spoke Model, and the Value chain Model (Halder & Pati, 2011) which are discussed below in detail.

2.3.1 Traditional Supply Chain

'Traditional Model' is a complex chain for the supply flow of F&V, which is predominantly followed currently in the traditional chain. **Figure 2.1** outlines the supply chain of the Traditional Model of F&V in India. Players involved in this model are agents (commission agents), auctioneers, wholesalers, traditional retailers of all types of formats family-run 'mom and pop' stores, roadside shops, pavement shops, and cart vendors apart from farmers and customers. Agents, auctioneers, and wholesalers are traders in the F&V supply chain. Farmers are the cultivators of produce and source of F&V produce. Farmers in India are small by land holding, yield volume of crop and are highly fragmented across geographical areas. In this traditional supply chain model, farmers sell their products to the customers through various intermediate partners who eat the entire price share in the market.

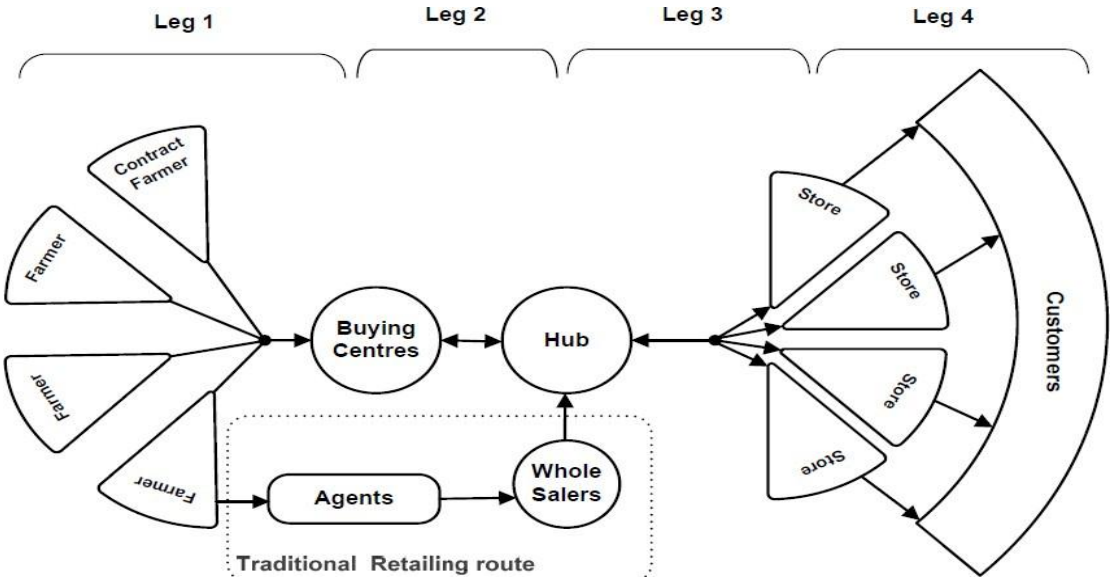


Source: Halder & Pati (2011)

Figure 2.1 Traditional Supply Chain Model

2.3.2 Hub and Spoke Model

Organized retailers including prominent players like Food Bazaar (Pantaloon Retail (India) Ltd), Spencer's Retail, and More (Trinethra Super retail Ltd.) are adopting the 'Hub and Spoke' Model for the Supply Chain of F&V. **Figure 2.2** illustrates the Hub and Spoke Model of F&V Supply Chain. Only a few players are involved in this type of supply chain model. Farmers, organized retailers, wholesalers, and customers are the partners involved in this chain. In this type of model, buying centers, hubs, and stores (retail outlets) are operational units of organized retailers. Small farmers and Contract farmers are the main sources of supply of F&V in this model.



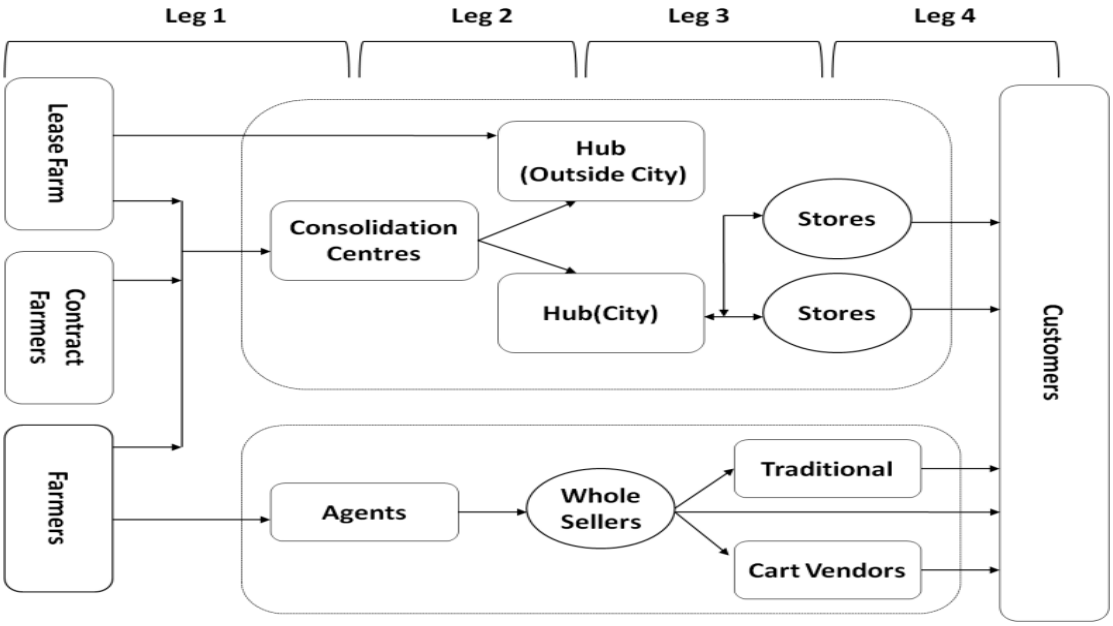
Source: Halder & Pati (2011)

Figure 2.2: Supply Chain of Hub and Spoke Model

The organized retailers collect the F&V directly from the farmers to their buying centers and thentransport to their hub which is served by one or more buying center and then the F&V are further distributed to their retail outlets. Hub infrequently buys a small volume of vegetables from the localwholesale market to balance the demand-supply gap. A retail store is served by only one hub. The store sells F&V in retail quantity to the customers as per the demand. In this model, F&V travel in four phases, namely farmers to buying centers of organized retailers, buying center to hubs, from hubto the organized retail stores, and then finally retail outlet to the end consumer.

2.3.3 Value Chain Model

Currently, only a few organized retail players like Reliance Fresh (Reliance Retail Ltd) follow a Value Chain Model. Organized retailers who adopt this type of model procure the F&V directly from farmers either through contract farming or by taking the farm on lease and sell to customers without the help of any intermediaries. This model is purely based on backward integration and focused on building an entire value chain starting from the farmers to the end consumers as shown in **Figure 2.3**. Compared to the other Supply chain models, the value chain model comprises only a few partners i.e. Farmers, organized retailers, and customers. In this practice, farmers, organized retailer's operational units, consolidation centers, hub (distribution centers), and retail outlets stores, and customers are players.



(Source: Halder & Pati (2011))

Figure2.3: Supply Chain of Value Chain Model

Generally, the traditional supply chain model is followed in India with a share of around 95- 98% which involves a large number of intermediaries who eat up all the share of about 75 percentof the total net margin accruing to the entire supply chain. The local traders/auctioneers and commission agents perform the function of aggregators who procure theF&V from small landholding farmers on behalf of big traders and sell to Mandi. Some large landholding farmers used to sell their F&V produce directly at the local Mandi (marketplace) without the help of

any local agents. Usually, farmers preferred to sell their produce to local agents or traders rather than selling directly in Mandi. Sidhu et al. (2010) in their study found that in India, more than 90 percent of the produce dispose through commission agents/wholesalers and a small proportion sells through retailers and directly to consumers. It involves a large number of intermediaries i.e. agents (commission agents), auctioneers, wholesalers, and traditional retailers apart from farmers and customers. The agents collect F&V from the small farmers and sell it to the big trader who then transports the commodity to the Mandi after processing or some value addition. The wholesaler buys F&V from the Mandi through auction and then sells to the retailer which includes pavement shops, cart vendors, family-run 'mom, and pop' stores, and roadside shops. Then these retailers sell the F&V to the end consumer.

[Source: Halder & Pati (2011)]

2.4 NEED FOR A SUPPLY CHAIN IN FRUITS AND VEGETABLE MARKETING

Supply chain development not only benefits the private sector but also creates spin-offs that stimulate social, economic, and environmentally sustainable development in the region (employment generation, added value, minimization of product losses, etc.) The specific gains are:

- Reduction of product losses in transportation and storage.
- Increasing sales.
- Dissemination of technology, capital, and knowledge among the chain partners.
- Better information about the flow of products, markets, and technologies.
- Transparency of the supply chain.
- Tracking and tracing to the source.
- Better control of product safety and quality.
- Large investments and risks are shared among partners in the chain.
- Productivity Improvement
- High customer satisfaction
- Increased profit

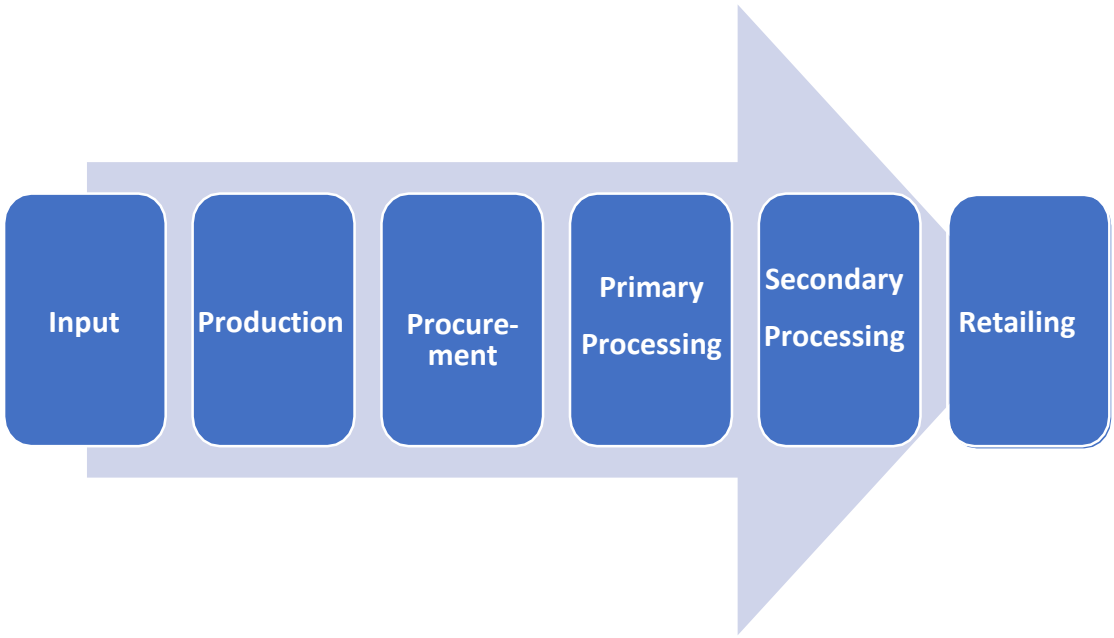


Figure 2.4: Supply chain in Fruits and Vegetable industries.

2.5 PRESENT SCENARIO OF THE SUPPLY CHAIN IN INDIA

It has been found that 30 – 40 percent of fruits and vegetables are wasted due to post-harvest losses. Table 2.1 shows the estimated waste percentages in each step of the food supply chain in India which is the cause of the low availability of fruits and vegetables for consumers and the need for import of them despite India being the second-largest producer. There is a lack of basic as well as specialized infrastructure such as cold storage, refer vans, cool chains, ripening chambers, etc. Also, there is a missing link between production and research systems and consumers. The system lacks in capacity-building market information, research and intelligence. India is short by 10 million tons of cold storage capacity due to which over 30 percent of agricultural produce goes waste every year, more than 20% of produce from fields is lost to poor post-harvesting facilities and lack of cold chain infrastructure. India, the world's second-largest fruit and vegetable producer encounters a waste of close to 25% worth of produce. India has a huge opportunity to become a leading global food supplier if only it has an agile, adaptive, responsive, and efficient supply chain. Some of the problems that are to be mentioned in the Indian food supply chain are the presence of numerous stakeholders who are working in isolation and the infrastructure connecting

these partners is very weak. There is a lack of demand estimation and technology applications such as cold chain logistic supply chains and product tracking and tracing. Lack of system integration and presence of a large number of unorganized retailers result in making unorganized supply chain practices further inefficient.

Deliya *et al* (2012). reported that the present supply chain that connects the farmers to both the organized, as well as the unorganized retail, is highly inefficient with several intermediaries and manual handling. The result is lots of wastages as much as nearly 30% and also less remuneration for the farmers. Sudarshan Naidu says supply chain development not only benefits the private sector but also creates spin-offs that stimulate social, economic, and environmentally sustainable development in the region (employment generation, added value, minimization of product losses, etc). The specific gains are reduction of product losses in transportation and storage, increasing ofsales, dissemination of technology, capital, and knowledge among the chain partners, better information about the flow of products, markets, and technologies, transparency of the supply chain, tracking and tracing to the source, better control of product safety and quality, large investments and risks are shared among partners in the chain, productivity Improvement, high customer satisfaction, increased profit and on-time delivery.

Table 2.1: Estimated/assumed waste percentages in each step of the FSC in India

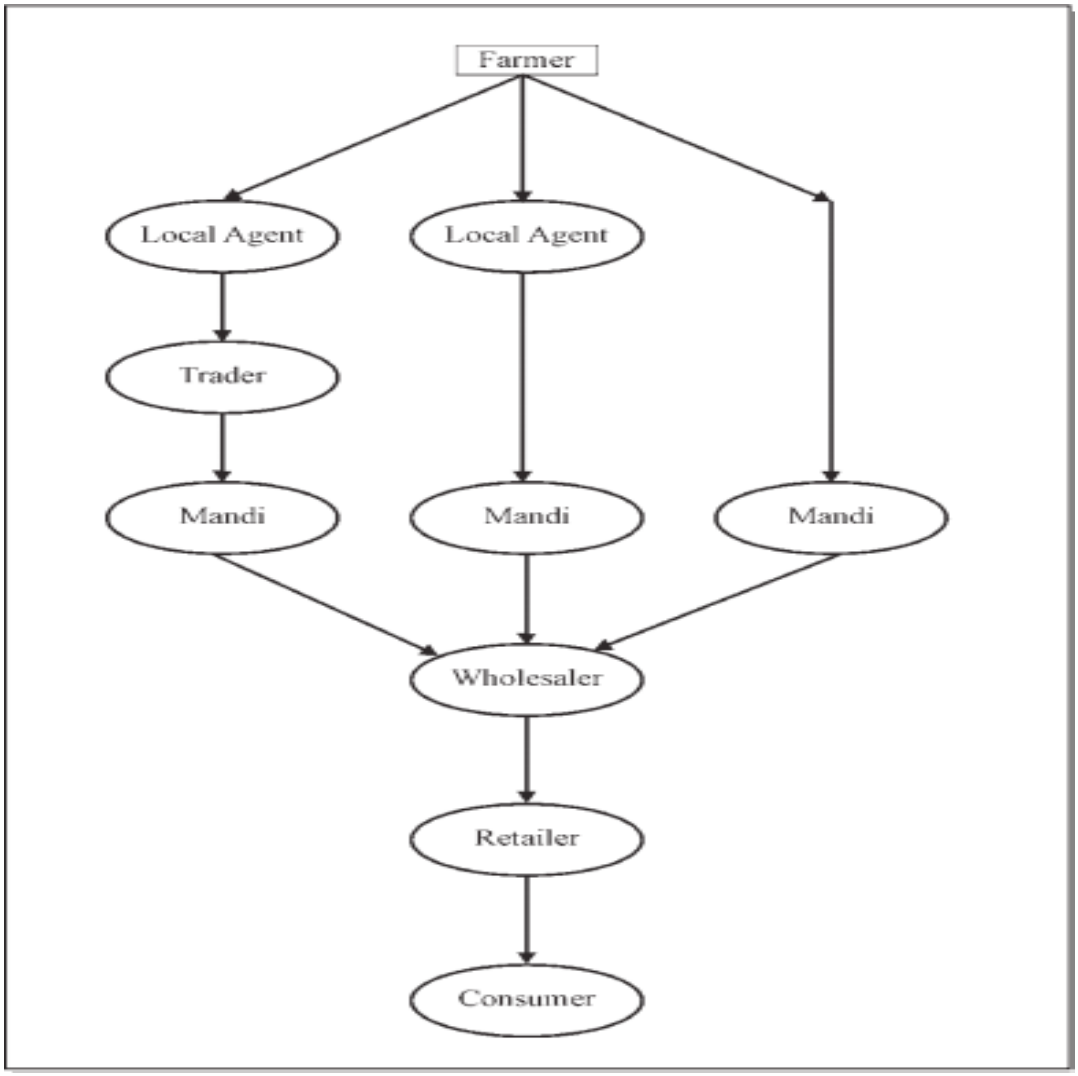
Commodity	Agricultural	Post-harvest	Processing And Packaging	Distribution	Consumption
	Production	Handling and storage			
Fruits and Vegetables	15%	9%	25%	10%	7%

(Source: Global Food Losses and Food Waste: Extent, Causes and Prevention, FAO, 2011)

2.6 TO STUDY THE EXISTING SUPPLY CHAIN OF FRUITS AND VEGETABLE IN KHEROJ TALUKA

Fruits and Vegetables constitute a major part of the world economy and are the raw material for many industries. Among the agricultural produce, perishable food produce like Fruits and Vegetables have got the least attention. The Supply Chain of Fruits and Vegetables constitutes the processes from production to delivery of the agro-fresh produce, i.e. from the farmer to the customer. The Supply Chain of Fruits and Vegetables is complex as compared to other Supply Chains due to the perishable nature of the produce, high fluctuations in demand and prices, increasing consumer concerns for food safety & quality, and dependence on climate conditions.

The existing Supply Chain in the Fruits and Vegetable sector involves many intermediaries **(Figure 2.5)** who eat up all the share of about 75 percent of the total net margin accruing to the entire supply chain. From a farm gate to a consumer, a horticulture product passed through six-seven different distribution channels. Fruits and Vegetables produced in the farmer's field reach the end consumer through a chain of intermediaries. These intermediaries carry out various functions, such as transfer of ownership of commodities, its movement, maintenance and preservation of quantity & quality, payment to the seller, and commodity delivery to the buyer. The commission agents and local traders perform the function of aggregators. On behalf of big traders, they procure fresh produce from the small growers. Some big farmers used to sell their produce directly to the local Mandis (APMC). Mandi (APMC) system has a number of inefficiencies like non-transparent price-setting where seller and buyer are often cheated, high losses due to non-scientific handling and storage. There exists inadequate infra-structural support leading to high losses, as high as 40 percent in the case of fruits and vegetables. Usually, farmers prefer to sell their produce to local agents or traders rather than selling directly in Mandi. More than 90 percent of the fruits and vegetable produce to dispose of through commission agents/wholesalers and a small proportion sells through retailers and directly to consumers. All the links from farmers to end-user of the commodity constitute the supply chain of the F&V sector in India. The F&V sector supply chain consists of various players. Logistics acts as a thread that connects the different players and components of the supply chain.



(Source: Modi.*et.al*)

Figure 2.5 Supply Chain in Fruits and Vegetable Sector

3. COMPANY PROFILE

3.1 INTRODUCTION

Impagro builds first-mile fruit & veg supply chain solutions that deliver higher incomes for farmers and quality products for food buyers. It was founded in 2018 by Mr. Suhrid Patel and Mr. Akbar Sher khan. It has its headquarters in Delhi. It operates in Bhopal and Ahmedabad cities of India. Impagro offers a variety of products ranging from fresh fruits and vegetables. Impagro also connects farmers with innovative agronomic and post-harvest service and technology providers. Impagro has a holistic approach to the numerous problems faced by India's agricultural sector and is building close links with partners that provide innovative solutions to these problems. The company's ecosystem model enables our partners to come together and optimize synergies between their products. Most importantly, Company's ecosystems are designed to operate as decentralized farm-level hubs enabling farmers to directly benefit from increased productivity, reduced losses, and higher prices. Impagro hubs facilitate supply chain integration between farmers and stakeholders such as food processors, exporters, retailers, and caterers. Impagro also cares deeply about the environmental sustainability of our solutions and is promoting the use of renewable energy and agricultural practices that preserve water, soil, and biodiversity.

3.2 COMPANY VALUES

- Increasing Farmer Incomes
- Reducing Food Wastage
- Food Safety
- Renewable Energy
- Soil & Water Conservation

3.3 REGISTERED ADDRESS

Impagro Farming Solutions Private Limited,
W-83 Anupam Garden,
Saidulajaib Extension,
New Delhi, 110068.
hello@impagrofarming.com

3.4 COMPANY PILOT PROJECT

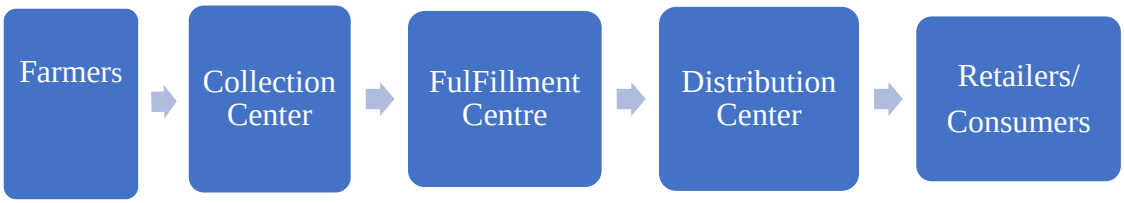
The company pilot project is located in the Ratapani region (Raisen district) of Madhya Pradesh. The project includes an Inspira Farms ™ cold room and packhouse that provides facilities for horticulture farmers to store and aggregate their produce. The facility allows farmers to benefit from innovative cold storage technology to help reduce post-harvest losses. In addition, the project provides marketing services to connect farmers with buyers in Bhopal and beyond.

Impagro is also working with our agronomic partners to develop a model farm to promote the latest technologies and practices in sustainable agriculture. These include drip irrigation and precision farming, and affordable mechanization solutions.

3.5 WHY IMPAGRO?

- **Benefit for Farmers**
  - 12-15 % higher Income
  - Demand-based harvesting
  - Bank Payment on time
  - One stop-sale for all produce
  - Transparent weighing & Pricing
  - Saves time
- **Benefit for Customers**
  - Lower Price
  - Doorstep delivery
  - Better Quality & Hygiene

3.6 SUPPLY CHAIN MANAGEMENT OF FRUITS AND VEGETABLES IN IMPAGRO



3.6.1 Collection Centers

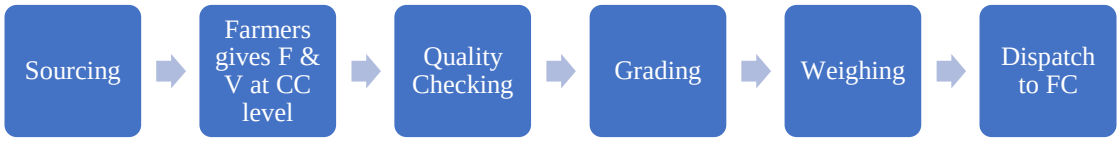
The collection center is the place where produces are bought in bulk together from the farmers. A farmer brought theirs produces to the particular point from where the company collects the goods. The produced stock in the center and company procures the goods and creates effective backward linkages and empower farmers by giving facilities to market their whole produce. This reduces wastages and increases the farmer's income.

The objective of CC is to buy fresh and good quality fruits and vegetables from farmers directly. Also, the company can save the vendor and mandi charge through these practices.

In Gujarat, they have different CC for buying F & V like Changodar, Limkheda, Petlawad, Dahod. Now the company is trying to establish more no. CC in Gujarat. It is obvious to prefer to plant their CC at that place which is more market potential means reducing transportation cost they can buy the fresh produce in bulk at suitable prices.

Changodar CC

- **How did the collection Center work?**



1. Sourcing

The Procurement team is been visiting the different villages and taluka and finding fresh, good quality fruits and vegetable sources. And they will purchase the F&V from the farmers and they are buying at more than current market prices.

2. Receiving

In the receiving area the purchased F&V are been arrived and then the F&V are unloading and weighed.

3. Quality Checking

The Sample is been withdrawn from the received F&V and then they are been checked according to quality parameters.

4. Grading and Sorting

The grading and sorting of the received F&V is been done.

5. Weighing

The F&V is been weigh and filled in crates in a fixed amount of quantity.

6. Batching

Each of the crates is been analyze and the detailed entry of data is been filled in the system.

7. Delivery to fulfillment center

The prepared batches is been loaded in trucks and delivered to the fulfillment center.

3.6.2 Fulfilment Center

At the fulfillment center mainly two types of works are been done

1. The quality checks of the received F&V from the CC are done.
2. The quality checks, Grading & Sorting, and batching of the F&V received from CC.

And then the required batches of different sizes according to demand is been made and then delivered to the Distribution Center.



Ahmedabad FC

3.6.3 Distribution Center

The prepared batches at FC are then delivered to the different customers like hotels, restaurants, retailers, etc. according to their orders. If any rejected quality F&V is there then it is been taken back when the delivery people are going to bring back the empty crates from the customers and the entry of the same is done, and at that time the payment is also collected from the customers.

3.7 OBJECTIVES OF THE STUDY

- To Study the existing supply chain for fruits and vegetables
- To study the cropping pattern of fruits and vegetables
- To Find out the constraint faced by the farmer in the existing supply chain

4. REVIEW OF LITERATURE

Review of the existing related literature forms an integral part of any systematic research work. It contributes to the understanding of the issue involved, analytical tools to be adopted, and overall handling of the research work. Very little work has been done on the marketing of seeds. The literature closely related and relevant to the present investigation has been reviewed under the following headings.

Halder and Pati (2011). in their paper on "A need for the paradigm shift to improve supply chain management of fruits & vegetables in India" discussed that the post-harvest losses in crops ranged from 15- 50 percent, which at micro-level increased the marketing cost of the product and at the macro level, reduced the per capita availability. Based on their findings, they recommended the need to develop technologies, methods, and mechanics to reduce these losses. They also recommended the need to remove the distortions in the present supply chain to create more integration between the different links of the supply chain that would help in reducing these losses.

Reddy *et al.*, (2010).. in Andhra Pradesh found that in the case of vertical distribution in the traditional value chain, 19.8 percent of the gross value went to producers, 11.3 percent to village merchant, 14.3 percent to middlemen, 15.3 percent to wholesalers, 12.0 percent to commission agent, 16.8 percent to rythu bazaar and the remaining 10.8 percent went to traditional retailers. Whereas in modern retailing, supermarkets and producers receive 38 and 22.75 percent of the total gross value, respectively.

Sidhu *et al.*, (2010). have analyzed the supply chain of onion and cauliflower in the Patiala district of Punjab. They showed that the cultivation of onion was more profitable (Rs. 74,597/ha) than that of cauliflower (Rs. 38,072/ha). These vegetables were being disposed-off mainly through commission agents/wholesalers (more than 90%) followed by retailers and consumers. The study suggested that the efficiency of the prevailing marketing channels could be improved by integrating with the organized retail chains and modernizing the vegetable marketing system.

Anita Arya (2008).. studied "The Changing Market Environment in Gujarat Agriculture for sustainable development", the adaption of the Model Agriculture Act in place of the APMC Act by the government of Gujarat in 2007 has changed the agricultural scenario in the state. The new act has opened entry of private companies into the agricultural sector and its effect can be seen in the entry of firms like 'Farm

Fresh', Gujarat Agro Industries Corporation, 'Desai Fruits and vegetables, 'Maccain Foods India Limited', 'Pepsi, etc. These companies have plans to open private wholesale markets and set up plants at different centers in the state. Hyderabad-based companies have plans to set up Food Park at Jamnagar.

Mangala and Chengappa (2008). in their study "A Novel Agribusiness Model for Backward linkages with Farmers: A case of Food Retail Chain", found that Spencer's have established backward linkages with the farmers for procuring fresh fruits and vegetables. The main strategy of this system ensures a study and continuous supply of fresh vegetables to the food retail chain and flow of income to farmers. This linkage has been able to change the method of farming and the marketing arrangement followed by the food retail chains. Direct supply by the farmers has allowed the retail chain to simultaneously increase control over the quality, supply reliability, and stability. This model of linkage is especially suited to small and marginal farmers and improves their economic conditions by providing an opportunity to grow and supply high-value vegetables around the year at a fairly decent price. The study has analyzed the impact of food retail chain linkage on farmers.

Suresh Reddy (2005). in his study revealed that "supply chain management" showed a way to cost minimization and value optimization all along the chain, starting from the customer order to the delivery of goods to him. It involves coordinated management of material, information, and manpower in the entire process within an organization. Managing was found to be the effective method to reduce operational costs and increase customer satisfaction.

Subha (2004). examined the "ways of managing a supply chain" and reported that the requisites to manage a supply chain were the creation of a logistics vision, tackling conventional problems, and developing a supply chain. The author also indicated that open communication between supply chain partners would help in better management of the supply chain.

Ricks (2000).. in his study revealed that the important area of need for the fruit industry supply chain is a consistent but not excessive supply of products to meet the market demand. This involved the supply of products balanced with demand in the same seasonal years and for several years.

Ricks (1999). in his study revealed that the appropriate combination of vertical coordination arrangements like contracts, informal agreement, and joint venture can

improve supply chain performance by providing adequate supplies to the shippers from packers and growers, aiding standardization and packaging of fruit products and risk sharing between the shippers, packers, and growers.

Mohamed Zairi (1998). in his study on the best practices of supply chain management in the retail sector noted that the retail sector is undergoing major changes resulting from factors such as increased competition and tighter profit margins. He found out that integrated management through the extended supply chain is the most effective means to achieve good value provided to the end consumer, which can be achieved through a better product, better quality, better assortment, and better in-stock service, less cost throughout the chain, accurate and timely information and committed business leaders.

Wilson (1996). in his study on the supply chain of perishable products in Northern Europe found out that, the supermarket chain was more important in the retail marketing of fresh products and he suggested that increased use of supply chain management techniques could increase the margins of the innovative and competitive firms that remain in the chain. Also, he found that the inherent cost of distribution networks and channels of fresh produce could be reduced substantially by using supply chain management. The fruit and vegetable supply chain has traditionally been fragmented. Some links have performed well but others have caused bottlenecks.

J. Lai, L. R. Singh, and R. V. Singh. (2015). in their study attempted to examine the cropping pattern, crop yields, and resource productivity on sample farms operating at different levels of farm mechanization in Meerut District of Western Uttar Pradesh. It was observed that the yield of the important crop showed a positive trend on the mechanized farms because of the timely accomplishment of tillage operations, a greater number of irrigations, and higher use of fertilizer per acre. About the expenditure on fertilizer and manure, they found that it was highest on the mechanized farms and also the per acre expenditure on 10 irrigation was found to be high on mechanized farms as against the bullock farms which reflected a higher level of use of these two points on the mechanized farms. They pointed out that the marginal value productivity of land was quite high on all the three categories of farms and reflected an increasing trend with the level of mechanization.

M.J. Azad *et al.* (2014). The purpose of this study was to determine the problems perceived by the farmers in vegetable cultivation and to explore the relationship of the selected characteristics of the vegetable growers with their problems. Data were collected from 109 vegetable growers of six villages of Belgachi Union of Alamdanga

Upazila under Chuadanga district by using a pretested interview schedule from 15 January to 13 February 2013. Pearson product-moment correlation was used to determine the relationship between the selected characteristics of the vegetable growers with their problems perceived in vegetable cultivation. The findings revealed that the majority (79.90%) of the respondents perceived medium to high problems in vegetable cultivation and 21.10% perceived low problems in vegetable cultivation. Co-efficient of correlation showed that out of nine variables only two variables, namely vegetable cultivation area and annual income from the vegetable of the vegetable growers had a significant negative relationship with their problem perceived in vegetable cultivation. According to the problem perceived index lower price of vegetables ranked the first problem followed by the high price of inputs, disease attack, insect attack, lack of technical knowledge, lack of HYV seed seedling, lack of technical help, lack of loan facility, and losses of vegetable production due to natural calamity.

S.K. Bhowal *et al* (2014). Studied that A field experiment was conducted at MLT site, Chandana under on-farm research division (OFRD), Bangladesh Agricultural Research Institute, Cumilla during 2015-16 and 2016-17 to study an economically profitable vegetable-based cropping pattern in Cumilla region for increasing cropping intensity and productivity as well as to meet the vegetable demand for farm family as well as the country. The studied vegetable-based cropping patterns were CP1: Red Amaranth-Potato-Coriander-Indian Spinach-Ladies Finger-Cauliflower and CP2: Red Amaranth-Potato-Indian Spinach-Ladies Finger-Coriander-Red amaranth, respectively. The results showed that six vegetable crops could be grown successfully one after another in a sequence in the farmer's field instead of two or three crops-based patterns in a piece of land. From the research results, it was revealed that the highest Potato equivalent yield (PEY) 226.66 t ha-1 was obtained from cropping pattern CP1: Red Amaranth-Potato-Coriander-Indian Spinach-Ladies Finger-Cauliflower where the lower PEY (171.38 t ha-1) in CP2: Red Amaranth-Potato-Indian Spinach-Ladies Finger-Coriander-Red amaranth cropping pattern. From the economic analysis, it was observed that the highest gross return Tk. 22,66,600 ha-1 was obtained from cropping pattern CP1: Red Amaranth-Potato-Coriander-Indian Spinach. Ladies finger-Cauliflower which leads to the highest gross margin (Tk. 18,94,542 ha-1) as well as the highest BCR (6.09) from that cropping pattern compared to CP2.

Ajay Kumar *et al* (2019). Studied that India is the largest producer of vegetables in the world after China. The cauliflower, potato, radish, tomato, onion are the major

vegetables cultivated in Haryana. The present study was conducted in Haryana to study the constraints faced by farmers and middlemen in the production and marketing of major vegetables. The study was carried out in Sonipat for cauliflower, Yamuna Nagar for Potato, Ambala for onion, Karnal for tomato, Gurugram for radish. The present study fully relies on the primary data and hence data was collected through a properly structured schedule for the production year 2014-15. Major production-related constraints expressed by vegetable growers were lack of information about the cultivation of vegetables, higher cost of fertilizers, seeds, and labor and their unavailability when needed, lack of suitable cold storage facilities, high cost of storage, costly weedicides, spurious plant protection chemicals, and lack of credit. Major marketing related constraints expressed in the marketing of vegetables were lack of market information, higher price fluctuation, higher amount of price spread, malpractices in weighing and storing of vegetables, the problem of storage facilities, lack of processing industries/units, higher price fluctuations, high cost of labor, high transportation cost, and delay in payments

Hegde and Madhuri (2013). discussed in their paper that the Indian system of agricultural marketing suffered from a number of defects. As a consequence, Indian producers were deprived of a fair price for their produce. The major defects of the agricultural marketing system were improper warehouses, lack of grading and standardization, inadequate transport facilities, presence of a large number of middlemen, malpractices in unregulated markets, inadequate market information, and inadequate credit facilities.

Shilpa (2008). in her study on "Supply Chain Management in Vegetables Marketing: A Comparative Analysis" in Bangalore revealed that the producers largely sold the vegetables to the modern formats mainly because of better services provision for technical guidance, getting storage and transport facility, absence of middlemen, spot payment, correct weight, and less charge. In a modern and cooperative supply chain, the frequency of sales by producers was almost daily because of the easy availability of the packing materials by the firms to producers and savings on transportation costs.

Ganesh Kumar (2000). classified the problems faced by the farmers under four groups viz., production, financial, infrastructural, and marketing problems in Gazani lands of Karnataka. For the production problems, the majority of the farmers complained of the non-availability of better variety seeds and fingerlings. Regarding financial problems, the lack of funds for the purchase of improved inputs was the major problem. Extension

problems included the non-availability of the package of practices. The important problem was the absence of market regulation and information.

Wermund and Fearne (2000). conducted a study on key challenges facing the cherry supply chain in the United Kingdom (UK). The study found that the fruit sector in the UK was struggling to maintain its competitive position. Substantial competition from imports and the variable climate were major constraints on British fruit production, particularly in the stone fruit industry. However, multiple retailers believed that increased quantities of quality domestic products can be sold easily if current production problems such as irregular cropping for cherries can be overcome.

Gupta and Rathore (1999). they conducted a study on disposal pattern and constraints in vegetable marketing in Raipur district of Madhya Pradesh in 1995-96. The study followed two supply chains one was producer to consumer with the involvement of wholesaler and retailer and the other one was directly from producer to consumer. In the study, they found that the various constraints faced by vegetable producers and also expectations suggested during the production and marketing are noted such as lack of resources was the main problem in vegetable production. They suggested in this context that financial institutions should make an easy process to sanction the loan for vegetable production. They should also increase the per hectare limit of loan because vegetable production is capital intensive enterprise, unbalanced use of fertilizers due to lack of technical know-how was another problem. Hence farmers should apply recommended doses of fertilizers according to soil tests. The non-availability of good quality seed is also a genuine problem for farmers. Until farmers do not get good quality seed, all the efforts in the direction of vegetable production will go to waste. Producers also felt some post-harvest problems. Some marginal and small farmers experienced difficulty with efficient transportation from village to market. Due to small produce with them, they are unable to hire big and efficient means of transportation. Most of the farmers were of the opinion that vegetable-based processing industries especially tomatoes must be established in producing areas in order to provide remunerative prices to farmers of their produce. Due to lack of storage facility, regulated and cooperative marketing producers are forced to sell their produce through commission agents, who charged 8 percent of the value of products which is quite high. A good number of farmers complained in this regard. Some of the farmers perceived that an adequate arrangement should also be made to disseminate the market news and rendering of grading service for vegetables in order to receive better prices of the produce.

Sailaja *et al.*, (1998). studied resource use efficiency on vegetable farms in the Guntur district of Andhra Pradesh. The results of the study indicated that vegetable production was profitable despite major constraints such as the non-availability of quality seeds, inadequate credit and marketing facilities, shortage of water, and inefficiency in post-harvest handling.

Singh (1997). in his study revealed that the main problem in front of the vegetable growers was lack of post-harvest technological services, like grading; packaging; transportation; cold storage; processing; weak linkage of institutional support and marketing information services, etc.

Gopalan and Gopalan (1991). found that the agricultural marketing system in India suffered from severe constraints like high costs, the existence of middlemen, storage and transport bottlenecks, and a lack of market information among producers. They used a case study of Tamil Nadu to evaluate various methods of raising marketing efficiency. The analysis suggested that the cooperatives have weakened the many small monopolies and malpractices of middlemen and have led to a considerable improvement in marketing efficiency.

5. MATERIALS AND METHOD

The purpose of the methodology is to describe the process involved in research design, data collection, sampling procedure, field survey, and analysis procedure. The research includes interviews of respondents with the help of a Schedule based on objectives and analyzing their responses with the help of statistical tools. The research was covered the Kheroj taluka of Sabarkantha District.

5.1 SOURCES OF DATA

Primary as well as secondary data were collected to meet the stipulated objectives of the study.

5.1.1 Primary Data

Primary data were collected from the Fruits and Vegetable cultivating farmers with the help of a schedule.

5.1.2 Secondary Data

Secondary data collected from different institution's websites, Annual reports, Govt. institutions, etc.

5.2 SAMPLING METHOD

The sampling method was non-probability sampling under which the purposive sampling technique was used.

5.3 STUDY APPROACH

The survey has been conducted on the following guidelines.

- The schedule was used as a research instrument for collecting information.
- Collection of primary data by interviewing farmers.
- After collecting information, completion, tabulation, and analysis were done, and then a report was prepared.

5.4 RESEARCH INSTRUMENT:

Considering the nature of the study as well as for obtaining correct data from theRespondent, it is decided to collect data through a structured Schedule.

5.5 ANALYTICAL TOOLS:

Mainly Tabular analysis, charts, graphs, and Garrett's ranking will be used to achieve the objective of the study.

5.6 AREA OF SURVEY

Kheroj Taluka of Sabarkantha district of Gujarat

5.7 SAMPLING PLAN

5.7.1 Sampling Unit

The sampling unit consisted of Fruits and Vegetable Growing Farmers.

5.7.2 Sample Size

The size of the sample was 100 Fruits and Vegetable Growing Farmers.

5.8 LIMITATION OF THE STUDY

1. The analysis was purely based on the responses of the respondents.
2. Respondents may not be maintaining proper records of their sales of fruits and vegetables, so they might be unable to provide exact information.
3. A small amount of bias on part of the researchers may also exist.

6. RESULTS AND DISCUSSION

The Project entitled "SUPPLY CHAIN ANALYSIS FOR FRUITS AND VEGETABLES OF KHEROJ TALUKA OF SABARKANTHA DISTRICT" has been carried out within the line of objectives and research methodology. This chapter is based on the information collected from the farmers through Schedule regarding the Marketing of Fruits and Vegetables, Identify Existing Supply Chain, To identify the problems faced by the farmers in the Supply Chain. The results were analyzed mainly concerning the response of the respondent.

6.1 SOCIOECONOMIC PROFILE OF FARMERS

The farmers were selected from Kheroj taluka of Sabarkantha District. The Respondent is cultivating fruits and vegetables.

6.1.1 Age of The Farmer

The age of the farmer is a very important demographic factor that helps in the perception and decision-making process.

Table No. 6.1 Age of Farmers (N=100)

Sr.No	Age	No. of Respondent	Percentage (%)
1	Below 25 yrs	06	6%
2	25 to 35 yrs	14	14%
3	35 to 45 yrs	38	38%
4	45 to 55 yrs	23	23%
5	55 to 65 yrs	13	13%
6	Above 65 yrs	06	6%
	Total	100	100.00

Table 6.1 and Figure 6.1 show that out of 100 farmers majority of them (38%) had ages having between 35 to 45 years, while, 23% of the farmer were between the age of 45 to 55 years. Next to this 14 % of farmers had ages of 25 to 35 years,13% of farmers had ages of 55 to 65 years, next 6% of age above 65 years, and 6% farmers were age observed to have age below 25 years.

It can be concluded that the majority of the farmers in Fruits and Vegetable production were relative of younger age.

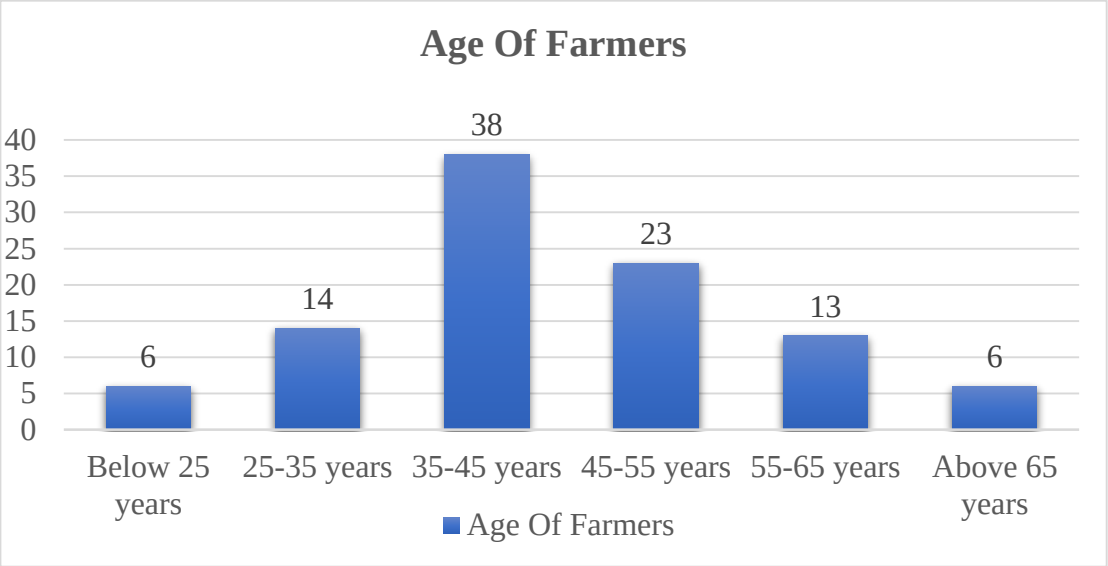


Figure 6.1 Age of Farmers

6.1.2 Education Level of Farmer

Education Level of farmers is also affecting in awareness of farmers adoption of new technology in today's era and also helps to know the market information and enhance their knowledge in farming.

Table 6.2 Education Level of Farmer (N=100)

Sr. No	Qualification	No. of Respondent	Percentage
1	Illiterate	15	15%
2	Below SSC	40	40%
3	SSC	30	30%
4	HSC	10	10%
5	Graduation	5	5%
6	Post-Graduation	0	0%
	Total	100	100%

Table 6.2 and Figure 6.2 reveals the educational level of the farmers, some 10% farmers had completed their HSC, 5% farmers had complete Graduate, 30% farmers have completed their SSC education, 40% farmers were below SSC, and only 15% were illiterate. The study concluded none of the respondents was postgraduate. So here we can see that the graduation ratio of education is less. It can be concluded that the majority of the farmers in Fruits and Vegetable production were relative below the SSC Education level.

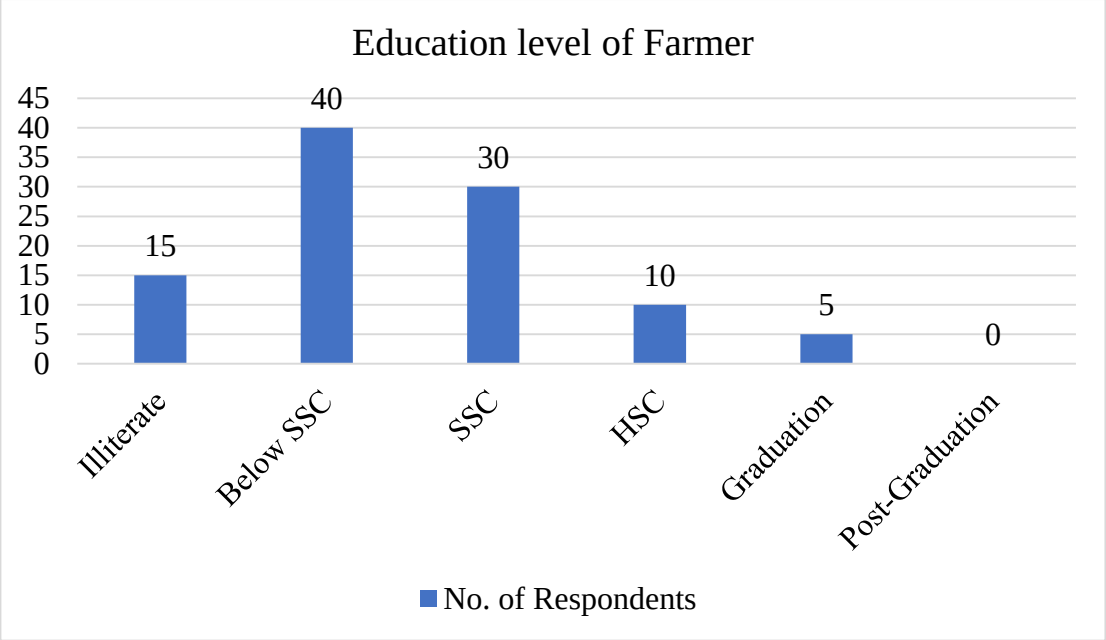


Figure 6.2 Education Level of Farmer

6.1.3 Landholding of The Farmers

Landholding of the farmer is an important factor as it decides the consumption of Agro-inputs and the risk-bearing ability of the farmers in fruits and vegetable cultivation.

Table 6.3 Landholding of the Farmers (N=100)

Sr.No.	Area(acre)	No. of Respondent	Percentage
1	0 to 1	36	36%
2	1 to 2	48	48%
3	2 to 4	13	13%
4	Above 4Acre	03	03%
	TOTAL	100	100%

As can be seen from Table 6.3 and Figure 6.3 that out of 100 respondent 48% were having medium 1 to 2-acre land, 36% of farmers were having small 0 to 1-acre land and 13% farmers were having 2 to 4-acre land, while 3 % farmers were having more than 4-acre land. It could be inferred from the analysis that the majority of the respondents belong to the small and medium category who jointly constitute about 84% of the total respondents.

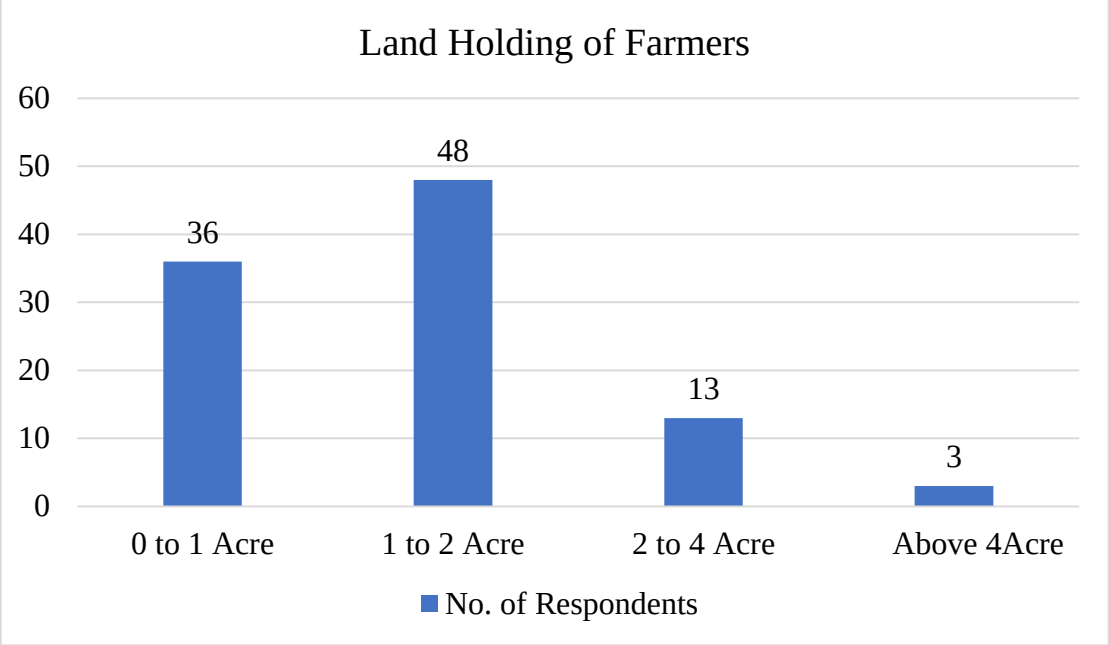


Figure 6.3 Landholding of the Farmers

6.1.4 Farming Experience

Table 6.4 Farming experience (N=100)

Sr. No	Particulars	No. of Respondent	Percentage
1	Below 5 years	06	06%
2	5-10 years	18	18%
3	10-15 years	40	40%
4	Above 15 years	36	36%
	Total	100	100%

The Above Table 6,4 and Figure 6.4 shows that 40 % of the farmer had 10 to 15 years of farming experience, however, 36 % of farmers had above 15 years of farming experience and 18 % farmers had 5-10 years of farming experience and 06 % farmer had below 5 years' experience. The majority of the farmer had above 10 years of farming experience.

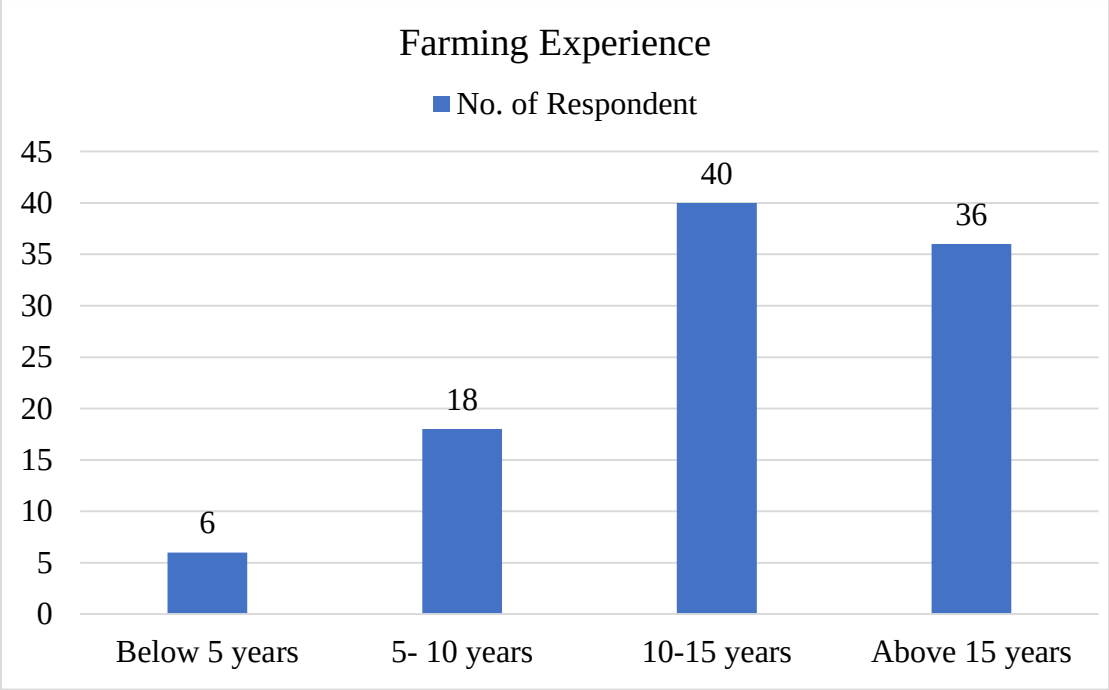


Figure 6.4 Farming experience

6.1.5 Annual Income of the Farmer

Table 6.5: Annual Income of The Farmer (N=100)

Sr.No	Annual Income	No. of Respondent	Percentage
1	Below 50,000	32	32%
2	50,000-2,00,000	58	58%
3	2,00,000-3,00,000	09	09%
4	Above 3,00,000	01	01%
	TOTAL	100	100%

As can be seen from Table 6.5 and Figure 6.5 that out of 100 respondents were 58% of Farmer having annual income of 50,000 to 2,00,000, 32 % of Farmers having annual income of below 50,000, 9% of a farmer having annual income of 2,00,000 to 3,00,000 and only 1% farmers having annual income of above 3,00,000. It could be inferred from the analysis that the majority of the respondents belong to the Annual income below the 2,00,000 who jointly constitute about 90% of the total respondents.

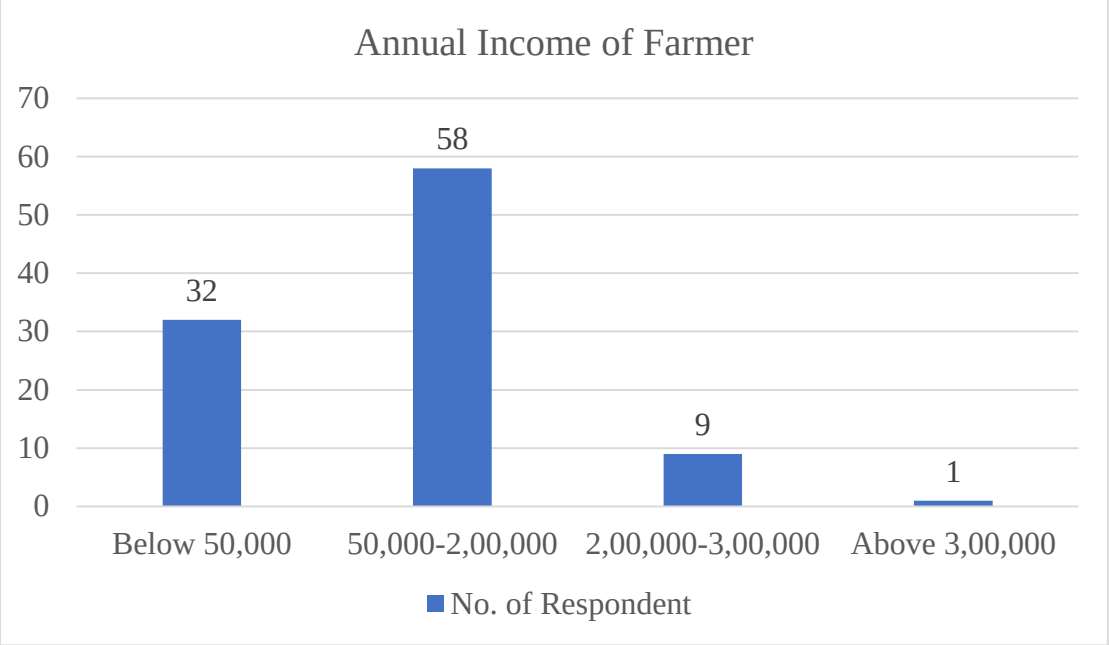


Figure 6.5 Annual Income of The Farmer

6.1.6 Farmers Cultivating Fruits and Vegetables

Table 6.6Farmers Cultivating Fruits and Vegetables (N=100)

Sr. No	Particulars	No. of Respondent	Percentage
1	Fruits	03	03%
2	Vegetable	95	95%
3	Fruits And Vegetable Broth	02	02%

Table 6.6 and Figure 6.6 reveals the farmers cultivating Fruits and Vegetables, out of 100 respondent 95% farmers are cultivating only vegetables after that 3% farmers are cultivating fruits only and 2% farmers are cultivating fruits and vegetable broth. The study concluded that most of the farmers (95%) are cultivating Vegetables.

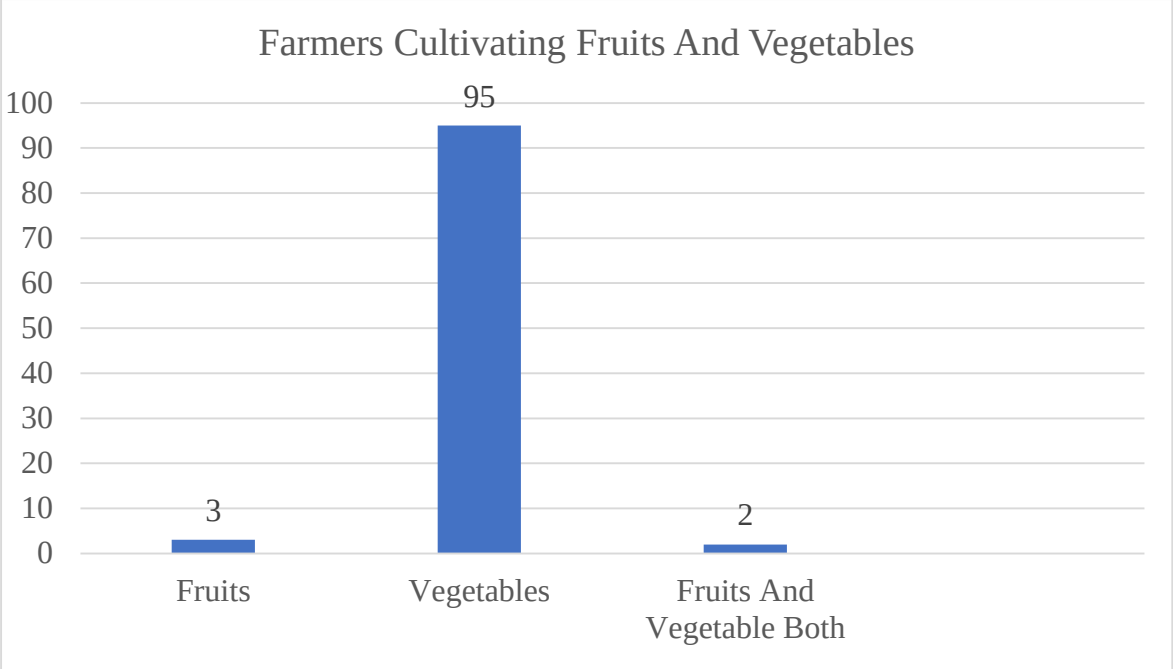


Figure 6.6 Farmers Cultivating Fruits and Vegetables

6.2. TO IDENTIFY THE EXISTING SUPPLY CHAIN OF FRUITS AND VEGETABLES

6.2.1 Supply Chain of Fruits in Kheroj

In existing Supply chain of fruits, the Agro Inputs like Seeds, Fertilizer purchased from SAFE Agro Center. In case of fruits Farmer Sell to their Produce to the Traders.

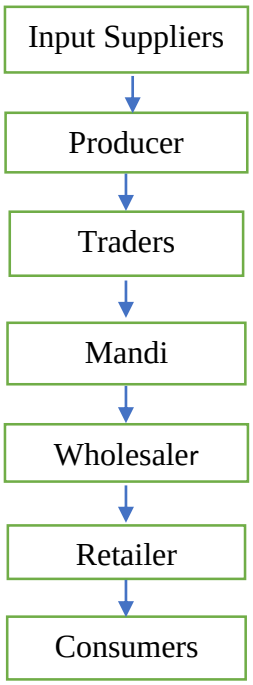


Figure 6.7 Supply chain of Fruits in Kheroj

6.2.2 Supply Chain of Vegetables in Kheroj

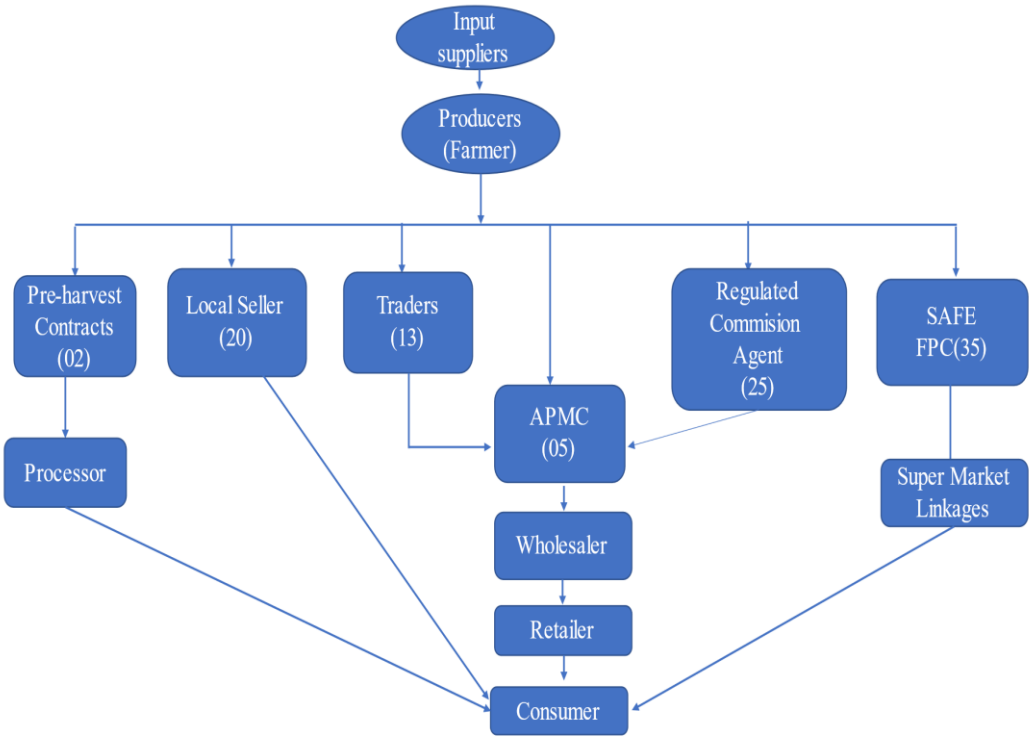


Figure 6.8 Supply chain of Vegetables in kheroj

The existing supply chain of vegetables the Agro-inputs like seedling of vegetables, fertilizer provided by the Safe FPC. In Pre- harvest contract the inputs provided by contracting company like McCain India. In case of Vegetables supply chain 35 farmers selling their produce to SAFE FPC, 25 farmers selling to Traders, 13 farmers selling to regulated commission agent, and 20 farmers selling to local seller, 05 farmers selling to APMC, and 02 farmers selling to pre-harvest contract.

6.2.3 Farmers Selling the Fruits and Vegetables To

Table 6.7 Farmers Selling the Fruits and Vegetables To (N=100)

Sr.No.	Particulars	No. of Respondent	Percentage
1	Pre-Harvest Contracts	02	02%
2	Local Sellers (Retailers)	20	20%
3	Regulated Commission Agent	13	13%
4	APMC	05	05%
5	Traders (Wholesalers)	25	25%
6	SAFE Farmer Producer Company	35	35%

As can we see from table 6.7 out of 100 respondents where 35 farmers sold the fruits and vegetables to SAFE FPC, 25 farmers sold to Traders, 20 farmers sold to local seller due to high price, 13 farmers sold to Regulated commission Agent, only 5 farmers sold to APMC due far-off location of APMC, and 2 farmers sold to pre-harvest contracts in case of potato growers.

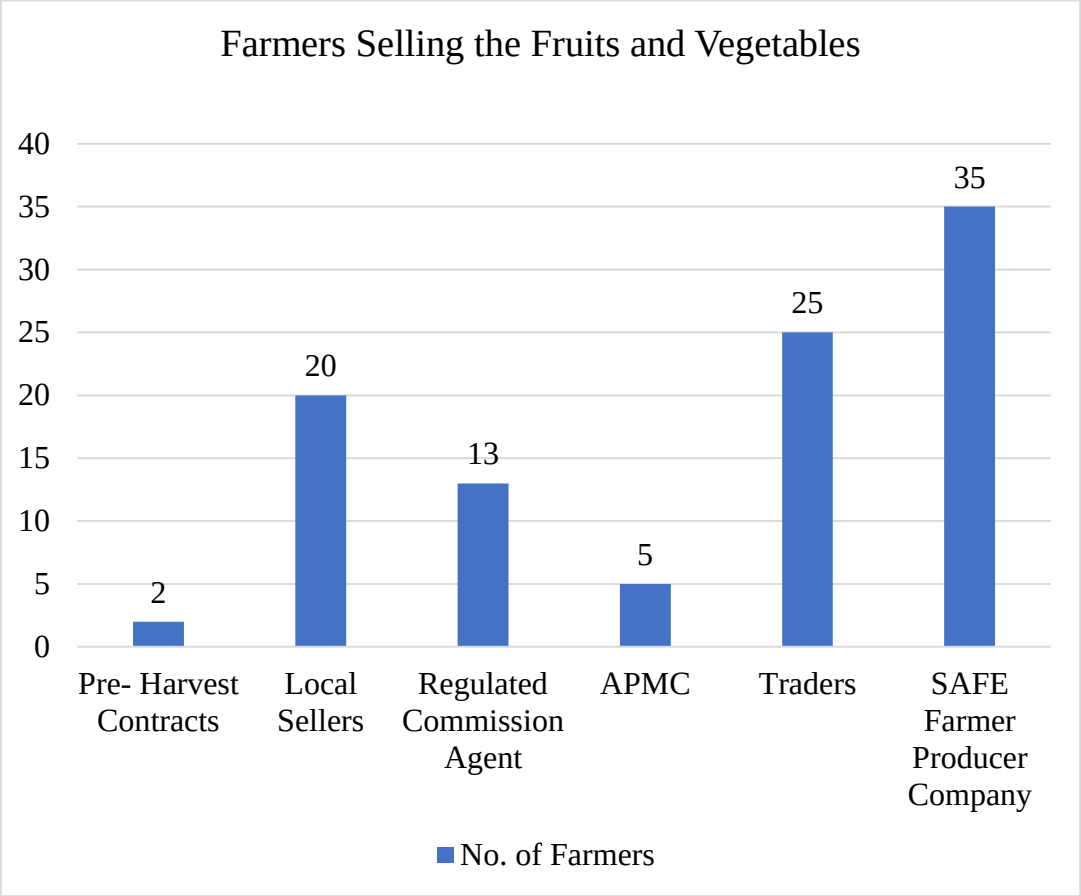


Figure 6.9 Farmers Selling the Fruits and Vegetables (N=100)

6.3 TO FIND OUT THE CROPPING PATTERN OF FRUITS AND VEGETABLE CULTIVATING FARMERS

A cropping pattern refers to a sequence of crops sown by the farmers in a specific given area. It ensures the greatest efficiency to land, fertilizer, irrigation water, and other inputs. It also offers some alternative plans for farmers to maximize production per unit area and time.

6.3.1 Cropping Pattern of The Fruits and Vegetable Cultivating Farmers in Kheroj

Table 6.8 Cropping pattern of fruits and vegetable cultivating farmers in Kheroj

(N=100)

Sr. No.	Cropping Pattern			No. of Respondent	Percentage
	Kharif	**Rabi**	**Summer**		
1	Brinjal	Potato	Tomato	20	20%
2	Ridge-gourd	Onion	Watermelon/ Muskmelon	05	05%
3	Tomato	Potato	Cluster bean	18	18%
4	Bottle-gourd	Tomato	Okra	14	14%
5	Tomato	Potato	Bitter-gourd	10	10%
6	Tomato	Okra	Cow pea	17	17%
7	Tomato	Potato	Okra	11	11%
8	Papaya	Sapota	Papaya	03	03%
9	Tomato	Strawberry	Watermelon/ Muskmelon	02	02%

Data with respect to the cropping pattern followed by the respondents are presented in Table 6.8. The data in Table 6.8 show that (20per cent) of the farmers had followed the cropping pattern Brinjal-Potato-Tomato with the first rank in all cropping patterns. The cropping pattern Tomato-Potato-Cluster bean was followed by 18 percent of farmers and got the second rank. The other cropping patterns followed by the farmers were Tomato-Okra-Cowpea, Bottle gourd-Tomato-Okra, Tomato-Potato-Okra, Tomato-Potato-Bitter gourd, Ridge-gourd-Onion-Watermelon/Muskmelon, Papaya-Sapota–Papaya, Tomato-Strawberry-Watermelon/Muskmelon.

6.4 CONSTRAINTS FACED BY THE FARMERS IN SUPPLY CHAIN OF FRUITS AND VEGETABLES

To analyze the constraints faced by the farmers in the existing supply chain of Fruits and Vegetables, farmers were asked to rank them according to experience. The ranks given by the farmers were converted into the average percent position and then into scores. Finally, the scores were converted into the ranks with the help of the Garrett ranking Conversion table.

Table 6.9 Constraints faced by the farmers in the existing Supply chain of fruits and vegetables. (N=100)

Sr. No	Particulars	Garret Score	Rank
1	Location of selling unit is far away	81	1
2	Transportation facility - Inadequate/ Costly	70	2
3	Delay in payment and sale proceeds	63	3
4	Lack of market information	58	4
5	Malpractices of buyers	52	5
6	Lack of grading facility	48	6
7	Large No. of Intermediaries	42	7
8	Lack of storage/Cold Storage facility	37	8
9	Lack of financial assistance/credit from any company	30	9
10	Lack of contracting agencies	18	10

Table 6.9 An analysis of the table indicates the Location of the selling unit is far away was ranked as the most considered factor by a farmer in Supply Chain with a Garrett score of 81 at the overall level. Transportation Facility was reported to be the second most important factor in Supply Chain by farmers at the overall level with Garrett scores of 70. Delay in payment and sale proceeds was the third most severe factor on an overall basis. Other factors according to their Garrett ranking at the aggregate level were Lack of market information, Malpractices of buyers, Lack of grading facility, Large No. of Intermediaries, Lack of storage/Cold Storage facility, Lack of financial assistance/credit from any company, Lack of contracting agencies.

6.5 AGRONOMIC CHALLENGES FACED BY THE FRUITS AND VEGETABLE CULTIVATING FARMERS

Table 6.10 Agronomic challenges faced by the farmers in Fruits And vegetable Cultivation. (N=100)

Particulars	Agronomic Challenges Faced by Farmers				PFI	Rank Order
	High Problem (3)	Medium Problem (2)	Low Problem (1)	No Problem (0)		
The lower price of vegetable	70	20	08	2	258	1
The high price of inputs	50	32	15	03	229	2
Disease attack	40	50	08	02	228	3
Insect attack	41	35	20	04	213	5
Lack of technical knowledge	43	38	10	09	225	4
Lack of HYV seed/seedling	36	42	16	06	208	6
Lack of technical help	39	30	23	08	200	7
Lack of loan facility	40	19	36	05	154	8
Losses of vegetable production due to natural calamity	12	25	43	20	117	9

(Source: Problem perceived by the farmers in vegetable cultivation.)

The observed problem perceived index of the selected nine problems in vegetable cultivation ranged from 117 to 258 against the possible range of 0 to 327. The severity of the problems was arranged in rank order according to the descending order of problem perceived index (PPI) as shown in Table 6.9 On the basis of PFI, it was observed that lower market price of vegetables, ranked first followed by the high price of inputs, disease attack, lack of technical knowledge, insect attack, lack of HYV seed/seedling, lack of technical help, lack of loan facility, losses of vegetable production due to natural calamity.

6.6 FARMER AWARENESS ABOUT POST HARVEST PROCESSES

6.6.1 Farmers Aware About the Primary Process Methods Like Grading Sorting and Packaging

Table6.11 Farmers Aware about the Primary Process Methods Like Grading Sorting and Packaging(N=100)

Sr. No	Farmers Aware about the Primary Process Methods	No. of Respondent	Percentage
1	Yes	72	72%
2	No	28	28%

The above table 6.11 shows the farmers are aware of the process of sorting, grading, and packing of the surveyed area. From the above graph can be concluded that out of 100 respondents, 72% of farmers are aware of the process of sorting, grading, and packing, followed by 28% of farmers are not aware. It can be concluded that farmers are aware of the process of sorting, grading, and packing.

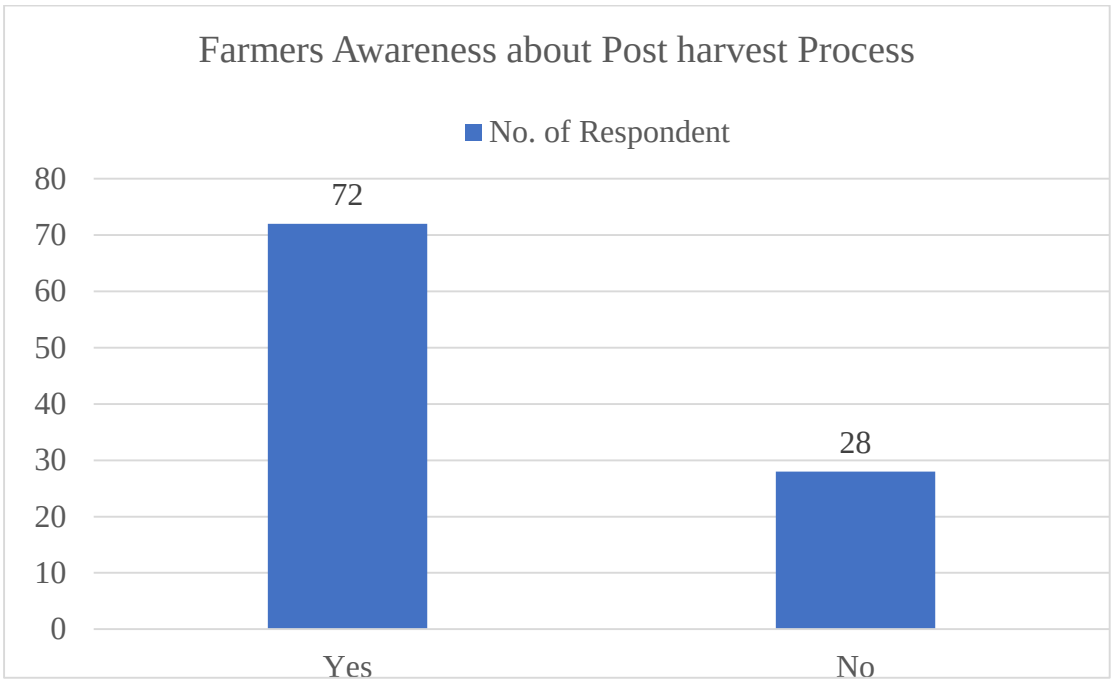


Figure 6.10 Farmers Aware about the Primary Process Methods Like Grading Sorting and Packaging

6.6.2 Farmers Want to Sell Your Fruits and Vegetables to Impagro?

Table 6.12 Farmers want to sell your fruits and vegetables to IMPAGRO? (N=100)

Sr.No.	Farmers want to sell your fruits and vegetables to IMPAGRO?	No. of Respondent	Percentage
1	Yes	76	76%
2	No	24	24%

The above table 6.12 shows the farmers are interested to sell fruits & vegetables to IMPAGRO of the surveyed area. From the above bar graph, it can be concluded that out of 100 respondents, 76% of the farmer are showing interest to sell fruits & vegetables to IMPAGRO, followed by 24% of the farmer is not interested to sell fruits & vegetables to IMPAGRO. It can be concluded that a greater number of farmers are interested to sell fruits & vegetables.

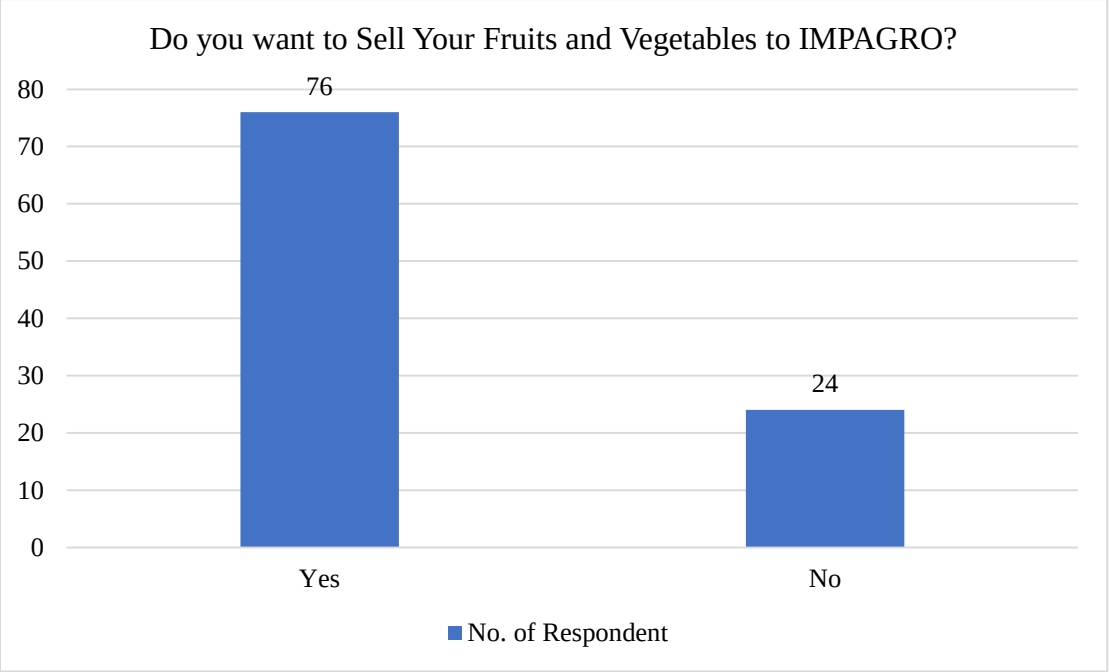


Figure 6.11 Farmers want to sell your fruits and vegetables to IMPAGRO?

7. SUMMARY AND CONCLUSION

India produces 191.7 million tons of vegetables (NHB report, 2019) and the total area under vegetable cultivation is around 10.3 million ha. Potato, tomato, onion, cabbage, and brinjal account for around 60% of the total vegetable production in terms of quantity. India's annual fruit production is 99 million tons (NHB report, 2019) and the total area under fruit cultivation is around 6.64 million ha. The major Indian fruits are mango, banana, citrus fruits, apple, guava, papaya, pineapple, and grapes.

Fresh fruits and vegetables play a vital role in the Indian context and their marketing works as an influencing force in the economy. Though retailing of fresh fruit and vegetables is a low-margin business, the market potential is very large in a country like India. This factor has attracted many corporates into this sector.

Marketing of agricultural produce is different and more challenging than many industrial products because of the perishability, seasonality, and bulkiness. The very nature of the small size of landholdings by the farmers, varied climatic conditions, production spread over a wide geographical area, mainly in remote villages, diversified consumption patterns/habits of the Indian consumers, and poor Supply Chain (SC) infrastructure makes marketing for fruits and vegetables more complicated. At the same time, Indian consumers demand fresh fruits and vegetables. The SCM plays a crucial role in marketing fruits and vegetables. Supply Chain efficiency not only helps in increased production and per capita consumption but also contributes to the economic development of the country. As a result, SCM throws both challenges and opportunities in the marketing of fruits and vegetables. Efficient SCM in marketing, not only increases the profitability and efficiency of retailers but also adds value to different stakeholders like cultivators (farmers), consolidators and consumers.

This study attempts to identify various issues involved in managing the supply chain in fruits and vegetables and identify and analyze different strategies that can be applied to optimize the supply chain in fruits and vegetables. This paper aims to analyze the business models of vegetable retailers in organized retailing.

This study's prime interest was to reveal the ground-level situations in the Supply chain of Fruits and vegetables including Constraints Faced by the farmers and Agronomic challenges faced by fruits and vegetables cultivating farmers. In this study the constraint faced by the farmer is in descending order are Far off location of selling

unit, Transportation facility Inadequate/ Costly, Delay in payment and sale proceeds, Lack of market information, Malpractices of buyers, Lack of grading facility, Large No. of Intermediaries, Lack of storage/Cold Storage facility, Lack of financial assistance/credit from any company, Lack of contracting agencies.

Major Agronomic challenges while Cultivating fruits and vegetables in descending order are the Lower price of vegetable, High price of inputs, Disease attack, Insect attack, Lack of technical knowledge, Lack of HYV seed/seedling, Lack of technical help, Lack of loan facility, Losses of vegetable production due to natural calamity.

Most of the farmers are selling their produce of Fruits and Vegetables to SAFE FPC (35%), After that 25% of farmers sell to Traders, 20 % of farmers sell to local seller due to high price, 13 %farmers sell to Regulated commission Agent, only 5% farmers sold to APMC due far-off location of APMC Unit, and 2% farmers sold to pre-harvest contracts in case of potato growers.

In the Cropping Pattern of fruits and Vegetables in Kheroj the vegetable crops are growing more than the fruits. Most of the farmers are cultivating Tomato/Brinjal/Bottle gourd/Ridge gourd during Kharif Season. In Rabi season Farmers Cultivating crops like Potato/Onion/Tomato/Strawberry. And in the summer season the farmers cultivating crops like Okra/ Tomato/ Watermelon/ Muskmelon/ Papaya. The Production of vegetable Crops like Tomato, Potato, and Brinjal is very high in Kheroj. In Kheroj 72% of farmers aware of the Primary Processing Methods Like Grading Sorting and Packaging and 28% of farmers are not aware of the Primary Processing Method. I observed that Farmer are worried about their B & C graded product, because company purchase only A graded product, how they sell rest of product. Majority of farmer-members lack awareness about the harvesting practices and also handling of fruits and vegetables.

SUGGESTION

- The company should establish a collection center nearby the sourcing area so the farmers easily sell their produce of fruits and vegetables and how can farmers reduce the transportation cost and save time.
- Company provides cold storage facility at the collection centre for highly perishable fruits and vegetables. Company provides the technical support to farmer to reduce the agronomic challenges in fruits and vegetables cultivation.
- Aware farmers about the price that in mandi the price of vegetables is rises and fall according to the arrival of produce in the Mandi, but at the collection center, a fixed price is declared for a whole day just before one day. This will help the farmer to take a decision for selling their produce to Mandi or the collection center.

REFERENCES

Acharya, S. S., and Agarwal, N. L., 1998. Marketing function. In: Agricultural Marketing in India. Oxford and IBH, New Delhi. pp. 386-387.

ANITHA ARYA, 2008, Changing market environment in Gujarat agriculture for sustainable development. Agriculture Economics.Res.Rev.21:434.

APEDA. (2014, August 10). *Fresh Fruits and Vegetables*. Retrieved August 8, 2014, from Agricultural & Processed Food Products Export Development Authority: http://www.apeda.gov.in/ apedawebsite/six_head_product/FFV.htm

ASSOCHAM. (2013). *Horticulture Sector in India- State-level experience.* New Delhi: The Associated Chambers of Commerce and Industry of India.

Bhardwaj, S., & Palaparthy, I. (2008). Factors Influencing Indian Supply Chains of Fruits and Vegetables: A Literature Review. *The Icfai University Journal of Supply Chain Management, V*(3), 59-68.

GANESH KUMAR, B., PRAMANIK, S.C. AND SHAKILA NAWAZ, 2004, Economics of production and marketing of vegetables in Andaman and Nicobar islands. Ind. J. Agric. Mktg, 18 (2) 36-40.

Ganesh Kumar, B., Pramanik, S.C. and Shakila Nawaz, 2004. Economics of production and marketing of vegetables in Andaman and Nicobar islands. Indian Journal of Agricultural Marketing, 18 (2): pp. 36-40.

Gopalan, M. and Gopalan, T. M., 1991. Marketing efficiency of co-operative in potato region in Tamil Nadu: An empirical study. Indian Co-operative Review, 28 (3): pp. 203-221.

Gupta, S. P., and Rathore, N. S., 1999. Disposal pattern and constraints in the vegetable market: A case study of Raipur district of Madhya Pradesh. Indian Journal of Agricultural Marketing, 42 (1): pp. 53-59.

Halder, Piali and Pati, Simayan, 2011. A need for a paradigm shift to improve supply chain management of fruits & vegetables in India. Asian Journal of Agriculture and Rural Development, 1 (1): pp.1-20.

Modi, P., Mishra, D., Gulati, H., & Murugesan, K. (2009, April- June). UTTARAKHAND STATE COOPERATIVE FEDERAL- TION: CAN IT HELP THE HORTICULTURE FARMERS?

MOHAMED ZAIRI, (1998), Best practices in supply chain management: The experience of the retail sector. European Journal of Innovation Management,1(2):59

RICKS, D., WOODS, T. AND STERNS, J., 2000, Chain management and marketing performance in the fruit industry. Acta Horticulture, 536(4):661-668.

RICKS, DONALD, TIMOTHY WOODS, AND JAMES STERN, 1999. "Supply chain management improving vertical coordination in fruit industries." Journal of Food Distribution Research. 30(3):44-53.

Shilpa, K., 2008. Supply chain management in vegetable marketing: A comparative analysis. MABM thesis, University of Agricultural Science, Dharwad (India).

Sidhu, R.S., Sanjay Kumar, Kamal Vatta and Parminder Singh, 2010. Supply chain analysis of onion and cauliflower in Punjab. Agricultural Economics Research Review, 23 (Conference Number): pp. 445-453.

Singh, M. R., 1997. Economics of production and marketing of vegetables: A case study in Patan block of Jabalpur district. Indian Journal of Agricultural Marketing, 40 (2): pp. 18-20.

SINGH, R.S., 1996, Marketing of citrus fruits in mid-hills of Jammu and Kashmir. Bihar Journal of agricultural marketing, 4:242-249.

SUBHA, V., 2004, Managing supply chain. Indian Journal of Marketing, 34(1):14-15.

SURESH REDDY (2005) Gaining competitive advantage through supply chain management. Indian journal of marketing, 12(5):32-34.

Viswanadham, N. (2007). *Can India be the food basket for the world? Working Paper Series, IBS, Hyderabad.* Retrievedfromhttp:// www.cccindia.co/corecentre/Database/Docs/DocFiles/Can_ India_be.pdf

Wermund, U. and Fearne, A., 2000. Key challenges facing the cherry supply chain in the U.K. Acta Hort., 53 (6): pp. 613-619,

WILSON, N., (1996), The supply chain of perishable products in Northern Europe. British Food Journal, 98(6): 9-1.

Web References:

- https://www.impagrofarming.com/
- https://doh.gujarat.gov.in/
- https://agricoop.nic.in/sites/default/files/GUJ%2028-Sabarkantha%2030.04.2011.pdf
- http://nhb.gov.in/statistics
- https://www.aps.dac.gov.in/

ANNEXURE

Respondent No _____ Date:_____

1.Respondent detail

a. Name of farmer: _____
b. Age: _____
c. Education: _____
d. Village: _____
e. Taluka: _____
f. District: _____
g. Experience in farming: _____
h. Name the vegetables/fruits that are grown: _____
i. To whom you sell the vegetables/ fruits: _____

2. **Land holdings and area under cultivation of fruits and vegetables.**

Sr. no	**Type of land holding**	**Area in Acre.**	**Cultivation of vegetables**	**Cultivation of fruits**
			Area (acre)	**Area(acre)**
1	**Dry land**			
2	**Irrigated land**			
3	**Rainfed land**			
4	**Wet land**			
	Total			

3. What is your Annual income ?

Sl. No.	**Source of Income**	**Income in Rupees (Rs.)**
1	**Agriculture**	
2	**Horticulture**	
3	**Others a.)**	
	b.)	
	Total Income	

4. Cropping pattern : Which crops have you cultivated during previous year ?

Sl.No.	**Kharif season**		**Rabi Season**		**Summer Season**		**Total Area(ha)**
	Crop	**Area(ha)**	**Crop**	**Area(ha)**	**Crop**	**Area(ha)**	
1							
2							
3							
4							
5							

5. Where the vegetable are sold or to whom the vegetable are sold ?

Sr.No.	Particulars	Place of selling
1	Pre-harvest contracts	
2	Local Sellers	
3	Regulated Commission Agent	
4	Supermarkets	
5	Traders	
6	Farmer Producer Company	

6. Agronomic challenges faced by the farmers in Fruits And vegetables Cultivation.

Particulars	Agronomic challenges Faced By Farmers			
	High Problem (3)	Medium Problem (2)	Low Problem (1)	No Problem (0)
Lower price of vegetable				
High price of inputs				
Disease attack				
Insect attack				
Lack of technical knowledge				
Lack of HYV seed/seedling				
Lack of technical help				
Lack of loan facility				
Losses of vegetable production due to natural calamity				

7.**Are you cultivating Fruits or Vegetables ?**

Fruits	Vegetables	Both

8. Do you make any value addition for vegetables before selling? Yes/No

(a)Are you aware about all post harvest process like sorting, grading, and packing?

Yes/No

(b) If yes then, do you follow all post harvest process?

Always	Most	Sometimes	Never

(c) In post harvest technology, do you follow process of sorting and grading? Yes/No

(d) If yes then what you grade?

A' grade	B' grade	C' grade

(e) Do you follow process of Packing? Yes/No

(f) If yes then what method?

Loose	Crate	Gunny bags	Plastic bag	Box

(g)Where do you sell your product?

Local	APMC

(h) Are you sell your product to private company? Yes/No

Big bazaar	Reliance	Mandali	IMPAGRO

9.Problems faced by the farmers in existing supply chain? Yes/No

If yes which of the following

Sr. No	**Particulars**	**Ranking**
1	Location of selling unit far away	
2	Transportation facility- Inadequate/Costly	
3	Lack of market information	
4	Malpractices of buyers	
5	Lack of grading facility	
6	Lack of storage/ cold storage facility	
7	Large No. of Intermediaries	
8	Lack of financial assistance/credit from any company	
9	Delay in payment and sale proceeds	
10	Lack of contracting agencies	

Others Specify:_____

10. Do you want to sell your fruits and vegetables to IMPAGRO? Yes/No

(A) If No then, why? _____

(B)Farmers feedback**:**_____

_____