

UGC -Funded Major Research Project

Dynamics of Marketing Fruits and Vegetables

A STUDY FOR
FARMERS AND MARKET INTERMEDIARIES IN
INDORE DISTRICT

DR. YAMINI KARMARKAR

DEVI AHILYA UNIVERSITY, INDORE

2018

Dynamics of Marketing of Vegetables& fruits: A Study for Farmers and Market Intermediaries in Indore District.

Major Research Project submitted to
University Grants Commission

By

Dr. Yamini Karmarkar
Research Centre
International Institute of Professional Studies,
Devi Ahilya University, Indore, M.P

Certificate

I hereby certify that this final report titled **"Dynamics of Marketing of Vegetables& fruits: A Study for Farmers and Market Intermediaries in Indore District"** has been written by the undersigned on the basis of research work done under "Major Research Project" funded by University Grants Commission (**MRP-MAJOR-MANA-2013-28038,)** during July 2015 to June 2018.

This final report is being submitted to University Grants Commission.

Principal Investigator
Dr.Yamini Karmarkar

Acknowledgement

Expressing gratitude signifies the satisfactory completion of task. When I started working on this project, my only prayer to my beloved Guru was that through this work I should be able to add some value to existing section of society which is truly ignored -the marketing channel of fruits and vegetables and all its intermediaries. Task was difficult given the vast nature of study, wide range of subjects and processes, lack of information available and several other challenges. But at every stage of the work I could feel HIS guidance and blessings flowing. Many people helped in many ways. This report is dedicated to all of them.

This work would not have been possible without the help of all the farmers, agents, wholesalers and consumers who shared their information wholeheartedly. Among the farmers, Pandu dada, Pappu bhai and Rahul bhai are special names to mention for their valuable insights. The discussions with them conveyed a feeling that everyone is willing to contribute for a positive change in whatever small way they can.

The idea of this study could be implemented because University Grants Commission (UGC, New Delhi) recognized the worth and extended funding support under Major Research Project. I express my gratitude to UGC. I also express heartfelt gratitude to Dr. Rajnish Jain, Secretary UGC, who was formerly at Devi Ahilya University and was the incharge of Development section at the time when this research proposal was submitted.

The research centre IIPS was the lifeline for this project. Directors of the institute during the project duration – Dr. B.K. Tripathi while it began and Dr. Anand Sapre while it ended, were continuous source of help and support. The colleagues Dr. Suresh Patidar, Dr. Geeta Nema, Dr. Sujata Parwani, Mr. Yogendra Bawal contributed through their lively discussions. The help received from office staff Mr. Manoj Mishra, Mr. Pankaj Tripathi and Mr. Lokesh was also significant. Students Shubham, Brijesh and Aman were

the cheerful team that worked for data collection. And how can I not mention Ms. Matreye Jain, while expressing my gratitude. She was a constant companion for two years, the most humble and docile and dedicated partner in this project.

I extend my thanks to Dr. Sangeeta Jain and colleagues at IMS, my present department for their unconditional love and support. The other staff at other departments like development section, accounts and finance and others, are also thanked for their timely help.

The nature of the project demanded lot of field visits – to villages, mandis and markets. It was time consuming. My family remained a constant source of strength and support throughout. All these words can only partially express gratitude; it cannot capture the feelings of my heart. My parents Eaknath and Eakta Shirdhonkar more than just filled the vacuum in home when I was at work. My husband Avinash Karmarkar, was the key person in instilling the idea of this research. He guided at each stage with critical inputs. His experience of working with more than 30,000 farmers helped in framing the right questions and identifying the right problems. My sons Siddhant and Bhaskar were very patient and caring throughout and gave inputs of emotional strength when required.

Last but not the least, my thanks to my domestic support system Tara, Lata, Sangeeta and Swati for taking care of everything so that I could focus on work.

It is said that he who thanks but with the lips thanks but in part; the full, the true Thanksgiving Comes from the heart. So, a big, heartfelt thanks goes to everyone because of whom this research could see the light of day.

Dr. Yamini Karmarkar

Preface

(१२,१।३अ) यस्यां समुद्र उत सिन्धुर् आपो यस्याम् अन्नं कृष्टयः संबभूवुः|

(१२,१।३च) यस्याम् इदं जिन्वति प्राणद् एजत् सा नो भूमिः पूर्वपेये दधातु ||३||

BaUima saU@t, Aqava- vaod

जिस भूमि में महासागर, नदियां और जलाशय विद्यमान हैं, जिसमें अनेक प्रकार के भोज्य पदार्थ उपजते हैं तथा कृषि, व्यापार आदि करने वाले लोग सामाजिक संगठन बनाकर रहते हैं, जिस भूमि में ये सांस लेते प्राणि चलते फिरते हैं ः वह मातृभूमि हमें भोज्य पदार्थ प्रदान करे.

Earth upon which ocean, rivers and water bodies exist, Earth which enables the cultivation of food, where farmers, business people live together as a community. Earth, upon which this moving, breathing life exists, May that motherland bestow up on us the finest of her harvests as food.

Food is the basic necessity for humans. In India we are fortunate to be bestowed with best resources in terms of climate, soil and water contributing to abundance in variety and quantity of food production. The country has come a long way after independence and data shows that now it is a net exporter in food.

The business scenario in India has also developed significantly generating prosperity in several related segments. Yet, there is much to be accomplished. The second line of above phrase from Atharva Veda says that the motherland is a place where farmers and businessmen live as one community. But today's India does not reflect this. The business is prospering but the farmer is not.

In fact agri-business is the most unorganized and inefficient system in the country today. The major sufferers are small farmers who are devoid of any bargaining power to fetch better price for their crops. Horticulture crops particularly are considered to be high value generating crops. But due to perishability, small lot size, no branding of products, no proper packaging and several other issues, these farmers are deprived of the benefits of a good business.

The present study was conceived and planned in 2014 when agri-products supply chain was emerging as a new concept. Most of the attention of academia and business was on enhancing farm level productivity. Presently this area has gained lot of

significance. The government has realized this lately and has taken up "Doubling of Farmers Income by 2022-23" as a key agenda for present. The report has identified agri supply chain as one of the key areas which require improvement at multiple levels.

This study has tried to address the supply chain issue at three levels – farmers, intermediaries and customers. It tries to propose a solution for each of these levels. Reducing inefficiencies should be the main objective of the supply chain. Enhancement of income may be a natural outcome of this.

The researcher sees the dream of a day when farming will be a developed and profitable business and farmer communities will stand together in groups as corporate, customers will be stakeholders in the farming process. This might have indirect long term consequences – the young generation may get interested in taking farming and allied services as career options and put a halt to mad flight of rural youth towards cities for doing non – farming jobs.

There will be enough prosperity for farmers along with businessmen. And then they will be a truly supportive community for each other deriving the true sense of "*कृष्टयः संबभूवुः*".

****

Table of Contents

List of Figures and Graphs

List of Tables

List of Annexure

Annexure Number	Name
A1.1	Questionnaire-1 Farmer Cost of Production Template
A1.2	Questionnaire -2 FAWRC Market data Template
A1.3	Questionnaire -3 Consumer Feedback on Anar Bazar
A1.4	Questionnaire- 4 Home Delivery Potential Survey Template – For Consumer
A1.5	Questionnaire – 5 Home Delivery Potential through Piggy Backing Survey Template – For Retailers
A2.1	Published Paper -1 Small but Sustainable – Applying PGS to strengthen farmer's opportunity of earning in fruits and vegetables supply chain- A Conceptual Framework, August 2018, Volume 5, Issue 8 www.jetir.org (ISSN-2349-5162), Journal of Emerging Technologies and Innovative Research (JETIR), UGC Listed Journal
A2.2	Published Paper -1 Home Delivery of Agri Fresh – Can Piggy backing be a new business model, Prestige Journal

Chapter 1

Introduction

Chapter Highlights

1.1.Agriculture the Back Bone of Country

1.1.2. Decreasing land holding – increasing small and marginal farmers

1.1.3. Misery of Farmers

1.2. Horticulture – The High Value Segmet

1.3. Broken Backbone – Poor state of Agri Supply Chain

1.3.1. Increasing Food Loss

1.3.2. Lack of Cold chain support

1.3.3. High Margins of intermediaries and Depleting Farmers income

1.4. Demand increasing in FV

1.5. Sustainable Development in Farming

1.5.1 Problems of Marketing of Vegetables and Fruits

1.6 Research Gap

1.7 Objectives

1. Introduction

1.1. Agriculture the Back Bone of Country

In my early schooldays I learnt in social science that India is agriculture based country which means that 70 % of its people earn their living from agriculture and allied activities. And I also observed that majority of farmers are poor – particularly the ones who have small land holdings. Gradually, the statistic changed. According to (NSS 70th Round, 2014), the agricultural households were about 58 % of the total estimated rural households. But interestingly they contribute 16% to country's GDP and yet majority of farmers are still poor.

Table below shows that there has been a substantial growth in the production of horticulture crops and food grains in the country over a period of past few years. Though the variation in annual percent growth is high due to large dependence on monsoon and other reasons, still the sector has witnessed a CAGR of 4.86% in horticulture production and 2.09 % CAGR in Food Grains production. India is the largest producer of several agricultural produces and second largest producer of horticulture crops like beans, cabbages, onions, potatoes etc (Sector Profile, 2016). The rising income levels and increasing urbanisation has given a boost to the domestic food consumption industry as well.

As seen from the table, agriculture and allied sector has added substantial value to economy. The GVA has shown and increasing trend year on year. But there is a decline in the share of agriculture and allied Sectors in the GVA from 18.6 percent in 2013-14 to 17.4 percent in 2016-17. Falling share of agriculture and allied sectors in GVA is an expected outcome in a fast growing and structurally changing economy. The sector has witnessed a growth of 4.9 % in the year 2016-17.

The above information makes it clear that agriculture and its sustainability is at the centre stage in terms of policy. Nation's policy for the sector has primarily focused on two dimensions – increasing productivity and improving food security.

Table 1.1- Production and Growth of Agriculture in India				
	Horticulture (Million Tonnes)	**Annual Percent Growth**	**Food Grains (Million Tonnes)**	**Annual Percent Growth**
2001-02	145.79		212.85	
2002-03	144.38	-0.97	174.77	-17.89
2003-04	153.3	6.18	213.19	21.98
2004-05	166.94	8.90	198.36	-6.96
2005-06	182.82	9.51	208.6	5.16
2006-07	191.81	4.92	217.28	4.16
2007-08	211.24	10.13	230.78	6.21
2008-09	214.72	1.65	234.47	1.60
2009-10	223.09	3.90	218.11	-6.98
2010-11	240.53	7.82	244.49	12.09
2011-12	257.28	6.96	259.29	6.05
2012-13	268.85	4.50	257.13	-0.83
2013-14	277.35	3.16	265.57	3.28
2014-15	280.99	1.31	252.02	-5.10
2015-16	286.19	1.85	251.57	-0.18
2016-17(Provisional)	295.16	3.13	273.38	8.67
CAGR		**4.86**		**2.09**
Source - (Horticulture Division, 2015)				

Table 1.2- Gross Value Added by Agriculture Sector in the Economy				
	Rs in Crore			
	2013-14	**2014-15**	**2015-16**	**2016-17**
GVA of Agriculture and Allied Sectors	19,26,372	20,68,958	21,75,547	23,72,085
Percent to total GVA	18.6	18	17.5	17.4
Source 1-Agriculture Annual Report 2017-18				

The present government has laid out the vision for doubling farmer's income till 2022-23.The policy paper by (Chand, Doubling Farmer's Income- Rational, Strategy, Prospects & Action Plan, Policy Paper, 2017) suggests that doubling the real income of farmers in this stipulated time requires 10.41% annual growth in farmer's income.

It suggests a list of measures which might accelerate the growth operating within agriculture sector. Improvement in productivity, resource use efficiency or saving cost of production, increasing cropping intensity, diversification towards high value crops are a few to name. Shifting cultivators from farm to non-farm activities and improvement of prices received are yet another measures suggested by the policy document.

1.1.2. Decreasing land holding – increasing small and marginal farmers

Almost 85% of farmers are marginal and small farmers as their land holding is less than 2 hectare. These small farms, though operating only on 44 per cent of land under cultivation, are the main providers of food and nutritional security to the nation, but have limited access to technology, inputs, credit, capital and markets . The estimates indicate that small and marginal farmers may account for more than 91 per cent of farm holdings by 2030. The continuously declining farm size also gives rise to concerns on the very sustainability of the small farm

Table 1.3- Farmer's Land Holding in India

Sr.No	Size Group	Percentage of Number of Operational holdings to total holdings	Percentage of area operated to total
1	Marginal (Below 1.00 ha)	67.1	22.50
2	Small (1.00-2.00ha)	17.91	22.08
3	Semi-Medium (2.00 - 4.00 ha)	10.04	23.63
4	Medium (4.00 - 10.00 ha)	4.25	21.2
5	Large (10.00 ha and above)	0.7	10.59

Source 2- Agriculture Census 2011

The probable reason of decrease in land holding could be the fact that several farmers sell part of their land to repay debt. There could be other reasons like increasing family size and distribution of land among family members. The declining farm size is indicative of yet another upcoming problem. This will further add to farming being un profitable venture. It will further make it difficult for the farmers to benefitted by economies of scale.

1.1.3. Misery of Farmers

The farmer feeds the nation but remains hungry and deprived himself. Average earning levels of the farmers in the country present an extremely grave picture. The Ministry of Statistics and Program Implementation did the NSS 70th round survey (NSS 70th Round, 2014) in 2014 to find out the Situation of Agricultural Households in India Households in India. The results were eye openers. There are around 9 crore households in India who derive their living from agriculture. 42% of farmers live below poverty line.

Table 1.4- Average Monthly Income (Rs) per agricultural household for year (2012-2013)

	Income from wages	Net receipt from cultivation	net receipts from farming of animals	net receipt from non-farm business	Total Income
Madhya Pradesh	1332	4016	732	129	6210
All India	2071	3081	763	512	6426
Source - NSS 70th round					

The poor level of income leads to high indebtedness among farmers. The same survey shows that there is and 52% of the agriculture households are indebted with an average debt of Rs 47,000 per farmer in the country. In Madhya Pradesh 45.7% of the farmers are indebted with an average loan of Rs 27000 per farmer. No wonder there has been an increased concern about farmer suicides in the country. Government

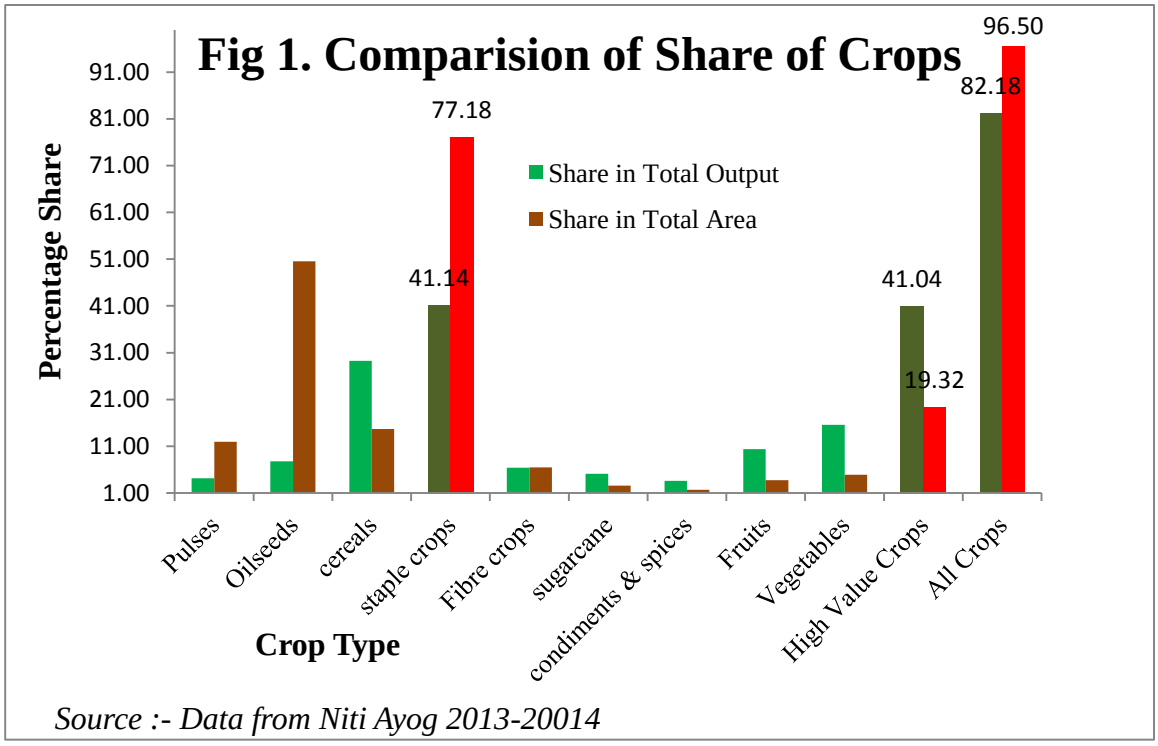
has taken several measures for improving this condition. Schemes for providing facilities for enhancement of yield, training for imparting technical knowhow and large scale loan exemptions have no doubt provided some relief to the farmer. But, a lot needs to be done to explore ways to improve the income of the farmers.

In an effort to boost socio-economic growth in the agriculture sector, the Government has set the goal of doubling farmers' income by 2022-23. To achieve this, government support and policy interventions need to shift from a production-driven approach to a demand-driven value system. While other incremental efforts to optimise production continue, focus on the post-production logistics connectivity is needed as a key transformation to redefine agriculture from cultivation alone, to gainful agriculture. (Chand, Doubling Farmer's Income- Rational, Strategy, Prospects & Action Plan, Policy Paper, 2017)

1.2. Horticulture – The High Value Segment

Keeping in mind the agenda of doubling farmer's income, multiple options have been explored. A farmer needs to carefully design the portfolio of his crops including low value but less risky crops and high value and high risk crops. Horticulture crops are an area which is seen to be high value crops assuring better source of income for farmers. Horticulture sector comprises of Fruits, Vegetables, Condiments and Spices, etc. This forms a separate segment in the agriculture which has stated gaining significance recently as these crops are considered to be high value crops and help increase the return for farmer. Can horticulture crops (High value crops) be an area of focus for achieving this objective? A look at figure 1 shows that the high value crops which include fruits and vegetables occupy an area of 19.32% of total cultivated land in the country as against 77% land occupied by staple crops like pulses, cereals etc. But the horticulture crops contribute 41.04% of output as against 41.14% contribution of staple crops. The current estimates confirm this as production of horticulture crops is estimated at record 307.16 million tonnes (mt) in 2017-18, 5.5% higher than previous year. (Sector Profile, 2016).

Figure 1.1- Comparison of Share of Crops



Source :- Data from Niti Ayog 2013-20014

Thus, horticulture crops are being viewed as a prominent source of increasing the farmer's income.

1.3. Broken Backbone – Poor state of Agri Supply Chain

(Particular Reference to Perishable Crops)

Though the improvement in production has been achieved to a large extent, in India, still farming does not count as a profitable business venture due to poor income generated by producers. Most studies attribute this loss making pattern of agriculture to the faulty marketing practices in agriculture. Agricultural marketing has been defined by the National Commission on Farmers as "a process which starts with a decision to produce a saleable farm commodity and it involves all aspects of market structure of system, both functional and institutional, based on technical and economic considerations and includes pre and post-harvest operations viz. assembling, grading, storage, transportation and distribution." (FICCI Report, 2017) Agricultural marketing differs from conventionally known meaning of marketing which implies meeting the consumers demands or expectations. Since the major output of

agricultural marketing is food, and food being a basic, life-sustaining necessity and a human right, ensuring the supply of food becomes an important part of the mandate of governments across the world. In addition to the pure exchange of goods, agricultural marketing also serves a greater social purpose in terms of raising incomes in the rural hinterlands.

In India, farmers' produce is generally disposed off in the village, rural / primary market or secondary agricultural market. According to XII plan report on fruits and vegetables (Agriculture Division, 2011), the number of regulated (secondary) agricultural markets stood at 7,157 as of March 2010 as compared to just 286 in 1950. There were also about 22,221 rural periodical markets, about 15 per cent of which function under the ambit of regulation.

Average area served by a market is 115 sq. km while an average area served by a regulated market is 454 sq. km. According to recommendations by National Farmers Commission, availability of Markets should be within 5 km radius (approx. 80 sq km) (2004). Not only the distance to markets is large, but a look at the supply chain of vegetables and fruits indicates the poor state of affairs at all levels. Dominance by middle men, farmers with small land holdings, very small lot size of the product, perishability, poor infrastructure are some of the prevailing issues which have contributed to inefficiencies in the value chain of vegetables and fruits.

India over the years witnessed a marked increase in production of perishable high nutrition products like fruits, vegetables, meat and poultry products etc. but development of cold-chain infrastructure was not strategically directed, for safe handling and to convey these perishable products to markets, except in the dairy sector. A resultant demand supply mismatch emerged across these agricultural commodities, frequently contributing to wide spread price fluctuations and inflation. The inadequacy of scientific farm-to-market logistics, also contributed to high food losses in case of perishable foods, further adding to inflationary pressures.

1.3.1. Increasing Food Loss

There has been a substantial increase in Production but failure in distribution. Food and agriculture Organisation of Untied Nation (FAO) define "Food loss and food waste" refer to the decrease of food in subsequent stages of the food supply chain intended for human consumption. Food is lost or wasted throughout the supply chain, from initial production down to final household consumption. The decrease may be accidental or intentional, but ultimately leads to less food available for all. Food that gets spilled or spoilt before it reaches its final product or retail stage is called food loss.

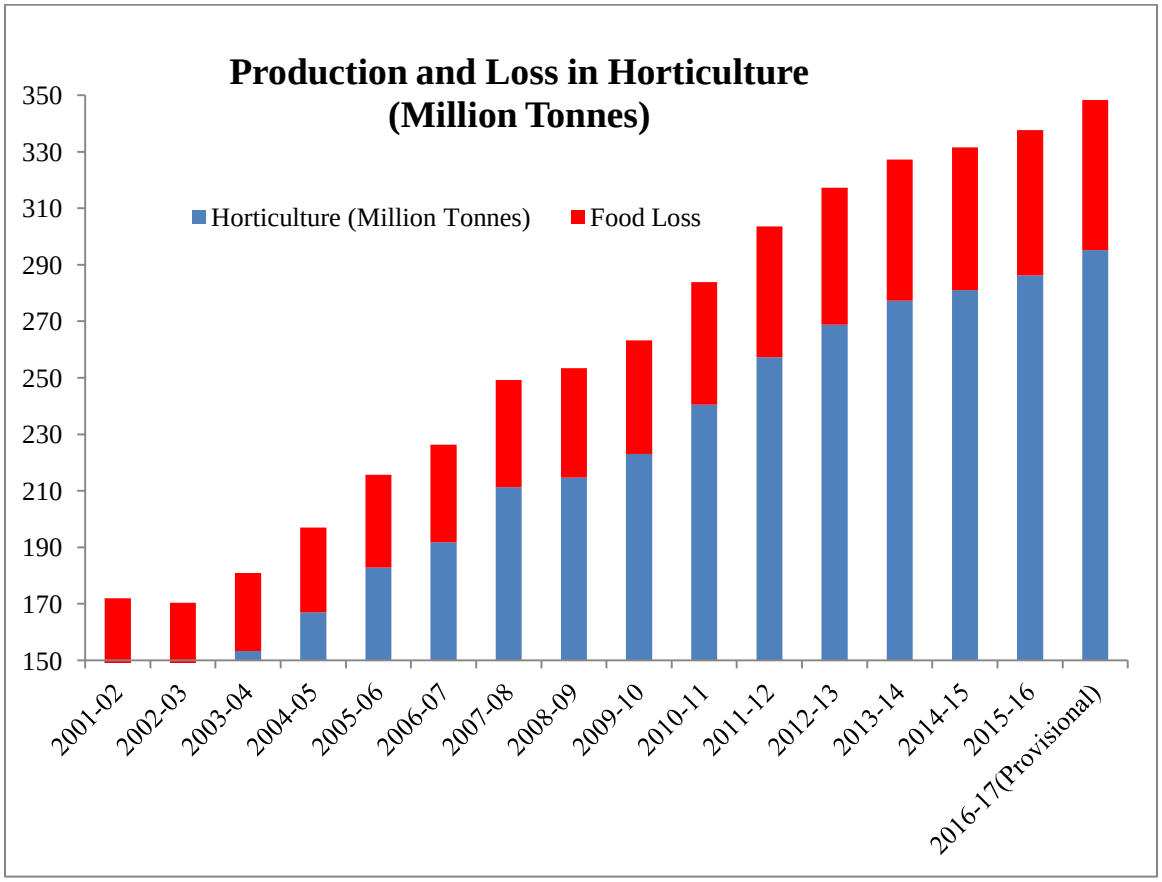
This may be due to problems in harvesting, storage, packing, transport, infrastructure or market / price mechanisms, as well as institutional and legal frameworks.

A study on relationship between food wastage and cold storage infrastructure (Emerson Climate Technologies, 2013), revealed that average food wastage is highest in case of fruits and vegetables in India. It is as high as 18 % per year. Going by this estimate figure below shows the food crop wasted over the years due to lack of supply chain related infrastructure in the country. In the perishable produce segment, the fruit and vegetable sector is the one with the weakest market connectivity and in consequence suffers the highest food loss. Food loss is not necessarily due to lack of technology; **a large quantum of food loss occurs from a lack of access to the national markets, resulting in localized surplus and discards in the hands of farmers.** (Department of Agriculture, Cooperation and Farmers' Welfare, 2017). Estimation of the monetary value of Food Loss shows that India looses approximately Rs 13,000 Crore worth of fruits and vegetables.

An assessment was done by the National Centre for Cold-chain Development (NCCD) in 2015-16, of the losses incurred on fruits & vegetables, conducted with Amity International Centre for Post-Harvest Technology & Cold-Chain Management. They identified physical losses (weight loss and discards) at varied stages of movement to market. Each stage of measure was where a change in custody occurred and the produce entered the next step in its post-harvest journey to market.

a) At farm-gate (point of harvest); b) At collection point (aggregation); c) On loading onto transport; d) During transportation; e) On receiving at Wholesale point

Figure 1.2- Production and Loss in Horticulture



Source 3 (NCCD, 2016), National Centre for Cold Chain Development

The study reported maximum loss upto 44% in case of fruits like pear and litchi and upto 35% for vegetables like bottle gourd (Lauki) and peas (matar). These results were from UP, Haryana and Uttarakhand. Studies in other states have reported as high as 50 % production losses in fruits and vegetables. This is extremely high by any definition of efficiency in supply chain.

The answer to food loss, is market linkage and effective logistics. Especially in view of the fact, that many a time, there remains unfulfilled demand, while the surplus is discarded due to inability to connect with that demand.

1.3.2. Lack of Cold chain support

A comprehensive study (NCCD, 2016) was conducted by National Centre for Cold-chain Development (NCCD) with Nabard Consultancy Services (NABCONS) in 2015. It pointed out that the existing trade in perishable food items suffers a lack of market connectivity from shortfall in infrastructure. This shortfall directly impacted the income capabilities of farmers as they remained limited in their market reach, restricting the selling range of their produce. The study evaluated the entire chain of logistics needed for perishable crops. The study identified the actual gap in the cold chain infrastructure in India.

Table 1.5- Cold-chain infrastructure shortfall

Type of Infrastructure	**% share Shortfall**
Integrated Pack-house	99.6
Reefer Transport	85
Cold Storage (Bulk)	10
Ripening Units	91
Source: NCCD 2015-2016 Study	

A Cold chain infrastructure is more than just cold storage. It includes integrated pack houses, Refrigerated Transport Vans, bulk storages and ripening units etc. The above table shows that there is as high as 99 % shortfall in the infrastructure required for cold chains. There exist hardly any packaging houses which are necessary for assembling and preparing the fresh produce to enter the cold-chain. Without these assembly and preconditioning units, the farmer cannot take advantage of the national market and is forced to limit his/her selling range to the limits imposed by the natural holding life of the produce.

1.33 High Margins of intermediaries and Depleting Farmers income

Selling of horticulture crops is largely done at local levels – farmer markets, agriculture mandis, wholesellers, contract farmers etc. Mandi's contribute out 90% of sales of fruits and vegetables. There are regulated as well as unregulated mandi's in India.

Figure 1.3- Value Chain of market

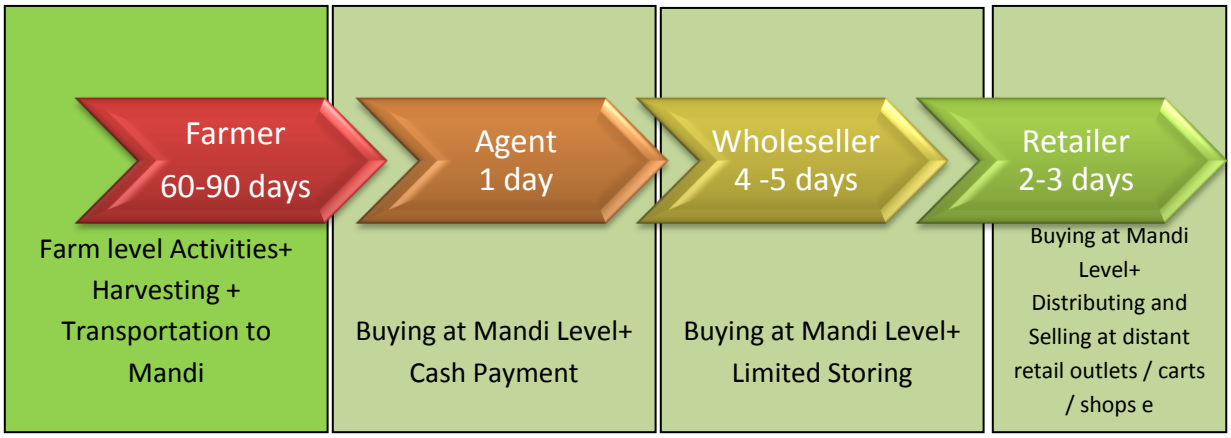
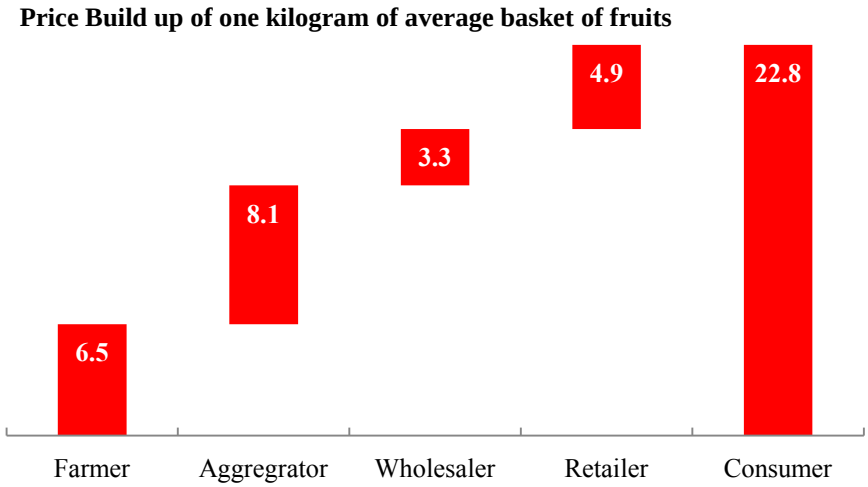
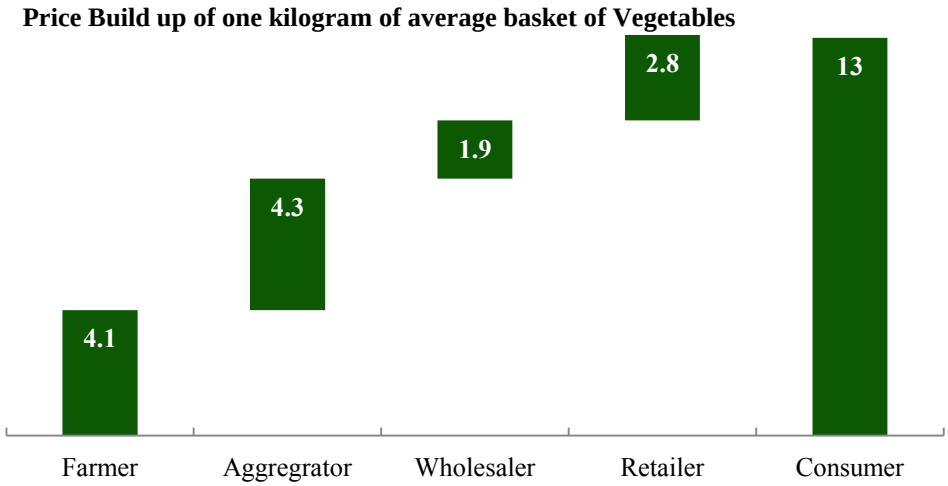


Figure 1.4- Price Build up of one kilogram of average basket of fruits



Source- Report on Doubling of Farmers Income, 2017

Figure 1.5- Price Build up of one kilogram of average basket of Vegetables



Source - Report Doubling Farmer's Income, 2017

The adjoining figure represents the most common flow of marketable fruits and vegetables. The farmers from nearby villages bring their crops to mandis early morning. There are agents and wholesalers in these mandis who buy the produce from the farmer and sell to the retailers. The farmers hardly have any say in the price setting mechanism. Once they arrive at the mandi, they are the mercy of agents who charge high commission. Farmer's share in the consumer's rupee is only Rs 6.5 out of Rs 22.8 paid by the consumer, which is approximately 28% only in case of vegetables and Rs. 4.1 out of Rs. 13, approximating to 13% in fruits. The point worth noticing here is that the farmer earns this margin after putting in efforts for the entire duration of crop growth (sowing to harvesting) which may range from 60 days to 90 days or even more in case of some crops. The wholesaler and retailers generally earn this margin over 3-4 days as the produce is perishable. But the agent earns this margin only in one day, rather in just couple of hours when the farmer comes in the mandi.

1.4. Demand increasing in FV

India is a developing economy. The per capita income is on a constantly growing stage. In the urban areas, the growth is much higher. With smaller families, rising incomes and changing lifestyle and awareness towards health and food has contributed to increased consumption of fruits and vegetables. The per person recommended

consumption of fruits daily is 230 grams(WHO) and vegetables is 400 grams per person per day. The available production is less that the recommended level. Given the buying capacity of urban India, there is an indication that the demand for fruits and vegetables is going to increase in near future. Moreover, requirement for export and food processing units is also contributing to the increased demand.

Table 1.6- Per capita Availability of Fruits and Vegetables	
Projected Population of India in 2016-17 (million)	1268
Fruits Production in 2016-17 (thousand tones)	92846
Vegetables Production in 2016-17 (thousand tones)	175007.9
Per Capita Availability of Fruits (gms/person/day)	200.6
Per Capita Availability of Vegetables (gms/person/day)	378.13
Source- Horticulture Statistics at Glance, 2017	

1.5. Sustainable Development in Farming

The increasing demand for fruits and vegetables gives a hope for increasing farmers income. But, in order to realize this, the first and foremost requirement is to make farming sustainable and profitable venture.

Year 2015 was a critical political and diplomatic milestone: the member states of the United Nations signed a new agenda for development, with the 17 Sustainable Development Goals (SDGs) placing sustainability at the core of international efforts. Development and academic actors are since then exploring new avenues for translating the SDGs into reality and implementing global and local frameworks and partnerships. The SDG is a matter of interest in the agriculture sector in India as it has seen several ups and downs in the past years.

1.5.1 Problems of Marketing of Vegetables and Fruits

In most of the developing countries, including some part of India, there are several types of market linkage arrangements for agri-produce. Exports, Food Processing,

using technology etc are some examples. The success of these arrangements depends on the market and the efficiency of operations. But, most of these arrangements do not include small and marginal farmers. They are still dependent upon the local mandis, agents etc to buy their produce. They are not equipped with ways and means to add value to their produce. According to XII plan report on Fruits and Vegetables marketing (Agriculture Division, 2011), the major concerns for marketing of fruits and vegetables in India are as follows -

- Too many intermediaries resulting in high cost of goods and services
- Inadequate infrastructure for storage, sorting, grading or post-harvest management
- Private sector unwilling to invest in logistics or infrastructure under prevailing conditions Price setting mechanism not transparent
- Mandi staff ill-equipped and untrained
- Market information not easily accessible
- EC Act impedes free movement, storage and transport of produce

1.6 Research Gap

Linking of farmers to consumer was identified as the key focus area in the XII plan. The policy of government is based on the basic principle of extending help to smallholder agriculture and disadvantaged producer groups. The XII plan aimed at improving the terms of trade of small producers with the market, addressing the risks faced by small producers and help to reduce them. It recognized the importance of small producers in the value chain and the need to facilitating their inclusion in the wider economy so that the small producers further move up the value chain to increase their returns on investment and their economic security.

While the government has identified this prospect and has started shifting the focus of industry to this sector, it is aware of the challenges in this sector. Marketing of fruits and vegetables is biggest challenge owing to perishability of crops, small land holdings of farmers, middlemen dominance and lack of proper infrastructure. The XII

plan report (Agriculture Division, 2011) identified the need to bring reforms in Agricultural Marketing. It emphasized the need to empower producers with knowledge, information & capability to undertake market-driven production, provide multiple choice and competitive marketing Channels to farmers and attracting large scale investments needed for building post-harvest infrastructure as the areas where policy needs to be focused.

Agricultural value chains form spaces where local and global challenges to sustainability connect and this is the area where much needs to be done. Most of the policy measures have ignored this aspect.

There are only generalized solutions for all farmers- big, medium and small. The resources available to the famers are different. Therefore, the proposed solutions should also be different. The regional challenges may vary from national level to city like Indore, where there is the largest regulated mandi dominated by Agents leading to more inefficiencies. Different type of crops may need different solution. There is no connectedness between the consumer and the farmer. This raises several issues like doubt on pesticides and chemicals used by farmer and many more.

These are some of the issues which past studies have not been able to answer.

1.7 Objectives

Dwelling upon the above research gap, the present study is formulated to achieve the following specific objectives -

1. To estimate the Farmer's share in consumer's rupee, market efficiency and price spread for selected vegetables and fruits cultivated in Indore District.
2. To study role of intermediaries in terms of value added or depleted by them in the process of selling selected vegetables and fruits in regulated and non regulated markets of Indore District.
3. To study feasibility and propose a method to have "Minimum Support Prices" for vegetables and Fruits in Indore District.
4. To identify the optimum value chain for selling vegetables and fruits.
5. To find out ways to enhance the interest of farmers and other community in general in cultivating vegetables and crops
6. To propose a "Sustainable Business Model" for marketing of vegetables and fruits for Small farmers in Indore District.

Chapter 2

Literature Review

Chapter Highlights

2.1. International and National Studies on Agri-Supply Chains

2.2. Measures of Marketing Efficiency

2.3. Review of Reports and Policy Papers

2.3.1. Doubling Farmer's Income by 2022-2023- Planning Commission

2.3.2. Enhancing Producer's benefit

2.3.3. Collective farming and certification mechanism

2.3.4. Understanding Intermediaries - Street Vendors Role

2. Review of Literature

The objective of this chapter is to present a brief literature review with the focus on identifying the issues in the supply chain planning of fruits and vegetables in agri-food supply chains and recommending measures to solve these issues. The research papers were collected for twenty five years (1999-2017). There is a wide body of literature dealing with preharvest techniques. Post harvest techniques have gained researchers interest in recent years. The agri-fresh (fruits and vegetables) supply chain and marketing, distribution of margins in supply chains, increasing farmer's share in consumer's rupee and reducing food mileage were the key areas of interest. Researches addressing supply side issues as well as demand side issues were reviewed. The present study reviewed the works of some of the leading authors with details like the year of publication of their work, the objectives of the reviewed work, the methodology adopted, and the tools employed for the study. The results derived from the study and identified the gaps in the research.

Fresh Fruits and Vegetable (FFV) are one of the most important components of a retail chain (supermarket) and act as a strategic product in attracting the customers. The demand for fresh fruits and vegetables is growing year-by-year, with greater potential for the future. Agri-food produces from the farmer's field reach the end consumer through a long chain of intermediaries such as farmers/growers, cooperatives, wholesalers, retailers, commission agents, etc. The dynamically changing fruits and vegetable market environment differentiate it from other agricultural products and complicates the efforts of local or regional suppliers to effectively match supply with demand. Thus, there is a need for the proper chains to structure their agri-food procurement processes to respond to upstream-side demand (customers) and to absorb downstream-side risks (farmers) with the objective to augment, retain, satisfy consumers and gain new revenue opportunities without the creation of excess inventory or capacity.

For the purpose of the study, an initial list of 110 articles from major science-cited journals was prepared. As supply chain studies are of multidisciplinary nature, the

papers which are located at the junction of agriculture supply chain, its constraints, relationships and associations, models for performance measurement and small holders were kept in the list to be able to present a wide viewpoint covering agri-fresh produce uncertainty, role of small holders; customer-oriented supply chain management, farmer's welfare and rights, input supplier relationship and management, enterprise logistics, and networks and overall trust and transparency. Taxonomy of the papers was prepared and studies which were much more relevant for fulfilling the objectives of the study. As such, the review in this study is based on 80 papers from major journals.

This chapter presents a critical review of the earlier work done relevant to the area of present research work, identifies the research gaps that exist and postulates the hypothesis and justification for taking up the current research problem. The primary aim of this study is to provide a brief literature review with the focus on identifying the issues with the procurement of fruits and vegetables in agri-food supply chains and recommending measures to solve these issues. The list of papers included in the review and their classification with respect to their topic and methodology, focus, contributions and approaches are summarized in Table.

The review of literature is chapter is broadly classified into the following heads: Supply chain Management, Agri-Fresh Supply Chain Management, Agri- Fresh Produces and Cold Chain, Modeling, Farmer Producer Company or Cooperatives,

The evolution of supply of fresh produces i.e. agri-food systems in the contemporary context reflects inter-connected processes of agricultural industrialization, globalization, trade liberalization, advances in technology and consumer and policy concerns regarding food quality, safety and the environment, among others (Reardon & Barrett, 2000; Pinstrup-Andersen, 2002). These processes are taking place across both industrialized and developing countries; in the latter case most prominently during the last two decades. Thus, developing countries are experiencing the rapid rise of contractual exchange in procurement systems, aimed at complying with specific product and/or process requirements that are increasingly institutionalized in the form of informal and/or formal private standards (Reardon & Barrett, 2000; Berdegue´ *et.al*,

2005; Henson & Reardon, 2005). Hence, many developing countries like Turkey, Honduras, Kenya, and South Africa are benefited by the transforming of their traditional marketing channel or supply chain into the supermarkets or by introduce the new agri-fresh supply chain. The main drivers of this transformation identified in the literature are changes in consumer demand regarding quality and safety that occurred first in rich countries (Fulponi, 2007, Bignebat *et. al* 2009).

Agri-Fresh supply chain management plays an integral role in keeping business costs minimum and profitability as high as possible. There are many factors involved in agri-fresh supply chain management of which flow is one of the most important factors. Flow includes the product flow, the information flow and the finances flow. The product flow includes the movement of goods from a supplier to a customer, as well as any consumers' returns or service needs. The information flow involves transmitting orders and updating the status of delivery and the finance flow includes all the financial aspect such as invoices and payments. The present challenge in agri-fresh supply chain management is to maintain all three flows in an efficient manner, resulting in optimal results for farmers, growers, wholesalers and consumers.

Supply chain management (SCM) may be defined as "the coordination of material flows, information flows and financial flows among all the participating organizations so as to ensure that the right product in the right place, at the right price, at the right time, and in the right condition."

Over the few decades, the researchers supply chain management have changed and broadened the scope but still limited to manufactured products and services with little attention being paid to agriculture. Agricultural produce constitutes a major part of the world economy and is the raw material for many industries. Despite the large production of agricultural produce, agri-fresh produce have got the least attention. The SCM of agri-fresh produce, herein after referred to as agri-fresh supply chain management (FSCM), constitutes the processes from

Table 2.1– A summary of Articles reviewed and their approach/contribution

Author (Year)	Constraint Study	Performance Measurement/ Metrics	Supply Chain (Production, Distribution, Marketing)	Small Holder	Fresh Fruits/Vegetables	SCM-IT	Relationship and Association	Globalization	Review	Case Study/Survey	Statistical Tools Applied	Math approaches	Conceptual Model/ Framework
Ahumada O and Villalobos J R (2009a)						*	*		*				*
Ahumada, O. and Villalobos, J.R. (2009b)	*		*	*	*		*			*		*	*
Anjaly, B. and Bhamoriya, V. (2011)			*		*					*			
Bahinipati, B. K. (2014).	*		*	*	*	*	*			*			*
Behzadi et al.(2016)		*	*		*	*		*	*			*	
Berdegué et al. (2008)				*	*		*		*	*			
Beske et al. (2014)			*						*				*
Bhagat, D., & Dhar, U. R. (2011)			*		*		*		*				
Bhardwaj S and Palaparthy I (2008)			*		*		*	*	*				
Blandon et al. (2009 b)		*							*				*
Blandon et al. (2009a)			*	*	*					*		*	*
C. Bignebat et al. (2009)			*	*	*		*						
Cohen, A. J. (2013)			*	*	*				*				*
Dastagiri and Immanuelraj et al., (2012)			*	*	*		*			*	*	*	
Dastagiri et al., (2013)		*	*	*	*		*				*		
Deliya et al (2011)	*		*	*	*				*				*
Deshingkar et al. (2003)			*	*	*		*			*			
Dey Subhendu (2012)			*	*	*		*			*			*
Ganesan et al. (2009)		*	*				*						
Ganeshkumar C.et. al, (2017)			*		*				*				
Goknur and Turan (2009)		*	*						*				*
Halder P. and Pati S. (2011)			*	*	*				*				
Iannoni and Morabito (2006)			*	*	*					*		*	
Jang et al. (2011)			*	*			*					*	
Jitender Singh (2011)			*		*		*						
Kaipia, et al. (2013)			*		*					*			
Louw, A., et.al.(2008)			*	*	*		*		*	*			*
Lynch (1994)			*		*				*				
Negi, S. Anand, N. & Trivedi, S. (2017)			*	*	*		*			*			
Negi, S. and Anand, N. (2015)			*	*	*				*	*			*
Omkar D. Palsule-Desai (2015)		*	*	*			*					*	
Opondo (2000)	*				*			*		*			
S.S. Acharya (2007)			*		*				*				
Shivani Agarwal (2017)		*	*		*			*	*				
Silpa Sagheer and S.S. Yadav and S.G. Deshmukh (2009)		*	*	*			*	*					*
Thomas Reardon Bart Minten (2009)	*	*	*	*			*	*	*				*
Thomas Reardon Bart Minten (2011)	*	*	*					*	*	*			*

production to delivery of the agri-fresh produce, i.e. from the farmer to the consumer. FSCM 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 (Van der Vorst and Beulens, 2002), and high dependence on climate conditions (Salin, 1998).

The proper role of horticultural products in poverty reduction remains a controversial topic. Reardon and Timmer (2007) raise a number of important topics, including the impact of such trade on the domestic agri-food systems, the restructuring of domestic food markets, the emergence and evolution of new actors belonging to domestic chains (intermediaries, cooperatives, food service segments) and the foreign direct investments that impact this restructuring.

2.1 International and National Studies on Agri-Supply Chains

International studies

The marketing of vegetables and fruits has been studied internationally by few researchers. The focus in these studies has been on identifying the appropriate methods to enhance the profitability of the farmer and making the system more efficient.

The value chain concept suggested by **Michael Porter** seems to have caught attention of few researchers in other parts of the world for studying the vegetable value chains. The term ‘Value Chain’ was used by Michael Porter in his book "Competitive Advantage: Creating and Sustaining superior Performance" (1985). Value chain methodology provides an analytical framework to assess the competitiveness of market.

A value chain is the set of market actors in the flow of a particular product (or service) from the raw material stages through production, processing and distribution and on to an end market. The application of a value chain to agriculture is meant to ascertain the context for the market actors and includes:

- The vertical linkages or relationships between market actors (rural households, private sector processing and marketing firms, etc); how enterprises buy and sell from one another.
- The horizontal linkages or relationships and linkages between market actors engaged in a similar activity (e.g. rice farming, coffee processing, exporting, etc.) and how they collaborate and create partnerships with one another (professional associations, farmer groups, civil society, research, extension, infrastructure, and the institutional and organizational environment, including the role of the public sector, private sector, and decentralized formal and informal stakeholders).
- The process of generation and distribution of Value Added (VA) along the chain and across actors;
- The supporting markets for products or services that benefit members of the value chain (e.g. financial and transportation services and equipment and input suppliers).
- Growth opportunities (domestic and international demand/supply projections and perspectives including improving the competitiveness of domestic supply).
- The enabling environment, which comprises the policy, regulatory and governance environments, and includes existing resources and capacities, that governs all the market actors in the value chain, at the national and/or the international level.

The agriculture sector report of Liberia done by Ministry of Agriculture, Republic of Liberia, creates the value chain for vegetables selling in Liberia. The report states that very little value addition takes place, with the chains being limited, very short and often confined to only two or, at best, three stages along the chain. Previous analysis of value chains in the smallholder tree-crops sector has reached similar conclusions (**Parker, 2001).** There is little value being added in most cases, whilst at best a simple trading relationship seems to take place in **Liberia (2007).**

Hualiang Lu (2012) studied the supply chain from producer to consumer in Nianzing, China and proposed a Two-Stage Value Chain Model for Vegetable Marketing Chain

Efficiency. Lu evaluated the technical efficiency (TE) for vegetable producers' multiple chain alternatives regarding to their production techniques, resource endowments and institutional combinations; and to investigate the impact of disaggregated different categories of transaction costs on marketing chain efficiency

Studies in India

The production of vegetable and crops is a very regional issue. Therefore, even if some inputs of the studies conducted in other countries may be helpful, but it is essential to have a region specific study to address the regional problems more precisely. **Murthy, Reddy, Rao**, did a classic study in 2012, on marketing of perishable crops like vegetables in Andhra Pradesh. The study revealed that marketing of perishable commodities is very important both in terms of price realization to the farmer - producer and prices within the reach of consumers. The marketing efficiency reflects the share of consumer rupee by the farmer (producer) to a greater extent possible especially in the case of agricultural commodities which are perishable in their nature. The price escalation both at the producer level and consumer level is common phenomenon as it depends upon the number of players involved in marketing of the produce to make it available with the consumers in most appropriate way. The small vegetable vendors have some things in common. The major characteristics are described in table 4.1. It is interesting to see that there are many young people between the age of 25 to 45 involved in this business.

Some studies have shown that producers' share in consumers' rupee is comparatively lower for perishable **crops (Saikia, 1985, Singh M, 1985).** This could be due to a variety of factors such as number of intermediaries, cost of various market functions rendered by intermediaries, spread of location of the producers and consumers. Further the degree of perishability, variety and quality, and various market imperfections, market infrastructure etc also influence the marketing costs and price levels. Producers' share was found to be relatively high in areas where better infrastructure facilities for marketing were made available. Some studies have cited examples of an improvement in producers' share over a period of time due to improvement in market infrastructure, such as cold storage facilities. On the other hand the low share of

consumers' rupee for potato growers in different parts of the country may be due to high margins of intermediaries. Producers' share was also often varies during peak and lean seasons **(Subbanarasaiah, 1991)**. The solution to this is suggested as "Regulated Markets". Regulating markets are only the first step to improve the marketing efficiency. Past studies on regulated markets in various parts of the country brought out various inadequacies in the system in terms of their functioning, infrastructure, price realized by farmers and so on.

Many studies have been conducted in the recent past to evaluate the existing grading system and to determine the relationship between grade, price and quality. However, not much effort has been made to estimate the relationship between grade and quality factors of the commodities and also to compare eye-sight grading with scientific grading.

The share of farmers in the consumer rupee, was an area of interest for several studies. In Ahmedabad it was 41.1 to 69.3 percent for vegetables and 25.5 to 53.2 percent for fruits. **(Gandhi, Namboodari, 2004**) In Chennai KFWVM, the farmers' share was 40.4 to 61.4 percent for vegetables and, 40.7 to 67.6 percent for fruits. In the small AUS market in Chennai, where the farmers sell directly to the consumers, the share of farmers was as high as 85 to 95.4 percent for vegetables. This indicates that if there are few or no middlemen, the farmers' share could be much higher.

N. Chandrasekaran and G. Raghuram, (2014), the book sheds light on the emerging issues of agribusiness supply chain in India that inherently suffers from ill-equipped physical infra-structure, unorganized physical markets with fragmented marketing channels, inadequate institutional support, and policy distortions. The authors suggest that by incentivizing the private sector for investing in logistics and supply chain, the improved agribusiness supply chain might mitigate the problems related to infrastructure for storage, sorting/assaying, grading, packaging, and other post-harvest problem.

Several studies in past have indicated that the direct contact between commission agents and farmers is very low. Further, in the system of transaction, secret bidding

and simple transaction dominate and open auction is relatively rare. In several markets, the wholesalers act as commission agents and receive consignments directly from producing centers through agents or producers. By and large the system of transaction remains traditional and open auction is rarely seen. This is one major reason for poor efficiency.

2.2 Measures of Marketing Efficiency

Shepherd (1965), suggested that the ratio of total value of goods marketed to the marketing cost may be used as a measure of marketing efficiency. The higher the ratio, the higher is the efficiency and vice-versa. Shepherd's formula does not take into account the net margin retained by the intermediaries and the net price received by the farmers in assessing the marketing efficiency. Shepherd's formula assumes that the marketing cost itself includes some fair margins of intermediaries'. But if the margins retained by the intermediaries' are excessive, it is argued that this should not be treated as a part of marketing cost.

According to Acharya (Acharya SS, 2001) an ideal measure of marketing efficiency particularly for comparing efficiency of alternative marketing channels should be such which takes in to account the followings. 1. Total marketing cost (MC) 2.Net marketing margin (MM) 3.Price received by the farmer (FP) 4.Prices paid by the consumer or retail price (RP)

Talukdar (Talukdar Bidyasagar, 2017) and (Ramesh, 2016) studied the Marketing Effciency of rice growers using Acharya's formula in 2017. Dastagiri et al conducted study in the states of Andhra Pradesh, Karnataka, Tamil Nadu, Punjab, Rajasthan, West Bengal, Manipur and Mizoram, covering 29 crop types. Their study found that, in the case of most commodities, marketing costs, marketing margins, transport costs and labour charges adversely affect marketing efficiency, and open market price, volume of produce handled and net price received increase market efficiency or have a positive effect.

Agri-fresh supply chain management and Convenience Store:

The sale of perishable products is of vastly increasing importance for grocery retailers worldwide. At present, it accounts for almost 50 per cent of turnover of the grocery retail industry of Western Europe and North America (First Research Inc., 2005). In Latin America, several studies has been done on the convenience stores (small stores), as it could be transformed into a local source for fresh produce (Sloane *et al*., 2003; Galvez et al., 2008). Curran *et al*., 2005 and Gittelsohn *et al*., 2006, both the studies are recognizing the potential of convenience stores in changing the food environment and the effects of labelling healthier foods in these stores had been shown in their studies.

Nevertheless, convenience stores provide an existing retail infrastructure to sell fresh produce in low-income areas. These stores are plentiful and are used by neighbourhood residents for "fill-in" shopping for milk and other food items in between major trips to the supermarket (Kaufman *et al*., 1997). In recent studies, Jetter and Cassady (2010), examines the impacts of a pilot study that increases the availability of fresh produce in a convenience store in a low-income neighbourhood not served by a supermarket. The study resulted that consumers are willing to purchase fruits and vegetables if they are available at the convenience store and also identified that the costs to learn and implement effective management of a produce section may be a barrier for convenience store owners.

Agri-Fresh produce and Cold Chain

A cold chain protects a wide variety of food produce in the whole supply chain by providing temperature-controlled facility. It is a logistic system that provides a series of controlled temperature storage and transport conditions from the point of origin to the point of consumption, i.e., from farm to fork. It saves fresh produce from degradation, humidity, and improper exposure to temperature, and keeps them frozen, fresh and chilled (Bishara, 2006). Any disorder in temperature or time-distance in the cold chain could hamper the net present value and their added value (Bogataj et al., 2005). The cold chain starts at farm level and covers up to the consumer level, using

the temperature-controlled practices and behavior. Cold chain infrastructure generally consists of grading, sorting, packing, storage, processing and transportation facilities. Cold chain is now recognized as a sunrise sector in India. It is very true that the country, which ranks second in F&V production in the world, needs a fully developed cold chain sector. However, the current scenario reveals that there is tremendous scope for the development of cold chain facilities. These units were mostly engaged in storage of potato and were located in areas like UP, Punjab, West Bengal, Bihar, etc. Realizing the importance of the cold chain industry, the Government of India has taken various initiatives through bodies like NHB to establish standards for all the arms of the cold chain. In short, the cold chain industry is on the cusp of a revolutionary change.

Jain (2007), Viswanadham (2007), Bhardwaj and Palaparthy (2008), FICCI (2010), Rathore et al. (2010), Halder and Pati (2011), Narula (2011), and Veena and Venkatesha (2011) found poor cold chain as a major problem in the supply chain of F&V, which is resulting in various inefficiencies, leading to losses. Supply chain of perishable food requires proper controlled temperature to maintain and sustain the quality as well as increase the shelf life of the produce and make them easily available to the customer in a quality manner; but the weak and ill-equipped cold chain infrastructure (Rathore et al., 2010), and improper marketing systems and facilities (Gauraha and Thakur, 2008; and Singh et al., 2008) of the country have become the major impediments to the growth of the sector.

Agri-Fresh produce and Consumers Buying Behaviour

Food purchase behavior of consumers in most emerging economies such as India, Kenya and Turkey has significantly changed due to an increase in the per capita disposable income, global interaction, information and communication technologies, urbanisation, education and health awareness, movement of households towards higher income groups, changes in lifestyle and family structure (Rao, 2000; Shetty, 2002; Deshingkar et al., 2003; Vepa, 2004; KPMG, 2005; Kaushik, 2005; Kaur and Singh, 2007; Pingali, 2007; Ali et.al., 2010). Due to change in lifestyle, food

environment also get changes. These factors are fuelling a rapid growth in the demand for high nutrition food products such as fresh fruits, vegetables and milk.

Food purchase patterns in developing economies like India are characterised by daily or frequent purchasing from nearby marketplaces called "mom and pop stores" (Veeck and Veeck, 2000; Sabnavis, 2008). Though, increase in number of young working couples, resulted in increase in demand for new agri-fresh supply chain management such as home delivery model. Ayieko et.al., (2005), also examine in their study the shopping pattern of fresh produces by consumers and various supply chain system for fresh produce. In nutshell they are integrating the issues of supply chain system performance and the consumers' demand of fresh produces. Results shows that income and educational status are most influencing factor while consumption of fresh produce and also gives suggestion to take curative action on improving the traditional marketing system: modernize the whole supply chain; rethink the role of traditional market intermediaries; improve the wholesale, retail, and assembly market places, and establish vertical linkages up and down the chain that allow farmers more easily to know what consumers and traders need and want, and to satisfy that demand more efficiently.

Agri-Fresh Supply Chain Management and Producer End

The first and foremost challenge in front of the farm producers i.e. they are not aware of the final buyer of their produce, due to lack of transparency in the traditional marketing system. There are lots of studies which throws the lights on the downstream restructuring (supermarkets) on upstream decisions (producers) (e.g. Dolan and Humphrey, 2000; Reardon and Barrett, 2000; Weatherspoon and Reardon, 2003). Many developing countries are also transforming the traditional agri-fresh supply such as contract farming, direct procurement like mother diary, reliance fresh model and many more.

Bignebat *et.al*, (2009), investigates the impact of rise of the supermarkets on the farm producers and also the role of the intermediation in assessing and understanding this impact. For this purpose they introduce a standard model of market participation

variables about the intermediary which can be used by the producer. They are identifying the characteristics of the producers and commissioners that are jointly related to a higher probability of selling to supermarkets. And conclude that the producers that are linked to supermarkets seem to have integrated some post-harvest value-adding activities related to the specific requirements of the modern marketing channels, namely packing, but not grading. Moreover, they seem to be insensitive to the price premium the supermarkets offer for this effort. In last they raise a question on the role of the wholesale market agents who act as a buffer in the chain and protect small producers from negative shocks, but who stop positive shocks as well, and thereby reduce incentives.

Blandon *et.al*, (2009), explores the marketing preferences of small-scale producers of fresh fruits and vegetables in Honduras, for this purpose used a stated choice model and eight attributes, proposed in hypothetical contracts to farmers, are evaluated. The results suggest that farmers have strong marketing preferences associated with new supply chains, such as prearranging prices and quantities with buyers, although they have preferences for some attributes of traditional spot markets, such as the lack of grading produce, receiving cash payments, lack of delivery schedules, ability to sell at the farm gate, and ability to sell individually. Further, farmers prefer market channels that do not require major upfront investments. The results suggest that the traditional marketing preferences of farmers could impede participation of small-holders in emerging supply chains and take advantage of the potential opportunities that new agri-food supply chains can offer.

Agri-Fresh produce and Quantitative Modelling Aspects of Supply Chain Management

Blackburn J. & Scudder G. (2009), examined and studied the optimal supply chain design strategies for a particular type of perishable product (fresh produce) melons and sweet corns and minimized lost value in the post-harvest supply chain of these perishable products. A model was developed using the product's marginal value of time using an exponential decay function**.** One of the important findings of this work was that coordination across the supply chain was not a pre-requisite for supply chain

optimization. The marginal cost of time for a product was used as a tool to analyze the optimal supply chain strategy. **Jang *et al.* (2011),** studied and developed models for supply chain for small agricultural enterprises. Mathematical and experimental modeling techniques were used. The proposed models would help in developing strategic planning and decision–making tools to keep the small agricultural enterprises in market competition, and this scientific approach will help them to reduce costs and improve their service. The pricing strategy for multiple products could be investigated in future work with more focus towards other parameters of quality and customer service rather than size of the enterprise. **Behzadi *et al.* (2016),** the study carries out a thorough review of the relatively limited literature on quantitative risk management models for agricultural supply chains. The major findings of this paper that the lots of quantitative modeling such as news vendor modeling (Single Period- Inventory Management Modeling) for short shelf life and Multi Period Model for short. This study has identified robustness and resilience as two key techniques for managing risk.

Constraints in Marketing of Agri-Fresh Produce-

***Hiremath (1993*)** studied the economics of production and marketing of lime in Bijapur district, Karnataka and identified the problems relating to production and marketing of lime. The absence of processing facility, absence of cold storage facility, fluctuations in prices were the major problems expressed by 100 percent of farmers and other problems were absence of cooperative marketing of lime, non-availability of packing material at reasonable price and difficulty in transportation.

Sharma et al. (1993), in their study, have identified the problems of storage, transportation and marketing of off-season vegetable crops in Solan district of H.P. The study found that due to poor storage facilities at farmer's level, the losses to all the major off-season vegetables (tomato, capsicum, beans and peas) were the highest. The losses were higher in the market mainly because of unauthorized deduction. Higher production with minimization of market losses is likely to enhance the market surplus. The establishment of factories using fresh vegetables as raw materials, formation of co-operatives in the vegetable growing areas and strengthening of market

intelligence network are the major suggestions for the overall development of the area in general and vegetable growers in particular.

Thakur et al. (1994) identified the problems encountered by the farmers in marketing of vegetables. They were unorganized marketing and low prices paid to farmers, Lack of mechanical grading, packing, and proper storage facilities, Malpractices, high and undue marketing margins and costs in markets, Lack of village roads, lack of sufficient and low cost transportation facilities, Lack of market information and market news, and Lack of processing units and cooperative societies.

More (1999) studied the economics of production and marketing of banana in Marathwada region of Maharashtra state. The study identified the problems faced by the farmers in Banana production. All the farmers mentioned that the Banana production in the study area was facing the problem of Musa sercospora disease. The other major problems included high labour wages, non-availability of quality planting material at right time and non-availability of adequate technical assistance from experts on behalf of government. The problems in marketing were due to variation in the prices across various markets, thus creating uncertainty among cultivators in choosing the markets for sale of produce. High transportation cost was also one of the important marketing problems in marketing of banana in the study area. Inadequate availability of the loan at right time by the financial institutions was the main problem in the production of banana in the study area.

Sethi (2003) tried to explain the constraints involved in the production and marketing of fruits and vegetables in north-eastern region. The study found that the production share of this region in India's total production was as much as 50 per cent in case of pineapple, 13 per cent in case of oranges and 6 per cent in case of bananas. But due to lack of simple technologies of processing, preservation and transportation facilities, the post-harvest losses were estimated to be more than 25 per cent. Hence, determined efforts are necessary to overcome these problems and to raise the production above self-sufficiency level.

Acharya (2009) while studying Market Policy and system Improvement felt that the amendment in the state APMR Acts should be speeded up and model rules and regulations should be adopted to all the states to encourage contract farming and direct marketing arrangements from farmers. The role of APMCs and State Agricultural Marketing Boards should be redefined to inter alia promote value addition in primary markets, rather than just collection of fees and undertaking of construction activities.

Marimuthu (2010), in his study, has identified the constraints in marketing of vegetables. Normally, vegetable crops give higher yield per unit area as compared to cereal crops. Further, increase in vegetable production provides more farm employment. Despite its utility, vegetable cultivation, consumption and marketing in India remain relatively neglected aspect. The production and marketing of vegetables were affected by many constraints like insufficient and imperfect markets, abundance of intermediaries in channel results in exploitative practices in marketing of fresh produce, scattered production and sometimes in isolated places where even the transportation facilities and other infrastructure was not sufficient, lack of proper grading, improper pre and post-harvest care and handling. The study suggested that if the farmer does the marketing of his produce himself, then the net returns to him would be double.

Choudhari et al, (2012) in their study on "economic analysis of marketing of aster in Pune" identified high cost in packaging as the major constraint indicated by 49 percent respondents followed by labour problems 46 per cent and time consuming operation by 22 per cent growers. In the transportation, high cost was major constraint followed by non availability of vehicle in time and high transit losses which were expressed by 88 per cent, 29 per cent and 11 per cent of the farmers respectively. Malpractices in weighing and more number of middlemen were also other constraints which were expressed by 84 and 17 per cent of the farmers, respectively. Other constraints such as unavailability of market information, delay in payment and fluctuations in prices were also faced by the farmers. Fluctuations in prices were the major constraints, expressed by 99 per cent of the farmers.

From the rigorous literature review, it can be conclude that the previous studies highlights that there is a competitive environment for agri-fresh supply chain due to rise of lots of new supermarkets, new dimension of supplying of fresh produce and high demand of new agri-fresh supply chain as well as the producer also want to shift to new and short agri-fresh supply chain. But what is the new agri-fresh supply chain and how it can be satisfying all the people such as producer end, retailer end, wholesaler end and consumer end? And what is the role of intermediaries in this new agri-fresh supply chain management? These are very big questions to make comfort for all.

Direct Marketing of fruits and vegetables

HOPCOMS offers an example of an organization that provides benefits of collective marketing to both producers as well as consumers in fruits and vegetables. The Horticulture Producer and Cooperative Marketing Society (HOPCOMS) was established in 1959, at the initiative of the Department of Horticulture of the Government of Karnataka in India. Currently, it is a primary cooperative society covering three districts of Karnataka state - namely the Bangalore Rural, Bangalore Urban, and Kolar Districts. The stated objective of this society is to promote and encourage the development of horticultural produce (Smitha, 2005). This is achieved by selling horticultural produce and providing training, technical advice and agricultural inputs as well as cold storage and marketing facilities to its members (Selvaraj et al, 2006). Studies found that HOPCOMS have been quite popular which is reflected in the membership rise, which has increased to 11,680 farmers, with 100 tonnes of horticultural produce being traded per day in cooperative society.

However, while the gross profits have grown, the net profits have shown a variation from the trend of gross profits (The Hindu, 2005). This is due to the high operating expenses, which have almost been equal to the gross profits made for these years, leaving a very negligible net profit. This negligible profit has been attributed to the increase in the employees at HOPCOMS, with the number of employees per retail outlet being an average of about four (Vivek, 2005a). The society plans to increase the number of outlets to increase its sales and profits.

Rythu Bazar

Rythu Bazars were formulated by the Government of Andhra Pradesh in 1999 as a direct interface between the farmers and consumers, and to eliminate middlemen. They were instituted to act as price stabilization centers. Rythu Bazars operate outside the purview of Agricultural Market Committees. The objectives were to ensure remunerative prices to the farmers and provide fresh vegetables to consumers at reasonable rates on a daily basis, facilitate prompt realization of sale proceeds to farmers without any deductions, curb malpractices and provide vegetables with correct weighment to consumers and provide a direct interface between farmers and consumers eliminating intermediaries from the system (Noelia, 2006).

The review of above studies shows that while in other countries, the marketing of vegetables and fruits is an important issue and the studies explore it from a holistic perspective. Therefore, most of the studies focus on exploring various aspects of entire vegetable market value chain.

But, there is a lack of such holistic perspective in Indian literature on this topic. The studies conducted on Indian vegetable markets have explored the pricing mechanism, logistic related aspects market intermediaries separately. There is no study that talks of having a complete solution to the marketing of vegetables and fruits so as to ensure benefit to the farmer and provide him with a "Sustainable Business Model"

2.3 Review of Reports and Policy Papers

The central and the state government have realized the urgency of need to transform agriculture as a business in the country. Several policy measures, reviews, schemes and plans have been laid out by central and state government. More than 5 policy documents were reviewed for the purpose of this study. This included policy papers by agencies like planning commission, Department of Agriculture Cooperation and Welfare, Mission for development of horticulture(MIDH) , research papers by National Institute of Agriculture Management (NIAM) and several other studies which were found to be important.

This section gives a brief review of selected literature in this domain.

2.3.1 Doubling Farmer's Income by 2022-2023- Planning Commission

The new agenda of the current government is to double farmer's income in a stipulated time. A high power committee was formed to explore this area. The committee comprised of experts from various cross sections- academicians, researchers, farmers, scientists, private business players etc. The findings of this committee and suggestions (Department of Agriculture, Cooperation and Farmers' Welfare, 2017) have drawn attention from a large section of society. The report has dedicated entire volume to the post harvest logistic improvement in the country. The report starts with the phrase "Agricultural Logistics is the Backbone of Agri-Business Agricultural Marketing is the Brain behind Value Realizations".

The report has given several important suggestions for doubling farmer's income. One important suggestion is related to agri value chain.

Report of the Committee for Doubling Farmers' Income on "Post-production Agri-logistics: maximizing gains for farmers" (2017): The study emphasis on the post-production activities that safeguard agricultural produce, transfer the harvested value to markets, and allow to connect with markets across place, time and form. Physical connectivity to markets is the primary medium by which farmers can access the opportunity to exchange produce for money. A lack of logistics connectivity to convey their harvest to markets, results in a lowering of the farmers' ability to monetise their produce. The deliberations have been kept farmer-centric, concentrating on the capabilities needed, such that the full quantity of production is monetised and delivered to their consumers safely, in quantity and quality. Following template has been given to identify the major activities in agri – value chain

Table 2.2- Range of segmented activities identified for agri-value chain system	
Primary inputs: Source, Quality, Quantity, Price	Planting/Feedstock: Availability of (a) Seed (b) Planting material
	(c) Livestock (d) feed, (e) others
	Expected yield: match advance information on market demand
	INM/IPM: Fertiliser/pesticides/organic manure/feed
	Irrigation: Micro or conventional
Cultivation or Production	Cultivation practices: Open field, protected, orchard, others.
	INM/IPM application practices, veterinary practices
	Livestock management: monitoring, feeding, health
	Harvesting produce: HAACP, assembling/pooling/collection
	Technology adopted: ICAR package of practices, others
Post Production Practices	Aggregation, staging and dispatch to local or wholesale markets
	Preconditioning: Need based cleaning, sorting & packaging
	Transport and/or Storage facilities, linked to holding life of produce
	Market Linkages: Where and when to send the produce
	Market channels: distance, access, local and terminal market demand
	Food or agro-processing: for the processing variety produce
Institutional input: Credit, Insurance, Extenstion Markets	Organisation of farmers into FPOs and other producer groups
	Collaboration / Partnership / Services models
	Skill Status, front line demos, program awareness
	Lab to Land, capacity building, others
	Market to facilitate exchange, price transparency, market demand
Infrastructure for Operations	Infrastructure for irrigation/fertigation, plant or animal health, farm mechanisation, on-farm handling, on-farm storage
	PHM infrastructure: produce transport, warehousing/cold storage, pooling/assembly/pack-house, preconditioning lines, ripening units
	Market channels: market yards, processing units, alternate channels, farmer markets, e-NAM, institutional markets, others.
Source 4-Doubling Farmers Income VOl III	

The study focused on a fork-to-farm approach called as the reverse information flow from markets to farmers would also enable the farmer to take informed decisions about what to market, when to market and to whom. Various avenues or market channels are available for farm produce, such as food or agro-processing industry, wholesale into retail and other consumer channels, institutional sales, etc. Thus, the study reveals that the farmers' primary earning capacity is restricted to their first point

of sale, usually to agents, or near farm mandis, or rural markets, which are not always the best of options. All transactions, further up the value chain system, are remote from a farmer's perspective. The study describes the immediate opportunity for farmers to undertake next level activities, to connect directly to the wholesale market or processor, or at least a level above their current stage of transaction. For connecting with markets, logistics is the backbone, and functions to bridge supply to consumption centre. Preparing the farmers' produce for next stage handling after harvest, connecting to their points of sale, storage where necessary, and other options to maximize value gain for the farmers is discussed in the report.

Policy Paper on Doubling Farmers' Income (Rationale, Strategy, Prospects and Action Plan) by National Institution for Transforming India, Government of India (New Delhi) (2017): The study focused on three pronged strategy to achieve the target of doubling farmers' income by 2022 (i) development initiatives, (ii) technology and (iii) policy reforms in agriculture. Also highlights that the country need to increase use of quality seed, fertilizer and power supply to agriculture by 12.8, 4.4 and 7.6 per cent every year. Besides these the study highlights the major source of growth operating within agriculture sector such as improvement in productivity, resource use efficiency or saving in cost of production, increase in cropping intensity, diversification towards high value crops (from staple crops to horticulture crops as fruits and vegetables, fibers, condiments & spices and sugarcane), as staple crops occupy 77 percent of total or gross cropped area (CGA) but contribute only 41 per cent of total output of the crop sector. In spite this, almost same value of output was contributed by high value of crops, which just occupy 19 per cent of gross cropped area during 2013-14, and shifting cultivators from farm to non-farm occupations and improvement in terms of trade for farmers or real prices received by farmers. The study also reveals that the agriculture sector has needed the inputs from modern capital as well as modern knowledge for the sustainable growth in farmers' income.

There were some studies dedicated to supply chain issues in agri chai. National Horticultural Research and Development Foundation (NHRDF), Delhi (2017-18) published a project report on Value Chain Study of Tomato of Karnal, Haryana. The

study explored the gaps in value chain of tomato and measures required to improve the livelihood of tomato growers and other stakeholders of the area. Value Chain Study of Tomato had conducted in the district of Karnal, Haryana with a sample size of 200 farmers and 50 other stakeholders such as mandi traders, stockiest, exporters, inputs suppliers, wholesalers, retailers and APMC officials. The sample size was taken from 5 blocks of Karnal district. Further, 5 villages from each block and 33 to 34 farmers from each block distributed in five villages.

The study reveals that there was an about 13.34% loss in tomato value chain at the farmers' level. Maximum losses occur at the cleaning, grading, weighing and packaging stage (6.21%) followed by harvesting (4.80%). During transportation, loss in tomato is about 2.33% and no storage loss observed at farmers' level. At trader's level, the average loss reported was 3.4% which was mainly due to handling, weighing, loading and delay in marketing. At the wholesaler's and retailers' level, average losses were about 6.89 and 8.53% respectively and the reasons of such losses found were sorting, grading, weighing and delay in marketing.

National Institute of Agricultural Marketing (NIAM), Jaipur published a paper on Linking Farmers to Electronic Markets (E-Nam): Current Scenario and a Way Forward (2017). This study discusses the emerging changes in agriculture marketing environment of the country i.e. electronic market, model act, warehousing, pledge loan, contract farming etc. that are ushering in opportunities for new formats of markets which are effective in responding to demand and supply. These changes talks about the investment in infrastructure, infusion of technology and building awareness and capacity building.

Electronic National Agriculture Market (E-NAM) is envisioned as a unified national electronic market bringing interconnectivity to markers across the country. The diffusion of E-NAM is through Organizations and intended through change in policy. The diffusion will be faster if the desired policy changes are made in the organization followed by change management in organizations. Three organizational characteristics will affect the rate of diffusion of technology in markets- desire for change

(motivation and ability), innovation-system fit (compatibility) and assessment of implications (observability). E-NAM for agriculture marketing can be regarded as technology which will bring a social change in markets. The social change in relationships and networks that work between buyer and seller as they exist in traditional markets will change as the technology enabled E-NAM is adopted in agricultural markets. Successful adoption /diffusion will depend on easing the adoption barriers that can be categorized as technological and organizational.

Linking sellers and buyers to markets is a key factor that will bring better participation in the evolving markets and ensure better returns to both sellers and buyers. Owing to the fact that the sellers are smallholders producers and have constraints in access to markets the task of integrating smallholders' producers to E-NAM is going to be a daunting one. Paper offers pathways to have national integration of markets. The Study had examined the issues and challenges faced by States in implementing the E-NAM and explored the possible solutions and way forward.

Agriculture Marketing report by Federation of Indian Chambers of Commerce and Industry (FICCI) (2017): The study has identified the challenges in agricultural marketing as small scale of individual production which adversely affects marketing economies for farmers, poor market information systems, insufficient storage and post-harvest value-addition at the farm level, post-harvest credit, and high transaction costs for buyers and processors to engage with farmers. This study also proposes developing institutions to bring farmers together; establish direct links between farmers and retailers, processors and consumers; and develop competitive and transparent markets. Farmer producer organizations, direct marketing initiatives such as contract farming, technology- enabled, seamless markets such as e-NAM are some examples of such institutions. On the infrastructure side, the report proposes investments in all kinds of storage infrastructure; sorting, grading and quality certification infrastructure; broadband connectivity and primary processing facilities at the farm level. The study has proposed four dimensions- (i) market integration to overcome the problems associated with fragmented markets, (ii) market access to

farmers, (iii) market infrastructure and (iv)value addition to raise returns to farmers and generate off- farm employment in the rural areas.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on ODISHA- Linking Farmers to Electronic Markets (ENAM) Current Scenario and a Way Forward (2017): The study brings forth the factors responsible for poor arrivals and reasons for dys-functioning of markets as it is well understood that these are the prerequisites for integration of APMC with eNAM. The observations in the report are based on interaction with stakeholders, collection of data from buyers, sellers and discussion with officers and marketing secretaries. The study discusses the problems suffers from poor marketing linkages, non-remunerative price to farmers, ineffective markets and uncoordinated supply chain leading to value loss and loss of opportunities by farmers to enhance income.

Indian Council for Research on International Economic Relations Published a paper on Making Rapid Strides- Agriculture in Madhya Pradesh: Sources, Drivers and Policy Lessons (2017): The study has the composition, sources and drivers of agricultural growth in Madhya Pradesh and discusses the lessons that can be drawn for other major states of India. The study found that among the many measures taken by the state government to make rapid strides in agriculture, three interventions stand out – expanded irrigation, a strong procurement system put in place for wheat along with bonus over MSP for wheat, and all-weather roads to connect farmers to markets. In the light of these findings, the study makes three principal recommendations to stimulate agricultural growth in other states with somewhat similar characteristics, viz., with somewhat similar characteristics i.e. improve the quality and quantity of rural power supply by strengthening transmission and distribution and by separation of feeders for irrigation and household use, increase the density of surfaced roads in rural areas, and improve procurement and marketing infrastructure to reduce market risk of farmers.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on Marketing Strategies for Organic Produce of Sikkim (2016-17): The study highlights the necessity of bringing reforms in the agri-marketing system in the state both

operational and infrastructure which can help in creating an enabling condition for state producers to take benefit of marketing of organic produce. The study has focused for leveraging the advantages of high value organic agriculture produce for high end market, this study was designed to do market analysis for five identified crops (Ginger, Turmeric, Large Cardamom, Buckwheat and Cymbidium) and suggest an action plan to link the producers of Sikkim state to consumers of premium market.

All India Cold- Chain Infrastructure Capacity (Assessment of Status and Gap) REPORT by NABARD Consultancy Services Private Limited (NABCONS), DELHI, INDIA (2015): This study evaluated the consumer driven demand for food items, the infrastructure required to link such consumption backwards to production points, and holistic infrastructure required at source points. The study highlights that the consumption of major fresh fruits and vegetables is the main determinant for assessing development needs of cold-chain infrastructure in the country. The study sample has examined nine major consumption centers/cities viz. Mumbai, Delhi, Kolkata, Ahmedabad, Jaipur, Chennai, Bangalore, Hyderabad and Guwahati and consumption demand for perishable items viz. apple, grapes, orange, kiwi, strawberry, mango, banana, papaya, okra, cauliflower, cabbage, tomato, carrot, potato, onion and other processed food products.

National Mission for Sustainable Agriculture (NMSA) by Department of Agriculture & Cooperation Ministry of Agriculture Government of India (2014): The study has promoting sustainable agriculture through a series of adaptation measures focusing on ten key dimensions encompassing Indian agriculture namely; 'Improved crop seeds, livestock and fish cultures', 'Water Use Efficiency', 'Pest Management', 'Improved Farm Practices', 'Nutrient Management', 'Agricultural insurance', 'Credit support', 'Markets', 'Access to Information' and 'Livelihood diversification'. The four interventions such as Rainfed Area Development (RAD), On Farm Water Management (OFWM), Soil Health Management (SHM) and Climate Change and Sustainable Agriculture: Monitoring, Modeling and Networking (CCSAMMN) has construct to achieve this dimensions.

A Report on Feasibility Study on Options for Long Distance Bulk Transportation of Horticulture Produce (2014) Published by National Horticulture Board, Government of India: The study has a view to expanding the facilitation for distribution of horticultural products in India by the National Horticulture Board (NHB) and to carry out a critical review of the existing circuits of movement for wide ranges of horticulture produce. Thus, a critical assessment of the 'Horti-Container Train' operated by CONCOR under a special arrangement with NHB and exploring the possibility of adopting the option of running Horti special trains with Special Purpose wagons (SPW) under the recently introduced 'Liberalized Wagon Investment Scheme' (LWIS) of the Indian Railways also constitutes an important component.

The Ministry of Agriculture, Government of India, New Delhi, published a report on State Of Agriculture In Madhya Pradesh (2013): This study enlightens the performance of agriculture in Madhya Pradesh along with future option available for accelerated growth with inclusiveness of all the stake holders for the benefit of the farming community.

Agriculture division planning commission government of India published a report of the working group on agricultural marketing infrastructure and policy required for internal and external trade for the xi five year plan (2007-12): The study reveals that the bottlenecks in the domestic marketing system, assessed the size of agricultural markets and supply chain for different farm products and reviewed the working of agricultural markets and wholesale mandies. The study also highlights the emerging alternative marketing channels and vertical linkages of marketing groups of farmers with retail and terminal markets and processors. Market information system and existing institutional infrastructure for human resource development in marketing and agribusiness were also analyzed. The study also reviewed the export performance and identified the constraints in promoting exports of agricultural commodities and provide the recommendation relating to marketing system improvement, strengthening of marketing infrastructure, investment needs, possible sources of funds including that from the private sector, improvement in marketing information system using ICT,

human resource development in agricultural marketing, and measures needed for promotion of exports.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on Public Private Partnership in Agril. Marketing – A Case of Pune District, Maharashtra (2010-11). The study explored agricultural marketing through a sample study of the different stakeholders of Pune district of Maharashtra. The study had a sample size of 130 including farmers, traders, entrepreneurs, bankers and market secretaries in Pune district of Maharashtra.

The study reveals gross lack of awareness amongst the stakeholders about different schemes of the Government of India for promoting PPP in the sector. There is significant difference in the perception of different stakeholders like traders, entrepreneurs, farmers, market functionaries and bankers towards private participation in different agricultural marketing infrastructure projects traditionally dominated by public sector. The different factors determining investment in agri marketing infrastructure are risks and uncertainty of returns on capital, lack of entrepreneurship, and lack of motivation for the entrepreneurs to invest in the sector.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on A Study on Agricultural Marketing System In Odisha (2011-12): The study is mainly based on discussion with different stakeholders in different types of markets in the state- Municipality, RMC, Panchayat and Private. The study reveals that markets under different type of ownership prevailing in the State are not conducive to adoption of good marketing practices in the state. The major problems in effective implementation of market regulation are; markets under different ownership and management governed by different Acts, absence of a permanent cadre of market secretaries and they being on deputation from department of cooperation from among cooperative inspectors lacking knowledge of agricultural marketing, absence of proper training of subordinates staff of RMCs, strong lobby of traders, market fees being collection at check gates, focus on check gates rather than market management. The study also highlights the need for professional management of markets.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on Trends in Marketing and Export of Onion in India (2012-13). The study focused on reasons for such high rise in the price of onion and also revealed that, the astronomical increase in the prices of onion was a result of hoarding of the stocks in anticipation of rise in the price and higher retailer's mark- up.

National Horticulture Mission (NHM) Delhi published a report on Impact Evaluation Study of National Horticulture Mission (2005-06 to 2010-11): The study team of APPC has conducted field survey and interacted with 9036 beneficiary farmers spread across 66 Districts in 18 States and 2 Union Territories in the country, besides interactions with the officials of State Horticulture Missions (SHMs). The study highlights the status of horticulture in terms of Area, Production and Productivity, observations and suggestions for future reference. There has been a good impact of National Horticulture Mission (NHM) scheme both in respect of the area of coverage as well as the productivity of horticulture crops. On account of Mission intervention, the area under horticulture crops increased from 184.45 lakh ha in 2005-06 to 232.42 lakh ha in 2011-12. The corresponding increase in production is from 1669.39 lakh tonnes to 2572.77 lakh tonnes. It can be noticed from the above figures that the productivity of land has improved significantly from 9.05 tonnes per hectare in 2005-06 to 11.07 Tonnes per Hectare in 2010-11. The study reveals about enhanced horticultural productivity and production associated services like Processing, Prevention of Post Harvest Losses and Marketing using modern technologies should be the major objective for development of horticultural crops. Diversified cropping patterns for increasing the availability of fruits, vegetables and other horticultural crops round the year should be aimed at, to make them available to the consumers at reasonable prices at the same time providing economic sustainability to the growers.

National Institute of Agricultural Marketing (NIAM), Jaipur published a report on A Study on Floriculture Marketing System In Karnataka (2009): The study explored floriculture marketing through a sample study of the different stakeholders of Karnataka. The study had a sample size of 202 including farmers, wholesalers,

retailers, consumers, exporters, association etc and gathering information on four flower markets of Karnataka and also neighboring State Tamil Nadu.

The policy has targeted modern markets for flowers in public private partnership, maintenance of hygiene and other facilities, cold storage, transparent auction system, strengthening the supply chain and alternative marketing.

Institutional Change in Indian Agriculture by National Centre for Agricultural Economics and Policy (2003) – This book discusses provisions in and appropriateness of several institutional reforms. It discusses the institutional changes needed for agricultural marketing, credit and management of natural resources. Institutions for common pool resources, agricultural technology systems, agrarian and credit institutions, institutions affecting incentives

Approaches for Sustainable Development of Horticulture by National Horticulture Board (2001): The Book has covered several aspects like research, development, export, WTO issues, crop related issues, quality standard, and horticulture programmes etc. and is expected to be of much help for all those interested in horticulture.

National Policy for Urban Street Vendors by Ministry of Urban Employment and Poverty Alleviation, Government of India: The study has aimed to ensure that Urban Street Vendors, an important segment of the urban population, find recognition for their contribution to society and is conceived of as a major initiative for urban poverty alleviation by provision of and support to dignified livelihood. Provide and promote a supportive environment for earning livelihoods to the Street vendors, as well as ensure absence of congestion and maintenance of hygiene in public spaces and streets. The study had focused on proper hawking zones (legal status of street vendor), role in distribution system, self compliance, participatory mechanisms, and rehabilitation of child vendors, social security and financial services.

Department of Agriculture & Cooperation Ministry of Agriculture Government of India Madhya Pradesh – State Agricultural Portal Software Requirement

Specifications: The study has covered Agriculture Sector, Livestock Sector and Fisheries Sector. The NeGP-AMMP aims to address the needs of the farming community and its other related stakeholders, through provision of relevant information and services through the various delivery channels available in their vicinity for assisting them in making rational decision for raising farm productivity and farm income. In first Phase project will be implemented in 7 pilot states. These are Assam, Himachal Pradesh, Maharashtra, Madhya Pradesh, Jharkhand, Kerala and Karnataka. 12 Cluster of Services identified under this project, will cover information on Pesticides, Fertilizers and Seeds, Soil Health, crops, farm machinery, training and Good Agricultural Practices (GAPs), forecasted weather and agro-met advisory, prices, arrivals, procurement points, and providing interaction platform, Electronic certification for exports & imports, marketing infrastructure, Monitoring implementation / Evaluation of schemes & programs, fisheries, irrigation infrastructure, Drought Relief and Management, Livestock Management.

2.3.2 Enhancing Producer's benefit

Farmer's consideration has to be given consideration in recent past studies. Doubling farmers income has been of concern for governments. Several alternative marketing models were suggested under XII plan to meet this cause of strengthening the supply chains for small farmers particularly engaged in farming fruits and vegetables.

These alternate options are being implemented by government in different proportions in different states. In Madhya Pradesh, the horticulture department has taken initiatives like PKVY, ATMA, PKVY, ATMA, SAMETI, BTT etc to improve the pre and post harvest management. But there is lack of steps taken to strengthen the value chain or to make the markets more efficient.

The private sector has also been attracted to this segment. Companies like Adani Fresh, Mahindra, Reliance Fresh etc have ventured into selling branded fruits. These companies mostly rely upon contract farming and market agents for procurement. They are charging premium for branding these products and making them sell into premium segment of markets. But how much of the premium is passed on to the farmer is a question mark?

They have created a market for branded fruits and vegetables which is good, but what is not good is that the farmer is still not a part of this profit making venture.

2.3.3 Collective farming and certification mechanism

Participatory Guarantee System is a mechanism to bring a group of farmers together, certify their produce on certain parameters and brand it and sell it collectively to the buyers. These buyers may vary from market to market. The PGS gives an advantage in terms of collective bargaining.

IFOAM (International Federation of Organic Agricultural Movements) defines **Participatory Guarantee Systems** (**PGS**), as "locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange." They represent an alternative to third party certification especially adapted to local markets and short supply chains. They can also complement third party certification with a private label that brings additional guarantees and transparency. PGS enable the direct participation of producers, consumers and other stakeholders in the choice and definition of the standards, the development and implementation of certification procedures and the certification decisions

The IFOAM which is a leader in the concept of PGS at the international level is running a program to recognize PGS in the organic sector. But PGS is a tool that need not be restricted to for organic agriculture but is useful in various sectors.

PGS is different from FPC (Farmer Producer Company). While an FPC is a group of farmers coming together for selling their produce. PGS is a certification system which is done by a peer group. It can be adopted by FPC or any other group of farmers who may get associated for business. Participatory Guarantee System is a process of certifying products which ensures agriculture production process in accordance with the standards laid down for organic products and that desired quality has been maintained. This is exhibited in the form of documented logo or a statement. PGS is a decentralized organic farming certification system aimed to promote domestic market growth and to enable small and marginal farmer so that have easy access to organic certification. It is cost effective, farmer- friendly and hassle-free. It is outside the framework of third party

system of certification, which is a pre-requisite to enter export market of organic produce.

There are examples from across the world where PGS has helped the farmers to come together, brand and certify their product, enhance marketable lot and thus get better value for their produce. Studies undertaken by (Matovu, 2016), (Robineau, 2016), (Ino, 2016), (Tran, 2016), (Truong, 2016) in different parts of the world like Vietnam, Argentina, Uganda and China have found that PGS has served to provide a direct guarantee, through the formation of a market, for sustainably produced food and agriculture products.

PGS has been found to strengthen farmers' innovations in strategic market negotiation, encourage communication and trust among farmers, intermediaries and consumers, starting in the field, improve public infrastructure for value chain logistics.

A study on PGS in Hanoi, Vietnam by (Cory William Whitney, 2014) suggests that PGS has helped the farmers of the region in several ways. The transition from individual plot management to cooperative land management assures better crop rotations, more reliable fallow periods, higher use of green manures, better and more reliable yields and higher quality and productivity overall among these small-scale producers. The management of collective groups is more comprehensive but, at the same time, easier. Retailers prefer the collective management scheme, find that the products are better, and the groups easier to do business with. Collective labor is a more effective and efficient way to go about doing the more labor-intensive work i.e. weeding and tilling, where the majority of the labor happens. Thus, one may say that PGS is not only about certification, but it brings a lot of other benefits of collective farming and marketing of produce.

The Food and Agriculture Organization (FAO), IFOAM, and the Ministry of Agriculture in India initiated consultations with various stakeholders in 2005 to identify alternative certifications systems that are inclusive of the many small farmers and peasants in the country. The PGS Organic India Council was set up in 2006 as a result of these consultations. It functioned as an informal coalition of Voluntary Organizations or NGOs committed to the promotion of organic food production for domestic consumption in India, with export not being a priority at all. In April 2011, it

was formally registered as a society in Goa as Participatory Guarantee Systems Organic Council (PGSOC). Many of the federal states within India have incorporated promotion of PGS for certification of organic produce in their state-level agriculture policies. At the national level, the National Centre of Organic Farming (NCOF) under the Ministry of Agriculture began to operate the PGS-India as a voluntary organic guarantee program with the PGS-National Advisory Committee as the apex decision making body.

In 2015, PGS scheme was launched in India by Department of Agriculture. It has proven to be a quality assurance initiative that is locally relevant with active participation of stakeholders including producers/farmers, traders and consumers in certification system. This group certification system is supported by Paramparagat Krishi Vikas Yojana (PKVY) scheme.

2.3.4 Understanding Intermediaries - Street Vendors Role

Most of the literature has been focused towards studying the farmer related issues. The role of retailers is very important in vegetable and fruit market. They enable the distribution in small size. These retailers are mostly urban street vendors particularly in Tier II cities in India.

(MuePA, 2014)Street vending as a profession has been in existence in India since time immemorial. However, their number has increased manifold in the recent years. According to one study Mumbai has the largest number of street vendors numbering around 250,000, while Delhi has around 200,000. Calcutta has more than 150,000 street vendors and Ahmedabad has around 100,000. Some studies estimate that street vendors constitute approximately 2% of the population of a metropolis.

The role played by the hawkers in the economy as also in the society needs to be given due credit but they are considered as unlawful entities and are subjected to continuous harassment by Police and civic authorities. This is reported to be continuing even after the ruling of the Supreme Court that “if properly regulated according to the exigency of the circumstances, the small traders on the sidewalks can considerably add to the

comfort and convenience of the general public, by making available ordinary articles of everyday use for a comparatively lesser price.

(MuePA, 2014) The National policy for urban street vendors aims at ensuring a suitable role for the street vendors. It aims to make Street vendors a special component of the urban development /zoning plans by treating them as an integral and legitimate part of the urban distribution system by realizing their role in distribution. Apart from this it aims at promoting self-compliance amongst Street vendors and promotes, if necessary, organizations of Street vendors' e.g. Unions / Co-operatives/ Associations and other forms of organization to facilitate their empowerment.

Given this significant role of urban street vendors, it is required to take in cognizance of their role in distribution of fruits and vegetables. Though the street vendors contribute to several business like street food, daily goods, textile, electronics, toys, etc. (Vazhacharickal, 2016 May) studied the street vendors in Mumbai and found that 50% of the urban street vendors are engaged in distribution of fruits and vegetables.

(Rao, 2010) A study on street vendors in India by the National Alliance of Street Vendors in India found that the population of hawkers in Indore numbers 30,000, but that the city lacks specific laws for or against street vending. Street vendors appear in most high traffic areas and sell a wide range of products ranging from fresh fruits and vegetables, to prepared food, to clothing, to electronics, to services like shoe-shining and cellular repair. For urban planners, hawkers are a double edged sword: they enhance the pedestrian environment in unique ways but in many cases also impede the movement of pedestrians. Vendors may occupy sidewalks where there is insufficient space for vendors and their cart or stall, patrons, and walkers. The effective narrowing of the sidewalk causes pedestrian congestion and forces many pedestrians to walk in the vehicle carriageway. The Supreme Court has ruled that vendors are within their constitutional right to carry out trade and business. Nevertheless, the view of municipal authorities in many cities is that hawkers are obstructions or encroachments. Hawkers are often shutdown on this basis. Cracking down on hawkers is not only an infringement of rights. It is inconsistent with municipal authorities' tolerance of other types of encroachment such as illegal vehicle parking and business spill-out into the

street. Perhaps most importantly, shutting down hawkers is a partial and temporary solution. Hawkers choose their locations because they know them to be profitable; the reward is great and therefore the probability of hawkers returning is high.

The above review of literature points towards the gap in literature. There is an urgent need to explore sustainable solution for small – marginal farmers in horticulture. These solutions need to be region specific as the needs and characteristics are region specific. The farm level productivity has improved but post harvest issues, are yet in highly unorganized state. The present study tries to address value chain issues and propose a solution to overcome these challenges.

Chapter 3
Research Methodology

Chapter Highlights

3.1. Defining Market Stakeholders

3.2. Models and Methods for data analysis

3.2.1. Producer's Cost estimate

3.2.2. Marketing Costs estimates

3.2.3. Comparison of different supply chains

- Price Spread
- Producer Share in Consumer Rupee
- Food Mileage
- Marketing Efficiency
- Price Efficiency

3.3. Population and Sampling

3.4. Data Collection Tools

3.4.1 Primary data - Survey designs

3.4.2. Secondary data – sources

3. Research Methodology

The present study proposes to explore the dynamics of marketing in selected vegetables and fruits in mandis of Indore district. This is an exploratory study which aims at assessing the farmer's share in the consumer's rupee and ways to increase the farmer's share without adding the burden to consumer. This chapter provides us the framework in which the study is carried out. It defines and explains the main concepts used in the study that include concepts, types of markets, market players, types of marketing channels, marketable surplus, determinants of marketable surplus, concept of price spread and market efficiency. Each of these concepts is explained in detail as follows.

On the basis of competition markets are classified as perfect market and imperfect market. Perfect market is one where large number of buyers and sellers prevails. There must be one price for one standardized commodity is exchanged in the market. There should be no restriction on the movement of goods. In a perfect market all the potential sellers and buyers are aware of the prices at which transaction takes place and at that price the whole lot of a commodity is exchanged in that market. A market is imperfect when different prices are charged for one commodity at the same time. The buyers and sellers are not aware of each other's intentions regarding price offers and also the quantities offered.

On the basis of time duration markets are classified as very short period, short period and long period market. Very short period market represents the limited time period during which the buying and selling is to complete. In a short period, market demand is always more than market supply. In a long period market demand always matches supply. Vegetables and Fruits markets are very short period markets due to perishable nature. These markets also possess some features of perfect market and imperfect market. So it is a blend of both perfect and imperfect markets.

3.1. Defining Market Stakeholders

Market stakeholders are those individuals who perform various marketing functions involved in purchase and sale of goods and move goods from producers to the consumers.

Wholesaler -A distributor or middleman is one who sells fruits and vegetable mainly to retailer or institutions, rather than to consumers.

Commission agent -Commission agent is one who solicits and procures commodity from potential producers on behalf of one or more consumers, usually against payment of a percentage of the realized sales revenue as commission.

Retailer -A retailer buys fruits and vegetable in large quantities from trader or commission agents either directly or through a wholesaler, and then sells all quantities to the general public or end user customers, usually in a shop, also called a store.

Consumer -Consumer is one who purchases goods and services for satisfying his needs. The major objective of the consumer is buying better quality goods at lower price. The consumer looks at marketing from the point of view of goods, their timely availability and the prices at which they are offered.

Marketing channels -Marketing channels are the alternative routes through which agricultural products move from producers to final consumers. Marketing channels varies from commodity to commodity and even for some commodity, channels varies with the type of farmer, producer, quantity of produce to be marketed, nature of the product, type of consumer demand, degree of regional specialization in production etc., Marketing channels for agricultural commodities could be divided in to different categories. They are

Table 3.1- Common supply chains in selling vegetables and fruits	
P-M-R-C	Producer → Middle Men→Retailer→Consumer
P-M-W-R-C	Producer→Middlemen→Wholesaler→Retailer→Consumer
P-W-R-C	Producer→Wholesaler→Retailer→Consumer
P-R-C	Producer→Retailer→Consumer
P-PHC-R-C	Producer→Pre Harvest Contractor→Retailer→Consumer
P-C	Producer→ Consumer

The price received by the farmer in absolute terms as well as in terms of farmers share in consumer's price varies greatly from channel to channel.

3.2 Models and Methods for data analysis

3.2.1 Producer's Cost estimate

The cost of cultivation classified as recommended by, "Special expert committee on cost estimates, GOI, New Delhi", was used in this study. The cost concepts are given below:

Table 3.2- Cost of Production (COP)

Recommended by "Special expert committee on cost estimates"

Cost A1 i. Value of hired human labour,

ii. Value of hired and owned bullock labour,

iii. Value of hired and owned machinery labour,

iv. Value of owned and purchased seed,

v. Value of fertilizers, manures and chemical,

vi. Value of insecticide and pesticides,

vii. Expenditure on irrigation,

viii. Land revenue and taxes,

ix. Interest paid on crop loan if taken,

x. Depreciation on farm assets excluding land,

xi. Interest on working capital,

xii. Miscellaneous expenses.

Cost A2 Cost A1 + rent paid for leased in land

Cost B1 Cost A2 + interest on value of owned fixed capital assets. (Excluding land)

Cost B2 Cost B1 + rental value of owned land

Cost C1 Cost B1+ imputed value of family labour

Cost C2 Cost B2 +imputed value of family labour

Cost C3 Cost C2 + 10 percent of cost C2 to account for managerial input of the farmer.

Table 3.3- Basis for calculation of COP as mentioned above	
Rent for Owned land (Source : Calculated on the basis of Average rent paid in the region)	@18000per acre
Farm Labour (Source : Agriculture Wages in India 2016, Dept of economics & Statistics, Govt of India)	@Rs 213 per day
Working days on Farm	120
Note for Working days	
Other crops (days in a year is considered for calculating MSP of rabi and kharif crop	110
Vegetables (Assuming 6 crops in a year and 20 labour days for each crop)	120

3.2.2 Marketing Costs estimates

The marketing costs include costs incurred on weighing, loading, unloading, marketing fees and transportation charges, which were paid by the farmers and market functionaries per bag or quintal.

Marketing Margin -Marketing margin is the difference of the total payment and total receipts for a unit of the commodity by the middlemen. Three alternative measures of marketing margins are as follows.

(a) Absolute margin of ith middleman

$$Ami = PRi – (Ppi + Cmi)$$

(b) Percentage margin of the ith middleman

$$Pmi = PRi - (Ppi+Cmi) / PRi \times 100$$

(c) Mark-up of the ith middleman

$$Mi = PRi - (Ppi+Cmi) / Ppi \times 100$$

Where, Ami = Absolute margin of ith middleman.

Pmi = Percentage margin of ith middleman.

PRi = Total sale value of good of ith middleman.

Ppi = Total purchase value of good of ith middleman.

Cmi = Costs incurred in marketing by ith middleman in the process of buying and selling.

3.2.3 Comparison of different supply chains

The different supply chains are compared on the basis of following Price Spread, Marketing Efficiency. Different mandis are compared on the basis of Price Efficiency.

Price Spread -The term price spread has been defined and understood differently according to its usage. The term price spread means the difference between the price paid by the ultimate consumer and price received by the producer. Price Spread is the difference between the two prices. The difference is often called farm retail spread or price spread.

Price spread includes marketing margin, costs of assembling, storage, transportation packing and handling charges, the margins earned or loss incurred in the process of marketing of vegetables.

- The farmer – consumer spread – The difference between price paid by the consumer and the price received by the producer. For e.g. P1-P2, Where, P1 is

price at one level or stage in the market P2 is price at another level. The Price spreads for each of the above supply chains will be assessed for select fruits and vegetables in Indore Market.

- The market – market spread – The price paid to farmer for each crop in mandi A and mandi B. This spread will be studied between regulated and non regulated markets. 3 mandi's of M.P mandi board are regulated markets and other smaller mandi are non regulated.

Producer Share in Consumer Rupee

$$\mathbf{PS = (Pf/Pr)*100}$$

Where,

Pf is price received by the farmer,

Pr is retail price (consumer price)

Food Mileage [Food Miles or Food Kilometers]- The distance the food travels from the location where it is grown or processed to the location where it is consumed. The distance food travels from farm to plate. It is a factor to understand inefficiency of food supply chain. In economical or business perspective, every food miles is cost. Transportation cost is directly propositional to food miles. The food mileage is the Weighted Average Source Distance (WASD) (Pirog and Benjamin, 2003).

WASD = $(\sum Vi * Di) / \sum Vi$

Where, Vi =Vegetable weight in Kg

Di =Distance travelled in Km

Marketing Efficiency - Each market intermediary has a certain role to play in the process of buying and selling. The market is said to be efficient if the intermediary is adding certain value to the product. If it doesn't add any value, then it adds to the "In efficiency" of the market. The "value" for vegetables and fruits may be assessed in terms of grading, cleaning, logistics, shelfing etc. Marketing efficiency is the degree of market performance. It is the ratio of marketing output to marketing input. The following methods were used for measuring marketing efficiency. According to,

Conventional Method Marketing efficiency is the Value added by the marketing system upon the total marketing cost.

Acharya's Modified Marketing Efficiency is the most commonly used model of marketing efficiency**.** According to Acharya (2011) [3], an ideal measure of marketing efficiency particularly for comparing efficiency of alternative marketing channels should be such which takes in to account the total marketing cost, net marketing margin, Price received by the farmer, Prices paid by the consumer or retail price

$$MME = FP/(MC+MM)$$

Where MME is modified measure of marketing efficiency. Acharya's method of Modified Marketing Efficiency can also be stated as

$$MME= [RP/(MC+MM)]-1$$

Because RP=FP+MC+MM,

Where,

a) MC=Total marketing cost
b) MM=Net marketing margin
c) FP=Price received by the farmer
d) RP=Price paid by the consumer

i) Higher the (a), lower the efficiency ii) Higher the (b), lower the efficiency iii) Higher the (c), higher the efficiency iv) Higher the (d), lower the efficiency**.**

Price Spread, Marketing Cost and Marketing Margin Market functionaries or institutions move the commodities from the producers to consumers. Every function or service involves cost. The intermediaries or middlemen make some profit to remain in the trade after meeting the cost of the function performed.

Price Efficiency – In the stock market, there is a concept called "Efficient Market Hypothesis" which explains the price build up mechanism of stocks. The EMH states that asset prices fully reflect all available information. This indicates poor informational efficiency in the market. There are three variants of the hypothesis: "weak", "semi-strong", and "strong" form. The weak form suggests that the prices reflect all publicly available information. But there is private and insider information

which can affect the movement of prices. This makes the prices vulnerable to non-public information. Thus, the prices are said to follow a “Random Walk”. This implies that future price movements are determined entirely by information not contained in the price series. Hence, prices must follow a random walk. This 'soft' EMH does not require that prices remain at or near equilibrium, but only that market participants not be able to *systematically* profit from market 'inefficiencies'.

In case of vegetable and fruits prices, a similar kind of lack of information exists in the markets. There are studies that point out towards integration of prices in commodities markets. But same has rarely been tested in vegetables and fruits prices.

This study, therefore applies the concept of weak form of efficiency to F&V prices in different markets. The daily price series for selected F&V is taken from www.agrimarketnet.gov.in . This series is tested for randomness by applying “Runs Test”. (Neeraj Gupta, 2014) The “Runs Test” is based on price change in subsequent days. A price change is denoted as “+” if the price change is positive and “-” if the price change is negative. A run exist when two consecutive changes are the same (i.e., ++or--). When price changes in a different direction, such as +-or-+ The run ends and a new run may begin .To test for independence, the number of runs for a given series of price changes are compared with the number of runs for a given series of price changes compared with the number in a table of expected values for the number of runs that should occur in a random series.

To test the independence of the prices, we require:
Total Number of Runs: (r) , Number of Positive Price Changes: (n1) , Number of Negative Price Changes: (n2)

Mean,$\mu(r) = \frac{2n_1n_{21}}{n_1n_2}+1$

Standard deviation, $\sigma(r) = \sqrt{\frac{2n_1n_2(2n_1n_2-n_1-n_2}{(n_1-n_2)^2\ (n_1+n_2-1)}}$

To test the weak form of efficiency of the stock market ,the Runs Test is applied at 5% significance level where z=1.96 (From z-table). The next step is to calculate the upper and the lower limits. This is done as follows:

Lower limit :{ μ-1.96*(σ)}

Upper limit :{ μ+1.96*(σ)}

Where μ=mean σ=standard deviation

The hypothesis is stated as follows:-

Null hypothesis	H_0: The daily prices are random
Alternative hypothesis	H_1: The daily prices are not random

Accept / Reject Criteria

If the observed run is between upper and lower limit , then accept Ho

If the observed runs is not in the range of upper and lower limit, then reject Ho

Acceptance of null hypothesis indicates that the series in random order. The prices do not follow any information or pattern and the market is “Weakly Efficient”.

3.3 Population and Sampling

Table 3.4- Point of Survey & Details of Data Collection

Location Type	Place	Name	Farmers	Agents	Wholesalers	Retailers	Consumers	Subject Experts
Rural	Farm /Village	Bagdoh	8	-				5
	Farm / Village	Dongargaon	10	-				
	Farm /Village	Jhapdi	12	-				
	Farm /Village	Khegaon	10	-				
	Farm /Village	Mothapura	8	-				
	Farm /Village	Palsudh	30	-				
	Farm /Village	Ramdhan	5	-				
	Farm /Village	Methwa	3	-				
	Farm /Village	Karahi	10	-				
	Farm /Village	Bardwaha	50	-				
Urban Locations	Multiple Locations	Indore City	-	-			85	8
	Regular Mandis	Choithram F &V Mandi	-	35	23	100		
	Regular Mandis	Depalpur Mandi	-	5		30		
	Regular Mandis	Sanwer Mandi	-	20	10	40		
	Regular Mandis	Nanlalpura Mandi	-		10	33		
	Regular Mandis	Rajkumar Mill Mandi	-		2	43		
	Weekly Haat	Itwaria Haat	-			20		
	Weekly Haat	Agrasen Haat	-			15		
	Weekly Haat	Bangalai Chauraha Haat	-			12		
	Weekly Haat	Jaivik Setu	-			4		
	Mobile Hawkers	Miscellaneous Places	-			38		
	Organised Retail Shops	Miscellaneous Places	-			4		
	Online / Home Delivery	Miscellaneous Places	-			4		
Sample Size of Group			**146**	**60**	**45**	**343**	**85**	**13**
Grand Total (Sample Size)			**692**					

3.4. Data Collection Tools

3.4.1 Primary data - Survey designs

The primary data was collected by survey method. Structured questionnaires were designed to collect information from Farmers, Agents, Wholesalers, Retailers and Consumers. There were five different sets of questionnaires as follows:-

1. Farmer Cost of Production Template
2. FAWRC Market data Template
3. Consumer Feedback on Anar Bazar
4. Home Delivery Potential Survey Template – For Consumer
5. Home Delivery Potential through Piggy Backing Survey Template – For Retailers

The questionnaires are given in the annexure. A brief description is as follows.

3.4.1.1 Farmer Cost of Production Template - This survey template consisted of information related to calculation of cost of production of various crops grown by the farmer. Information related to land, expenses on seeds, fertilizer, equipments, electricity, loan and other details were asked in the survey. On the basis of this information the costs A1, A2, B1, B2, C1, C2 and C3 have been calculated.

3.4.1.2. FAWRC Market data Template -This survey template consisted of items required to calculated the marketing related information from all stakeholders in the agri-supply chain – The farmer, the agent, the wholesaler, the retailer. The elements of cost incurred on storage, transportation, packaging etc was collected. The weight of vegetables, price, distance traveled were also included in the template.

3.4.1.3. Consumer Feedback on Anar Bazar -The study had conducted an experiment by organizing a farmer bazaar for employees of a company. This questionnaire was designed to collect feedback of consumers for the anar bazaar.

3.4.1.4. Home Delivery Potential Survey Template – For Consumer -This survey was designed to understand the potential if any in the home delivery model gaining popularity in urban areas for F&V. The questionnaire included socio-demographic information of the respondents such as age, gender and family size and some questions

relating to their buying behavior in terms of frequency of purchase, monthly expenditure, place of purchase, the individual perceptions of consumers on home delivery model and preferred choices such as frequency of order, price mechanism, payment system in home delivery model, various attributes of fruits and vegetables in terms of price, freshness, size, colour and packaging while getting fresh fruits and vegetables through home delivery model;

Measurement was on a Likert-type scale to analyze the importance of various product attributes (1= not important, 2= somewhat important, 3= important, 4= very important and 5= extremely important).

3.4.1.5. Home Delivery Potential through Piggy Backing Survey Template – For Retailers

This survey was designed to asses the supply side of home delivery model. The existing retailers doing home delivery of packaged milk were studied to understand whether they could be used to piggy back vegetables with their existing product. In this study two type of retailers has been covered. One who has sold packed milk such as Amul, Saachi and Saboro from their outlets as well as delivered at home and other who has grocery store and sold packed milk. Retailers' selling pattern and basic amenities such as quantity delivered at home as well as sold by outlet, number of customer catered via home delivery of milk, how they catered milk at home. The individual perceptions of retailers on home delivery for agri-fresh produce (fruits and vegetables) were also studied.

3.4.2. Secondary data – sources

The secondary data relating to prices of F&V was collected majorly from the government portal of agmarknet. Several government reports, annual reports of department of agriculture, horticulture statistics, census report, national statistical survey etc were used for capturing miscellaneous secondary data.

Chapter 4

Madhya Pradesh and Indore- District- A demographic profile relevant to agribusiness

Chapter Highlights

4. Madhya Pradesh and Indore – District – A demographic profile relevant to agribusiness

4.1 MP- The Heart of India

Madhya Pradesh, the heart of India, was formed on 1st November 1956 and was reorganized on 1st November 2000, with the enactment of Madhya Pradesh Re-organization Act. Geographically, it was the largest state in India before the Chhattisgarh region was declared an independent state and now it's positioned 2nd i.e. 3, 08,000 sq. kms accounting for 9% of the total geographical area of the country. Over 95 lakh hectare area consulting about 30.88% of its geographical area is under forest. A land immensely blessed by natural resources.

Figure 4.1- Madhya Pradesh Map

It is located at between latitude 21.2°N-26.87°N and longitude 74°02'-82°49' E. Landlocked in the central part of the country, it is bounded by the states of Rajasthan to the northwest, Uttar Pradesh to the north, Chhattisgarh to the east and Maharashtra to the south, and Gujarat to the west. The state is sub-divided into 11 sub agro-climatic zones, which offers vast opportunities for agriculture diversification. The average rainfall in the state is 1092mm.

The State is divided into 10 divisions covering 51 districts spread over 352 tehils, 313 blocks and 54903 villages. The state has 51 Zila Panchayats, 313 Janpad Panchats and 23040 village Panchayats. As per census 2011, the state had a population of 725.98 lakh (6% of the country's population). The literacy rate of Madhya Pradesh has improved from 63.7 in 2001 to 70.6 in 2011.

Table 4.1- Population Distribution based on occupation

		Type of Workers				Total Workers	Non Workers	Total Population (Workers + Non Workers)
		Cultivators	Agricultural Labourers	House Hold Industry Workers	other workers			
Indore	Total	150,907	185,528	43,584	888176	1,268,195	2,008,502	3,276,697
	Percentage	4.61	5.66	1.33	27.11	38.70	61.30	100.00
Madhya Pradesh	Total	9,844,439	12,192,267	959,259	8,578,168	31,574,133	41,052,676	72,626,809
	Percentage	13.55	16.79	1.32	11.81	43.47	56.53	100.00

Source: - http://www.censusindia.gov.in/2011census/dchb/2322_PART_B_DCHB_INDORE.pdf

4.2. Roots in Agriculture - The 'Krishi Karman' state

According to Agriculture Census, Madhya Pradesh is one of the top nine states which account for 78% gross cropped are of the country. The other eight being, Andhra Pradesh, Karnataka, Gujarat, , Maharashtra, Rajasthan, Uttar Pradesh, Punjab, and West Bengal. .

The State is primarily an agriculture State. About 73% population of the state is rural, which is directly or indirectly depends on agriculture. Thus Agriculture Sector is the main Stay of the State economy. The Agriculture and allied services contributes about 44% share in state economy and 78% of its working force is directly engaged in

Agriculture. Thus Agriculture sector forms the backbone of MP economy. Approximately 49.03% of the geographical area is under cultivation. Of the total gross cropped area Crop group Cereals covers 38% , Crop group Pulses 22% and Crop group Oilseed 31% and the remaining is covered by Crop group Commercial (cotton & sugarcane etc.), vegetables, fruit, fodder and medicinal crops. Of the total gross cropped area 63% is sown in Kharif season, 37% in Rabi season and multiple cropped area is about 31%. As per Agriculture census 2010-11, total land holdings in the state were 88.72 lakh in 2010-11 and the average size of land holding declined from 2.22 ha(2000-01) to 1.78 ha(2010-11). The marginal and small farmers account for 71% and hold 34% of the total area. The gross cropped area during 2015-16 was 237 lakh ha with cropping intensity of 153%.

Total agriculture production was 423 lakh metric tons during 2015-16 (97.66% increases in a decade). While total food-grains production in the state during 2015-12 was 346 lakh metric tons. The state produces 51.4% of the soyabean, 20% for the wheat, 33% of the gram, 30% of oilseeds, 28% of Pulse production of the country. The joint efforts have resulted that the state had been won the prestigious KRISHI KARMAN AWARD, continuously last four year.

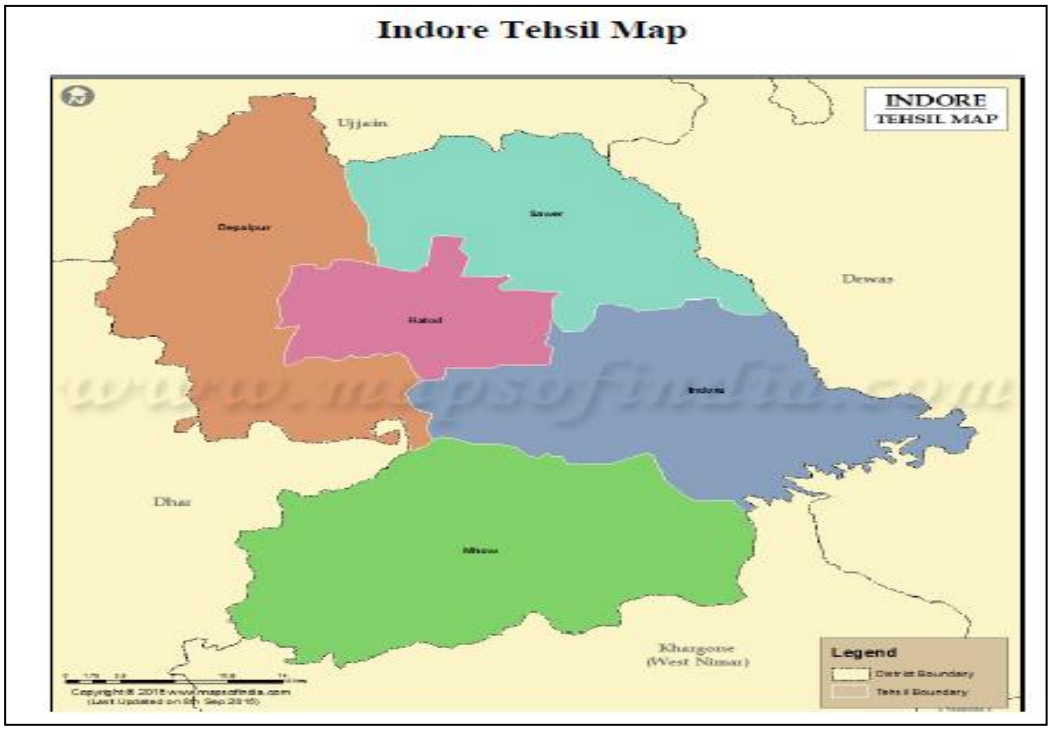
Out of the total 64.57 million hectare Net Irrigated Area, 48.16 percent is accounted by Small and Marginal holdings, 43.77 percent by Semi-medium & Medium holdings and 8.07 percent by Large holdings. The income level of the farmer is low matching the national trends. Average monthly income of the farmer is Rs 6210/- (NSS 70th Round, 2014)

4.3 Indore District – The Detroit of Madhya Pradesh

As Madhya Pradesh geographically represents the heart of India, Indore is in all senses is the heart of Madhya Pradesh. Indore is the commercial capital of the state and a hub for all major business activities in the Western part of the state. Indore is situated

between the two holy cities namely Ujjain and Omkareshwar which are "Jyotirlingas" according to the Hindu belief. They are important places of worship related to Lord Shiva and hold great religious significance. The city got its name Indrapur from the famous Rashtrakut ruler Indra, whose empire extended over the entire Malwa region. Indrapur became *Indoor and finally it became* Indore. There is another story which runs amongst the locals of the place that in the year 1741, the Indreshwar temple was built and the region was named after it. Later, it was subsequently renamed to Indrapur. Under the influence of Marathas, it began to be called *Indoor*. The British pronounced it as Indoure, which eventually became Indore.

Figure 4.2- Indore Tehsil Map



Indore is the largest city of Madhya Pradesh by population. It serves as the headquarters of both Indore District and Indore Division. It is the 9th largest city in India and 76th in the World (District Collector Indore).

Indore is located in the western region of Madhya Pradesh, on the southern edge of the Malwa plateau and is 190 km west from the state capital of Bhopal. It is bound in the

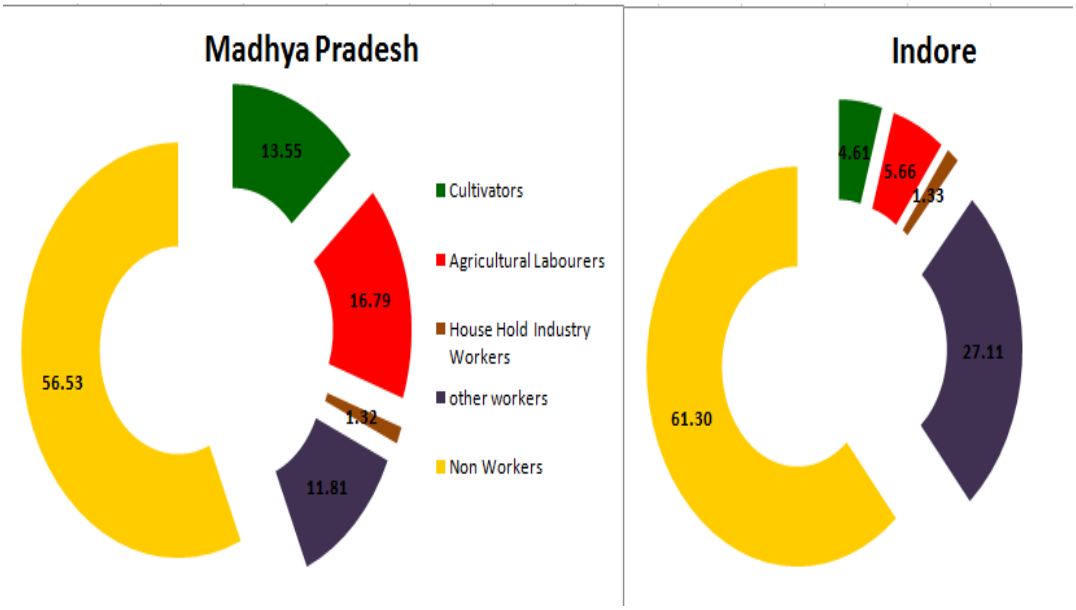
north by Ujjain district, in the south by West Nimar district, in the north east by Dewas district and in the west by Dhar district. Physically the boundaries of Indore district stretch mostly along the natural features on three sides, viz. the Kshipra river in the north east, the Chambal in the west and the water-parting line of the Vindhyas in the south between the Karam and the Choral rivers, both flowing into the Narmada to the south. As per the Census 2011, its geographical area is 3898 sq.kms. It is the 43rd largest district in respect of area, which is 1.3% of the total area 308,245 sq.kms. of the state. Indore is situated on an average elevation of 553.00 meters above sea level. It lies on the bank of the tributaries of the Shipra River namely, Saraswati and Khan. The mountain ranges of Vindhya ranges to the south of this city. Indore is well connected with airways, roadways and railways. It has got two major industrial areas namely Dewas and Pithampur, which offer employment opportunities at all levels; to men and women.

Table 4.2- Workwise distribution of population in Indore Division

		Main Workers		Marginal Workers		Total Workers(Main + Marginal Workers)		Non-Workers	
District	Total Population	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Depalpur	228,101	84,454	37.02	22,763	9.98	107,217	47	120,884	53
Hatod	99,313	36,381	36.63	9,296	9.36	45,677	45.99	53,636	54.01
Sawer	197,835	69,582	35.17	11,655	5.89	81,237	41.06	116,598	58.94
Indore	2,389,511	819,085	34.28	63,262	2.65	882,347	36.93	1,507,164	63.07
Mhow	361,937	127,749	35.3	23,968	6.62	151,717	41.92	210,220	58.08
Indore Total	3,276,697	1,137,251	34.71	130,944	4.00	1,268,195	38.7	2,008,502	61.3

Indore is the administrative centre and chief city of the district. The Indore Division comprises of seven districts namely, Indore, Dhar, Jhabua, Alirajpur, Khargon, Barwani, Khandwa, Burhanpur. According to District Census Handbook (2011 census), there are five tehsils in the district namely, Indore, MHOW, Depalpur, Sanwer and Hatod. The census of 2011, gives a detail that Indore district consists of 629 villages, of which inhabited villages account to 614 and 15 villages are uninhabited.

Figure 4.3- Workwise distribution of population in MP and Indore



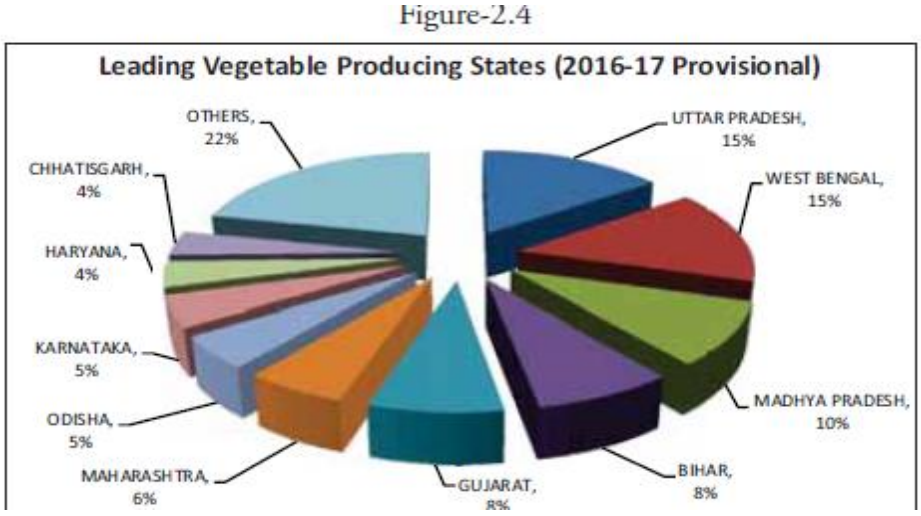
According to 2011 census report total population was 3,276,697 persons with sex ratio of 928 per thousand. Average density of population is 841 per square kilometre. The literacy rate was found to be 80.87 percent and the per capita income at constant prices (2004-05) was Rs.95, 663 per annum. The climate is generally dry with a temperature ranges from 240C to 360C.

Indore, the most promising TIER II city in central India, has a total population of 32.76 lakh. Indore. Indore has emerged as the commercial capital of the state with increasing number of business, growing education sector and flourishing IT and retails sector in the city. Indore has 61.3% % of population as Non Workers and 27.11% as other workers engaged in non farming activities, which is substantially higher than the state level. There are only 10.27% people enganged in farming who have the onus to feed remaining 89.73% population of the district. Further, out of these 10.27 % farmers, there are very few farmers engaged in cultivation of vegetables and fruits. This indicates a great scarcity in terms of number of farmers working to feed the non farmers.

4.4 Horticulture in Madhya Pradesh and Indore

Horticulture is one of the sunrise sectors in Madhya Pradesh with increasing area under fruits, vegetables and spices. Although the major crop in MP food grain but, it has shown interest and growth in into horticulture. From 2005-06 to 2014-15, the proportion of area under horticultural crops has increased from 2 per cent to 6 per cent. Around 43 per cent of the total area under horticulture is devoted to vegetables. (Horticulture Division, 2017). There has been a significant increase in vegetable production in MP from 3.6 MMT in 2010-11 to 14.2 MMT in 2013-14. This has improved MP's position in vegetable production from thirteenth in 2010-11 to fourth largest vegetable producer in the country 2013-14; MP's contribution in total vegetable production has increased from 2.8 per cent to 7.4 per cent. In fact, production of horticultural crops as a whole has increased from 7.8 MMT in 2010-11 to 23.9 MMT in 2013-14. .The State has also done well in spices production with the largest production of Garlic, accounting for 39% of the total national production and is second largest producer of Coriander in the country. Among vegetables, Malwa potato has gained famous for potato chips processing.

Figure 4.4- Leading Vegetable Producing States (2016-17 Provisional)



The state's share in the total national production of Peas is 09.50 %. Vegetables and fruits occupy comparatively less cultivated area. Thus, there is ample scope to increase the present level of area under vegetables and fruits in the state.

Given the huge potential in the state for horticulture, the government of Madhya Pradesh announced the 'Horticulture Hub (H2) Establishment Policy, 2012'. It has given emphasis to food processing sector. The agro-processing sector is one of the very rapidly growing sector in the state exhibiting several distinguishing features.

• This sector forms an average of 32% share of the total industrial output value in Madhya Pradesh

• There are about 22 leading processing units in the state. In addition to this, there are over 500 units in the SME sector 250-300 potato processing units in Indore and adjoining districts, and 125-150 flower processing units (Gulkhand, Rose water) located in Ujjain. There is potential for increase in the number of processing units, especially for Aonla, Garlic and Coriander with linkage to the proposed Food Parks (MPTRIFAC, 2015)

Under the Horticulture policy of state 2012, land allotment to MSME is done at a concessional rate of 25 per cent and exemption of stamp duty and registration charges of Rs 1 per 1,000. Moreover, fruits, vegetables, floriculture and other notified agricultural produce purchased in any market area of the state for processing/production are exempted from payment of mandi fee. Additionally, power has been subsidised at Rs 1.5 per unit, subject to a ceiling of 25 per cent of the electric units consumed in cold storage, cold chambers, ripening chambers and individual quick freezing enterprises for five years. In 2009-10, there were 812 agro-based food product industries in MP, accounting for nearly one fourth of the total industries. This Sector contributes an average 30 per cent to the total industrial output value in Madhya Pradesh. (ICRIER Report, 2017)

Figure 4.5- Madhya Pradesh - Output of Horticulture Crops

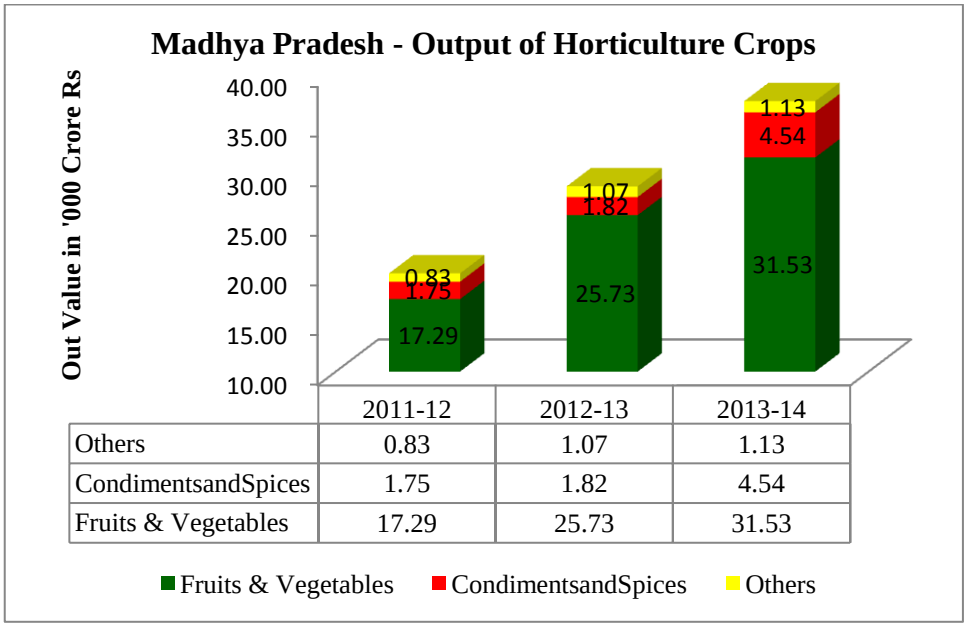


Figure 4.6- Contribution of MP in overall Area and production of Vegetables

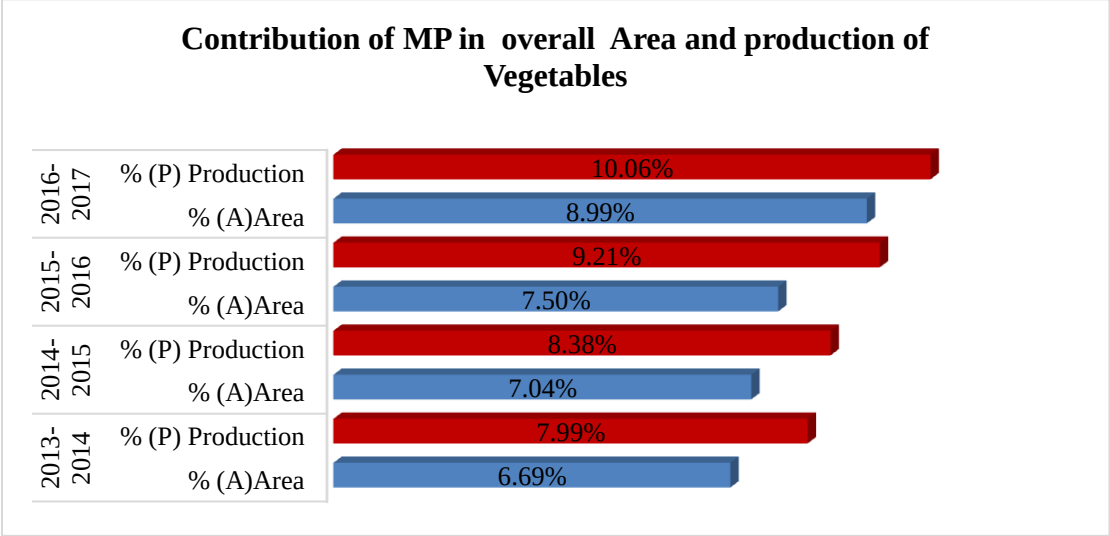


Figure 4.7- Contribution of MP in Overall Production and Area of Fruits

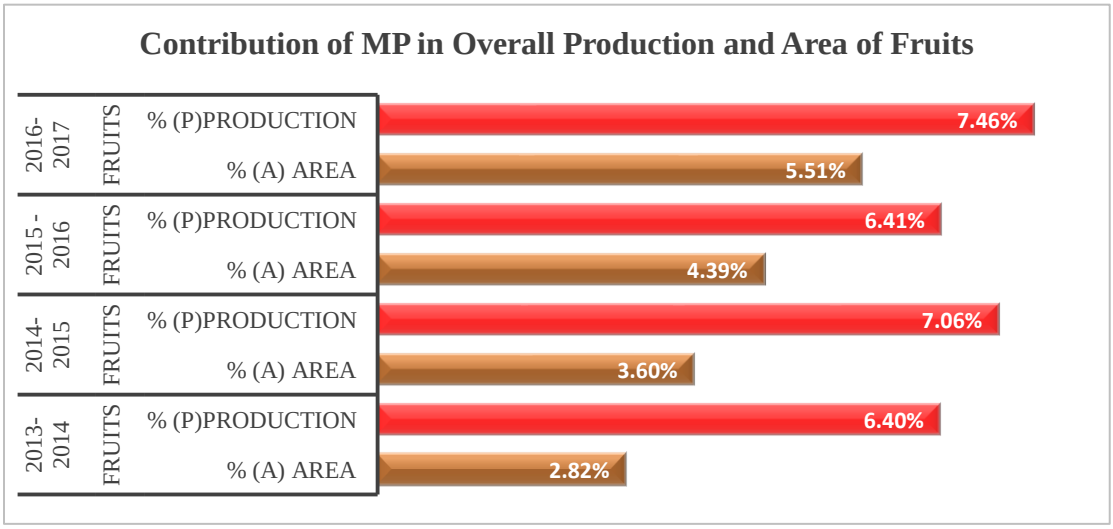


Table 4.3- Madhya Pradesh Output Of Major Horticulture Crops (Rs In Crore) (At Current Prices)

	2011-12	2012-13	2013-14
FRUITS			
Orange	1,809.37	2,459.58	2,664.12
Banana	1,379.00	1,963.50	2,271.05
Mango	387.90	851.64	890.68
Lemon	363.86	761.99	823.68
Papaya	316.14	354.80	439.07
Guvava	186.59	585.41	962.32
Mosambi	65.24	420.74	421.89
VEGETABLES			
Onion	2,089.88	3,026.38	4,490.72
Totmato	1,851.70	2,864.92	3,321.81
Potato	1,758.51	2,754.86	3,330.02
Cauliflower	832.03	1,043.69	1,309.89
Green Peas	655.70	852.58	881.25
Brinjal	651.10	1,355.25	1,802.55
Garlic	648.00	694.28	823.50
Cabbage	542.86	1,051.40	1,036.01
Okra	446.05	521.18	635.59
Coriander	378.33	383.00	358.14
Ginger	96.38	98.75	144.80
Sweet Potato	25.72	61.31	68.13

Source – Horticulture Statistics at glance, 2017

Figure 4.8- Madhya Pradesh- Output of Major Fruits

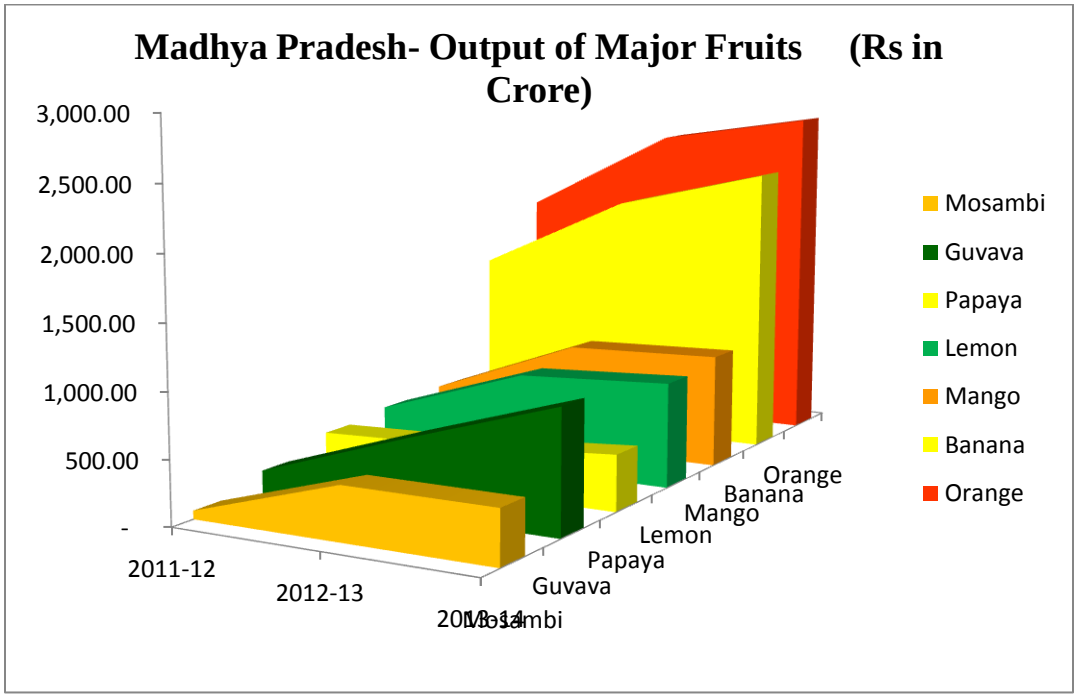


Figure 4.9- Madhya Pradesh - Output of Major Vegetables

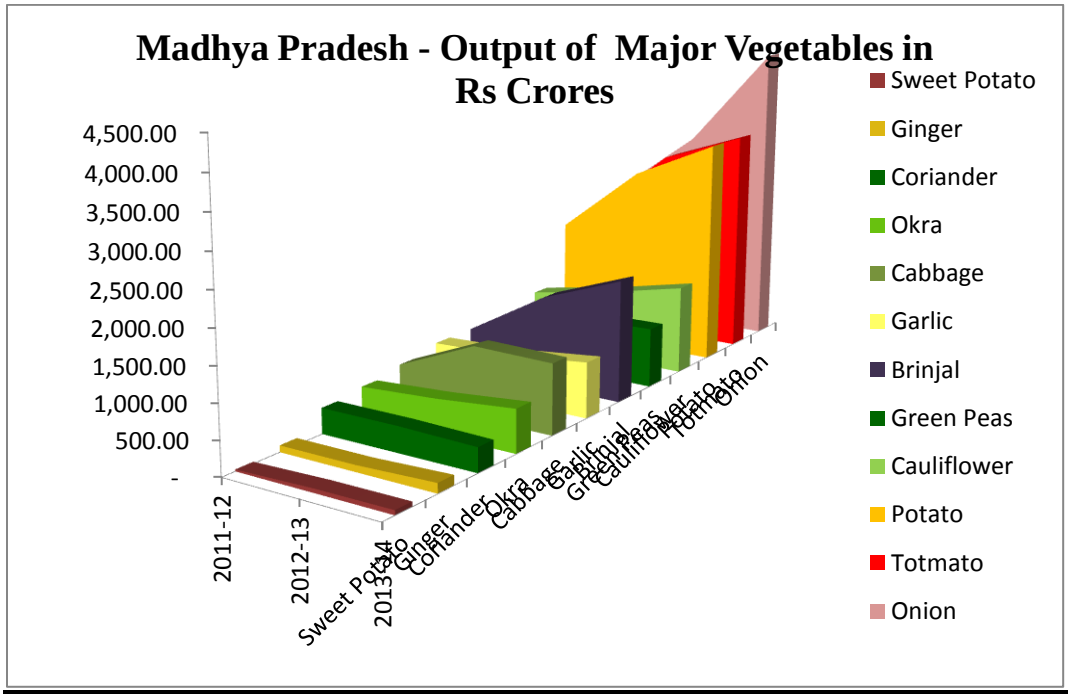
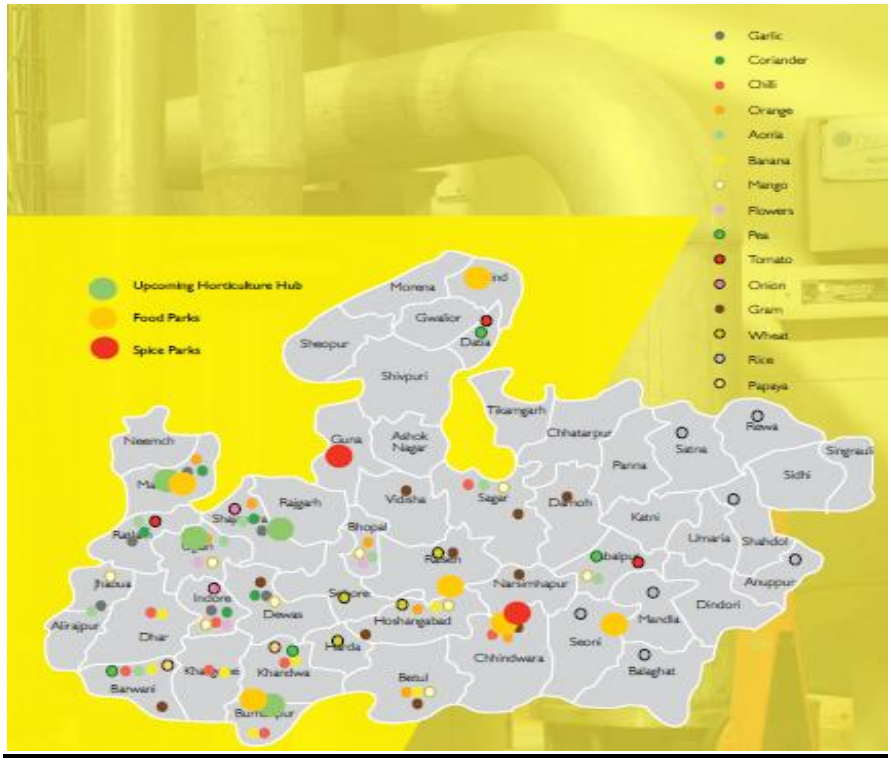


Figure 4.10- Madhya Pradesh horticulture schemes



As seen in the graphs above, Madhya Pradesh has shown an increasing trend in output of Orange, Banana, Mango, lemon and Guavas. In case of vegetables, an increasing trend has been seen in Onion, Tomato and Potato. These three crops have been brought under the purview of MSP (Minimum Support Price). Brinjal, Cabbage, Cauliflower, Green Peas and Okra are other high output vegetables in the state.

4.4.1 Agriculture in Indore

The main principal crops of the district are “Jowar”, cotton and ground-nut during “Kharif” and wheat, gram and linseed during “rabi”. Some of the pulses like tur, moong and urad are also grown mixed with other crops. Sugarcane and maize are sown on limited scale in isolated patches. The land utilization in the district is as follows –

Table 4.4- The land utilization in the district					
Year	**Forest Area**	**Area not available for cultivation**	**Uncultivated land excluding follow land**	**Agricultural Land**	**Waste Land**
2009-10	29,216	46,460	19,688	234,720	8,596
2010-11	29,216	36,523	20,270	178,911	2,515
Source: http://www.censusindia.gov.in/2011census/dchb/DCHB_A/23/2322_PART_A_DCHB_INDORE.pdf					

Total Area under Food Crops in Indore Division is 21 lakh hectares. Major Crops being Soyabean, Wheat and Gram. Horticulture is seeing little growth in the district. The area under cultivation of horticulture crops in Indore Division is approximately 6%, which is below the state average of 10 %. Whatever increase is seen in figure below is due to the multiple crops harvested in same land. Vegetable crop cycle is approximately 2-3 months. This enables minimum 4 harvests in a year.

Table 4.5- Total cultivated land under Horticulture Crops in Indore District (land in Hectares)					
S.No	Name of the Crop	2007- 2008	2008 - 2009	2009 - 2010	2010-2011
1	Fruits	858	900	1018	1200
2	Vegetables	23358	24612	26468	27000
3	Spices	3315	3400	3948	5000
4	Flowers	878	950	1021	1200
5	Medicinal Plants	225	252	308	500
Total		**28634**	**30114**	**32763**	**34900**
Source : Udhaniki and Food Processing Department, Middle Pradesh					

Table 4.6- Major Horticulture Crops of Indore District	
Category	**Crops**
Fruits	Guvava, Mango, Lemon, Cheeku, Pomegranate
Vegetables	Potato, Tomato, Caoliflower, Cabbage, Chilli, Guard, Lauki, Spinach, Fenugreek, Corriander, Bitter Gaurd
Spices	Galic, Onion
Flowers	Marie Gold, Giardia, Rose, Gladiolus, Aster, Chraise, Xanthium
Medicinal Plants	Anwala, Safedmusali
Source : Udhaniki and Food Processing Department, Middle Pradesh	

According to health experts, a healthy human being requires 180 gms of vegetables and 85 gms of fruits daily. Small bit of calculations can show that the present level of production of fruits (0.5 lakh tons) and vegetables (7.5 lakh tons) in the state is far below desired level. Thus, there is an urgent need to take steps to enhance the production level of vegetables and fruits and make it within reach of common man.

4.4.2 Agricultural Marketing in Indore -

The term agricultural marketing is composed of two words agriculture and marketing. Agriculture, in the broadest sense, means activities aimed at the use of natural resources for human welfare and marketing connotes a series of activities involved in moving the goods from the point of production to the point of consumption. To be specific, the subject of agricultural marketing includes marketing functions, agencies, channels, efficiency and cost, price spread and market integration, producers' surplus, etc.

In Madhya Pradesh regulatory framework for agricultural marketing is unique and consists of two distinct set of measures. One of these is development and regulation of

primary markets, popularly called "Regulated Markets" and the second set is the regulation of market through a series of legal instruments. The **M.P. State Agricultural Marketing Board** i.e. MPSAMB (also known as Mandi Board) has come into existence w.e.f 1973 under the provisions of M.P. Krishi Upaj Mandi Adhiniyam 1972. The Mandi Board is a three tier organization of which the first tier consists of regulated markets. These are in the nature of physical and institutional infrastructure at the first contact point for farmers to encash their farm marketable surpluses.

Regulated Markets:

Presently in the state there are a total of 524 regulated markets of which 246 are main wholesale markets having elaborate infrastructure also known as Krishi Upaj Mandi and the balance 278 having lower level of infrastructure known as Sub Mandi. In addition to these there are haat bazars in the rural areas where farmers and other people congregate periodically to sell their farm marketable surpluses and buy their essential requirements. These haats have not been provided the needed physical infrastructure so far. For administrative purpose Sub Mandis are controlled by the respective Krishi Upaj Mandi of the area. Area of operation of Mandi Board is entire state of Madhya Pradesh i.e. 51 District through 246 notified Mandi Committees and its 278 (notified) Sub-Mandi Committees. Available covered godown capacities in Mandi Committees of the state are 0.2572 million tonnes which is under expansion to 0.100 million tonnes. But M.P has only 3.7 % share in the national cold storage facility, of which 87 % cold storages are owned by private sector. Major commodity-wise arrivals in the state are wheat, jowar, maize, paddy, gram, masoor, tur, soybean, mustard, cotton, bananas, oranges etc. As obvious vegetables and fruits have a very less share. The state government has notified 126 mandis for marketing of fruits and vegetables in the state for infrastructure improvement work. But the efforts needed for improvement are rarely rigorous.

A review of the share of different horticulture crops in the district is interesting. Vegetables and fruits contribute to maximum land cultivation in the state out of total land under horticulture. While the cultivated land for vegetables and fruits are highest in Indore district, this owes to the high population density and urban areas. But the return on different products varies substantially. Though there is less data available, but from whatever is available, it can be seen that the prices of vegetables and fruits are very high, at times 150 to 200 % high in Indore district. Further, the spreads are seen to be very high in some crops. Moreover, seasonal variations are obviously there.

The mandi's in Indore, though regulated, do not have the provision for any assured price or minimum support price in case of vegetables and fruits. Also, there are no cold storages fit for storing vegetables available. The selling mechanism is still dominated by mediators lading to fluctuation in price. Farmers still have to rely either on the pre-harvest contractors or other intermediaries and they end up realizing the least price. Farmers are hardly seen to have the knowledge on market information, for taking better sales decision. Table 4.6 shows that the spread between retail and wholesale price is much higher than the return that farmer gets on his crop.

The spectrum of prices from producer to consumer, which is an outcome of demand and supply of transactions between various intermediaries at different levels in the marketing system, is also unique for fruits and vegetables. Moreover, the marketing arrangements at different stages also play an important role in price levels at various stages viz. from farm gate to the ultimate user. These features make the marketing system of fruits and vegetables to differ from other agricultural commodities, particularly in providing time, form and space utilities. While the market infrastructure is better developed for food grains, fruits and vegetables markets are not that well developed.

Table 4.7- Licensed Intermediaries in Regulated Mandis in Indore

Choithram Mandi (Fruits & Vegetables)
No. of Licensed Wholesale and Other Functionaries of all categories including Cooperatives:

Name	Number	License Fee	Number Of Years
Commission agent	241	1000	5
Hammal	2004	10	1
Traders	58	1000	5
Traders+ commission agent	1155	2000	5
Tulawati	46	20	1

Sanyogitaganj Mandi
No. of Licensed Wholesale and Other Functionaries of all categories including Cooperatives:

Name	Number	License Fee	Number Of Years
Broker	5	800	5
Commission Agent	383	1000	5
Hammal	606	10	1
Process	348	1000	5
Traders	1570	1000	5
Tulwati	56	20	1
Warehouse	29	1000	5

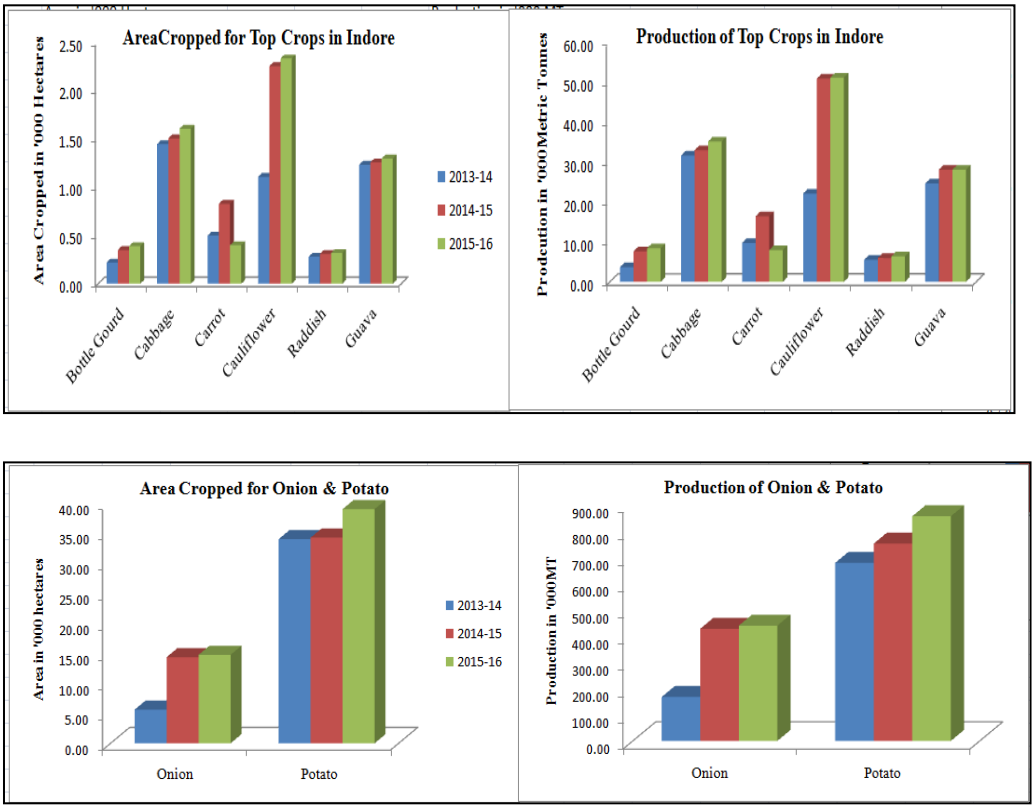
Table 4.8- Indore Profile in Horticulture Crops

Indore is among Top Producers for selected Horticulture Crops (Data 2015-2016)

Crop	Production in MP	Production in Indore
Guava	4047.79 Thousand MT	28.2Thousand MT
Onion	20931.21 Thousand MT	440.29 Thousand MT
Potato	43417.05 Thousand MT	858 Thousand MT
Garlic	1617.34 Thousand MT	NA

Source :- Horticulture at a glance, 2017

Figure 4.11- Horticulture Crops at Indore Area



The horticulture statistics report of Government of India, 2017 shows that Indore has contributed in certain horticulture crops to make the state top producer in the area. These crops are Guava, Potato, Onion and Garlic. Indore also appears in the top producing districts for Bottle Gourd, Cabbage, Cauliflower and Raddish. Largest contributors being Onion and Potato.

Given its importance on business scenario of the nation, Indore offers lot of scope for flourishing of innovative business ideas and growth. It is also important to note that Indore has earned a name and fame as the "Food Capital" in India owning to variety of street food available and the foodie instinct of peoples here. People in Indore are highly quality conscious when it comes to food. People in Indore are quite creative in terms of food related businesses as well.

But the very basic ingredient in the food, fruits and vegetables are yet to catch the attention of businesses in terms of innovation and creativity and sustainability.

4.5. Institutional Setup in Madhya Pradesh

In Madhya Pradesh regulatory framework for agricultural marketing is unique and consists of two distinct set of measures. One of these is development and regulation of primary markets, popularly called "Regulated Markets" and the second set is the regulation of market through a series of legal instruments.

Regulation of primary markets was taken up as an institutional innovation and construction of well laid-out market yard was considered as an essential requirement of effective implementation of the regulation programme. As the programme was a developmental-cum-legal measure, it took considerable time to extend it to a wider scale. Berar Cotton and Grain Market Law, 1897 will be long remembered as the first law which provided the basis for the regulation of markets all over the country. Till 1950 there was not any regulated market in the state. The then Government of Madhya Bharat passed the Madhya Bharat Agricultural Produce Market's Act in 1952, this was modelled mostly on the lines of Bombay Act. With the reorganisation of the state in 1956, more than one Act was operative simultaneously in different regions of the state. The programme got momentum after passing of the Madhya Pradesh Agricultural Markets Act, 1960 which came in force w.e.f 15th October, 1960.

Further in accordance with the recommendations of the National Agriculture Commission, the M.P. State Agricultural Marketing Board i.e. MPSAMB (also known as Mandi Board) has come into existence w.e.f 1973 under the provisions of M.P. Krishi Upaj Mandi Adhiniyam 1972. The Mandi Board is a three tier organisation of which the first tier consists of regulated markets. These are in the nature of physical and institutional infrastructure at the first contact point for farmers to encash their farm marketable surpluses. Presently in the state there are a total of 546 regulated markets of which 257 are main wholesale markets having elaborate infrastructure also known as Krishi Upaj Mandi and the balance 293 having lower level of infrastructure known as Sub Mandi. In addition to these there are haat bazars in the rural areas where

farmers and other people congregate periodically to sell their farm marketable surpluses and buy their essential requirements. These haats have not been provided the needed physical infrastructure so far. For administrative purpose Sub Mandies are controlled by the respective Krishi Upaj Mandi of the area.

Table 4.9- Category Wise Mandi in Indore Division under Mandi Board MP

	Indore Division	Indore District
1	6	1
2	7	2
3	9	1
Total	22	4

Table 4.10- Regulated Mandi's & Sub Mandi's Under Mandi Board MP

Mandi Name	Category	Date of establishment	Area of Mandi Hectare	Sub Mandi	Total Sub Mandi	Date of Regulation	Area of Mandi	Blocks Covered by Mandi
Indore	1	3/23/1953	27	Sanyogitaganj	2	12/13/1961	Area Of Indore Tahsil.	Indore
				Indore Fruit & Vegetable		7/6/1985		
Gautampura	3	5/26/1960	2.69	Depalpur	2	5/8/1973	Area Of Depalpur Tahsil.	Depalpur
				Betma		2/26/2007		
Mhow	2	9/2/1972	9.778	Manpur	1	6/25/1985	Area Of Mhow Tahsil.	Mhow(Mhow Gaon)
Sanwer	2	12/28/1955	4	Chandravatiganj	2	1/2/1996	Area Of Sanwer Tahsil.	Sanwer
				Manglia		1/4/1996		

4.6 Efforts by Government Vs Beneficiaries - Mismatch

Having understood the importance of value added by horticulture crops, the government is trying to promote horticulture in the state through various schemes and incentives to farmers. The horticulture policy 2012 of the state has tried to rope in public private partnership for food processing, development of cold chain infrastructure and market enhancement. The e marketing, kisan app and other initiatives are trying to leverage horticulture through technology.

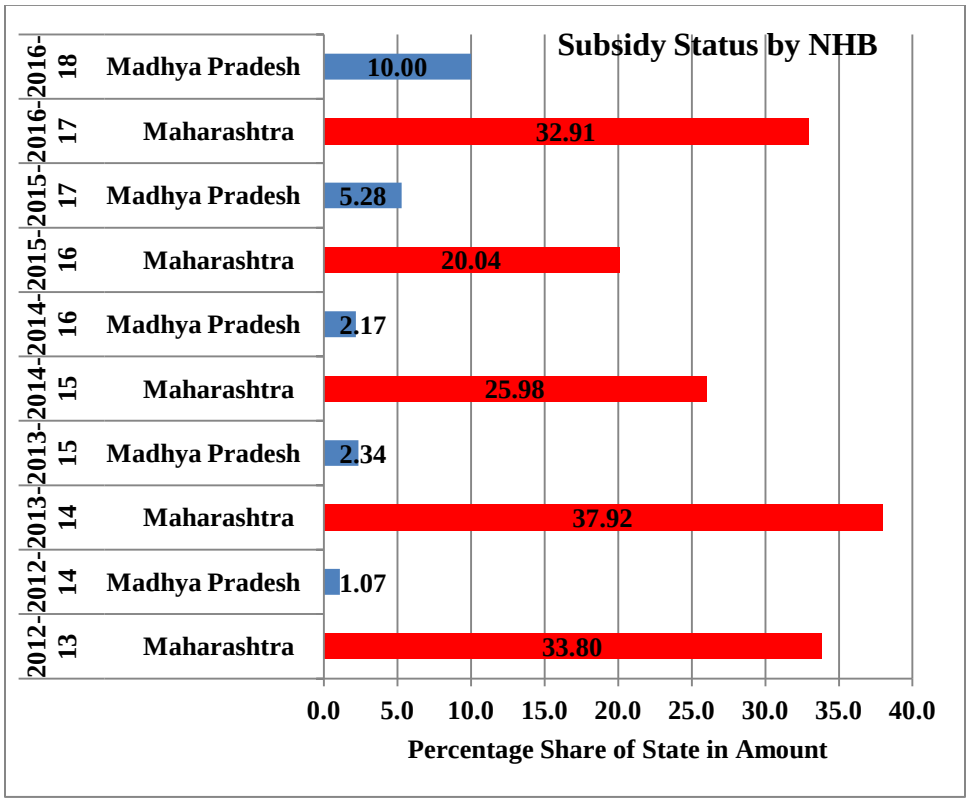
The farmers in Madhya Pradesh have also responded to the importance of horticulture. The table and the graph show the increasing trend in number of beneficiaries getting benefitted by government schemes. The number of beneficiaries in MP is continuously increasing since 2012. The amount of subsidy has also increased considerably. But, Maharashtra farmers are at the top in terms of horticulture benefits drawn from the government.

Table 4.11- Release of subsidy under the Scheme ' Development of Commercial Horticulture through Production & Post Harvest Management'

Year	State	Number of Beneficiaries	Amount In Lakhs	Percentage	Ranking (Based on Amount)	Ranking (Based on No. Of Bene.)
2012-13	Maharashtra	990	1707.944	33.80	1	1
	Madhya Pradesh	36	53.972	1.07	13	5
	Grand Total		**5053.79**		22	22
2013-14	Maharashtra	2561	4759.599	37.92	1	1
	Madhya Pradesh	154	294.058	2.34	10	4
	Grand Total		**12551.04**		21	21
2014-15	Maharashtra	462	2065.902	25.98	1	1
	Madhya Pradesh	66	172.685	2.17	12	4
	Grand Total		**7951.796**		21	21
2015-16	Maharashtra	458	3238.93	20.04	1	1
	Madhya Pradesh	82	853.78	5.28	7	4
	Grand Total		**16161.52**		26	26
2016-17	Maharashtra	556	5963.939	32.91	1	1
	Madhya Pradesh	178	1812.229	10.00	4	2
	Grand Total		**18120.39**		23	23

Source – National Horticulture Board, Statistics 2017

Figure 4.12- Subsidy Status by NHB



There are other schemes and benefits provided by the government for promoting horticulture production. But what is needed urgently is the "Market Reforms.". In order to achieve the objective of "Doubling Farmer's Income" by 2022, more options need to be explored.

The National Horticulture Mission (NHM) under MIDH, the Mission for Integrated Development of Horticulture corps has laid down year wise action plan to promote the growth in horticulture sector. For the year 2017-2018, the total outlay was Rs 9705 lakhs out of which 60% was contributed by Central Government and 40% by State Government. Out of this 9705 lakhs, 46% is for post harvest management which includes packaging, grading, cold chain support, storage etc.

The schemes of NHM are as follows:-

- Pack house / On farm storage units
- Integrated pack house with facilities for conveyer belt, sorting, grading units, washing, drying and weighing.
- Cold Storage Units
- Technology induction and modernisation of cold-chain
- Technology induction and modernization of cold-chain, for modernization of PLC equipment, packaging lines, dock levelers, advanced graders, alternate technologies, stacking systems,

Chapter 5
Finding and Discussion

Chapter Highlights

5.1 Descriptive Statistics

5.1.1 Summary of Primary data collection

5.2 Value Chain in Urban Indore

5.2.1 Estimation of Supply and Demand

5.2.2 Stakeholders between– Farmer and Fork

5.2.3 Types of distribution networks

Value added by each stakeholder in different Channels

5.3 Farmer's Profit- Loss Analysis

5.4 Price Efficiency – Price Spread, Cost for different supply chains

5.5 Case Studies for Farmer Profitability

Case Study I -Marginal Farmer – Pandharinath Patidar (Pandu Dada)

Case Study II - Manoj Patidar – A Middle Farmer

Case Study III- Large Farmer Pappu Bhai from Mothapura

5.6 An Experiment in Corporate Participation in Farmer-Consumer Connect

5. Findings and Discussion

5.1 Descriptive Statistics

The study was exploratory in nature. The findings are based on Primary data collected from multiple stakeholders in agri supply chain from farm to fork. Secondary data collected from published resources. Interviews were conducted with several subject experts including farmers, business people, NGOs and others.

5.1.1 Summary of Primary data collection

There were multiple sources of primary data in the study. Each stakeholder, each member of the agri-value chain was included as a unit of observations. The data was collected from several locations – Regulated Mandis, Farmer Markets, and Retailers and nearby villages. Table summarizes the different sources and data collected from them

Table 5.1-Population Estimates in Indore District

Place	Name	Number of Mandi/sell points	Agents	Wholesalers	Retailers
Regulated Mandi	Choithram F &V Mandi	1	241	1155	800
Regulated Mandi	Depalpur Mandi	1	40	30	50
Regulated Mandi	Sanwer Mandi	1	20	10	100
UnRegulated Mandi	Nandalpura Mandi	1	3	25	75
UnRegulated Mandis	Rajkumar Mill Mandi	1		2	100
Unregulated Mandis	Miscellaneous Locations	10			Not Estimated
Weekly Haat	Itwaria Haat	1			35
Weekly Haat	Agrasen Haat	1			35
Weekly Haat	Bangali Chauraha Haat	1			40
Weekly Haat	Jaivik Setu	1			5
Mobile Hawkers	Miscellaneous Places	10,000			2000
Organised Retail Shops	Miscellaneous Places	7			30
Online / Home Delivery	Miscellaneous Places	10			15
Population Size			304	1222	3285

Table 5.2- Point of Survey & Details of Data Collection

Location Type	Place	Name	Farmers	Agents	Wholesalers	Retailers	Consumers	Subject Experts
Rural	Farm /Village	Bagdoh	8	-				5
	Farm / Village	Dongargaon	10	-				
	Farm /Village	Jhapdi	12	-				
	Farm /Village	Khegaon	10	-				
	Farm /Village	Mothapura	8	-				
	Farm /Village	Palsudh	30	-				
	Farm /Village	Ramdhan	5	-				
	Farm /Village	Methwa	3	-				
	Farm /Village	Karahi	10	-				
	Farm /Village	Bardwaha	98	-				
Urban Locations	Multiple Locations	Indore City	-	-			85	8
	Regular Mandis	Choithram F &V Mandi	47	35	23	100		
	Regular Mandis	Depalpur Mandi	-	5		30		
	Regular Mandis	Sanwer Mandi	9	20	10	40		
	Regular Mandis	Nanlalpura Mandi	-		10	33		
	Regular Mandis	Rajkumar Mill Mandi	10		2	43		
	Weekly Haat	Itwaria Haat	-			20		
	Weekly Haat	Agrasen Haat	6			15		
	Weekly Haat	Bangali Chauraha Haat	4			12		
	Weekly Haat	Jaivik Setu	5			4		
	Mobile Hawkers	Miscellaneous Places	-			38		
	Organised Retail Shops	Miscellaneous Places	-			4		
	Online / Home Delivery	Miscellaneous Places	-			4		
Sample Size of Group			**271**	**60**	**45**	**343**	**85**	**13**
Grand Total (Sample Size)			**817**					

In order to make the sample representative, it was essential that all sources of supply of fruits and vegetables were analysed. It was observed that there were as high as 33 varieties of vegetables and 18 varieties of fruits available in the different markets. The major fruits and vegetables were sourced from local and nearby villages. Few of them were sourced from other states. Karnataka, Maharashtra, Himachal, Gujarat and Rajasthan are the major states from where vegetables and fruits are sourced in Indore. It would have been preferable to collect weight wise data for locally sourced and

outside products. But, such data could neither be collected from primary sources, nor it could be located among secondary data sources.

Table 5.3-Description of Sample of Fruits and Vegetables Collected from different sources

		Number of Vegetables in Sample			Number of Fruits in Sample		
		Locally Sourced	Sourced From Outside Indore	Total	Locally Sourced	Sourced From Outside Indore	Total
Regular Mandis	Choithram F &V Mandi	16	6	22	2	1	3
Regular Mandis	Depalpur Mandi	31	2	33	4	-	4
Regular Mandis	Sanwer Mandi	17	7	24	8	4	12
Regular Mandis	Nandlalpura Mandi	9	-	9	9	2	11
Regular Mandis	Rajkumar Mill Mandi	17	-	17	3	-	3
Weekly Haat	Itwaria Haat	10	-	10	4	-	4
Weekly Haat	Agrasen Haat	9	1	10	3	2	5
Weekly Haat	Bangali Chauraha Haat	10	-	10	3	1	4
Weekly Haat	Jaivik Setu	5	-	5	-	-	-
Mobile Hawkers	Miscellaneous Places	8	2	10	10	8	18
Organised Retail Shops	Miscellaneous Places	18	12	30	6	9	15
Online / Home Delivery	Miscellaneous Places	8	7	15	10	8	18

There are four mandi's regulated by the Mandi Board which – The Choithram Fruits and Vegetable Mandi, the Gautampura(Depalpur) Mandi, Sanwer Mandi and Mhow Mandi. Apart from these four mandi's there are several other unregulated mandis. The major ones being – Rajkumar Mill Mandi, Malwa Mill Mandi, Bengali Chouraha Mandi, Agrasen CHoraha Mandi, Vijaynagar, Patnipura, Tilak Nagar and several others.

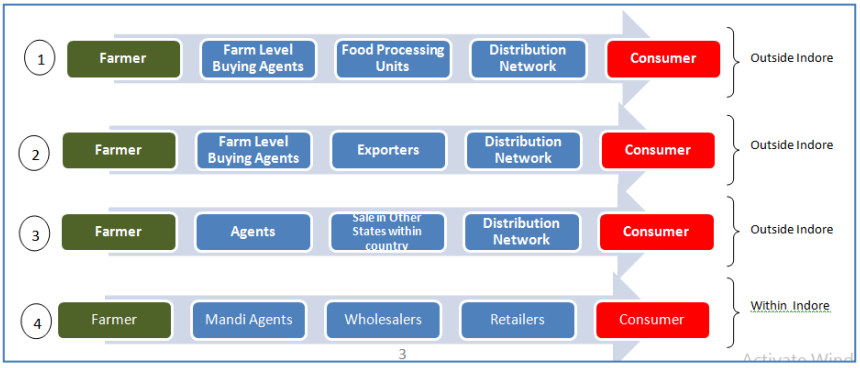
5.2 Value Chain in Urban Indore

5.2.1 Estimation of Supply and Demand

The agri supply chain from farm to fork, consists of several stake holders. Several supply chains can be identified for the purpose of delivering farm produce to the end consumer. There are several farmers mostly those who have large land holdings and have substantially large scale production. These farmers prefer one of the first three supply chains. This means their produce goes for food processing or export or for sale

in other states. But there are other farmers, particularly those who have small and marginal land holdings. These farmers are less privileged in terms of resources for farming, access to market and knowledge. According to agriculture census 2011 (Agriculture Division, 2011) and National Statistical Survey, 70th round (NSS 70th Round, 2014), 67% of the farmers are small and marginal with land holdings below 1 hectare of land and monthly income around Rs 6000/-.

Figure 5-1 Agri Marketing Channels in Indore



Observation during data collection revealed that these small, marginal and semi medium farmers are the ones who sell their produce especially fruits and vegetables in and around Indore Urban. These are the farmers, who largely rely upon the 4th type of supply chain. Types 1 to 3 generally require huge quantities of produce which can be supplied by medium and large farmers.

For the purpose of present study, the 4th type of supply chain was focused and farmers selling produce of F&V inside Indore Urban were selected for study.

Supply side -

In the city of Indore, the sources for supply of vegetables are several mandis. As mentioned in the previous section – there are four regulated mandis and several unregulated mandis. The "Devi Ahilya Bai Holkar Fruit and Vegetable –Mandi", commonly known as Choithram mandi is the largest market for fruits and vegetables in the state. There is no other mandi of this magnitude in the area of 600 km. The available statistics (arrival data, agmarknet.gov) shows an average daily arrival of

more than 3000 Tonnes of vegetables and 200 Tonnes of fruits. The yearly data of arrival of major fruits and vegetables in Indore Mandi's is shown in Table 5.5

As seen, more than 90% of the vegetables arrive in Choithram mandi. In case of Fruits, similar pattern is observed except for fruits like grapes and mosambi which are sourced from outside indore. But still, Choithram mandi provides a major unit for studying the agri market in Indore.

Madhya Pradesh is among the front runner states in performance of horticulture. The yield and production data reveal this. The above table shows production for selected F &V. In 12 out of 15 vegetables, MP is among top ten producers in country. In fruits 6 out of 10 frutis, MP is among top ten producers.

Table 5.4- MP State Production of Vegetables and Fruits (Tonnes) (Source – Horticulture Statistics,2017)					
Crop	**2014-15**	**2015-16**	**2016-17**	**Is Indore among the largest producing districts**	**Is MP among the top producer states**
VEGETABLES					
Green Peas	607,000	707,460	1,113,470	No	Yes
Cauliflower	750,000	842,060	913,420	Yes	Yes
Cabbage	606,000	444,420	614,440	Yes	Yes
Green Chili	-	514,100	574,800	No	Yes
Bhindi	328,000	342,050	536,730	No	Yes
Garlic	270,000	424,500	405,000	Yes	Yes
Potato	136,010	141,050	156,200	Yes	Yes
Radish	47,000	157,190	153,270	Yes	Yes
Onion	117,880	118,200	120,140	Yes	Yes
Cucumber	34,000	118,910	116,070	No	No
Tomato	70,230	73,700	100,000	No	Yes
Carrot	32,000	47,610	66,340	Yes	Yes
Capsicum	-	33,840	33,840	No	Yes
Ginger	1,940	1,730	1,620	No	No
Pumpkin	NA	NA	NA	No	No
FRUITS					
Banana	1,836,000	1,758,050	1,646,890	No	Yes
Mandarin	1,030,000	1,126,270	1,437,970	No	No
Guava	952,000	990,000	523,750	Yes	Yes
Mango	396,000	371,480	494,360	No	Yes
Papaya	455,000	464,670	454,710	No	No
Orange	111,000	43,480	182,060	No	Yes
Watermelon	47,000	117,340	172,840	No	Yes
Pomegranate	28,000	54,200	88,860	No	No
Muskmelon	44,000	40,300	63,190	No	Yes
Grapes	3,000	2,200	1,280	No	No

Table 5.5 - Analysis of Arrivals in Choithram F& V Mandi (Top commodities important in terms of arrivals) in Tonnes (Source : Agmarknet.gov.in)						
Name of Commodity	**2014-15**	**2015-16**	**2016-17**	**Five Years Total**	**Five Years All Mandi Total**	**% share of Choithram F&V**
VEGETABLES						
Onion	199811	242658	246428	1157993	1244967.6	93.01
Potato	62055	75774	76432	406775	431935.12	94.18
Garlic	88486	67125	52345	398475	432056.31	92.23
Tomato	7296	7683	12008	45917	46138.36	99.52
Cauliflower	335	132	9000	18634	18976.56	98.19
green chili	2988	1574	8873	18970	NA	NA
Ginger	1262	1254	2380	8780	9551.62	91.92
Pumpkin	733	708	1163	3030	3093.43	97.97
Cabbage	123	122	373	7628	7654.55	99.65
Aravi	174	415	148	985	NA	NA
FRUITS						
Apple	2,778.00	1,978.80	7,234.80	21,119.80	21,728.80	97.20
Banana	2,422.40	661.00	373.00	6,419.90	6,508.90	98.63
Grapes	1,055.40	828.90	782.10	3,694.30	4,676.60	79.00
Mango	5,786.10	2,748.60	3,923.00	25,995.80	26,824.00	96.91
Mousambi	994.80	368.00	717.00	5,798.80	7,315.80	79.26
Orange	356.00	69.00	282.00	1,104.20	1,261.10	87.56
Papaya	3,175.40	2,672.00	2,389.00	15,206.90	18,022.40	84.38
Pineapple	2,596.30	1,688.10	1,179.00	9,862.20	10,758.90	91.67
Pomegranate	937.80	630.60	1,239.90	4,162.50	4,405.30	94.49
Water Melon	2,582.90	1,323.00	2,341.00	11,074.70	12,617.70	87.77

The Table shows the daily arrivals of top vegetables ranked on the basis of arrival quantity in various Mandi's in Indore. As the Choithram Mandi is the largest mandi in the state, it attracts producers from entire state and even outside state to sell their produce. Potato, Onion and Garlic are largest crops brought for sale. The reason may be availability of cold storage and demand from food processing units across the country. Rest of the vegetables are locally grown and locally consumed. In case of fruits, Mango, Papaya, Guava, Orange, Pomegranate and watermelon are sourced

locally as well as outside Indore. Some fruits like pineapple, Apple, grapes and other exotic fruits are majorly sourced from outside Indore.

Table 5.6-Average Daily Arrival Analysis **Top Vegetables & Fruits Indore In Tonnes Mandis (Source Agmarknet)**			
Vegetable	**Average Arrivals**	**Fruit**	**Average Arrivals**
Onion (I)	1022	Mango (I& OI)	35.77
Potato (I)	878	Apple (OI)	28.97
Garlic (I)	473	Papaya (I)	24.03
Green chili (I)	99	Others (I &OI)	20.00
Tomato(I)	72	Water melon (I&OI)	16.82
Ginger (I)	47	Pineapple (OI)	14.35
Cauliflower (I)	33	Mousambi (OI)	9.75
Pumpkin (I)	33	Banana (I &OI)	8.68
Colocasia roots (Arvi) (I)	24	Grapes (OI)	6.24
Cabbage (I)	20	Pomegranate (I&OI)	5.87
Others	300	Orange(I&OI)	1.68
Total	**3001**		**172.16**
*** I- Grown in and around Indore, OI – Grown outside Indore**			

Further, it is worth mentioning that the vegetables like Onion, potato and garlic are locally grown but consumed locally as well as outside. And these crops are consumed directly as well as in the processed form.

Demand Side -

In order to estimate the demand and understand the supply dynamics, it is essential to look at the population profile of Indore. As mentioned in the previous chapter, the total population of Indore district is around 33lakhs. Out of this the urban or the city dwellers are 23lakhs. Thus, the vegetable and fruits markets in the city have to cater to the need of these 23lakh people. Out of this 75% of the people can be considered in the range of grown ups from the point of view of consuming fruits and vegetables.

This estimate is based on an assumption that few sections of the society are not consuming vegetables and fruits due to multiple reasons. Infants below the age of 6 months, people living in extreme poverty, and people unable to buy fruits and vegetables are such examples. Researcher's estimate based on observation and miscellaneous statistical data, 75% of the total urban population is considered to be the consumer of fruits and vegetables in Indore. This estimate will also make room for the variation in per capita consumption of fruits and vegetables among different sections of society.

Table 5.7-Estimation of Total Daily Consumption of F& V in Indore	
Total Population of Urban Indore	23,00,000
People consuming Vegetables and Fruits	17,25,000
Recommended Per capita Average Consumption of Vegetables and Fruits per day (Source Vegetable statistics, Technical Bulletin IIVER, 2013)	230 gms
Total Estimated Daily Consumption of Vegetables in Indore (Researcher's Estimate)	3,96.75 Tonnes
Total Actual Daily Consumption of Vegetables (Source :Arrival Data in Mandi Agmarknet)	3000.00 Tonnes
Recommended Per capita Average Consumption of Vegetables and Fruits per day (Source Vegetable statistics, Technical Bulletin IIVER, 2013)	120gms
Total Estimated Daily Consumption of Fruits	207.00 Tonnes
Total Actual Daily Consumption of Fruits (Source :Arrival Data in Mandi Agmarknet)	152.16 Tonnes

The above table establishes the demand and supply gap for fruits and vegetables in Indore. As seen, the estimated consumption of vegetables is approximately 396.75 tonnes (estimated by researcher) while actual consumption is less than this. There is around 3000 tonnes (based on arrival data of various mandis and selling points) of vegetables. This 3000 tonne includes vegetables which are sold in local market as well as vegetables which are sold to outside markets through agents and companies etc. Thus, local consumption is very less that 3000 tonees. This indicates a competition in

prices of vegetables owning to huge supply but relatively lower demand in local market. This indicates the need for improving the infrastructure of cold chains, logistics etc for farmers to sell outside.

In case of fruits, the estimated consumption is approximately 207.00 tonnes (estimated by researcher) while actual consumption is only 152.16 tonnes (based on arrival data of various mandis and selling points). This indicates a gap of around 55 tonnes on a daily basis, which means more than 20,000 tonnes per year and approximating to Rs 100 crores of annual volume of business.

5.2.2 Stakeholders between– Farmer and Fork

The major actors in this distribution channel, from mandi to consumer are: -

Agents /Middlemen – These are intermediaries operating to act as the link between farmer and the wholesaler. The agents are provide market linkages and help the farmer identify where and when to send the produce. Agents are active at farm levels when they but the complete pre harvest produce, collect it at farm level and arrange to transport it to the buyer. Such agents are more common in case of food grains and other non perishable crops. Other Agents are active at mandi level where they buy the post harvest.

Table 5.8-Licensed Intermediaries in Regulated Mandis in Indore

Choithram Mandi (Fruits & Vegetables)			
Name	**Number**	**License Fee**	**Number Of Years**
Commission agent	241	1000	5
Hammal	2004	10	1
Traders	58	1000	5
Traders+ commission agent	1155	2000	5
Tulawati	46	20	1
Sanyogitaganj Mandi			
Name	**Number**	**License Fee**	**Number Of Years**
Broker	5	800	5
Commision Agent	383	1000	5
Hammal	606	10	1
Process	348	1000	5
Traders	1570	1000	5
Tulwati	56	20	1
Warehouse	29	1000	5

Wholesalers – The wholesalers play an important role in the agri-supply chain. They buy the produce in bulk quantities and store it, sometimes ensure transportation from mandi to storage place. They also take care of preserving the crop, artificial ripening if needed. They bear the risk of wastage in case of product remaining unsold. This risk is high in case of F&V as they are highly perishable. In rare cases, the wholesalers also do the preconditioning of the product which include need based cleaning, sorting & packaging. The table gives the number of agents and wholesalers registered to operate in the two regulated mandis of Indore. The data is not available for unregistered agents and agents working in unregulated mandis of Indore.

Retailers – These are the most significant actors in the agri supply chain. They are the ones who ensure distribution from mandi to every nook and corner of the city. The retailer performs preconditioning activities for the product which include need based cleaning, sorting & packaging, arranging display, weighing etc. The retailers also take care of ensuring longevity of the product owing to perishable nature of F&V. There are mainly two categories of retailers in Indore F&V market.

- **Organised Retailers-** The organized retailers include the large shops like Big bazzar, Ondoor, Farmfresh, Reliance fresh, Big Basket etc. These organized retailers sell F&V from their outlets as well as online. Though there are limited players in this category, but this is an upcoming area where more big players are expected to enter. These retailers are able to invest in infrastructure to maintain freshness and hygienic distribution of F&V to some extent. The Indore market has attracted few national level big retailers but there are hardly and local retailers in this segment.
- **Unorganised Retailers -** The unorganized retailers include small shop owners, street hawkers, roadside sellers etc. These retailers buy from wholesalers and sell F&V on hand carts, cycles, vans, in small shops or roadside setups. Majority of the F&V distribution at local level is dominated by this segment of retailers. They are not able to invest much on the infrastructure to maintain freshness and hygienic distribution. So they adopt

very basic means such as sprinkling of water, covering in jute sacks etc to keep the F&V fresh. Therefore have limited capacity to sell.

It is important to note that in spite of the fact that these retailers contribute to major distribution of F&V in the entire 350sqkm area of urban indore, they are not united in the form of any formal group. Further, their profit margins also need to be studied with a different perspective. It is essential that their role needs to be given due cognizance and steps need to be taken to help them enhance their role in the agri supply chain.

Table 5.9-Type of Retailer and Distance catered by them

Type of Retailer	Category	Average Sale of Total Vegetable & Fruit Per Day (KG)	Average Distance catered Per Day (KM)
Manual Cart (thella)	Urban Street Hawker	200	30
Cycle	Urban Street Hawker	50	25
Small Van	Urban Street Hawker	300	50
Road side gumati	Urban Street Hawker	100	5
Temporary Shops	Urban Street Hawker	400	-
Big Organized Retail Shops	Organized Retail	600	-
Online Delivery	Organized Retail	150	50
Source - Primary data collected by researcher			

Table 5.10-Approximate Estimation of Number of Retailers in Urban Indore

Total Fruits & Vegetables Sold Daily (Source – Market Arrivals Data)	700 Tonnes (Apprx)
Average Sale by 1 retailer (Primary data collected by researcher)	250 KG
Min sale (Primary data collected by researcher)	50
Max sale (Primary data collected by researcher)	500
Estimated retailers for F&V in Indore	3200 – 5000
Urban Households in Indore	600000
Number of Households catered by Each Retailer	180 (Apprx)

Advantage to Urban Street Vendors

From the above discussion, the role of small retailers, particularly the street hawkers is very important in the GLSL type of supply chain. Their role needs to be acknowledged in distribution of F&V and due cognizance needs to be given by ensuring better business opportunity and profitability. Given this significant role of urban street vendors, it is required to take in cognizance of their role in distribution of fruits and vegetables. Though the street vendors contribute to several business like street food, daily goods, textile, electronics, toys, etc. (Vazhacharickal, 2016 May) studied the street vendors in Mumbai and found that 50% of the urban street vendors are engaged in distribution of fruits and vegetables.

At national level, the role of urban street hawkers has been understood and in 2014, the National Policy for urban street hawkers was laid out. (MuePA, 2014) The National policy for urban street vendors aims at ensuring a suitable role for the street vendors. It aims to make Street vendors a special component of the urban development /zoning plans by treating them as an integral and legitimate part of the urban distribution system by realizing their role in distribution. Apart from this it aims at promoting self-compliance amongst Street vendors and promotes, if necessary, organizations of Street vendors e.g.Unions / Co-operatives/ Associations and other forms of organization to facilitate their empowerment.

Buyers – The last segment of the value chain is buyer. In case of F&V, there are end consumers and food processing units and exporters who buy the produce. While end consumers buy it directly from retailers, the other two type of buyers rely on agents or wholesalers for sourcing their produce as their requirement is bulk. There are around 600000 households in Indore city who buy F&V daily from organized as well as unorganized retailers.

Apart from this, there are food processing units, big buyers from outside and exporters who buy vegetables (particularly potato, onion, garlic and tomato) from Indore.

5.2.3 Types of distribution networks

As seen from the above data, Madhya Pradesh, Indore District and Choithram F&V Mandi are hub of major activity in the horticulture business. This being the wholesale mandi, and the biggest mandi in several surrounding districts, attracts producers of all types- small and large and buyers of several types.

Further, as seen from the table of production in MP, the state is largest producer for several vegetables and fruits. Indore is the largest producing district for some of them. Thus, there is ample supply which is more than the demand in the local markets. This surplus naturally goes to the food processing units or big buyers outside Indore. Some of the produce is sold directly to the agents or buyers outside and may not be routed through the Choithram mandi or any other mandi in Indore. There are several other crops particularly fruits like Apple, Pineapple etc which are not grown in MP. These fruits come from other states to be sold in Choithram Mandi.

The stakeholders involved in each of these process are different and the efficiency and competition level is also different. A classification shown in table below can help us understand the different value chains active in the choithram mandi.

Table 5.11-Coding of Crop for classifying different supply chains

GLSL	Grown Locally Sold Locally
GLSO	Grown Locally Sold Outside
GOSL	Grown Outside Sold Locally
GLSLO	Grown Locally Sold Locally as Well as Outside
GLOSL	Grown Locally and Outside Sold Locally

The adjoining graphic gives the description of each supply chain and their characteristics. As evident, the GLSL value chain mostly comprises of Small & Marginal Farmers. They sell their produce through all big and small mandis in Indore. The competition is only among the local farmers and is less. The food mileage is expected to be less due to limited quantity of supply and less distance travelled. This value chain is expected to provide fresh F&V to consumers.

The GLSO value chain mostly comprises of large producers who grow crops which have demand outside Indore – particularly for food processing units, exporters, big organized retailers and other state consumers. These farmers do not compete locally but they have to face competition from farmers of other places. This chain is expected to incur high transportation cost and food mileage.

The third type of value chain is GOSL. This comprises of crops which are not grown locally. Fruits like apple, pineapple etc are sourced from other states. Even pomegranate has high demand in the city but it is almost fully sourced from outside. There is very little or no production in and around Indore. Such crops have high Food Mileage but they have competition for local farmers. Moreover, the GOSL crops ensure availability of variety F&V to consumer.

The GLSLO value chain comprises of those crops which are produced abundantly in Indore as well as in MP. These crops are sold in Indore, but, owning to huge surplus in production, they are also sold to buyers in other markets. These buyers may be food processing units, Big organized retailers or outside mandis. These F&V have high price competition owning to huge supply in the local mandi as there is no differentiation in price that farmers receive for the crop that is further sold locally or goes outside. The last but not the least classification is GLOSL, i.e, crops that are grown in and around Indore and sold in local mandi, but same crop is bought for sale in the local mandi by outside sellers. The outside sellers are particularly those, who bring huge quantities for sale affecting local prices. Generally this value chain is observed in case of selected fruits like Mango, watermelon and vegetables like capsicum, beans.

Moreover, the intermediaries particularly Agents needs to be examined for crops being sold through different value chains. Most of the vegetables belong to GLSL category. This means they are grown by nearby farmers and sold locally. Do agents really add any value to their sale?

It is expected that there will be differences in price efficiency, price spread and food loss in different value chains. The nature of competition is also different. Therefore, it

seems essential that different solutions are explored for different value chains. "One size fits all" type of policy recommendation may not suit each type of value chain.

Table 5.12-Distribution of Fruits on the basis of Place of Cultivation & Place of Sale

Crop	Is MP among the top producer states	Is Indore among the largest producing districts	Is this among the top arrivals at Choithram F&V Mandi		Type of crop
			Daily	Annual	
Mango	Yes	No	Yes	Yes	GLOSL
Watermelon	Yes	No	Yes	Yes	GLOSL
Guava	Yes	Yes	No	No	GLSLO
Pear	NO	NO	NO	NO	GOSL
Pineapple	NO	NO	NO	NO	GOSL
Chikoo	NO	NO	NO	NO	GOSL
Jhamun	NO	NO	NO	NO	GOSL
Apple	No	No	Yes	Yes	GOSL
Banana	Yes	No	Yes	Yes	GOSL
Grapes	No	No	Yes	Yes	GOSL
Mandarin	No	No	No	No	GOSL
Mausambi	No	No	Yes	Yes	GOSL
Muskmelon	Yes	No	No	No	GOSL
Orange	Yes	No	Yes	Yes	GOSL
Papaya	No	No	Yes	Yes	GOSL
Pomegranate	No	No	Yes	Yes	GOSL

Table 5.13-Distribution of Vegetables on the basis of Place of Cultivation & Place of Sale

Crop	Is MP among the top producer states	Is Indore among the largest producing districts	Is this among the top arrivals at Choithram F&V Mandi		Type of crop
			Daily	Annual	
Arvi	No	No	Yes	No	GLSL
Balor	NO	NO	NO	NO	GLSL
Beans	NO	NO	NO	NO	GLSL
Bhatuhaa	NO	NO	NO	NO	GLSL

Bhindi	Yes	No	No	No	GLSL
Brinjal	NO	NO	NO	NO	GLSL
Capsicum	Yes	No	No	No	GLOSL
Chatur fali	NO	NO	NO	NO	GLSL
Chawli Bhaaji	NO	NO	NO	NO	GLSL
Chowala Fali	NO	NO	NO	NO	GLSL
Cucumber	No	No	No	No	GLSL
Dhaniya	NO	NO	NO	NO	GLSL
Garadu	NO	NO	NO	NO	GLSL
Gilki	NO	NO	NO	NO	GLSL
Ginger	No	No	Yes	No	GLSL
Karela	NO	NO	NO	NO	GLSL
Keri	NO	NO	NO	NO	GLSL
Kuthaal	NO	NO	NO	NO	GLSL
Lauki	NO	NO	NO	NO	GLSL
Lemon	NO	NO	NO	NO	GLSL
Methi	NO	NO	NO	NO	GLSL
Mint	NO	NO	NO	NO	GLSL
Muli	NO	NO	NO	NO	GLSL
Parmal	NO	NO	NO	NO	GLSL
Pumpkin	No	No	Yes	No	GLSL
Spinach	NO	NO	NO	NO	GLSL
Suran	NO	NO	NO	NO	GLSL
Surjana fali	NO	NO	NO	NO	GLSL
Sweet Potato	NO	NO	NO	NO	GLSL
Turayi	NO	NO	NO	NO	GLSL
Cabbage	Yes	Yes	Yes	Yes	GLSLO
Cauliflower	Yes	Yes	Yes	Yes	GLSLO
Garlic	Yes	Yes	yes	Yes	GLSLO
Green Peas	Yes	No	No	No	GLSLO
Onion	Yes	Yes	Yes	Yes	GLSLO
Potato	Yes	Yes	Yes	Yes	GLSLO
Tomato	Yes	No	yes	Yes	GLSLO
Carrot	Yes	Yes	No	No	GLSO
Radish	Yes	Yes	No	No	GLSO
Corn	NO	NO	NO	NO	GOSL
Green Chili	Yes	No	No	Yes	GLOSL

Table 5.14-Type of Value Chain & Its Stake holders

		Characteristics
GLSL	Local Farmer → Local Mandi → Local Distribution Network → Local Consumer	*Small & Marginal Farmers *Local Competitions
GLSO	Local Farmer → Agents → Long Distance Transportation → Food Processing Units / Big Buyers → Outside Distribution Network → Outside Consumer	*Big Farmers *Big Buyers *Better Price *No Local
GOSL	Outside Farmer → Agents → Long Distance Transportation → Loccal Distribution Network → Local Consumer	*Almost no local production *High Food Mileage
GLSLO	Local Farmer → Agents → Local Distribution Network → Local Consumer Local Farmer → Agents → Long Distance Transportation → Food Processing Units → Outside Distribution Network → Outside Consumer	*Huge Local Production *Demand at local as well as outside level *Good quality produce *Possibility of Price efficiency
GLOSL	Local Farmer → Local Mandi → Local Distribution Network → Local Consumer Outside Farmer → Agents → Long Distance Transportation → Local Distribution Network → Local Consumer	*High competition to local farmers from outside farmers *Price inefficiency *Variety to consumer

Value added by each stakeholder in different Channels

In terms of type of value chains described above, the role of intermediaries can be understood from given table. The entities that add less value or deplete value can be eliminated from that particular distribution network.

As seen, in the GLSL distribution network, the role of agents is not adding value rather it is depleting value in terms of creating price spread and not enhancing quality to the product. The unorganized small retailers on the other hand add much value in terms of distribution, sorting, cleaning the product.

Table 5.15- Type of Channel and Value Added by Intermediary

Code	Farmer	Agent	Wholesaler	Organized Retailer	Un Organized Retailer	Big Buyer for further Processing/ Selling outside
GLSL	Small and marginal farmers	Less value addition	Some Value Addition	Add Little or No value	Add Maximum Value	Add No Value
GLSO	Large farmers	High Value Addition	Some Value Addition	High Value Addition	Less Value Addition	High Value Addition
GOSL	Outside Farmers	Some Value Addition	High Value Addition	High Value Addition	Some Value Addition	Add No Value
GLSLO	Small Farmers, Large Farmers	Adds Partial Value only for outside sale	Adds Partial Value	High Value Addition	High Value Addition Outside	Adds High Value
GLOSL	Small & Large Farmers .Local and Outside	Adds Partial Value only for outside sale	Adds Partial Value for Local Sale	High Value Addition	High Value Addition	High Value Addition

Value Added Value Depleted

5.3 Farmer's Profit- Loss Analysis

The first and foremost entity in the supply chain is the farmer. In this study, a sample of 500 farmers producing vegetables and fruits were targeted for data collection. These farmers were located from choithram mandi as well as other mandis and villages. But the targeted number could not be achieved as most of the farmers approached were not willing to talk during trading hours in mandi and then they were not available in the mandi in non trading hours. So, the researchers had to go to nearby villages to locate these farmers and collect data.

A snowballing approach was adopted for identifying farmers who cultivated vegetables and fruits in nearby villages. It was observed that roughly 2 to 5 % farmers in a village were engaged in farming of vegetables and those doing fruits were even lesser. The reason being challenges in cultivation like availability of water, short duration of crop cycle, high risk and cost involved, more efforts in terms of harvesting, and uncertainty in getting proper price for the crop. Perishability is one of the biggest reasons behind farmers disinterest in vegetables and fruits. Very few farmers realized the potential of adding vegetables and fruits to their crop portfolio and were willing to take the efforts.

Table 5.16-Description of Farmer's Sample

Sr.No	Size Group (Classification as per Census2011)	Number of Farmers in Sample collected from Village	Number of Farmers in Sample collected from Indore mandis
1	Marginal (Below 1.00 ha or 2.47 acres)	7	58
2	Small (1.00-2.00ha or 2.47 to 4.94acres)	11	36
3	Semi-Medium (2.00 - 4.00 ha or 9.88 acres)	13	37
4	Medium (4.00 - 10.00 ha or 9.88 acres to 24.7 acres)	14	54
5	Large (10.00 ha and above or 24.7 acres and above)	4	37
	Total	**49**	**222**

Moreover, lack of availability of proper market channels, dependence upon intermediaries and unfair margins added to the trouble of F&V farmers.

Given the above challenges, it was difficult to collect data from these farmers. 10 surrounding villages were visited to get groups of farmers. Focused group interviews were conducted. Structured questionnaires were used to collect data related to cost of production, income and details of cropping. The findings are presented in this section.

Revenue Pattern for farmers in different type of crops

The table shows that average annual revenue for farmers is as low as Rs 1,84,599/- . This is the gross income. After deducting the cost of production all the farmers are having negative net income. The data shows that revenue is highest for vegetables but at the same time, loss is also highest. Cultivation of fruits has been able to generate positive return for the farmers. But this is only for farmers have big land holdings. Cultivation of fruits has not been profitable venture for marginal and small farmers. The food loss data shows highest loss in vegetables with an average of 40.91%.

The average number of crops cultivated by each farmer is 5.7 (standard 6 crops in vegetable MP agriculture data). Average land holding is 3.03 acres, which shows that majority of the farmers in the sample are small and marginal.

Table 5.17-Land holding, Production, Sale and Revenue of selected farmers						
VEGETABLES						
	Number of Crops per Year	**Land (In Acres)**	**Production (In Quintals)**		**Sale (In Quintals)**	**Revenue (In Rupees)**
Average	5.7	3.03	260.67		153.92	1,84,599
Minimum	2	0.4	2		0	0
Maximum	16	31.5	6740		1735	32,30,000
Average Per Acre Per Year			85.94		50.75	60,863.50
Production Loss per Acre per Year (%)					**40.95%**	
FRUITS						
Average		3	4117.5		3292.5	2,83,750
Minimum		0.5	0		0	0
Maximum		6.5	30000		25000	9,50,000
Average Per Acre Per Year			1372.5		1097.5	94,583.33
Production Loss per Acre per Year (%)					**20.04%**	
OTHERS						
Average		13.9	114.33		93.90	2,62,106.3
Minimum		0.5	2		0	0
Maximum		60	545		545	10,30,500
Average Per Acre Per Year			8.22		6.75	18,850.91
Production Loss per Acre per Year (%)					**17.87%**	
TOTAL						
Average (Owned-O	9.61(O)	2.06(L)	16.53	1009.05	755.8	4,72,177.5
Minimum	0(O)	0(L)	1.5	35	16	12,900
Maximum	35(O)	22(L)	65.5	30111	25105	41,80,000
Average Per Acre			61.0		45.7	28,564.2
Production Loss per Acre per					**25.10%**	

Cost of Production and Profitability

The cost of production was calculated as per the standard guidelines used while estimating MSP of grains and other crops. It has different cost elements related to inputs, labour, equipments and infrastructure.

While majority of the primary data was collected from the farmers through structured questionnaires, some data was estimated on the basis of guidelines available. The following guidelines were followed for arriving at COP.

Rent for Owned land (Source : Calculated on the basis of Average rent paid in the region)	@18000per acre
Farm Labour (Source : Agriculture Wages in India 2016, Dept of economics & Statistics, Govt of India)	@Rs 213 per day
Working days on Farm Vegetables (Assuming 6 crops in a year and 20 labour days for each crop)	120

Table 5.18-Per Acre Income, Cost of Production & Profit/Loss for different types of farmers					
Farmer Type	**Number of Crops**	**Vegetables**	**Fruits**	**Others**	**Total (Not Average)**
		Average Revenue Per Acre			
Marginal	6.3	31,400	-	65,750	38,979
Small	5.4	48,844	-	15,119	24,644
Semi Medium	4.7	43,474	75,000	25,649	29,105
Medium	6.7	46,358	151,333	19,660	34,573
Large	6.8	45,747	100,000	19,956	23,542
	Total COP as Percent of Revenue	**Average COP(C3) per acre**			
Marginal	280.%	92,654	-	229,071	109,135
Small	350%	189,052	-	45,903	86,166
Semi Medium	218%	125,993	45,692	52,043	63,364
Medium	180%	163,783	52,014	44,916	62,489
Large	307%	177,980	97,308	51,007	72,342
		Average Profit/ Loss Per Acre			
Marginal		(59,312)	(3,957)	(50,456)	(109,796)
Small		(125,872)	-	(26,276)	(51,355)
Semi Medium		(73,587)	**29,308**	(11,453)	(21,486)
Medium		(120,309)	**22,986**	(19,268)	(33,384)
Large		(128,968)	**2,692**	(24,635)	(40,068)

The above table gives the brief comparison of Average revenue , Cost of production and Average profitability /loss of different type of farmers.

Figure 5-2Average Income Per Acre of Farmers

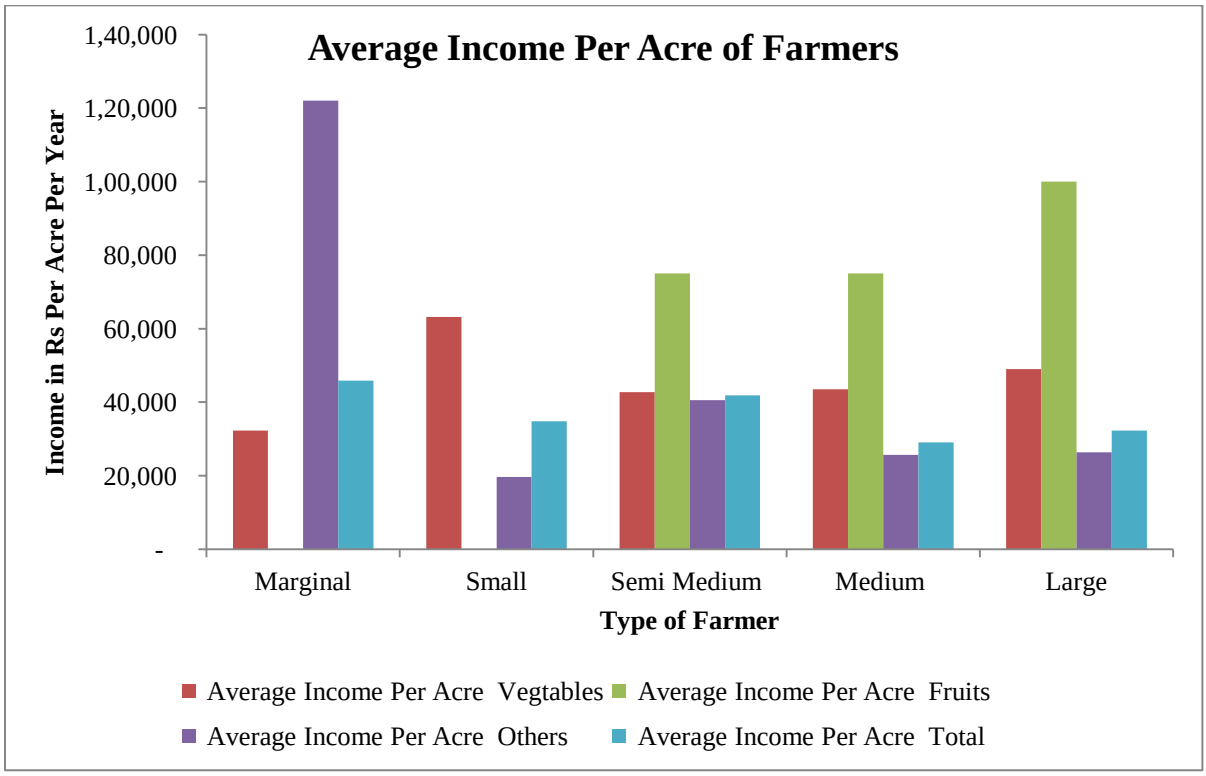


Figure 5-3-Average COP(C3) Per Acre of Farmers

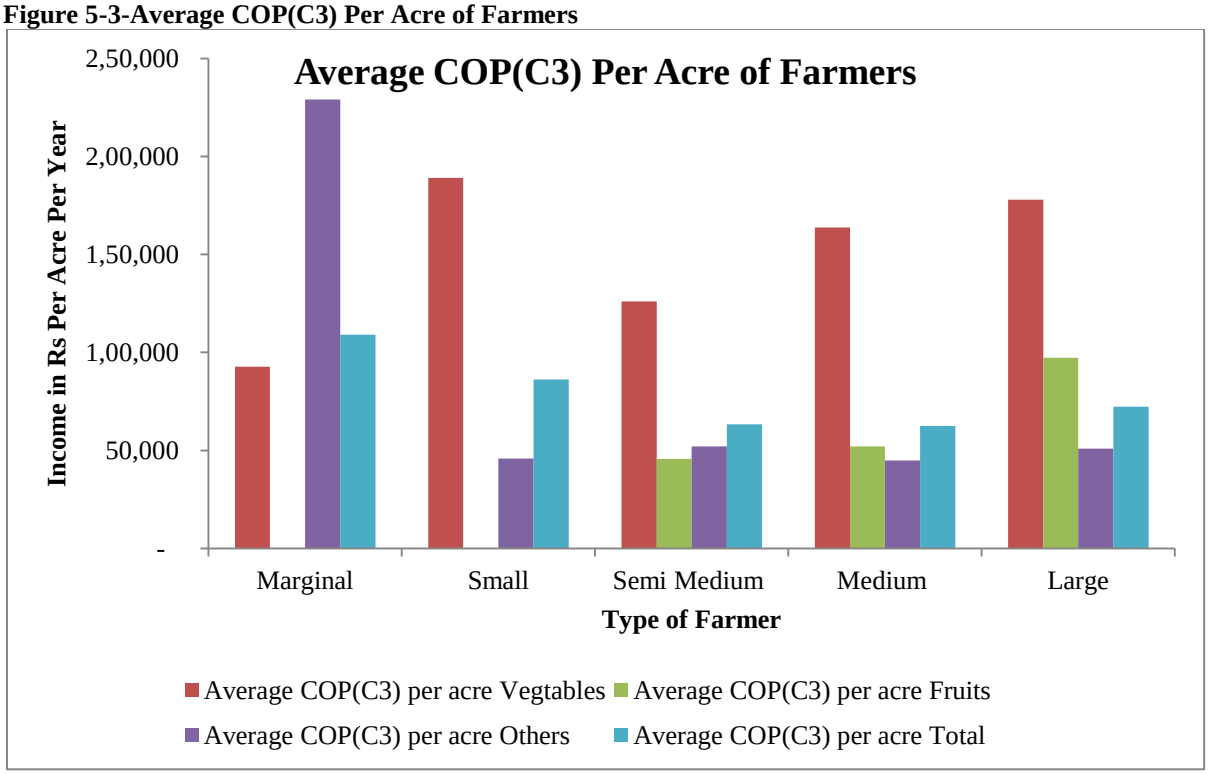
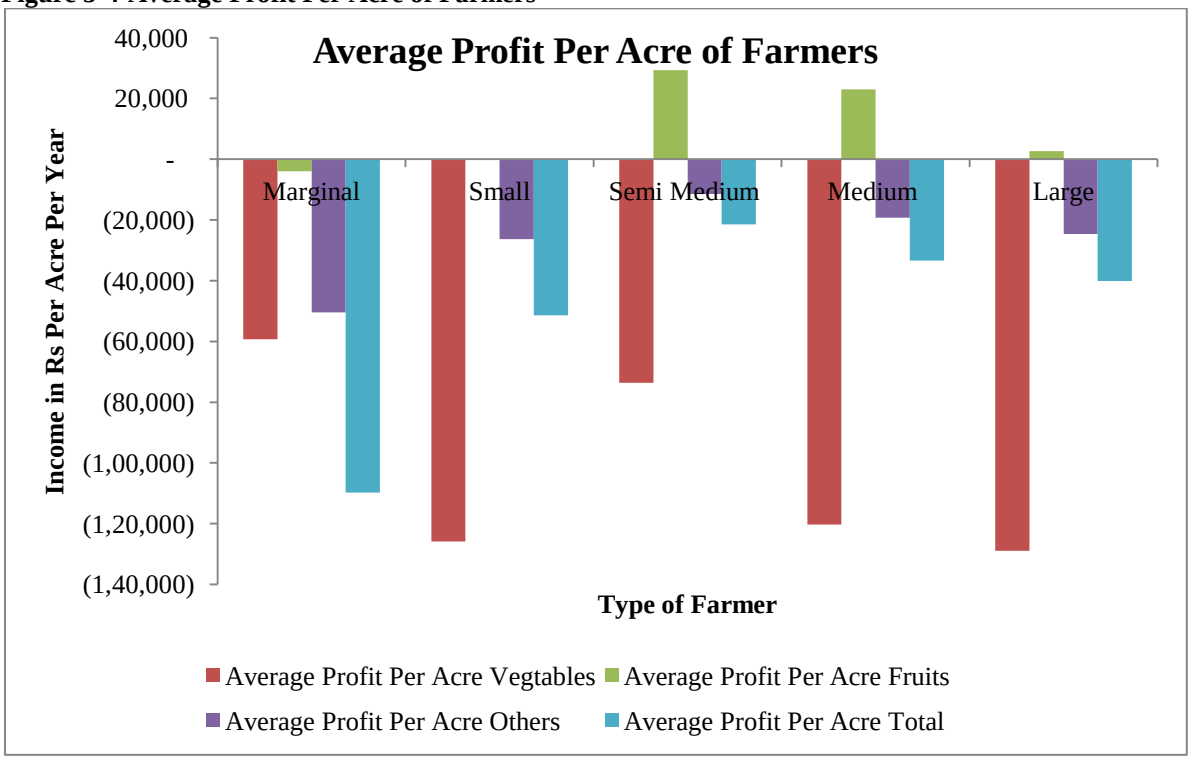


Figure 5-4-Average Profit Per Acre of Farmers



5.4 Price Efficiency – Price Spread, Cost for different supply chains

Price Inefficiency

The inefficiency exiting in the price levels of F&V in different mandis of Indore was estimated with the help of Runs Test. Runs test is used to assess the randomness of prices. If the prices are random, it indicates that there is Weak Efficiency in terms of integrating information getting reflected in the prices. This means that farmers suffer due to this poor information efficiency. It gives rise to possibility of disproportionate earnings to sellers in different markets. According to Runs test, the null and alternate hypothesis are as follows.

Null hypothesis	H_0: The daily prices are random
Alternative hypothesis	H_1: The daily prices are not random

As seen in the table, daily prices of selected vegetables was collected from Agmarknet for three different mandis in Indore – The Choithram Mandi, which is the largest mandi in Madhya Pradesh, Sanwer Mandi and Other Mandi. The runs test was applied and the results show that the null hypothesis of randomness was accepted for almost all cases except Ginger in choithram mandi, Tomato in other mandi, pumpkin in Sanwer mandi and tomato in Sanwer mandi. This shows high level of inefficiency in price in all the mandis in both fruits as well as vegetables. It is surprising to see that Choithram mandi which attracts maximum trade in the state in maximum number of F&V is also exhibiting "Weak efficiency" in Prices.

Table 5.19 Price Efficiency in Selected Vegetables and Fruits using Runs Test

Vegetable / Fruit	Market	n1	n2	Observed Runs	μ	σ	Upper Limit	Lower Limit	Hypothesis testing at a 5% level of significance
							μ+1.96*σ	μ-1.96*σ	H0: Randomness
Cabbage	Choithram Mandi	12	14	23	13.92	2.483	18.79	39.31	Accepted
Cauliflower	Choithram Mandi	15	15	29	16.00	2.691	21.27	44.39	Accepted
Garlic	Choithram Mandi	398	395	612	397.49	14.071	425.07	847.22	Accepted
Ginger(Dry)	Choithram Mandi	33	1	23	2.94	0.235	3.40	6.90	Rejected
Onion	Choithram Mandi	268	261	435	265.45	11.487	287.97	575.91	Accepted
Papaya	Choithram Mandi	77	79	152	78.99	6.224	91.19	184.95	Accepted
Potato	Choithram Mandi	257	256	458	257.50	11.314	279.67	559.47	Accepted
Ginger(Dry)	Indore Other	6	1	6	2.71	0.452	3.60	7.51	Accepted
Onion	Indore Other	22	22	33	23.00	3.278	29.42	60.95	Accepted
Papaya	Indore Other	7	7	13	8.00	1.797	11.52	24.38	Accepted
Pomegranate	Indore Other	6	5	12	6.45	1.559	9.51	20.20	Accepted
Potato	Indore Other	11	10	21	11.48	2.228	15.84	33.28	Accepted
Pumpkin	Indore Other	46	44	78	45.98	4.714	55.22	112.94	Accepted
Tomato	Indore Other	228	252	36	240.40	10.916	261.79	524.03	Rejected
Bhindi(Ladies Finger)	Sanwer Mandi	150	149	277	150.50	8.631	167.42	336.77	Accepted
Bitter gourd	Sanwer Mandi	36	37	60	37.49	4.241	45.81	94.02	Accepted
Bottle gourd	Sanwer Mandi	111	122	214	117.24	7.599	132.13	266.58	Accepted
Brinjal	Sanwer Mandi	94	92	163	93.99	6.800	107.32	217.14	Accepted
Cabbage	Sanwer Mandi	37	37	65	38.00	4.272	46.37	95.16	Accepted
Cauliflower	Sanwer Mandi	114	111	208	113.48	7.482	128.14	258.65	Accepted
Cucumbar (Kheera)	Sanwer Mandi	14	11	21	13.32	2.411	18.04	37.78	Accepted
Garlic	Sanwer Mandi	65	62	111	64.46	5.609	75.46	153.51	Accepted
Guava	Sanwer Mandi	17	20	35	19.38	2.979	25.22	52.40	Accepted
Onion	Sanwer Mandi	190	180	328	185.86	9.598	204.68	410.76	Accepted
Potato	Sanwer Mandi	143	148	274	146.46	8.512	163.14	328.27	Accepted
Pumpkin	Sanwer Mandi	9	11	47	10.90	2.153	15.12	31.79	Rejected
Spinach	Sanwer Mandi	96	100	176	98.96	6.979	112.64	227.75	Accepted
Tomato	Sanwer Mandi	166	177	629	172.32	9.237	190.43	382.48	Rejected

5.5 Case Studies for Farmer Profitability

Case Study I -Marginal Farmer – Pandharinath Patidar (Pandu Dada)

Pandharinath Patidar, fondly known as Pandu dada is an old farmer from village Mothapura. Pandu dada is a marginal farmer with only 1.5 acre of land. He is respected for his knowledge of farming and his ability to take maximum crops in his small piece of land. He has cultivated as high as 16 crops in a year (Average farmers take 6 crops). He applies intercropping to enhance land utilization. He has adopted organic farming for past several years and has almost no expenses on fertilizer and pesticide. He makes organic manure from the farm waste and other things available in the house. He has a huge knowledge of traditional and homemade inputs for farming which help him reduce the cost of input.

The following tables describe his revenue from farming. He planted 15 crops out of which his marketable surplus was derived from 8 crops. Remaining were consumed by his family. The crops that earned him revenue were mainly horticulture crops. He earned a total revenue of Rs 2,45,500 /- in a year. Against this, his cost of production was Rs 1,67,022 /- including family labour of Rs 51120/-. Pandu dada is earning Rs 1,45,424/- on 1.5 acres of land (adding back the family labour). Here it is important to note that Pandu dada is the only earning member in his family of 5 members. His only son died at a young age of 25 years leaving behind wife and children.

After much efforts, hard work and simple life style, Pandu dada's earning is not enough for his family and he had to take loan on several occasions.

Speaking from his experience, Pandu dada says, I don't need any concession from government on loan repayment. I just want that the government should enable a proper market mechanism so that I can sell my produce at decent price. I have the knowledge for enhancing productivity and reducing cost of cultivation. But I can't do any thing about the market mechanism on my own.

Table 5.20 Case Study I - Revenue and Cost for Pandharinath Patidar for One Year

Crop	Revenue (Rupees)	COP (Rupees)	Proportion of Revenue for crop
Guvava	80000	50317	31.43
Plants (Nursery)	80,000	50317	31.43
Haldi	75000	47172	29.47
Dollar Chana	9000	5661	3.54
Cauliflower	4000	2516	1.57
Moong	4000	2516	1.57
Cabbage	2000	1258	0.79
Balor Beans	500	314	0.20
	254500	**160072**	**100**
Net Profit	**Rs 94428**		
Adding back family labour	**Rs 94428+51000=145428/-**		

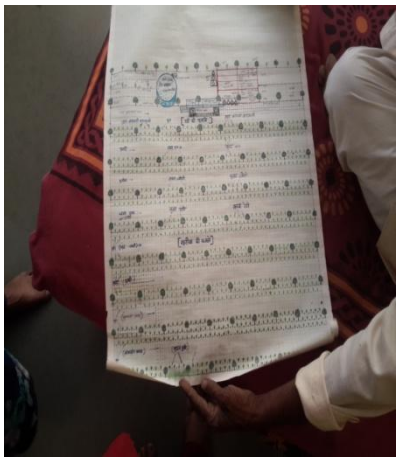
The summary of his revenue and cost confirms his claim. His cost of production is only 63% of his revenue as against 280% average of other marginal farmers. Although, his Cost of production per acre is higher than the average COP of marginal farmers as well as average COP of all farmers. A closed look at individual cost elements show that he is earning substantially high on labour because of intensive cropping practice and no mechanization. But at the same time he is saving on fertilizers and pesticides because of organic farming

practices adopted by him. If he is able to get better price for his crops, he would be able to make his farming even more profitable.

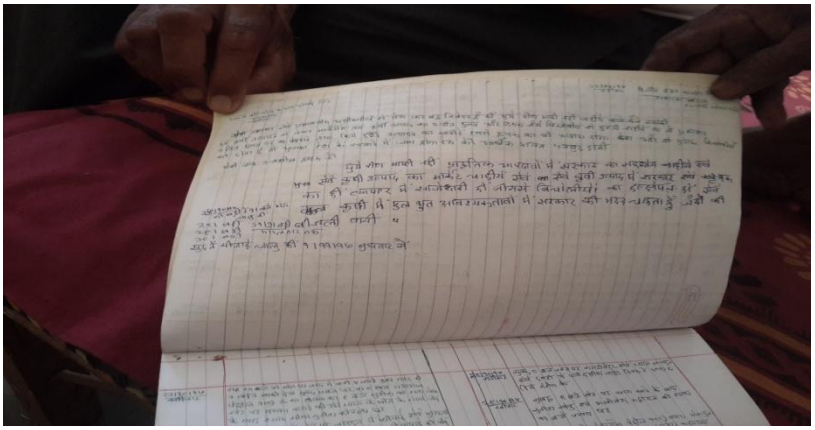
Table 5.21 Case Study I – Cost of Production for Farmer Pandharinath Sitaram Patidar							
Total Land - 1.5 Acre							
Marginal Farmer at Village Mothapura							
Cost of Production		Elements of Cost (In Rupees)			Element of Cost as Percentage of Total Cost(C3)		
		Pandu Dada	Average of Marginal Farmers	Average of All Farmers	Pandu Dada	Average of Marginal Farmers	Average of All Farmers
A1	Hired Human Labour	50000	21667	163011	31	8	21
	Hired Bullock Cart Labour						
	Owned Bullock Cart Labour						
	Owned Machinery Labour	25000	3867	25363	16	1	3
	Hired Machinery Charges						
	Seed	0	6667	24964	0	3	3
	Insecticide & Pesticide	0	19667	67936	0	8	9
	Manure						
	Fertilizer						
	Depreciation on Farm Buildings						
	Irrigation	5000	89000	240253	3	34	31
	Land Revenue, Cess, Taxes						
	Interest on Working Capital	4200	0	14802	3	0	2
	Misc Expenses	10200	16033	62676	6	6	8
	Misc (Logostics)	0	1333	19072	0	1	2
	A1	94400	158233	611393	59	61	79
A2	A1+ Rent Paid for Leased Land	94400	158233	611393	59	61	79
B1	A1+Int on Value of Owned Fixed Cap Assets(other than Land)	94400	158233	611393	59	61	79
B2	B1+Rental Value of Owned Land +Rent Paid for Leased land	94400	158233	622158	59	61	81
					0	0	0
C1	B1+Imputed value of family labour	145520	234913	700843	91	91	91
C2	B2+Imputed Value of Family Labour						
C2*	Adjusted C2 at higher labour rate	145520	234913	700843	91	91	91
C3	**C2*+Value of Mgmt Input at 10% of C2***	**160072**	**258405**	**770927**	**100**	**100**	**100**
	Average Land (Acre)	1.5	2	11.40			
C3	**C3 per Acre**	**106715**	**110745**	**67596**			
	Revenue Per Acre	**169667**	**38979**	**41072**			

Another important thing to be noted here is that Pandu dada is such small farmer, that his total production through out the year is 78 quintals out of which his marketable surplus is only 58 quintals. He may not be benefitted by government proposed solutions such as cold chains, large equipments subsidies, export subsidies etc. He is totally dependent upon local market and he can only be benefitted if the local market mechanism is made more efficient.

Model made by Pandu Dada for support activities on his farm



Graphical representation of Intercropping Planning done by Pandu Dada



A Record of Observations and income and expense maintained by Pandu dada

Case Study II - Manoj Patidar – A Middle Farmer



There is yet another case study worth mentioning. That is about farmer Manoj Patidar, a medium farmer with land size of 20 acres. Manoj is a progressive farmer and has grown a fruit called "Apple bor" which is green coloured berry which resembles green apple in taste but is a bit tangy. Apple bor is quite popular in this part and has fair enough demand in Delhi region also. Manoj harvested around 150 tonnes of apple bor on just 3 acres of land and earned Rs 9.5 lakhs by selling it in Delhi market with the help of an agent. The Delhi based agent helped him sell the Apple Bor, but there was long delay in getting money. He also grew 300 tonnes of tomato on 10 acres of land out of which his marketable surplus was only 250 tonnes (50 tonnes was wasted due to delay in harvesting, non availability of buyer in time and due to the farmer's strike that took place in MP in 2017. The cost of production and revenue can be seen in the table.

Table 5.22 Case Study II - Revenue for Manoj Patidar from different crops

Name	Production	Sold Amount	Total Revenue in One Year
Gourd	300	200	1050000
Apple Bor	150	145	950000
Chilli	13	13	800000
Tomato	300	250	650000
Capsicum	10	10	400000
Cucumber	4	4	250000
Bitter Gourd	5	5	80000
Total Income			**Rs 41,80,000**

Manoj Patidar being a progressive farmer, has experimented in new fruit crop successfully. He has been able to increase his per acre revenue because of this. But his cost of production is still high and he is not been able to earn net profit.

Table 5.23 Case Study II- Cost of Prodcution for Farmer Manoj Patidar					
Total Land 20 Acre					
Medium Farmer at Village Jhapdi					
Cost of Production		**Elements of Cost (In Rupees)**		**Element of Cost as Percentage (%) of Total Cost(C3)**	
		Manoj Patidar	**Average of All Farmers**	**Manoj Patidar**	**Average of All Farmers**
	Hired Human Labour	800000	163011	19	21
	Hired Bullock Cart Labour			0	
	Owned Bullock Cart Labour			0	
	Owned Machinery Labour	300000	25363	7	3
	Hired Machinery Charges			0	
	Seed		24964	0	3
	Insecticide & Pesticide	800000	67936	19	9
	Manure				
	Fertilizer				
	Depreciation on Farm Buildings				
	Irrigation	1860000	240253	43	31
	Land Revenue, Cess, Taxes				
	Interest on Working Capital	56000	14802	1	2
	Misc Expenses	230000	62676	5	8
	Misc (Logostics)	550000	19072	13	2
A1	A1	3896000	611393	90	79
A2	A1+ Rent Paid for Leased Land	3896000	611393	90	79
B1	A1+Int on Value of Owned Fixed Cap Assets(other than Land)	3896000	611393	90	79
B2	B1+Rental Value of Owned Land +Rent Paid for Leased land	3896000	622158	90	81
				0	0
C1	B1+Imputed value of family labour	39,21,560	7,00,843	91	91
C2	B2+Imputed Value of Family Labour			0	
C2*	Adjusted C2 at higher labour rate	39,21,560	7,00,843	91	91
C3	**C2*+Value of Mgmt Input at 10% of C2***	43,13,716	**7,70,927**	100	**100**
	Average Land (Acre)	20	11.40		
C3	**C3 per Acre**	**2,15,686**	**67,596**		
	Revenue Per Acre	**2,09,000**	**41,072**		

Case Study III- Large Farmer Pappu Bhai from Mothapura

Table 5.24 Case Study III - Revenue for Pappu Bhai from different crops			
Name	Production (In Quintal)	Sold Quantity (In Quintal)	Total Revenue in One Year
Pomegranates	250	215	6,50,000
Dollar Chana	85	85	5,10,000
Cotton	80	80	4,00,000
Chilli	20	10	80,000
Haldi	3	3	45,000
Ginger	8	8	16,000
Total Income			**17,01,000**

Table 5.25 Case Study III- Cost of Production for Farmer Pappu Bhai					
Total Land - 36 Acre (14 Acre Own land + 22 Acre Lease Land)					
Large Farmer at Village Mothapura					
Cost of Production		**Elements of Cost (In Rupees)**		**Element of Cost as Percentage (%) of Total Cost(C3)**	
		Pappu Bhai	Average of All Farmers	Pappu Bhai	Average of All Farmers
A1	Hired Human Labour	450000	163011	33	21
	Hired Bullock Cart Labour				
	Owned Bullock Cart Labour				
	Owned Machinery Labour	100000	25363	7	3
	Hired Machinery Charges	0			
	Seed	24000	24964	2	3
	Insecticide & Pesticide	0	67936	0	9
	Manure	0			
	Fertilizer	0			
	Depreciation on Farm Buildings	0			
	Irrigation	375000	240253	28	31
	Land Revenue, Cess, Taxes	0			
	Interest on Working Capital	1000000	14802	74	2
	Misc Expenses	80000	62676	6	8
	Misc (Logistics)	0	19072		2
	A1	1029000	611393	76	79
A2	A1+ Rent Paid for Leased Land	1172000	611393	87	79
B1	A1+Int on Value of Owned Fixed Cap Assets(other than Land)	1172000	611393	87	79
B2	B1+Rental Value of Owned Land +Rent Paid for Leased land	1172000	622158	87	81
C1	B1+Imputed value of family labour	1223120	700843	91	91
C2	B2+Imputed Value of Family Labour				
C2*	Adjusted C2 at higher labour rate	1223120	700843	91	91
C3	**C2*+Value of Mgmt Input at 10% of C2***	1345432	**770927**	100	**100**
	Average Land (Acre)	36	11.40		
C3	**C3 per Acre**	**37,373**	**67,596**		
	Revenue Per Acre	**47,250**	**41,072**		

5.6 An Experiment in Corporate Participation in Farmer- Consumer Connect

The Anar Story –Pratibha Syntex

Pratibha Syntex is a vertically integrated textile company based in Indore having its manufacturing setup at nearby industrial area Pithampur. The company is the largest employer with 10000 employees and works with 33,000 farmers for integrated value-chain that farms, spins, knits, dyes and sews organic garments worth billions of $ annually. It is a supplier of garments to brands like Nike, Zara, David Jones, Levis, C&A. In order to ensure a sustainable and organic produce, Pratibha believes in socially and economically engaging farmers to produce cotton.

In the recent years, Pratibha has started its Vasudha Organic initiative for sustainable farming for crops other than cotton also. Vasudha Organic aims at encouraging farmer to adopt organic practices for all its produce. It facilitates, provides handholding in terms of identifying market for organic food crops of its associated farmers. According to Mr.Avinash Karmarkar, Vice President Vasudha Organics, "Organic farming brings a kind of change in attitude of farmers. When they learn to live in co-

existence with ecology this reflects in their social behavior as well. They prefer to live in more harmony with community members, they adopt to better value system and also become change leaders in community to fight against evil customs."

Vasudha Organics is engaged into several initiatives for sustainability.

The Idea of experiment

While discussing the challenges of farmers, non-availability of fair price, difficulty in differentiating organic crops and other issues with Mr. Avinash, who works with Vasudha farmers to make farming a sustainable venture for them. It was thought that the company should take some initiative to provide market to the farmers.

After much deliberations, an experiment was designed in the factory premises of Pratibha syntax.

Objective of the experiment –

- To provide a platform to the Vasudha farmer to sell his product to the factory workers.
- To study the response of staff towards this "Farmer Stall in Factory" initiative.
- To study the price efficiency in this sale and compare it with sale in other regular markets
- To assess the feasibility of Farmer stall initiative as a sustainable model for establishing Farmer – Consumer connect.

Farmer selection and product identification –

Pappu bhai from Mothapur village, the farmer whose case study has been discussed above was identified for this experiment. Pappu 's experience and association with Pratibha is from last four years as organic cotton farmer. He is the recipient of "Green Hero Award" given by TERI (The Energy and Resource Institute, New Delhi), for sustainable farming practices,

Vasudha Organic
together, with nature

वसुधा फार्म्स का
ऑर्गनिक अनार बाजार

शनिवार, १८ तारिख को

७५/- प्रति किलो

शुध्द जैविक पद्धति से उत्पादित अनार
स्वास्थ्य के लिए लाभदाई
कोई रंग को निखारने वाला रासायन नहीं
कोई रासायनिक खाद का छिड़काव नहीं

स्थान : स्पिनिंग एडमिन, के डी जी एवं
योगा हॉल के समीप

Vasudha Organic
together, with nature

Green Hero brings you Organic Pomegranates

Winner of Green Hero Award, for spreading word about organic farming practices, Om Prakash Patidar brings you farm fresh Organic Pomegranates.
Have these pomegranates and lead a healthy life.

Available in 10 kgs and 20 kgs pack
Can be preserved for a month
Rs 75 Per Kg
Book your order through
SMS or WhatsApp@ 8821985221 & 9424555131
Home delivery in Indore within two days
Offer available from Nov 21 to 26
See his efforts on following video ....

Vasudha Organic
together, with nature

Do Good and Have Good !

All of us are benevolent at heart. But we seldom express our generosity. Pratibha gives you opportunity to help a farmer who toils day and night to feed you. Buy farm fresh pomegranates from him and make him feel that you care about him. The pomegranates are free from use of any pesticides, insecticides and colourant chemicals and are grown adopting organic farming practices. The organic fruit is good for health.

So, be good, do good & have good!

Vasudha Farm Anar Bazar
in front of spinning Admn, KDG and Yoga Hall
on Saturday 18 Nov

The season was winter. Pappu had experimented with growing Pomegranates and had a bumper yield. The quality of pomegranates was excellent. Pomegranates were chosen for the first "Farmer Stall" which was named as "Anar Bazar"

The Anar Bazar

On a Saturday during, the Anar Bazar was set up. In Pithampur, near Indore, the Anar stall was put up in the premises of three factories of Pratibha Syntex which has employee strength of 10,000 workers. The buzz was around and excitement was expected as Anar Bazar was promoted on company's email groups, whatsapp groups and notice board displays at prominent location 2 days in advance.

The promotion highlighted that the Anars were grown by a Vasudha Farmer. This created a sense of connectedness among the staff with the farmer 'Pappu". Till now, they were aware of Vasudha farmers growing cotton only. Vasudha farmer's anar was going to be a new experience for them. The experiment turned out to be fruitful both for the employees as well as Pappu farmer. Below table presents the summary of comparison of sale of Anar at different markets.

Table 5.26 Comparative Cost benefit of Selling Anar through different Channels

Channel Type	Quantity sold in Quintal	Cost of Transportation & Other Marketing Cost	Commission Paid to Agent	Selling Price Per Kg	Total Revenue	Total Net Profit	Net Profit Per Quintal
Farmer --> Consumer at Pratibha Factory	45	3000	-	50	225,000	225,000	4,933
Farmer --> Nashik Agent	150	60000	8%	25	562,500	375,00	1,900
Farmer--> Indore Agent in Choithram Mandi	20	1500	8%	25	75,000	50,000	2,225

Pappu Bhai showing his receipt from Nashik Agent

The result was remarkable for both farmer as well as consumer. As seen from the above table, Pappu bhai could earn upto Rs 4933 per quintal at Pratibha factory as he got a price of Rs 50 per kg as against Rs 25 per kag in choithram mandi or Nashik Mandi. At the same time the consumer's price in the Indore retail market was around Rs 80 per kg. Thus, the actual farmer's share in consumer's rupee was 100 % at factory and the consumer also saved Rs 30 per kg less. In other two cases consumer paid Rs 80 and farmer's share was only 68%. But Nashik Mandi helped him sell volume, which Anar Bazar could not have done.

The consumer's feedback at Pratibha Factory was outstanding. People were thrilled to know the farmer and buy Anar within the factory premises. The quality of Anar was extremely good as Pappu had followed organic practices at his farm.

This experiment highlights and importance of having more farmer- consumer type channels. Companies like Pratibha Syntes can identify the local farmers and provide them a platform. This also created a bonding between the farmer and the consumer which resulted in more sale in subsequent weeks.

Farmer Meetings at Different Places

Chapter 6

Supply Chain of Perishable Products

Chapter Highlights

6. Supply Chains of Perishable Products

6.1. Vegetables to Dabbawalas to Newspapers

Farmers in India have mainly focused on improving production activities. Hardly did they realize that the path to monetize the produce is primarily through properly coordinated marketing activities. Distribution and market related activities have mostly taken a backseat resulting into huge post harvest losses, improper price of crop to farmer and misbalance in demand and supply locations. The changed dynamics in consumer preference has raised the need to revisit the scope of agriculture, from cultivation alone into managing the overall agri-business eco-system.

In case of Horticulture crops the challenge becomes manifold due to perishability of the crop. "Time" is the crucial factor in horticulture which determines the efficiency of the selling process. Lack of appropriate infrastructure for storing and logistic has made the situation worse. The normal practice for fresh food supply (to reach our homes), was quite simple and a matter of routine. Due to urbanisation farmlands are distanced several kilometres away, entry points into our cities are becoming bottlenecks and transit time to reach markets is ever increasing. Presently the farmers of Perishable crops sell their produce to Wholesale mandis – local and national, Farmers markets for retail to local consumers, Private procurement by organised fresh food retailers , Private procurement by food processing units. None of these channels reflect efficiency as compared to other similar businesses. This may result into Food Loss, Time Loss, Reduced value for crop and eventually making the farmer poor and more poor.

While all these issues are linked with each other, we need to understand their consequences. Food losses can be understood in the light of unfulfilled demand of certain vegetables in large cities, while the same crop is discarded alongside farms, for want of effective market linkage. An assessment was done by the (NCCD, 2016) National Centre for Cold-chain Development (NCCD) in 2015-16, of the losses incurred on fruits & vegetables, conducted with Amity International Centre for Post-

Harvest Technology & Cold-Chain Management. They identified physical losses (weight loss and discards) at varied stages of movement to market. Each stage of measure was where a change in custody occurred and the produce entered the next step in its post-harvest journey to market. a) At farm-gate (point of harvest); b) At collection point (aggregation); c) On loading onto transport; d) During transportation; e) On receiving at Wholesale point.

The study reported maximum loss upto 44% in case of fruits like pear and litchi and upto 35% for vegetables like bottle gourd (Lauki) and peas (matar). These results were from UP, Haryana and Uttarakhand. Studies in other states have reported as high as 50 % production losses in fruits and vegetables. This is extremely high by any definition of efficiency in supply chain.

Food loss is not necessarily due to lack of technology; a large quantum of food loss occurs from a lack of access to the national markets, resulting in localized surplus and discards in the hands of farmers. (Department of Agriculture, Cooperation and Farmers' Welfare, 2017) . The answer to food loss, is market linkage and effective logistics. Especially in view of the fact, that many a time, there remains unfulfilled demand, while the surplus is discarded due to inability to connect with that demand.

Non availability of appropriate infrastructure for storage and warehousing is yet another reason for Food loss contributing to inefficiency in the supply chain. The focus on production activities has improved farm productivity and yield levels but due to lack of a cold chains and other infrastructure, the production is not able to reach the point of demand and gets wasted.

Table 6.1 Supply Chains of Perishable Products

Type of Infrastructure	% share Shortfall
Integrated Pack-house	99.6
Reefer Transport	85
Cold Storage (Bulk)	10
Ripening Units	91

Source: NCCD 2015-2016 Study

As per a comprehensive study (NCCD, 2016) conducted by National Centre for Cold-chain Development (NCCD) undertaken with Nabard Consultancy Services (NABCONS) in 2015, the existing trade in perishable food items suffers a lack of market connectivity from shortfall in infrastructure. This shortfall directly impacted the income capabilities of farmers as they remained limited in their market reach, restricting the selling range of their produce. The study evaluated the entire chain of logistics needed for perishable crops. The study identified the actual gap in the cold chain infrastructure in India.

As seen from above discussion, there is an urgent need to study and develop the post production activities in fruits and vegetables. This points towards building an efficient value chain. A "**Value Chain**" is a process view of the set of operations and procedures, internal and in control of an individual business unit. A value chain analysis allows an individual firm to identify unit cost of operations and make systemic changes to reduce internal inefficiencies and wasteful expenditure. Further, these individual activities undertaken by multiple value chains are integrated into a **supply-chain**, with the purpose to manage the flow of the materials and goods, starting from raw inputs to supply of final value at last mile. In a supply chain, a series of enterprises systemically integrate their operations, though the actors can be transient; together these value chain segments coalesce into the overall supply chain to ensure that system-wide, value based outcomes are affected.

6.2 Assessing a Supply Chain

Over the few decades, the researchers supply chain management have changed and broadened the scope but still limited to manufactured products and services with little attention being paid to agriculture.

The SCOR Model for Supply Chain - The supply chain operations reference model (SCOR) is the most widely used model to assess the efficiency of supply chain. It is a management tool used to address, improve, and communicate supply chain management decisions within a company and with suppliers and customers of a company. The model describes the business processes required to satisfy a customer's

demands. It also helps to explain the processes along the entire supply chain and provides a basis for how to improve those processes. The SCOR model was developed by the supply chain council. The model integrates business concepts of process re-engineering, benchmarking, and measurement into its framework. SCOR is a reference model that does not consider mathematical models or heuristics. It is based on the usage of indicators to analyze, compare and get the best improvement strategy, guidelines or standards.

Plan -Demand and supply planning and management are included in this first step.
Source -This step describes sourcing infrastructure and material acquisition..
Make -Manufacturing and production are the emphasis of this step.
Deliver -Delivery includes order management, warehousing, and transportation.
Return -Companies must be prepared to handle the return of containers, packaging, or defective product.

Though widely used, SCOR model has certain limitations to be applied to agri supply chain in local context. Main reason unorganized nature of the agriculture sector. More over it is not yet possible to forecast exact demand and supply of fruits and vegetables.

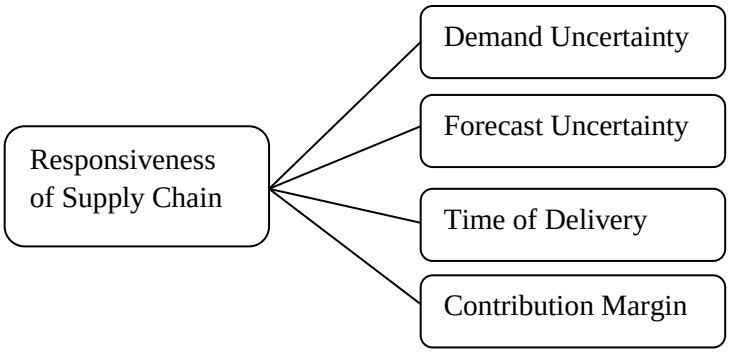
6.3 Comparing Supply Chain of other Perishables –

As mentioned, the uniqueness of agri supply chain is its perishability and unorganized nature. Marine products like fish and sea food are also perishables. The perishable nature can be compared with other similar supply chains.

News Paper - The daily news paper is yet another perishable product. It has no value after morning. Therefore, it has to be printed, transported to long distances, distributed and delivered in time. The collection and distribution is similar to F&V in some aspects. There are many new paper publishers and many readers. The delivery person has to carry and deliver different combinations of news papers to different readers. But it is different from agri-supply chain in terms that the supply of news papers is predictable and demand also to a large extent. The weight that needs to be carried is less as compared to F&V.

Dabbawalas in Mumbai - The Dabbawalas of Mumbai are most acclaimed and welknown for their efficient supply chain. Their system of distribution of lunch boxes of around 2,00,000 lunch boxes collected from different houses in suburbs of Mumbai and delivered to people in offices across the city spread over more than 60 kms. There are 5000 dabbawalas engaged in completing this process. Their collection work, distribution, transportation, delivery and the repeating the same process back to return the dabbas at home is completed with perfect efficiency between 10 am to 5 pm. (F.Jalalvand, 2011)

Responsiveness Measurement of Supply chain - Traditionally, SCM theories have described 'responsiveness' as an effect of the ability to think supply chain management from 'customer's customer to supplier's supplier' (Ellif, 1996). The (Sharma, 2012) studied the responsiveness of value chain of news paper industry. Responsiveness is its ability to forecast and handle uncertainties of demand, time of delivery and contribution margin of the channel partners. According to this study, the demand and supply of the news paper are difficult to forecast. Time available between printing and delivery is extremely less. The contribution margin of news paper companies if between 10-15% or even less. It earns most of its revenue from advertisements. The vendor / agent gets a margin of upto 30%.



This responsiveness is of newspaper supply chain is comparable to that of F&V supply chain. In this case also, forecast of demand and uncertainty of demand is a big challenge. Time for delivery is less and uneven distribution of margin among intermediaries is the biggest hurdle.

Table 6.2 Comparison of Distribution networks			
	Roaming Retailers of Fruits and Vegetables	**News Paper Delivery**	**Mumbai Dabbawalas**
Nature of Product	Perishable	Perishable	Perishable
Variety of Product	Many	One	One
Time Available to distribute the product	- Upto 2 days - No Return of product	- 2 hours in the morning - No Return of the product	- 10 am to 1pm -Collecting and returning back after 3pm
Number of collection points	Fixed	Fixed	Many
Number of Distribution Points	- Limited, Scattered - No Door to Door Delivery	- Many , Scattered - Door to Door Delivery	- Many , Scattered - Door to Door Delivery
Approximate Weight carried per day	50kg to 200 kg	Upto 30kg	35-50kg
Responsibility of Quality of Product	√	×	×
Responsiveness of SCM – Time	Critical	Extremely Critical	Extremely Critical
Responsiveness of SCM – Margin	Margin between Farmer to Consumer very high upto 75%	Margin between publisher and customer upto 30%	Fixed Remuneration Rs 8000/- per month
Responsiveness of SCM – Demand Forecast	Very Difficult	Little Difficult	Fixed
Responsiveness of SCM – Uncertainty of Demand	Highly Uncertain	Little Uncertain	Almost Certain

The share of farmers in the consumer rupee, Price Spread, Food Mileage, Net Marketing margin are the basic tools used to measure the efficiency of agri supply chains. But, these measures fail to capture the value added by each intermediary in the process of distributing the fruits and vegetables. This is essential to understand in the context of making the supply chain of F&V more efficient.

A look at the responsiveness measures and other measures of agri-supply chain will help in looking for alternate options to remove inefficiencies in the process and enhance profitability of farmers. This is essential if the goal of doubling farmer's income is to be met by the year 2022 as laid out by present government.

6.4 Responsiveness of Different Agri Supply Channels in Indore

Responsiveness – Margin - Share in Consumer's Rupee

The margin received by each stakeholder is a measure of responsiveness supply chain as discussed above. In case of Agri supply chain, the margin is understood in terms of "Farmer's share in consumer's rupee". This study calculated the data from stakeholders in three different channels of distribution. The share of farmer, intermediary and retailers in the rupee paid by consumer was compared in these channels.

Type I- Farmer to Consumer. There are no specific farmer markets in Indore. But some small farmers sell vegetables on outskirts of the city which are near to villages. The data reveals three important observations. Firstly, the price which consumer pays is relatively less than what consumer pays inside the city. Secondly, the entire margin is retained by the farmer as there is no other intermediary involved. Third and important observation, the average quantity of vegetables sold by these farmers is relatively less than what is sold in mandis and other prominent locations.

Table 6.3 Type I- Channel Farmer →Consumer

Vegetable	Vegetable Type	Farmer's Share in Consumer's Rupee (%)
Bhindi	GLSL	100
Brinjal	GLSL	100
Pumpkin	GLSL	100
Spinach	GLSL	100
Turayi	GLSL	100
Cauliflower	GLSLO	100
Onion	GLSLO	100
Potato	GLSLO	100
Tomato	GLSLO	100
Source:- Primary data collected from Indore City during period May- July 2017		

This is obvious due to dense population in prominent locations. Another, significant observation is that these farmers are able to sell only GLSL crops, thus resulting into less variety to consumer.

Type II- Farmer to Intermediary to Retailer to Consumer. This type of channel includes two intermediaries the wholesaler and the retailer. The data for this channel was collected from Malwa Mill, Rajkumar Mill, Nandlalpura and other mandis in Indore City during May-July 2017. These mandis are unregulated mandis. The average distance travelled by the farmers coming to these mandis is between 15 o 30 kms, which indicates that most of the farmers are from nearby villages. The margin is distributed between all stake holders. The farmer's margin has a wide range from 26 % on green leafy vegetables upto 75 % on potato. A primary observation tells that the margin is less for vegetables with high perishability such as methi and dhaniya (Coriander) and fruits like Kharbuja (Musk Melon). But more data needs to be studied before concluding. The average quantity of vegetables sold is much higher. Moreover, While majority of the vegetables belong to GLSL category, some vegetables and fruits belonging to GLOSL (Grown locally as well as grown outside and sold and in the city) and GLSLO (Grown Locally, sold locally and sold outside as well) category are also sold by farmers here. These are the corps which are grown locally in large quantities. As seen from the table, there is not much difference between farmer's margin in these three categories.

Type III- Farmer to Agent to Wholesaler to Retailer to Consumer. This type of channel includes three or more intermediaries between farmer and consumer. The data for this channel was collected from choithram fruit and vegetable mandi which is a wholesale mandi, regulated by mandi board. The period for data collected was same during May to July 2017. The average distance travelled by farmers coming to this mandi was 80 to 100 kms, which indicates that farmers from surrounding villages, surrounding districts come to sell their produce here. The farmer's margin varied between 26 % and 72%.. Interesting observation is that though the price paid by consumer remained almost same in Type II and Type III channels, but the farmer's share reduced in Type III channel. There was not much difference between retailer's margin in Type II and Type III channel. The increase in margin of intermediaries (agent and wholesalers) was extracted by squeezing the farmer's margin.

Morevoer, both Type II and Type III channels were similar in terms of category of vegetables and fruits sold. Though there was a larger variety sold at choithram mandi because it is the biggest mandi in the state. But the data for more crops could not be collected as it was difficult to contact farmers or their representatives coming from other states or distant places to sell their crops. In case of choithram mandi, crops come from Maharashtra, Karnataka, Gujrat, UP, Rajasthan etc. But most of them are fruits. These fruits belong to both GLOSL and GLSLO categories.

Big buyers, also buy from this mandi for direct selling or food processing. But there is no differentiation in the rates of local sellers or outside sellers. Rather, most of the times it is observed that if an outside sellers brings large quantity, the prices fall down for local farmers as well. And there is no way to forecast this sudden increase in arrivals at times.

Table 6.4 Type II- Channel

Farmer →Wholesaler/Intermediary →Retailer→Consumer

Vegetable /Fruit	Vegetable Type	Farmer's Share (%)	Whole Seller's Share (%)	Retailer's Share (%)
Bhindi	GLSL	50.9	17.7	31.4
Brinjal	GLSL	60.7	14	26
Chowala Fali	GLSL	67.9	3.6	28.6
Cucumber	GLSL	42.1	21.1	36.8
Dhaniya	GLSL	26.3	47.4	26.3
Gilki	GLSL	44.6	28.4	27
Karela	GLSL	34.7	35.9	29.4
Khaarbuja	GLSL	26	30	44
Lauki	GLSL	36.8	21.1	42.1
Methi	GLSL	30	36.7	33.3
Pumpkin	GLSL	37	19.3	43.7
Spinach	GLSL	40	26	34
Turayi	GLSL	64.7	8.8	26.5
Mango	GLOSL	65.9	4.9	29.2
Cauliflower	GLSLO	43.8	28.1	28.1
Garlic	GLSLO	64.3	1.8	33.9
Green Peas	GLSLO	28.6	50	21.4
Guava	GLSLO	33.3	33.3	33.3
Onion	GLSLO	31.3	37.5	31.3
Potato	GLSLO	75	15	10
Tomato	GLSLO	35.9	38.5	25.6

Source – Primary data collected from Malwa Mill, Rajkumar Mill and other mandis in Indore City during May-July 2017

Table 6.5 Type III- Channel
Farmer →Agent→ Wholesaler→Retailer→Consumer

Vegetable	Vegetable Type	Farmer's Share	Agent's Share	Whole Seller's Share	Retailer's Share
Bhindi	GLSL	48	15.7	5.2	31.4
Brinjal	GLSL	52	12.0	6.0	30.0
Chowla Fali	GLSL	42.1	15.5	12.5	30.0
Cucumber	GLSL	26.3	21.1	20.5	32.0
Dhaniya	GLSL	41.9	15.0	19.0	24.0
Gilki	GLSL	32.4	10.0	25.0	33.0
Karela	GLSL	36	6.5	29.0	28.5
Kharbuja	GLSL	34.7	12.0	9.0	44.0
Lauki	GLSL	26	23.2	26.3	25.0
Methi	GLSL	35.6	14.0	22.0	28.0
Pumpkin	GLSL	36	8.9	11.9	43.7
Spinach	GLSL	36	16.0	20.0	28.0
Turayi	GLSL	50	8.0	24.0	18.0
Mango	GLOSL	47.1	8.0	15.0	30.0
Cauliflower	GLSLO	40.6	10.9	16.1	32.3
Garlic	GLSLO	62.5	5.4	3.6	28.6
Green Peas	GLSLO	21	21.4	34.0	24.0
Guava	GLSLO	33.3	3.3	46.7	16.7
Onion	GLSLO	31.3	43.8	5.6	19.4
Potato	GLSLO	72	4.2	4.2	20.0
Tomato	GLSLO	33.3	5.1	35.9	25.6

Source – Primary data collected from Choithram Mandi and Sanwer Mandi during the period May- July 2017

Figure 6-1 Farmer's Share in Consumer's Rupee in Different Channels

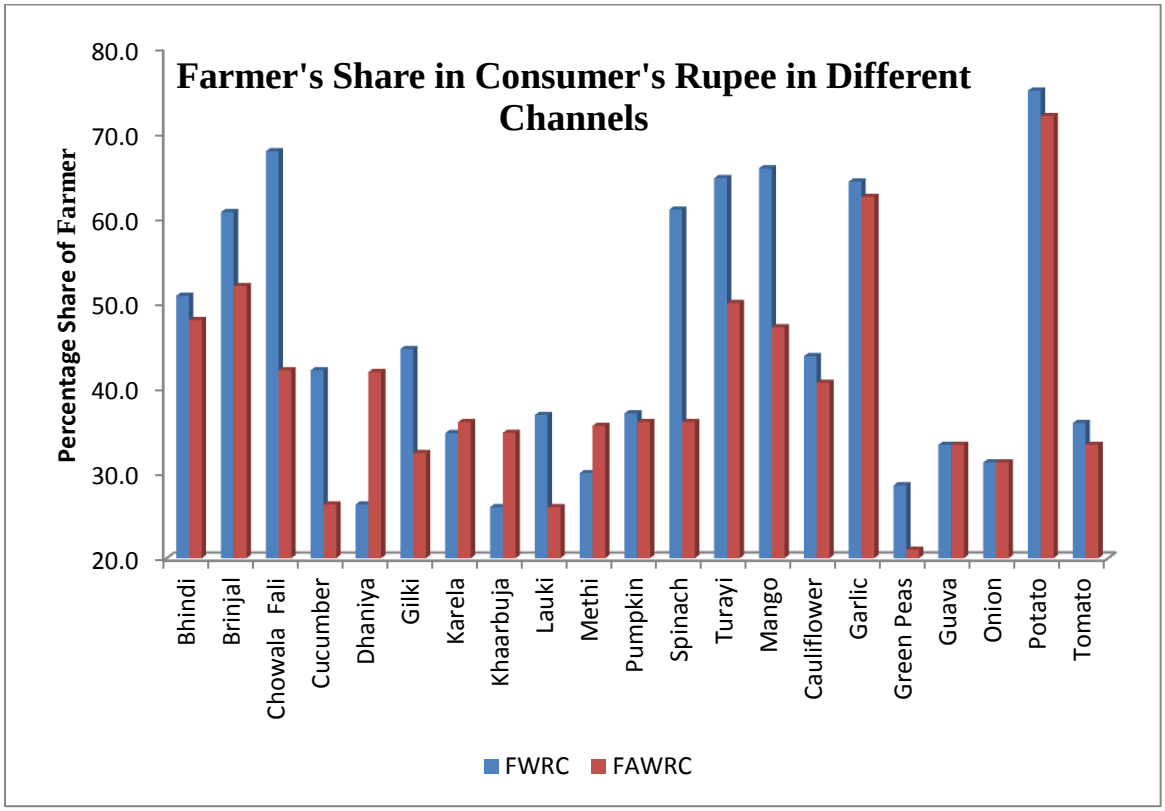
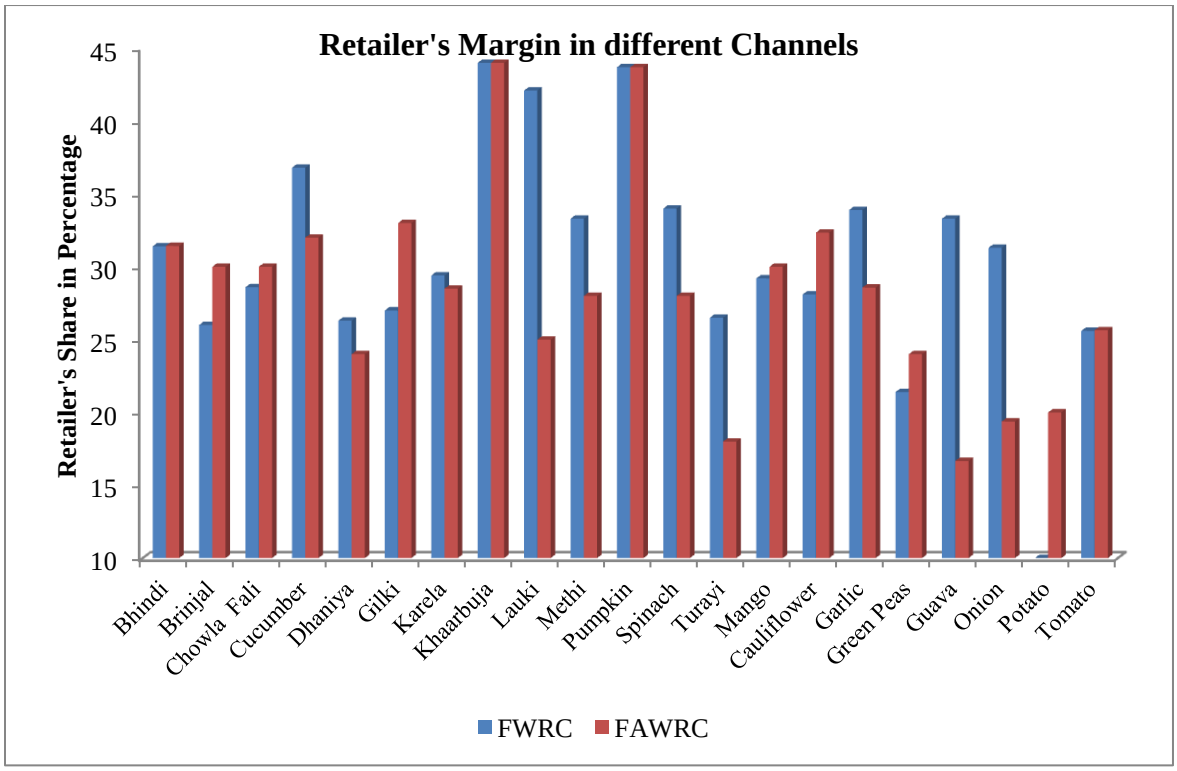


Figure 6-2 Retailer's Margin in different Channels



Case Study IV- Radhesyam' Watermelon Case Study

Table 6.6 - Farmer under Study - Radheshyam Patidar, Vasudha Farms	
Watermelon Area	1 Acre
Total Production	15 ton
Total Days	75
Person's Engaged in Farming	1Farmer +10 labour

Farmer Radheshyam Patidar planted watermelon on 1 acre of land in January 2018. After about 75days of nurturing and caring by him and 10 hired farm labour, he was able to harvest 15 tons of juicy red good quality watermelon. He took his crop in a tractor trolley to choithram mandi in Indore, which is around 120 kms from his farm.

Radheshyam reaches there at 5 am in the morning. He waits for the agent who is expected around 6 am. Radheshyam has done mental calculations and has taken an estimate of prices of watermelon on previous days. He hopes to get around 8 to 10 rupees per kg rate for his crop (value between Rs1.2 lakhs to Rs 1.5 lakhs). Around 6 am few trucks arrive from Karnataka with 500 tonnes of watermelon. This suddenly changes the scenario. Because of this sudden increase in supply of watermelons, Radheshyam get's worried as his lot size is comparatively small and there is no branding on his product to differentiate his watermelon from other watermelons. Moreover he cannot afford to take his produce somewhere else as it will add to his cost. There is no other farmer from his village who is selling watermelon in this mandi on this day. He decides to sell it at whatever price he gets. He gets hold of an agent and sells 15 tonnes of his watermelon at Rs 5 per Kg (Total value Table 2 and figures 3 and 5 summarize his cost profit analysis.

The table shows that farmer spends around 20 man days to nurture his crop (total crop duration is 75 days) and earns only 1.93% per day. While the agent and the wholesalers earn the major chunk of 38.59% and 57.88% per person per day. The retailer earns very less owing to distribution of volume among more number of

retailers. Another observation is in terms of value added to the produce. Farmer added the highest value in making the seed into fruit. Retailer added value in terms of logistics provided by him in carrying the fruit from mandi to customer. The wholesaler added some value by storing it for 2 to 3 days if required. But the agent practically added no value to the value chain and still earned 38.59% of the profit share (Apart from making on spot cash payment).

This case study reflects the plight of farmers in horticulture crops. Particularly in domestic markets where markets are not yet technologically advanced.

Table 6.7 - Cost Profit Analysis for Watermelon crop on 1 acre of land for 75 days
(Based on primary data collected from farmer, agent, wholesaler and retailers)

Value chain Member	Selling Price Per KG	Total Production (Kg)	Profit Per Kg	Gross Profit (GP)	% GP	Total Persons Involved	Total Days of involvement	Total Man Days Spent	Profit Per Person Per Day (Rs)	Percentage share in Profit
Farmer	5	15000	2*	30000	10	1	20	20	1500	**1.93**
Agent	7	15000	2	30000	10	1	1	1	30000	**38.59**
Wholesaler	10	15000	3	45000	15	1	1	1	45000	**57.88**
Retailer	20	15000	10	150000	50	120	1	120**	1250	**1.61**
Total Sale Value	RS 3,00,000								77,750	**100.0**

* Based on information provided by farmer ,Cost of Production is Rs 3 per kg
** Assuming 1 small retailer sells 5 fruits weighing 25 kg watermelon per day
*** Cost involved for value chain members other than farmer not included assuming it to be substantially low

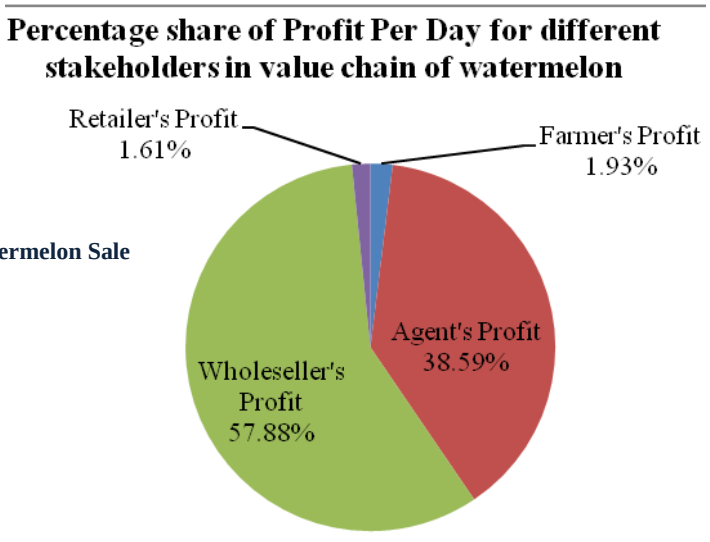
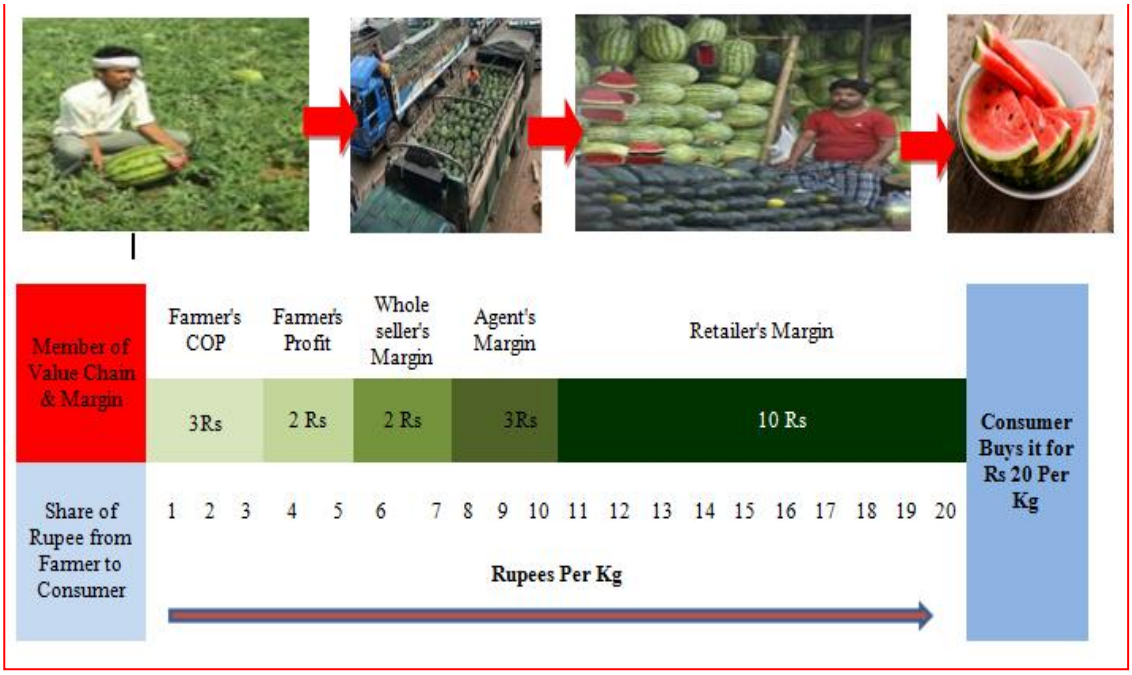


Figure 6-3 Percentage share in Watermelon Sale

Figure 6-4- Value Chain and each member's margin



What could Radheshyam have done to increase his share in the profit? Could he have done something to avoid the agents, wholesalers? Could he have done something like branding to differentiate his watermelon from the Karnataka watermelon which spoiled the prices? Could he have approached some other market? Was there any possibility of collaborating with some other producer to improve his bargaining power?

In short what choice does Radheshyam have to improve his position in the value chain from farmer to consumer?

Chapter 7

Suggestion for a Sustainable Business Model

Chapter Highlights

7.1. A different approach to look at the earnings

Quantity matters – The Power of Aggregation

7.2. Suggestions at Farmer Level

7. 2.1Suggested PGS Integrated Model

7.3. Suggestions at Consumer Level

From Consumer to "FARSUMER"

7.4. Suggestions at Intermediary level

"UFTeRCC Model"- United Farmer, Technology enabled Retailer and Connected Consumer-

7. Suggestions and Policy Implications

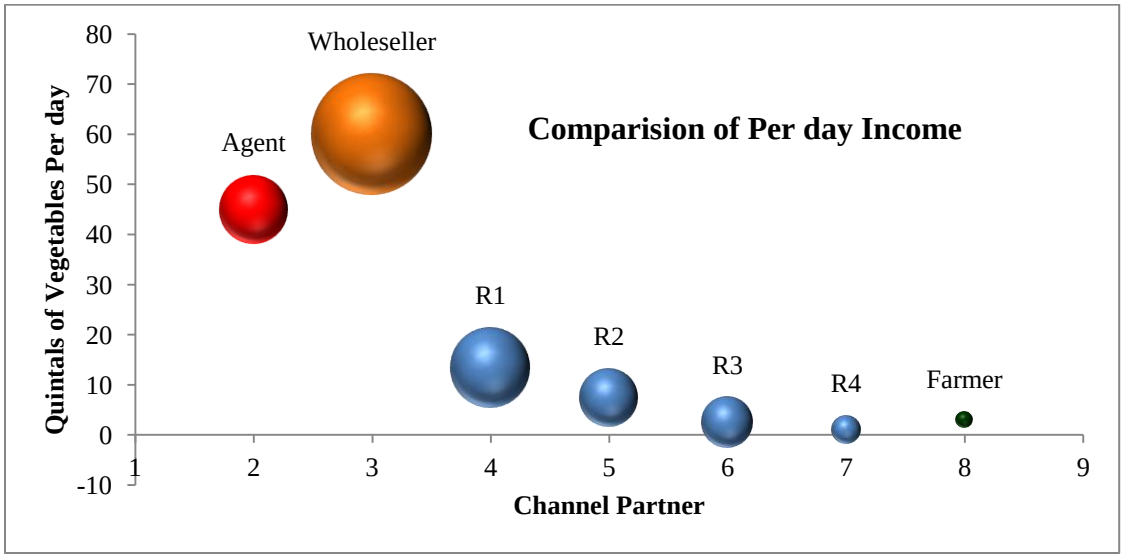
7.1 A different approach to look at the earnings

The primary data collected from different locations and different sources reveals astonishing facts. The agent, the wholesaler and the retailer work for one or two days, at the most 3 days to sell the crop which farmer grows in 2 to 3 months (Average vegetable crop takes 2 months for fruiting). The income disparity is extremely high. While the wholesaler is able to earn as high as Rs 11,200 average income per day by trading, Agent earns Rs 3500 per day in just couple of hours in the mandi and adds no value to the crop. The retailers add substantial value in terms of distribution of the crop. But the farmer, who adds maximum value by growing the crop and nurturing it for 2 to 3 months is not even able to earn Rs 200 per day. This data of farmer's income is supported by (NSS 70th Round, 2014) government statistics which states that the monthly income of farmer in India is Rs 6426/- only and in Madhya Pradesh it is 6210/- only. This is true for the small and marginal farmer. And the previous sections of this study have shown that 84% of the farmers in the country are marginal and small (Agriculture Census 2011).

Table 7.1 Comparative Earnings Per day for channel members of the sample collected from Indore City

Intermediary	Average Number of Vegetables Sold in One Day	Average Quantity sold in a day (KG)	Average Net Income Per day (Rs)
Agent	2	4500	3500
Wholesaler & Organized Retailers	4	6000	11200
Retailers			
R1- More than 1000 kg per day	6	1335	4820
R2- Between 500 - 1000 kg per day	7	735	2500
R3- Between 200 -500kg per day	5	240	1900
R4- Less than 200kg per day	4	100	600
Farmer	Works for 2 months for each crop	-	Less than 200*

Figure 7-1 Comparison of Income Per Day



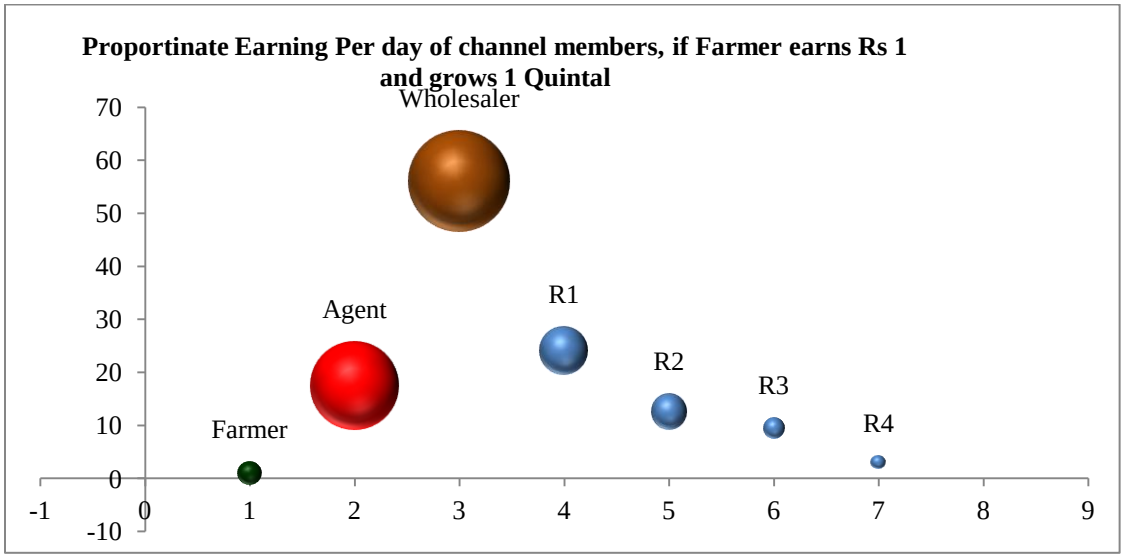
Quantity matters – The Power of Aggregation

If the quantity of vegetable sold by the farmer is considered 1 quintal and his earning as Rs 1/- per day, then the proportionate quantity and earning of each channel member can be seen in the table below and the chart. For every one rupee earned by the farmer, the wholesaler earns Rs 56. Even the smallest retailer earns 3 times that of the farmer.

Table 7.2Proportionate Earnings and Quantity Sold per day for channel members of the sample collected from Indore City

Intermediary	Proportionate Earning Per day	Proportionate Quantity Sold per day
Farmer	1	1
Agent	17.5	15
Wholesaler& Organized Retailers	56	20
Retailers		
R1- More than 1000 kg per day	24.1	4.5
R2- Between 500 - 1000 kg per day	12.5	2.45
R3- Between 200 -500kg per day	9.5	0.8
R4- Less than 200kg per day	3	0.3

Figure 7-2 Earning for channel partner when farmer earns Rs 1/-



This obviously points towards inefficiency in the supply chain. But what needs to be understood is that the agent, wholesaler or big organized retailers and even other retailers are selling larger quantities as compared to farmer. One single farmer has limitation in terms of number of crops that he can sell at a given time. On an average, he can grow upto 6 crops in a year. And his sale of crops is not on a daily basis but once in few days when he harvests the crop. On the other hand, the agents and wholesalers trade daily in the market and trade with multiple farmers and multiple crops. Thus, they are able to trade in larger quantities.

This is the power of aggregation.

According to Webster's dictionary, an aggregator is someone or something that gathers together materials from a variety of sources. Aggregation of vegetables and fruits leads to increased earnings for intermediaries. Not only in Fruits and vegetables, but the significance of aggregating goods and services under one umbrella has proved to be the key success factor behind modern organized retail industry. The hypermarkets, supermarkets are all forms of aggregation.

The farmers also need to adopt aggregation at their end so that they can get benefited by economies of scale.

In order to bring in efficiency in distribution of vegetables and fruits and ensure fair distribution of margins across the chain, there are changes required at each stage. The subsequent section discusses the suggestions arising out of this study at each level.

7.2 Suggestions at Farmer Level

Bulk of the produce is sold by farmers in raw form in the mandis after harvest. The farmer brings his produce to mandi and is dependent upon the agent for price fixing and weighing of the crop. The agent decides the price on some criteria which is purely based on his gut feel and has no scientific backing of price discovery mechanism. The farmer is not in a position to bargain because of the small lot size, lack of market information and fear of loss of crop with time and no major differentiation of his produce from other produce. So, the farmer is left with no choice but to sell his crop at throwaway price. The following cost breakup shows that on many trades, the farmer is not even able to recover his cost of production. To add to the misery, there is so far no mechanism of MSP in case of fruits and vegetables.

The study found that 80% of the farmers in the region studied are marginal and small farmers with small size of land holdings. The quantity produced by them is less and more so in case of vegetables and fruits. The farming of vegetables and fruits is remunerative but is highly labour intensive and involves higher cost of production. If the farmers come together as a group at village level or atleast 10 to 15 farmers together, then they can get the benefit of economies of scale.

The government has taken initiative and several alternative marketing models were suggested under XII plan to meet this cause of strengthening the supply chains for small farmers particularly engaged in farming fruits and vegetables.

Alternate Marketing Systems - direct marketing, contract farming, direct linkage with Retailers/ Processors/ Exporters and market oriented production are some of the approaches which could help the farmers in reducing the length of value chain and shift the margins in favour of farmers.

Government Initiatives- Apni Mandis in Punjab, Rythu Bazaars in Andhra Pradesh, Uzhavar Santhai in Tamil Nadu, and Shetkari Bazaar in Maharashtra, promoted by state Agencies. Horticultural Producers' Coop. Marketing & Processing Society (HOPCOMS – a cooperative) in Karnataka and SAFAL F&V project of National Dairy Development Board (NDDB) in Bangalore are some government initiatives for direct marketing by farmers.

Producer Groups / Farmer Groups (PG / FG) – Producers' Associations (PAs) – Farmer Common Service Centers (FCSCs): Farmer Common Service Centers (FCSCs) are conceptually small scale commercially viable entities owned by Producers' Associations (PAs). The FCSCs will support 250-300 members, through Producer Groups / Farmer Groups of around 12-19 active members in each Producer Groups (PGs). Around 15-20 PGs in a village or a group of villages can be formed within the radius of 3-5 Kms.

These alternate options are being implemented by government in different proportions in different states. In Madhya Pradesh, the horticulture department has taken initiatives like PKVY, ATMA, PKVY, ATMA, SAMETI, BTT etc to improve the pre and post harvest management. But there is lack of steps taken to strengthen the value chain or to make the markets more efficient.

The private sector has also been attracted to this segment. Companies like Adani Fresh, Mahindra, Reliance Fresh, Godrej etc have ventured into selling branded fruits. These companies mostly rely upon contract farming and market agents for procurement. They are charging premium for branding these products and making them sell into premium segment of markets. But how much of the premium is passed on to the farmer is a question mark?

They have created a market for branded fruits and vegetables which is good, but what is not good is that the farmer is still not a part of this profit making venture.

Participatory Guarantee Systems (PGS) to Improve Value Chain of F&V

The small and marginal farmers not only need to come together as a group, but they also need to create an identity and get equipped to differentiate their product from others. Participatory Guarantee System is a mechanism to bring a group of farmers together, certify their produce on certain parameters and brand it and sell it collectively to the buyers. These buyers may vary from market to market. The PGS gives an advantage in terms of collective bargaining.

IFOAM (International Federation of Organic Agricultural Movements) defines **Participatory Guarantee Systems** (**PGS**), as "locally focused quality assurance systems. They certify producers based on active participation of stakeholders and are built on a foundation of trust, social networks and knowledge exchange." They represent an alternative to third party certification especially adapted to local markets and short supply chains. They can also complement third party certification with a private label that brings additional guarantees and transparency. PGS enable the direct participation of producers, consumers and other stakeholders in the choice and definition of the standards, the development and implementation of certification procedures and the certification decisions

The IFOAM which is a leader in the concept of PGS at the international level, is running a program to recognize PGS in the organic sector. But PGS is a tool that need not be restricted to for organic agriculture but is useful in various sectors.

PGS is different from FPC (Farmer Producer Company). While an FPC is a group of farmers coming together for selling their produce. PGS is a certification system which is done by a peer group. It can be adopted by FPC or any other group of farmers who may get associated for business. Participatory Guarantee System is a process of certifying products which ensures agriculture production process in accordance with the standards laid down for organic products and that desired quality has been maintained. This is exhibited in the form of documented logo or a statement. PGS is a decentralized organic farming certification system aimed to promote domestic market growth and to enable small and marginal farmer so that have easy access to organic certification. It is cost effective, farmer- friendly and hassle-free. It is outside the

framework of third party system of certification, which is a pre-requisite to enter export market of organic produce.

PGS improving supply chain in the world -There are examples from across the world where PGS has helped the farmers to come together, brand and certify their product, enhance marketable lot and thus get better value for their produce. Studies undertaken by (Matovu, 2016), (Robineau, 2016), (Ino, 2016), (Tran, 2016), (Truong, 2016) in different parts of the world like Vietnam, Argentina, Uganda and China have found that PGS has served to provide a direct guarantee, through the formation of a market, for sustainably produced food and agriculture products.

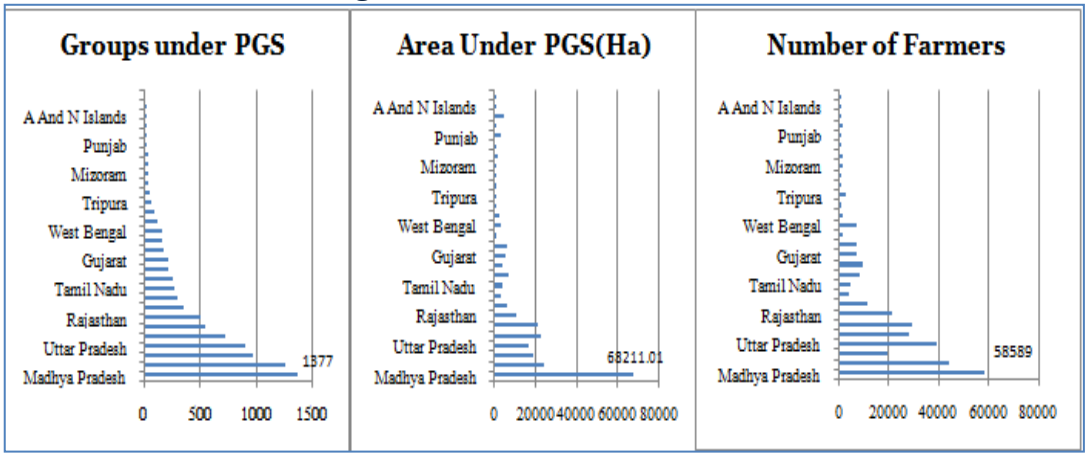
PGS has been found to strengthen farmers' innovations in strategic market negotiation, encourage communication and trust among farmers, intermediaries and consumers, starting in the field, improve public infrastructure for value chain logistics.

Thus, one may say that PGS is not only about certification, but it brings a lot of other benefits of collective farming and marketing of produce.

PGS in India -The Food and Agriculture Organization (FAO), IFOAM, and the Ministry of Agriculture in India initiated consultations with various stakeholders in 2005 to identify alternative certifications systems that are inclusive of the many small farmers and peasants in the country. The PGS Organic India Council was set up in 2006 as a result of these consultations. It functioned as an informal coalition of Voluntary Organizations or NGOs committed to the promotion of organic food production for domestic consumption in India, with export not being a priority at all. Many states within India have incorporated promotion of PGS for certification of organic produce in their state-level agriculture policies. At the national level, the National Centre of Organic Farming (NCOF) under the Ministry of Agriculture began to operate the PGS-India as a voluntary organic guarantee program with the PGS-National Advisory Committee as the apex decision making body. In 2015, PGS scheme was launched in India by Department of Agriculture. It has proven to be a quality assurance initiative that is locally relevant with active participation of

stakeholders including producers/farmers, traders and consumers in certification system. This group certification system is supported by Paramparagat Krishi Vikas Yojana (PKVY) scheme.

Figure 7-3 PGS in Indian States



Source 5-PGS India data 2018 (www.pgsindia-ncof.gov.in)

The figure shows that comparative interest shown by different states in PGS. As seen, farmers of Madhya Pradesh have shown the maximum interest in PGS in terms of number of groups, area and number of farmers registered under PGS. This shows the acceptance and interest of farming community towards this innovative tool. So far, PGS has been used only for certifying organic crops. But PGS needs to be promoted for all crops –organic as well as chemically treated. The nature of certification may obviously vary for both.

Farmers can collectively brand, package and sell the produce directly to consumer or to wholesalers. The PGS group can do collective bargaining by ensuring bulk volume of produce. This will enhance their margins. Further, PGS will en able the farmer groups to differentiate their branded produce from non branded produce. Branded produce is generally seen to fetch premium in the market as it assures quality to customer.

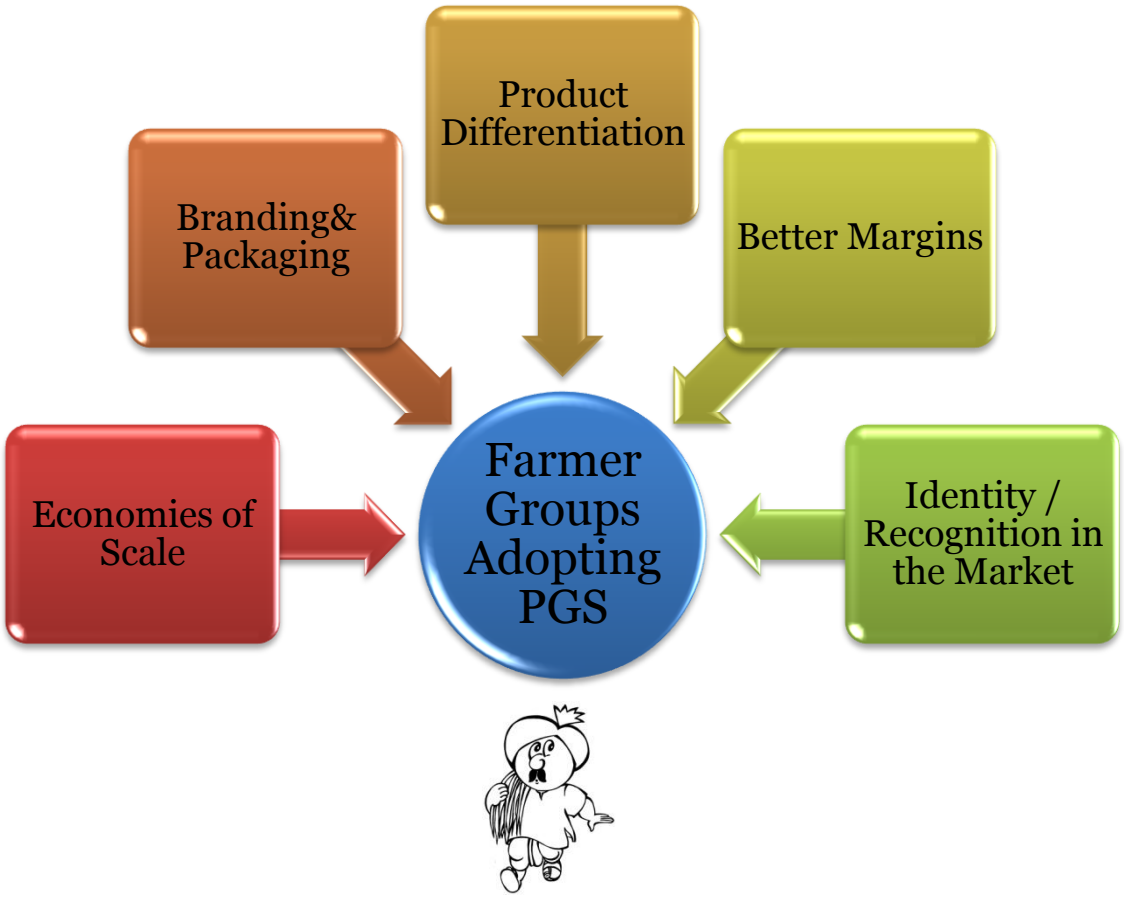
Let us coming back to Radheshyam problem and look at it again. If Radheshyam was a part of PGS certification system adopted by a group of farmers, then he would not have been left alone that day. He would have had more than 15 tonnes of branded watermelon to sell. The branding of his watermelon would have fetched him more

than what he got. And he would not have to be dependent on agent, he would have sold his branded watermelon to corporate houses or other bulk buyers.

7. 2.1Suggested PGS Integrated Model

The PGS model has already started gaining momentum among organic farmers in India. If introduced for farmers not yet involved in organic farming, it will help a larger segment of farming community to get benefited. The nature and terminology for organic and not organic certification may vary. Farmers can form groups which could be formal or informal. Formal groups could be self help groups (SHG), farmer producer company (FPC) or cooperatives. Informal groups could be any group of 5 to 8 farmers or more from a common village or community. These groups can develop a PGS system by defining parameters of quality and a commitment to deliver that quality. The commitment to deliver the quality will be key factor for the success of PGS as this commitment will help the group deliver a consistent quality and gain trust of buyers. The importance of issues like traceability of harmful pesticides can also be addressed through PGS. According to (Gale, 2006) control over processing and distribution channels through the traceability of ingredients and finished products is extremely desirable in modern supply chains. Large retailers and restaurant chains, such as Wal-Mart Stores and McDonald's Corp., are demanding traceability from their suppliers, and most processors are beginning to recognize that proof of traceability will soon be a minimum standard for doing business. This quality commitment can be translated in the form of a brand for the group.

Figure 7-4 Farmer Group Adopting PGS



Thus, PGS model will help farmers in multiple ways. It will provide the benefits of quantity to the farmer and quality to the consumer.

7.3 Suggestions at Consumer Level

The Indian consumer is changing. The growing income levels, high urbanization and several other factors have contributed to major lifestyle changes in the society. Changing family structures, increased women participation at work place have led to changes in the way consumer buying behavior as well as consumption levels in all segments. This is true for F& V also.

Consumer today is more aware of what he is buying and has become more brand conscious. But it is an irony, that we use branded toothpaste and face powder. We are particular about brand while choosing packaged food products because a brand conveys trust. But we don't exhibit a similar behavior while buying fruits and vegetables. Most of the consumers buy F&V from local retailers who do not know about the original source of the crop. Isn't this strange? We look at the package of chips or any other eatable to find out the contents in it, expiry date etc. But we are not aware of the pesticides, fertilizers and other crop quality measures of the vegetable that we eat.

The consumer needs to become aware of the source from where the vegetable or fruit is coming. This may not be possible in case fruits that travel long distance and come from other states or countries. But it is certainly possible for vegetables and fruits that are locally grown by farmers in the nearby villages- the GLSL crops.

There must be a direct link wherever possible between the farmer and the consumer. When a direct link is not possible due to distances and large volumes, there should be an identification of the source of vegetable by packaging or labeling or branding. This is achievable if the farmers themselves do the grading, sorting, packaging either at farm level or at some collection centre and then sell it directly or through intermediary.

In the developed countries like USA, this concept of direct linkage between farmer and consumer to ensure minimum gap as well as traceability of source is well accepted. The number of farmers markets has increased by almost 370 percent since

1994, with over 8,100 farmers markets listed in the U.S. Department of Agriculture (USDA)'s market directory in 2013. The local food movement sweeping the country is inspired by initiatives such as USDA's "Know Your Farmer", "Know Your Food", Farm to School and The People's Garden, a collaborative effort of over 700 local and national organizations working together to establish community and school gardens across the nation to unite neighborhoods and inspire locally led solutions to hunger and environmental concerns. (Harrison, 2014)

From Consumer to "FARSUMER"

The feedback from consumers received during the "Anar Bazar" experiment was quite encouraging. The customers showed interest in knowing more about the farmer, his problems and came up with ideas of what they could do for improving the profitability of farmers in general.

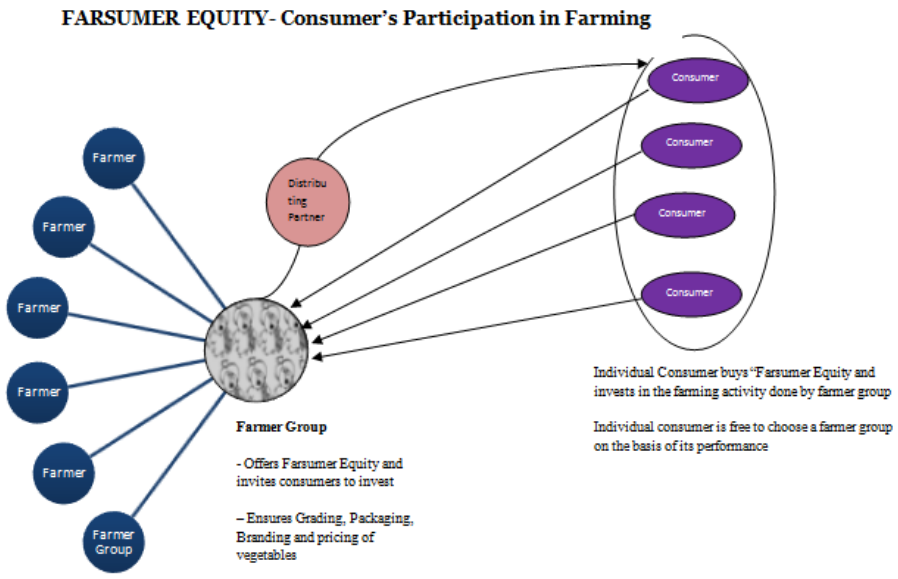
This resulted into a new concept which was newly termed as "Farsumer". A Farsumer is a consumer who has invested in the farming process of a farmer or a group of farmers. In return he gets two things - the farm produce for his personal consumption and a share in net profit of the farmer at end of the year.

Farmer + Consumer = Farsumer

Farsumer equity can be introduced by Farmer groups. The Farsumer equity can be understood as concept similar to "time share" which is promoted by several holiday resorts are tourist destinations. For example Mahindra club- in which the customer buys a share of time that he can spend in a holiday resort. A "Farsumer equity" is a share of crop that is purchased by the consumer at the beginning of the month or year. In return, the farmer group will provide him vegetables and fruits grown by them of equivalent value. The Farsumer equity may also get bonus return in the form of profit sharing at the end of the period. It may also be compared to a mutual fund, where small investors get the benefit of investing in diversified assets with experts doing investments. Farsumers will invest into farming activity in a limited sense, and get benefitted by the farmer's expertise. This will have multiple benefits –

- Farmer group gets 100% of share in the consumer's rupee
- Farmer group gets assured market for his crop of the amount invested in the form of Farsumer Equity.
- Farmer gets upfront capital investment which he can use for enhancing farm level activities
- Consumer gets to invest into farming activity with a limited risk.
- Instill healthy competition among farmer groups to ensure quality as each farmer group would like to retain maximum farsumers.
- The small and marginal farmers in the GLSL category will be especially benefitted by farsumer's participation

Figure 7-5 A pictorial representation of Farsumer's equity



The idea of a farsumer can further be developed in by regulating terms and conditions to be followed by both the consumer and the farmer. Government may promote this idea among urban consumers in order to connect them to farms and create an environment of public participation for achieving the goal of "Doubling Farmer's Income"

7.4 Suggestions at Intermediary level

The study found that the margins are not distributed appropriately among the members of agri-supply chain. This observation matches other studies done on similar lines. But there are few significant observations of this study –

- Fruits and Vegetables need to be classified separately on the basis of whether they are grown locally or brought from outside and whether they are sold locally only or sent outside. The GLSL, GLOSL, GLSLO and GOSL categories were identified and fruits and vegetables were grouped in each of them.
- Every region may have different fruits and vegetables falling into each of these categories depending upon the agriculture scenario in that region.
- The market dynamics vary for each of these categories and separate methods need to be adopted for improving marketing conditions of crops in these categories. Special attention needs to be paid to GLSL category as these crops are mostly grown by small and marginal farmers.
- The agents and wholesalers do have a role to play in the distribution channel but their role is more important for GLOSL, GLSLO and GOSL categories as they help in creating linkage between farmers and buyer located at long distance. But in case of GLSL crops, they actually deplete farmer's margin.
- Retailers play an important role in distribution. Mostly they are urban street hawkers. They are unorganized and earn lesser margin than agent and wholesaler.
- Organised retailers like Reliance fresh etc were found to be sourcing from wholesalers and agents mostly in Choithram mandi. There were not much of direct purchases from farmers or contract farming incidences in Indore.

Need for an Ola or Uber in Agri-supply chain -Indian economy is on growing like never before. Everything seems to have an 'e' solution. The Indian e-commerce industry has been on an upward growth trajectory as it is expected to grow from US$ 38.5 billion as of 2017 to US$ 200 billion by 2026 and is expected to surpass the US

to become the second largest e-commerce market in the world by 2034, says a report by India Brand Equity Foundation (ibef report, March 2018)

E-commerce is everywhere – B2B, B2C, mobile apps, websites, aggregators are a few to name. E-commerce has encompassed a vast segment of the society. E--commerce is set to become all pervasive – from retail to wholesale, urbal to rural. The Indian customer is becoming comfortable online and is set to replace a major chunk of market online. A young demographic profile, rising internet penetration and relative better economic performance are the key drivers of this sector.

An example of how e-commerce has changed urban consumer is the way people commuted in urban areas has been transformed by car rental companies like uber and ola. They use an online platform connected with GPS system to connect a driver and a passenger. The Uber neither employs the driver nor it owns the car. This system has generated tremendous opportunity of self employment for car drivers.

Coming back to fruits and vegetables, earlier food and grocery were never thought of as items for online trading. However, with the change of working habits, and consumers opting for adaptability and convenience, there are now innumerable small and large E-commerce companies selling provisions and food items like Grofers, BigBasket, etc(ibef report, December 2017). Similarly, uber eats, zomato and swiggy operate in the food industry. Strictly speaking they are not in the food business. They just list the food outlest, their menu choices, pricing etc. Customers order food from their choice of outlet and the delivery order is completed by an individual who is an independent entity.

7.4 "UFTeRCC Model"- United Farmer, Technology enabled Retailer and Connected Consumer-

Suggested Comprehensive model for Sustainable Agri Supply Chain -

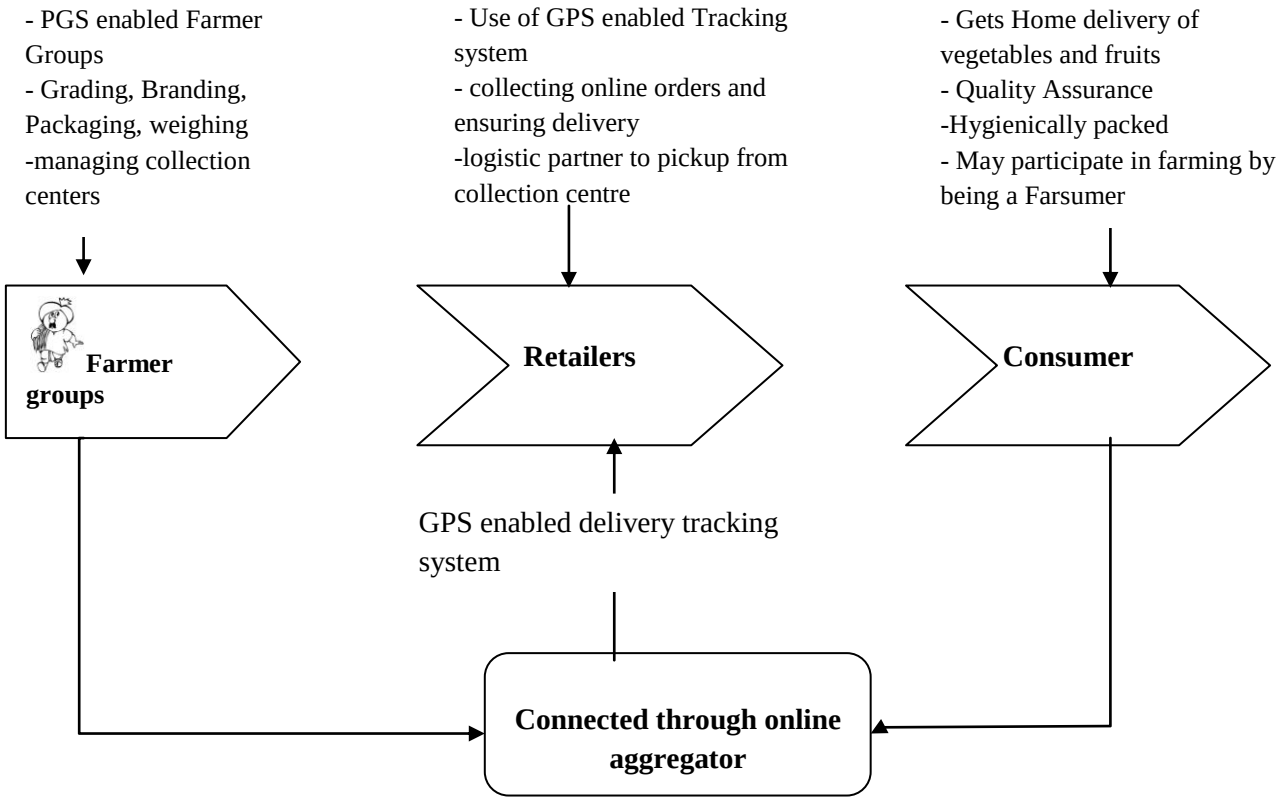
A similar kind of technology based aggregating service may be created for fruits and vegetable specifically belonging to GLSL category. This model is hereby named as "UFTeRCC Model", because it is an attempt to work at three levels. Firstly it strengthens the farmer not just by uniting them but enabling them to add value to their produce in terms of guarantee of quality, and differentiation by branding. Secondly it involved the existing retailers and taps in their potential by enabling them with technology. Third, it connects the consumer to the farmer and makes him a partner in his growth. It may work as follows -

- Source - Farmer groups particularly the ones with PGS certification, and branding may put up list of available vegetables and fruits. Farmer groups will be responsible for grading, packaging, weighing and collecting crops at a location centre.
- Consumer – Consumer may select and order fruits and vegetables from any of them.
- Delivery partner – Independent partner connected through the app may collect orders from collection centers and deliver it to consumers.
- Delivery time – Unlike ready to eat food, where delivery time is too short may be 30 minutes, for fruits and vegetables it may be couple of hours.

One may note that home delivery model is the most upcoming business model for fruits and vegetables because it saves time and travel for the buyer. A small survey was conducted by researchers for identifying the potential of home delivery model similar to that of milk distribution. The findings suggested that more than 60% of the urban consumer may be willing to buy vegetables and fruits through home delivery model.

There are certain challenges in executing this system. Several online models have already started working on these lines. Startups like paper tap, desiveg, farmfresh etc are struggling to survive. Many have closed shops. But they are all inventory based models which require investment and have high logistic cost. There have been several startups which have failed in this segment. The reason being they were just buying from the mandis and providing home delivery. They were not adding much value to the present system.

Figure 7-6 UFTeRCC Model



The above pictorial representation shows how the existing system of retailers and farmers can be integrated through online platform thereby enhancing value for each one in the supply chain.

The proposed e-commerce solution for vegetables and fruits should be a "Market place model" supported by GPS –an e-market place where buyers and sellers interact. It may be zero inventory model. The existing retailers, street hawkers can be roped in as logistic partners to deliver the orders. This will help in multiple ways. There are more than 5000 small retailers in Indore already distributing fruits and vegetables. On an average a small retailer travels around 30to 35 kms daily to sell vegetables. He has the required knowledge of vegetables, fruits and the business. He can be trained and facilitated and equipped to receive and deliver orders through online platform. He will collect the packed and branded vegetables and fruits from the collection centre and deliver it to consumer.

The success of this suggested system is based on two essential factors – inclusive growth for farmers and retailers and using technology for the purpose. In the coming times, any business which does not consider inclusive growth for all stakeholders may not be a sustainable business.

Chapter 8
Conclusion

8. Conclusion

Agriculture is the backbone of Indian economy. It is disheartening to see that while business in India has grown substantially. Several sectors have prospered in recent years. Agriculture sector adds almost 17% to the GDP and India is a net exporter of food. Madhya Pradesh is “agriculturally oriented” state. It has taken several initiatives for increasing production and facilities to farmers. Horticulture has picked up the attention of farmers and policy makers both. Area under horticulture crops has in MP has increased from 2 % to 6 %It’s importance has been identified as it has been found to add more value in less land. Therefore, horticulture crops are known are “high value” crops.

Given this importance to horticulture crops, the marketing dynamics of fruits and vegetables is not all that praise worthy. Disparities in margin distribution among channel members, food loss, mismatch of demand and supply are some pertinent issues which need to be addressed. Ironically, farm production has increasing but farmer has remained poor. In India, 80% of the farmers are marginal and small farmers with low average land holdings. Their income levels are abysmally low as Rs 6400 per month.

The present government has laid out the vision for doubling farmer’s income till 2022-23.The policy paper by (Chand, Doubling Farmer's Income- Rational, Strategy, Prospects & Action Plan, Policy Paper, 2017) suggests that doubling the real income of farmers in this stipulated time requires 10.41% annual growth in farmer’s income.

The present study tried to examine the nitty grities of marketing of Vegetables& fruits Indore district in Madhya Pradesh. The conclusion for each of the objective is as follows -

Objective - To study role of intermediaries in terms of value added or depleted by them in the process of selling selected vegetables and fruits in regulated and non regulated markets of Indore District.

- MP is among top 10 leading states in horticulture crops in India. The major horticulture crops are Onion, Potato, Tomato, Garlic, Cabbage, Green Peas, Cauliflower, Bottle Gourd, Bitter Gourd, Mango, Banana, Orange etc. Indore is among top producing districts for crops like Garlic, Onion, Potato , Guava, Cabbage, cauliflower etc. 10.27% of Indore's population is engaged in farming and out of these, farmers cultivating fruits and vegetables are even less.
- There is an estimated consumption of 370 tonnes of vegetables and 150 tonnes of fruits per day in Indore City. There are four major markets regulated by MP Mandi board – Devi AHilya Bai Holkar Fruit and Vegetable Mandi(Commonly known as Choithram mandi), Sanwer Mandi, Mhow Mandi and Gautampura(Depalpur) mandi. Apart from these mandis there are several unregulated markets, weekly markets, temporary markets for fruits and vegetables in the city which is spread over 40 kms.
- There are more than 5000 retailers estimated to be selling fruits and vegetables in the city.
- The majority of farmers come from nearby villages upto 80 to 100 kms to sell vegetables and fruits. Several big farmers come to sell large volumes of fruits from other states like Maharashtra, Karnataka, Gujarat, UP, Rajasthan etc.
- The fruits and vegetables grown locally are a different category for marketing and pricing purpose and those grown in far away regions are a different category. The following classification has been created in this study for understanding different needs of GLSL category in particular.

  GLSL Grown Locally Sold Locally
  GLSO Grown Locally Sold Outside
  GOSL Grown Outside Sold Locally
  GLSLO Grown Locally Sold Locally as Well as Outside
  GLOSL Grown Locally and Outside Sold Locally

- The above categories also differ in terms of value added by each intermediary. Agents and Wholesalers add no value to GLSL category.

Objective - To estimate the Farmer's share in consumer's rupee, market efficiency and price spread for selected vegetables and fruits cultivated in Indore District.

- Small and Marginal farmers are inclined towards cultivating vegetables. The average income for small and marginal farmers from fruits and vegetables was estimated to be between Rs 31,000 to Rs 48,000 per acre per Year. The average cost of production was very high , estimated to be between Rs 90,000 to Rs 1,80,000 per acre per year. Majority of small and marginal farmers were making loss.
- Farmer's share in consumer's rupee was estimated for different channels and different category of crops. Farmer's share in consumer's rupee was found to be between 26% to 75 % in FIRC channel. It was found to decline in FAWRC channel. There was no difference in farmer's share for different category of crops (GLSL, GLSLO etc)
- A comparison was made for per day income and it was found that for every 1Rupee earned by the farmer, the agent earns Rs 17.5 and the wholesaler earns as high as Rs 56 per day.
- The inefficiency in prices in different mandi's in different crops was estimated by applying runs test of randomness on daily price data. Results showed that there is randomness in all prices across all mandis.

Objective - To identify the optimum value chain for selling vegetables and fruits and to study feasibility and propose a method to have "Minimum Support Prices" for vegetables and Fruits in Indore District.

- The study suggests that there should be separate provisions in the market for different category of crops. GLSL crops are grown locally and sold locally by small and marginal farmers who do not have large volumes to sell.
- The role of agents and wholesalers should be restricted to channels of crops other than GLSL.
- The retailers, mostly urban street hawkers should be supported and encouraged as they add more value to the distribution network.

- Big organized retailers, add no value to GLSL crops. They should identify their niche as GOSL crops which they are better equipped to source from outside and sell in the city.

Objective -To find out ways to enhance the interest of farmers and other community in general in cultivating vegetables and crops

- The study suggested innovative way to enhance farmer –consumer direct linkage through **corporate intervention under social responsibility**. Companies can provide platform to nearby farmers in their factory premises and become partner in their growth. The experiment of Anar Bazar at Pratibha Syntex was appreciated by employees and it resulted into better margin for farmer Pappu bhai.
- The study recommends innovative concept of **"Farsumer**" and "Farsumer Equity" for enhancing consumer's participation in farming activity. Farsumer equity model has been suggested to establish link between farmer and consumer, increase farmer's share in consumer's rupee and enable the consumer to be aware of source of his vegetables and fruits. Farsumer Equity model is more suited to GLSL crops.
- The study also recommends the Participatory guarantee system (**PGS**), which is presently adopted by organic farmers, to be extended to all vegetable and fruit farmers. Collective farming, producer companies, cooperatives etc can adopt PGS certification and create a branding and differentiation for their crops. This will help them fetch better price by providing trust in their brand.

Objective - To propose a "Sustainable Business Model" for marketing of vegetables and fruits for Small farmers in Indore District.

- The final outcome of this study is a proposed business model – the **"UFTeRCC model**" which is suitable for small and marginal farmers, includes the participation of existing retailer's network and uses e-commerce aggregation model to make the marketing of fruits and vegetables a profitable venture for farmers, retailers and consumers. The suggested model ensures

sustainability as it takes care of all the stakeholders. Even the agents and wholesalers are not to be eliminated. Only their role is to be redefined and restricted to markets where they add value, i.e. where buyers and sellers from outside are to be linked and huge storage capacity is required. They are not adding value to marketing of GLSL crops. So, the marketing of GLSL crops should be done in a different manner as suggested. Private players may be encouraged to adopt this model.

- Private players, especially big organized retailers should be restricted to crops other that GLSL.

Finally, this study has potential to contribute towards the goal of doubling farmer's income.

Chapter 9
Limitation of the study

9. Limitations of the study

The study was conducted on farmers and intermediaries of fruits and vegetables in Indore. Primary data was collected through questionnaires. Though precautions were taken to ensure reliability, possibility of error may not be ruled out because, majority of the respondents were uneducated and it was difficult to explain the question and get exact information from them.

During the data collection period, there was a farmers strike which had resulted into closing of mandi for several days. It not only interrupted the data collection but also made it more challenging because post strike, respondents thought that data is being collected by government for some purpose against them. It was a big challenge to convince them and lot of efforts had to be done to make contact and connect with them. While utmost care was taken to critically evaluate the data but the possibility some incorrect information is shared by the respondent may not be ruled out.

Another major limitation of the study is the limited period. The data collected from farmers and intermediaries was collected between January 2017 and August 2017. Though sufficient sample size was ensured, but still it represents their present earnings only. If the past earnings would have been included, it would have been possible to draw a trend analysis in the data.

Seasonal variations in prices could not be captured and compared. This could add another dimension to understanding GLSL crops. While some crops may be grown in limited seasons in Indore, it may be grown in some other region in the same time. So, there is a possibility that a GLSL crop in peak season may become GOSL crop in other season.

Chapter 10

Bibliography

10. Bibliography

References

- A Mukkherjee. (2016). *India's Phytonutrient Report.* delhi: Academic Foundation, ICRIER.
- Acharya S.S.(2007), "Agribusiness in India: Some Facts and Emerging Issues", Agricultural Economics Research Review Vol. 20 (Conference Issue) 2007 pp 409-424
- Acharya SS, A. N. (2001). *Agricultural Marketing in India.* New Delhi: Third edition, Oxford & IBH Publishing Company.
- Agarwal, S. (2017). Issues in supply chain planning of Fruits and Vegetables in Agri-food supply chain : A review of certain aspects, International Journal of Commerce and Management, 37–43.
- Ahumada O and Villalobos J R (2009), "Application of Planning Models in the Agri-Food Supply Chain: A Review", European Journal of Operational Research, Vol. 196, No. 1, pp. 1-20.
- Ahumada, O. and Villalobos, J.R. (2009b), "A tactical model for planning the production and distribution of fresh produce", Annals of Operations Research, Vol. 190 No. 1, pp. 339-58.
- Ali, J., & Kapoor, S. (2010). "Buying behaviour of consumers for food products in an emerging economy", British Food Journal, *112*(2), 109–124. http://doi.org/10.1108/00070701011018806
- Ayieko M W, (2003), "Fresh fruit and Vegetable Consumption patterns and supply chain systems in Urban Kenya: Implications for policy and Investments Priorities" Working Paper 16, Tegemeo Institute of Agricultural Policy and development, Egerton University
- Babu, G. S., & Sekhar, P. M. R. (2015). Impact of Foreign Direct Investment (FDI) In Indian Food Processing Sector, IOSR Journal of Business and Management, *17*(1), 6–12. http://doi.org/10.9790/487X-17110612
- Bahinipati, B. K. (2014). The Procurement Perspectives of Fruits and Vegetables Supply Chain Planning, International Journal of Supply Chain Management, *3*(2), 111–131.
- Behzadi, G., Sullivan, M. J. O., Olsen, T. L., & Zhang, A. (2017). Agribusiness Supply Chain Risk Management: A Review of Quantitative Decision Models, The International Journal of Management Science, http://doi.org/10.1016/j.omega.2017.07.005
- Berdegué JA, et. al. (2008). A method for the analysis of innovative practice in connecting smallholder producers with dynamic supply chains. Resource Paper for Component 2. Regoverning markets: keys to inclusion of small-scale producers in dynamic markets. London: IIED.
- Beske, P., Land, A., & Seuring, S. (2014). Sustainable supply chain management practices and dynamic capabilities in the food industry : A critical analysis of the literature, International Journal of Production Economics, *152*, 131–143.

- Bhagat, D. & Dhar, U. R. (2011). Agriculture Supply Chain Management : A Review. The IUP Journal of Supply Chain Management, Vol. VIII, No. 3, 2011
- Bhardwaj S and Palaparthy I (2008), "Factors Influencing Indian Supply Chains of Fruits and Vegetables: A Literature Review", The IUP Journal of Supply Chain Management, Vol. V, No. 3, pp. 59-68.
- Biji, K. B., Ravishankar, C. N., & Mohan, C. O. (2015). Smart packaging systems for food applications : a review, Journal of Food Science and Technology, *52*(October), 6125–6135. http://doi.org/10.1007/s13197-015-1766-7
- Blackburn J, Scudder G. Supply chain strategies for perishable products: the case of fresh produce. Production and Operations Management, 2009; 18(2):129-137.
- Blandon J, Henson S and Cranfield J (2009a), "Small-Scale Farmer Participation in New Agri-Food Supply Chains: Case of the Supermarket Supply Chain for Fruit and Vegetables in Honduras", Journal of International Development, Vol. 21, No. 7, pp. 971-984.
- Blandon J, Henson S and Islam T (2009b), "Marketing Preferences of Small-Scale Farmers in the Context of New Agrifood Systems: A Stated Choice Model", Agribusiness, Vol. 25, No. 2, pp. 251-267.
- Bose, D. (2009). *Marketing of FLowers in Karnataka- Infrastructure, System and Economics.* Jaipur: CCS National Institute of Agriculture Marketing.
- C. Bignebat et al. (2009), "Small producers, supermarkets, and the role of intermediaries in Turkey's fresh fruit and vegetable market". Agricultural Economics 40 (2009) supplement 807–816
- Canavari M, Fritz M, Hofstede G J et al. (2010), "The Role of Trust in the Transition from Traditional to Electronic B2B Relationships in Agri-Food Chains", Computers and Electronics in Agriculture, Vol. 70, No. 2, pp. 321- 327.
- Chanana, P. (2018, August 21). Top 10 Food Delivery App Startups in India (2018) Which are Rocking! *Reviewsxp* , pp. https://www.reviewsxp.com/blog/best-food-startups/.
- Cohen, A. J. (2013). Supermarkets in India : Struggles Over the Organization of Agricultural Markets and Food Supply Chains, Public Law and Legal Theory Working Paper Series No. 235.
- Cory William Whitney, K. D. (2014). Farm Management Schemes within Organic PGS; Survey and Analysis in Sóc Sơn, Hanoi, Vietnam. *Proceedings of the 4th ISOFAR Scientific Conference, 'Building Organic Bridges', at the Organic World Congress* (p. 1187). IStanbul, Turkey: Rahmann G & Aksoy U (Eds.).
- Dastagiri M.B. et.al,(2013) . Indian Vegetables: Production Trends, Marketing Efficiency and Export Competitive- ness. American Journal of Agriculture and Forestry. Vol. 1, No. 1, 2013, pp. 1-11. doi: 10.11648/j.ajaf.20130101.11
- Dastagiri MB, Immanuelraj TK (2012) "Supermarket Supply Chains in Horticulture in India: The Novel Marketing Models, Effects and Policies." Agrotechnol S11:001. doi:10.4172/2168-9881.S11-001
- Deliya M, Thakor C, Parmar B (2012) A Study on differentiator in Marketing of fresh fruits and Vegetables from Supply Chain Management Perspective. Abhinav: National monthly Refered Journal of Research in Commerce and Managment 1: 40-57.

- Deshingkar, P., Kulkarni, U., & Rao, L. (2003). Changing Food Systems in India : Resource- sharing and Marketing Arrangements for Vegetable Production in Andhra Pradesh, Development Policy Review, *21*, 627–639.
- Dey, S. (2012). Rythu Bazaar : A Study of the Supply Chain of the Farmers ' Markets of Andhra Pradesh, The IUP Journal of Operations Management, Vol. XI, No. 3, 2012, 43–66.
- Epperson, J. E., & Estes, E. A. (1999). Fruit and vegetable supply- chain management, innovations, and competitiveness: cooperative regional research project S-222. Journal of Food Distribution, 30, 38-43
- Gale, S. F. (2006, January). Innovations in Traceability Systems and Product ID Tools. *Food and Safety Magazine* , pp. https://www.foodsafetymagazine.com/magazine-archive1/december-2017january-2018/the-supply-chain-and-food-safety-culture-retail/.
- Gandhi, V. P. (2003). Institutional Aspects of Agro-Processing and Value Addition for Rural and Small Farmer Development in India: A Study of the Issues and Lessons. In M. P. Suresh Pal, *Institutional Change in Indian Agriculture* (pp. 369-391). New Delhi: National Centre For Agriculute Economics And Policy Research.
- Gandhi, V.P. and Namboodir, N. V. (2002) ―Fruit and Vegetable Marketing and its Efficiency in India: A Study of Wholesale Markets in the Ahmedabad Area,‖ IIMA Working Paper,
- Gandhi, V.P. and Namboodir, N. V. (2004) ―Marketing of Fruits and Vegetables in India: A Study Covering the Ahmedabad, Chennai and Kolkata Markets,‖ IIMA Working Paper, 1 – 64.
- Ganeshkumar, C., Pachayappan, M. and Madanmohan, G. (2017) Agri-food Supply Chain Manage- ment: Literature Review. Intelligent Information Management, 9, 68-96, https://doi.org/10.4236/iim.2017.92004.
- Goknur A A and Turan E E (2009), "Supply Chain Performance Measurement: A Literature Review", International Journal of Production Research, pp. 1-19.
- H.E. Bilali, M. A. (2018). Transition towards sustainability in agriculture and food systems: role of information and communication technologies. *Information Processing in Agriculture* , doi: https://doi.org/10.1016/j.inpa.2018.06.006.
- Halder P and Pati S (2011), "A Need for Paradigm Shift to Improve Supply Chain Management of Fruits & Vegetables in India", Asian Journal of Agriculture and Rural Development, Vol. 1, No. 1, pp. 1-20.
- Harrison, J. A. (2014, July). Food Safety and Farmers Markets. *Food and Safety Magazine* , pp. https://www.foodsafetymagazine.com/magazine-archive1/junejuly-2014/food-safety-and-farmers-markets/.
- Hassler, M. (2012). Farmers ' producer companies in India : A new concept for collective action?, Environmental and Planning A, Vol. 44, 411- 427.. http://doi.org/10.1068/a44143
- Iannoni A P and Morabito R (2006), "A Discrete Simulation Analysis of a Logistics Supply System", Transportation Research, Vol. 42, No. 3, pp. 191-210
- Ino, M. (2016). The building of agri-chains toward sustainable community development: experiences of applying PGS for organic and diversified agricultural production in Ben Tre Province . *AgriChains and Sustainable Development-Linking Local and Global Dynamics* (p. 145). Montpellier, France: ACSD.

- Jetter, K. M., & Cassady, D. L. (2010). Increasing Fresh Fruit and Vegetable Availability in a Low-Income Neighborhood Convenience Store: A Pilot Study, Health Promotion Practice, Vol. 11, No. 5, 694-702 http://doi.org/10.1177/1524839908330808
- Kaipia et al. "Creating sustainable fresh food supply chains through waste reduction". International Journal of Physical Distribution & Logistics Management 43:3, 262-276
- KJ, S. (2017, December 1). Foodpanda India revenues increases 64% for FY16-17. *Medianama* , pp. https://www.medianama.com/2017/12/223-foodpanda-revenues-fy16-17/.
- Louw, A., et.al.(2008). Alternative marketing options for small-scale farmers in the wake of changing agri-food supply chains in South Africa, Agrekon, *47*(3), 287–308.
- Lynch K (1994), "Urban Fruit and Vegetable Supply in Dar es Salaam", The Geographical Journal, Vol. 160, No. 3, pp. 307-318.
- M.B. Dastagiri, B. G. (2012 December). Marketing efficiency of India's horticultural commodities under different supply chains. *Outlook on Agriculture* , 41(4):271-278.
- M.Sudha, T. (2003). Institutional Arrangements for Linking Horticultural Production, Marketing and Processing. In M. P. Suresh Pal, *Institutional Change in Indian Agriculture* (pp. 349-368). New Delhi: National Centre For Agriculute Economics And Policy Research.
- McIntyre, L. (2017, October). Evaluating Risk in Foods at Farmers' Markets. *Food and Safety Magazine* , pp. https://www.foodsafetymagazine.com/enewsletter/evaluating-risk-in-foods-at-farmerse28099-markets/.
- Neeraj Gupta, A. G. (2014). Testing of Efficient Market Hypothesis: a study on Indian Stock Market. *IOSR Journal of Business and Management* , e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 16, Issue 8. Ver. III (Aug. 2014), PP 28-3.
- Negi, S. (2013). Food Processing Entrepreneurship for Rural Development: Drivers and Challenges. In IIM, SUSCON III Third International Conference on Sustainability: Ecology, Economy & Ethics (pp. 186-197). New Delhi: Tata McGraw Hill Education, ISBN-13978-1-25-905869-1.
- Negi, S., & Anand, N. (2014). Green and Sustainable Supply Chain Management Practices- A Study of Wal- Mart. In A. D. Dubey (IIM Calcutta), Emerging Business Sustainability (pp. 141-157).
- Negi, S., & Anand, N. (2014, December). Supply Chain Efficiency: An Insight from Fruits and Vegetables Sector in India. Journal of Operations and Supply Chain Management, 7(2), 154-167.
- Negi, S., & Anand, N. (2015). Cold Chain: A Weak Link in the Fruits and Vegetables Supply Chain in India. The IUP Journal of Supply Chain Management, 48-62.
- Negi, S., & Anand, N. (2015). Issues and challenges in the supply chain of fruits & vegetables sector in India: A Review. International Journal of Managing Value and Supply Chains, 6(2), 47-62
- Negi, S., & Anand, N. (2015). Supply Chain of Fruits & Vegetables' Agribusiness in Uttarakhand (India): Major Issues and Challenges. Journal of Supply Chain Management Systems, 4(1 & 2), 43-57.

- Negi, S., & Anand, N. (2016). Factors Leading to Losses and Wastage in the Supply Chain of Fruits and Vegetables Sector in, Energy, Infrastructure and Transportation Challenges and Way Book Chapter (February). http://doi.org/10.13140/RG.2.1.2395.5607
- Parappurathu, R. C. (2012). Temporal and Spatial Variations in Agricultural Growth and Its Determinants. *Economic and Political Weekly, Reviw of Rural Affairs* , Vol 47 (26 & 27) 55-63.
- Peermohammad, A. (2018, January 30). India's online food ordering sector growing at 15% every quarter: RedSeer. *Business Standard* , pp. https://www.business-standard.com/article/companies/india-s-online-food-ordering-sector-growing-at-15-every-quarter-redseer-118012901417_1.html.
- Rais, M. and Sheoran, A. (2015) Scope of Supply Chain Management in Fruits and Vegetables in India. Journal of Food Process Technol 6: 427. doi:10.4172/2157-7110.1000427
- Ramesh, C. (2016). Marketing Efficiency: A Special Focus On Paddy Cultivators In Cuddalore District, Epra. *International Journal of Economic and Business Review* , 4(8).
- Rao, P. (2010). *Indore A Place for People- Building Pedestrian City.* Delhi: EMBARQ, The WRI Center for Sustainable Transport , World Resources Institute.
- Robineau, O. (2016). Transformation of the vegetable supply chain in Mar del Plata (Argentina). *AgriChains and Sustainable Development-Linking Local and Global Dynamics* (p. 166). Montpellier, France: ACSD.
- S.S.Aachatya, D. (2001). *Domestic agricultural marketing: policies, incentives and integration in Indian agriculture policy at the corssroads.* Jaipur: Rawat Publications.
- Saftey, F. a. (2017, November). The Supply Chain and Food Safety Culture: Foodservice. *Food and Saftey Magazine* , pp. https://www.foodsafetymagazine.com/magazine-archive1/octobernovember-2017/the-supply-chain-and-food-safety-culture-foodservice/.
- Sagheer S, Yadav SS, Deshmukh SG. Developing a conceptual framework for assessing competitiveness of India's agrifood chain. International Journal of Emerging Markets, 2009; 4(2):137-159
- Sharma, S. (2018, May 17). Food-tech hots up again, upto $800 million lined up for top players. *TImes of India* , pp. https://timesofindia.indiatimes.com/companies/food-tech-hots-up-again-upto-800-million-lined-up-for-top-players/articleshow/64200358.cms.
- Shukla M and Jharkharia S (2013), "Agri-Fresh Produce Supply Chain Management: A State-of-the-Artliterature Review", International Journal of Operations & Production Management, Vol. 33, No. 2, pp. 114-158.
- Srinivasan, S. (2018, April 13). India's online food aggregators are taking lessons from China . *Economic TImes* , pp. https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/indias-online-food-aggregators-are-taking-lessons-from-china/articleshow/63740650.cms.
- Suneera Tandon, I. S. (2016, April). PepperTap's collapse shows everything that is wrong with India's young internet companies. *Quartz India- Onlline* , pp. https://qz.com/india/669142/peppertaps-collapse-shows-everything-that-is-wrong-with-indias-young-internet-companies/.

- Talukdar Bidyasagar, S. N. (2017). Marketing Channel and Marketing Efficiency ANalysis for Rice in Nalbari District of Assam. *International Journal of Chemical Studies* , 5(5) 1285 1289 E-ISSN: 2321-4902.0103.
- Thron, T., Nagy, G. and Wassan, N. (2007), "Evaluating alternative supply chain structures for perishable products", The International Journal of Logistics Management, Vol. 18 No. 3, pp. 364-84
- Vasant Gandhi, P. (2002). Fruit and Vegetable Marketing and its Efficiency in India:A Study of Wholesale Markets in the Ahmedabad Area. *Working Paper* , https://web.iima.ac.in/assets/snippets/workingpaperpdf/2002-12-05vasantgandhi.pdf.
- Vazhacharickal, P. J. (2016 May). Street Vendors And Urban And Peri-Urban Agriculture: Scenarios From Mumbai Metropolitan Region (Mmr), India. *International Journal of Innovative Research and Review ISSN: 2347 – 4424 (Online)* , DOI: 10.5958/2321-5771.2017.00019.9.
- Veena, Babu, K. N., & Venkatesha, H. R. (2011). Supply Chain: A Differentiator in Marketing Fresh Produce. The IUP Journal of Supply Chain Management, VIII(I), 23-36
- Viswanadham, N. (2007). Can India be the food basket for the world?, Working Paper series, IBS, Hyderabad. Retrieved from http://www.cccindia.co/corecentre/Database/Docs/D ocFiles/Can_India_be.pdf

Reports and Other Documents Referred

- Agriculture Division. (2007). *Report Of The Working Group On Agriculture Marketing Infrastructure and Policy Requirement for Internal and External Trade.* New Delhi: Planning Commission, Governement of India.
- Agriculture Division. (2011). *Report of the WOrking group on Agriculture Marketing Infrastructure, Secondary Agriculture and Policy Required For Internal and External Trade For the XII five year PLan.* New Delhi: PLanning Commission, Governement of India.
- CCS NIAM . (2017). *Odisha-Linking Farmers to Electronic Markets(ENAM) Current Scenario and A Way Forward.* Jaipur: CCS NIAM and Idisha State Agriculture Marketing Board.
- CCS NIAM. (2011). *Public Private Partnership In Agricultural Marketing- A Case of Pune District.* Jaipur: CCS National Institute of Agricultural Marketing.
- CCSNIAM Report. (2016). *Emerging Trends in Marketing of Fuits and Vegetables : Feed the Future India, Triangular Training Program.* Jaipur: CCS National Institute of Agriculture Marketing.
- Chand, R. (2003). Agricultural Marketing and Trade in India: An Institutional Perspective. In M. P. Suresh Pal, *Institutional Change in Indian Agriculture* (pp. 349-368). New Delhi: National Centre For Agriculute Economics And Policy Research.
- Chand, R. (2017). *Doubling Farmer's Income- Rational, Strategy, Prospects & Action Plan, Policy Paper.* Delhi: Niti Ayog.
- Das et al NIAM. (2017). *Linking Farmers to Electronic Markets(E-NAM): Current Scenario and A Way Forward.* Jaipur: CCS National Institute of Agricultural Marketing.

- Department of Agriculture. (2015-2016). *Annual Report.*: Department of Agriculture, Cooperation and Farmers Welfare, Governement of India.
- Department of Agriculture. (2016-2017). *Annual Report.* New Delhi: Department of Agriculture, Cooperation and Farmers Welfare, Government of India.
- Department of Agriculture. (2017-2018). *Annual Report.* New Delhi: Department of Agriculture, Cooperation and Farmers Welfare, Governement of India.
- ecommerce Export. (April 2017). *Exploring thePotential of e-commerce for Retail Exports of Indian MSMEs in Manufacturing Sector.* Delhi: Federation of Indian Chamber of Commerce and Industry.
- FICCI Report. (2017). *Agriculture Marketing an OVerview and Way Forward A Knowldege Paper on Agriculutre Marketing.* New Delhi: Federation of Indian Chamber of Commerce and Industry.
- Horticulture Department. (2017). *Administrative Report - Prashaskiya Prativedan.* Bhopal: Department of Horticulture and Food Processing, Government of Madhya Pradesh.
- Horticulture Division. (2015). *Pocket Book on Horticulture Statistics -2015.* New Delhi: Horticulture Statistics Division, Department of Agriculture and Cooperation, Government of India.
- Horticulture Division. (2017). *Horticulture Statistics at a Glance - 2017.* New Delhi: Department of Agriculture, Cooperation and Farmers Welfare.
- ibef report. (August 2018). *E-Commerce Sector Profile for India.* Delhi: India Brand Equity Foundation.
- ibef report. (December 2017). *E- Commerce Sector Report.* Delhi: India Brand Equity Foundation.
- ibef report. (July 2018). *E-Commerce Sector Review.* Delhi: India Brand Equity Foundation.
- ibef report. (June 2018). *E-Commerce in India.* Delhi: India Brand Equity Foundation.
- ibef report. (March 2018). *Agriculture and Allied Sector Report.* Delhi: India Brand Equity Foundation.
- ICAER. (2013). *Technical Bulletin 51- Vegetable Sttistics.* Varanasi: Indian Institute of Vegetable Research, (Indian Council of Agricultural Research).
- ICRIER Report. (2017). *Making Rapid Strides- Agriculture in Madhya Pradesh: Sources, Drivers and Policy Lessons.* New Delhi: Indian Council for Research on International Economic Relations.
- *Impact Evaluation Study of National Horticulure Mission 2005-06 to 2011-12.* Hyderabad: Andhra Pradesh Productivity Council and National Horticulture Mission (NHM), Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India.
- KPMG-FICCI Report. (November 2016). *India's Food Service Industry- Growth Recipee.* Delhi: Federation of Indian Chamber of Commerce and Industry.
- MP-Govt. (2017). *Kisan Book- MP State.* Bhopal: Department of Agriculture, Cooperation and Farmer Welfare, Government of Madhya Pradesh.

- MPTRIFAC. (2015). *Agribusiness and Food Processing - Nurturing the Future of Madhya Pradesh.* Indore: Madhya Pradesh Trade and Investment Facilitation Corporation Limited (MPTRIFAC).
- MuePA. (2014). *National Policy for Urban Vendors.* http://muepa.nic.in/policies/index2.htm: Ministry of Urban Employment and Poverty Alleviation,.
- NCAERP. (2003). *Institutional Change In Indian Agriculture.* New Delhi: National Center for Agriculture Economics and Policy Research.
- NeGP. (2012). *National eGovernance Project -Agriculture, Empowering Farmers.* New Delhi: Department of Agriculture and Cooperation, Government of India.
- NIAM P Sharma . (2012). *A Study on Agriculture Marketing System in Odisha.* Jaipur: CCS National Institute of Agriculture Marketing.
- NIAM-Gummagolmath. (2013). *Trends in Marketing and Export of Onion in India.* Jaipur: CCS National Institute of Agricultural Marketing.
- NSS 70th Round. (2014). *Key Indicators of Situtation of Agricultural Households in India.* New Delhi: NSSO, Ministry of Statistics and Program Implementation, Governement of India.
- Report. (2017). *Three Years of Modi Government, Continued Efforts, Encouraging Results.* New Delhi: Department of Agriculture, Ministry of Agriculture, Cooperation and Farmers Welfare.
- Sector Profile. (2016). *Agribusiness and Foodprocessing Industry in India- A Sector Snapshot.* Indore: Global Investor Summit, Government of Madhyapradesh.
- SOM-NIAM. (2017). *Marketing Strategies for Organic Produce of Sikkim.* Gangtok: Sikkim Organic Mission and CCS National Institute of Agricultural Marketing.
- *State of Agriculture in Madhya Pradesh.* Jabalpur (M.P.) : Agro- Economic Research Centre For Madhya Pradesh And Chhattisgarh , Jawaharlal Nehru Krishi Vishwa Vidyalaya,.