A large pile of red chili peppers is the central focus of the image. In the foreground, a woman in a green shirt is sorting through the peppers. To her right, a young girl in a purple patterned shirt is also working, with a metal bowl nearby. In the background, a young boy in a yellow and blue striped shirt stands near the pile. The scene is set outdoors, with more piles of peppers visible in the distance.

access

Unlocking the Value Chain

Fruits and Vegetables Sub Sector
Potential for Primary Producers

Biswajit Sen

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The recent spike in fruits and vegetable prices in urban areas has been not only a burden to the large and expanding urban population in India but also a major political issue. The reasons for this price rise is multifold and include low volume of production as consumer tastes change and demand expands (often referred to as the supply constraint); the excessive margins retained by middlemen and retailers (often referred to as the value chain problem); the lack of storage and transport facilities for perishable commodities like fruits and vegetables (the infrastructure problem); the absence of modern market systems at each level of the value chain that can address the above problems in a comprehensive manner (the institutional problem) and finally the archaic policy framework put in place several decades ago when the economy was growing at a slow pace and rapid urbanisation and migration was restricted to a few pockets of the country.

Several research studies, mostly of a statistical nature, has been undertaken over the years that have continued to highlight these constraints, but in a fragmented manner. Further they offer little in the way of concrete recommendations that a player in the field of fruits and vegetables can adopt. There are very few examples of systematic documentation of solving the distortions of value chains in different commodities and different sub-regions. Despite the growing demand and high prices of fruits and vegetables, why does the primary producer continue to receive so little in these value chains.

This study seeks to address this lacuna in a more comprehensive way so that the study becomes relevant and useful to institutional practitioners working in the sectors of fruits and vegetables in different regions of India. A particular weakness in the development experience of India has been the transfer of knowledge and practice between institutions, states and regions having successful experiences and those where potential exists but lies untapped. The study also endeavours to give concrete recommendations. I hope this report will be valuable across board for all actors in the sector such as policy makers, bankers, private sector, farmers, and other institutions on how they can act to benefit the sector as a whole and the poor working within it in particular.

The idea for publishing this book came from the feedback we received from the field on understanding the policy environment and the real examples of inclusive fruits and vegetables value chains and

its potential. I'm sure the publication will enthuse private sector agri business companies, financial institutions, primary producer organisations and other stakeholders to structure such pro-poor value chains in the fruits and vegetable sub-sector.

I am extremely thankful to Biswajit Sen for authoring this study and putting together diverse case studies on interventions in the value chain that have enabled the small and marginal farmers to transform their livelihoods streams covering different dimensions. I am grateful to NABARD and Rabobank for their support to the Report. This is a part of an ongoing effort of NABARD to add to the knowledge repertoire for the sector, an effort for stakeholders to learn from other experiences for policy makers to analyse and frame forward looking policies and for private sector to design innovative value chain strategies.

I am also thankful to my Livelihoods Asia Team of Puja and Ila for providing efficient support and co-ordinating will all the stakeholders for getting the report ready.

Vipin Sharma
CEO

When Vipin approached me to write a book for Access Development Services on the fruits and vegetables subsector in India, I was rather reluctant for more than one reason. Firstly, I could not claim to be any kind of expert on the subject and had to actually start from a clean slate in understanding the subsector. Secondly, a quick glance through the internet revealed that a lot seemed to have already been written on the subject and what new could be added. Thirdly, the whole subject matter of fruits and vegetables didn't seem very exciting as a topic. Anyway, I took up the assignment as an opportunity to learn something I was ignorant about.

All this has changed today. A detailed search of the internet and review of documents and literature revealed that most of the material available was either based on dry statistics published by the Department of Horticulture. Useful, but not very insightful. Also most of the studies stopped at the first level of analysis, concluding with a very long list of problems facing the subsector. Most of the studies also did not have a clear analytical framework through which the sector was looked at to draw conclusions.

This led to the need for searching out what is happening in the subsector from the field and trying to identify various models from practice. The whole excitement factor transformed once I visited the field. The subsector while turning out to be vast, diverse and complex, also showed that it is on a dynamic growth path that is transforming Indian agriculture all over the country, albeit in small pockets. There is money to be made in the subsector and in states like Maharashtra is drawing back young people into agriculture from lower level industrial jobs. Also this whole transformation process is being led both by farmers but also by a variety of players such as home grown rural entrepreneurs, social entrepreneurs branching out from the NGO space; corporate houses; and farmer led producer companies. While government's direct role has become limited, it has through reforming the APMC act freed up the sector for greater participation by new players.

The scope for documenting, analysing, and presenting what is happening in the subsector seemed endless. One is still struggling at where to limit the scope of the study. That is why this version of the study can be termed as work in progress and only provides the frameworks and key findings of the work done till now. It has looked



at the subsector more from the farmer production side and has yet to look at the retail revolution that the sector is poised for as demand for fruits and vegetables transforms in urban India.

The study has drawn certain broad lessons from practice, but needs far greater elaboration through a much wider consultative process. It also needs to complete the cycle of the value chain by looking at a variety of more experiences from the field in different locations in the country. Hence we look at this version of the book as both an iterative learning process and a participative process of building up block by block rather than a conclusive final version. As every writer knows, a book is only worth it if people read it.

I would like to specially thank Jaipal Kaushik, who has been my fellow traveller in discovering what the subsector can offer and has done part of the field work as well as drafting of some of the critical case studies. Having got excited about the study and what the subsector can offer, I can now also thank Vipin and Access Development Services for giving me this opportunity to learn about what rural entrepreneurship really means.

Biswajit Sen

1.1 Study Perspective - The Storyline

Every research study and report on the Fruits & Vegetable (FnV) subsector begins with the fact that India is the second largest producer of fruits and vegetables in the world and that the sector has tremendous potential to not only transform the agriculture sector, but also lift millions of small and marginal farmers out of poverty through development of horticulture. Further with increasing urbanisation and rise in disposable income, the domestic demand for FnV is on a long term uptrend and this is reflected in the inflationary spike in prices in recent years. This combined with a consistent rise in exports of fresh and processed foods augers a bright future for the subsector.

However the story gets much more complex as we delve deeper into the sector. Several studies show that the value retained by the farmer is usually lower than 50% of the final price at the wholesale level; even lower for less developed markets in less developed states, due to a variety of reasons. Further a shocking amount of fruits and vegetables goes waste due to spoilage caused by their perishability and seasonality. Estimates range from 18 to 30% of total production. This is primarily due to the lack of efficient and modern post harvest systems of storage and supply chains. A host of factors lead to such a situation, primary amongst these being shortage of cold storages in the country, inefficiencies in transportation systems, and absence of aggregation and distribution systems. In India the value addition to food fortification is only 7% compared to 23% in China and 45% in Philippines, just to take two other country experiences. India's share of global exports of FnV is also only 1.7% in vegetables and 0.5% in fruits. Even within the country over 95% of the supply chain in FnV is still in the unorganised sector. So like in several other sectors, India has tremendous potential for the integrated development of the FnV subsector, but the promise continues to remain unrealised. A review of literature shows that this unrealised promise has continued to plague the sector for the last two decades.

As seen from the above prologue, to understand the full story of the FnV sector in India, and develop an integrated approach to the development of the sector, it is necessary to understand the issues

in the development of three interrelated sectors, first agriculture and within it the small farmers' problems and farm practice trends, second the food processing industry including the related supply chain required for its development, and third the trends in the nascent modern retailing sector and their future role, if any, in providing new solutions to the problems of the FnV sector as a whole. An exhaustive analysis of all the data trends in each of these interrelated sectors is not possible in a single study and some amount of selectivity is required. Further raw data provides at best only the indicators of the issues that characterise a sector as a whole. Also this study is only one amongst the many data sources and documentation studies that have been undertaken for the FnV sector. Hence this study has attempted to do something different. First, it has quickly reviewed the existing data sources and literature on the concerned subject, summarised the conclusions, and both from the conclusions reached from these data sources and the gaps in them, identified in a more focused manner the kind of issues in the sector. This exercise is completed in the Introduction **Chapter 1** itself, in the three sub sections of Fruits and Vegetables - Sectoral Overview, the Small and Marginal Farmer within Indian Agriculture, and finally identification of problems that need to be focussed on in the sector.

However this is only one tenth of the story to be told. By definition, a problem once identified either already has or needs a solution. These solutions are also available in plenty in the FnV sector. These are the stories that provide the silver lining for future development of the sector. Some of them can be replicated, some scaled up and others will remain as isolated examples of success. Strategies for up scaling or horizontal spread will be required if they need to be replicated. This cross learning for quick spread is something that India has been weak at in the development of many of the sectors. It is this study's hidden agenda to contribute to the 'idea dissemination as a source of change' business.

For telling these stories drawn from the sector both a conceptual framework and methodology is required. **Chapter 2** attempts to do this. The first cut for this is how we structure such a diverse sector straddling multiple industries. A lot of the data sources begin by the statement "India is endowed with a remarkably heterogeneous area characterised by a great diversity of agro climatic zones, allowing for production of a variety of horticultural crops". Also agriculture is a state subject in the federal polity and both adoption and implementation of policies

related to agriculture practice and agri marketing are state driven. Hence to understand both commodities and policies a state perspective is required. Second, if we have to understand the sector as a whole, we need to understand the value chains across a set of commodities. In a value chain there are various stakeholders who both retain and add value to a commodity, as it travels from the farm to the consumer. By changing the value retention at different points we can change the gains and losses to different stakeholders. Thirdly, development rarely occurs automatically but requires a focussed mission or set of goals provided by a range of institutional actors. Institutions can be a single organisation, a programme, a community, a group of entrepreneurs, the government, or a specific interest group, each with their specific values and goals. The role of institutions is often less studied, prioritised, or applied in the development field, but is uniquely applicable to the development of a whole sector where multiple stakeholders need to create an ecosystem. Finally, the methodology for using these perspectives and telling the success stories used in this study is to write up specific cases and then draw lessons from these or show them as examples for future practice. The main body of each of the following thematic chapters therefore are the case studies within them.

The role of institutions is often less studied, prioritised, or applied in the development field, but is uniquely applicable to the development of a whole sector where multiple stakeholders need to create an ecosystem.

Using these data sources and conceptual framework, from Chapter 3 onwards, we get into the main stories. The following chapters are therefore structured as follows.

Chapter 3 looks at the Policies that have guided the FnV sector in India, particularly agriculture, be it regulatory, enabling, or constraining. In this the Agricultural Produce Marketing Act (APMC) 1963 holds centre stage. The history of India's socialist 'control' determined policy past started changing only in the last two decades and several more 'market friendly' reforms have taken place. Documenting these is important, as agriculture continues to be a state subject and reforms in different states have been very uneven. Even in the other related industries such as food processing and retail, the states continue to be the primary drivers of policy implementation, if not initial adoption.

Chapter 4 moves on to look at commodity value chains as most agribusinesses at scale are organised in this manner. It also has implications for the small farmer and what systematic development of FnV cultivation and marketing can do to enhance their

livelihoods. There are three dimensions to this – new farming practices, aggregation through collectivisation at the procurement level, and the actual marketing of produce and greater value chain retention. In this chapter the case of apple farming in Himachal is taken up. As a solution producer, the case of Adani Fresh is documented.

Chapter 5 looks at a cluster that can develop and become a complete ecosystem for the FnV sector. The chapter looks at one such cluster that has emerged as a power house in Indian Horticulture. This is the case of the district of Nashik in Maharashtra. Being a whole cluster for horticulture, the case studies in this section focus on a variety of institutional models. It looks at Sula wines as a case of a pioneering private entrepreneur and the problems faced by them in entering the new field of wine making and running it as a profitable business. It looks at the case of a home grown farmer entrepreneur who is integrating the whole value chain for fruits and vegetables through Sahyadri Producer Company. Finally it looks at a producer organisation, Devnadi Valley Agricultural Producer Company that has been promoted by a local NGO. The idea of these case studies is to answer the question as to how can we improve the profitability of the different segments of the value chain in the sector so that investment can crowd in for developing a dynamic ecosystem.

Chapter 6 looks at the situation in Bihar where horticulture is a traditional agricultural activity, there is overall very high levels of production, but the systems stay stagnant and hence is incapable of realising its potential. Not surprisingly the two case studies presented, which attempts to integrate the value chain through making an entirely new channel, are both from the social enterprise space.

Chapter 7 discusses development programmes/ projects which are working at scale either at the national level or at least covering substantial part of a state. These programmes have been found to be critical to the development of a sector and can be game changers. Three case studies are taken up in this category. They are the World Bank supported Maharashtra Agriculture Competitive Project (MACP), the Small Farmers Agri-Business Consortium (SFAC) sponsored by the Department of Agriculture, Government of India, at the central level and the Safal operations of NDDDB in integrating the

value chain in fruits and vegetables.

Chapter 8 moves on to the Retail Marketing angle of the story. This category of case studies taken is from the new emerging organised retail sector as a business model. Here two case studies are taken - one from the small scale, exclusively focussing on FnV, and another multi-brand retail, having FnV as one of its product lines. The third case study is from an FnV exporter.

While the lessons from each of the thematic chapters and case studies therein are given within the specific chapter, the final **Chapter 9** draws all the lessons together and highlights both the contradictions present when we attempt to develop a sector as whole inorganically, as well possible solutions that are strategic in nature in terms of building on the intrinsic competitive advantages of a growing but traditional sector.

Over the last two decades both the share of cultivated area and the production of horticultural crops have increased in India.

1.2 Fruits & Vegetables: A Sectoral Overview

Production Trends: The Handbook on Horticultural Statistics, 2014, published by the Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India is the most recent and comprehensive data base for statistical data on the FnV sector. It is worth extracting data from it to understand some of the macro trends, particularly on the production side. Over the last two decades both the share of cultivated area and the production of horticultural crops have increased in India. The area under horticulture has nearly doubled from 12.77 million hectares in 1991-92 to 23.69 million hectares in 2012-13. The total production during the same period has increased 2.8 times. The total horticulture production in the country is 280.8 million tonnes in 2013-14 (compared to 96.6 million tonnes in 1991-92) and that was the first year where it surpassed food grain production. Hence horticulture has over the decades become as important a subsector within agriculture as food grains in terms of sheer volume. This upward trend has been more pronounced in vegetable cultivation as compared to fruit cultivation. Within horticulture, vegetable production constituted 60%, and within it just four vegetables (potato, tomato, cabbage and brinjal) contribute 80 % of vegetable production. Fruits constitute about 30% of the horticulture production and within fruits 70% of the production is made up of banana, mango, and citrus fruits. The annual growth rates have however been uneven and fluctuating in horticulture, largely following the overall agricultural growth trends but overall much

Production of Various Horticulture Crops over the Years

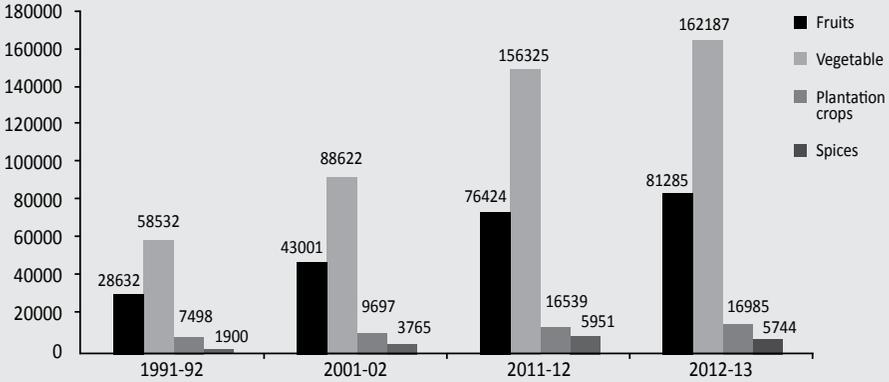


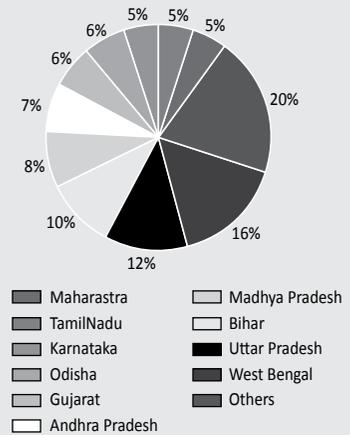
Figure 1: Production Trends in Fruits and Vegetables (million tonnes)

higher growth rates than agriculture as a whole, and ranges from 10.3 % in 2007-8, but dropping to 1.65% the next year and stabilising around 7% in the year 2011-12.

Considering that agriculture continues to be the largest employer still in the Indian economy, FnV as a subsector of agriculture is critical for generating rural employment and income in India. However, what is worrying is that the increase in production from horticulture in the last two decades has primarily come from an increase in the area under production and only secondarily from productivity increases. Productivity increase has been more pronounced in the case of vegetables as compared to fruits. Table 1 below highlights this situation.

There is a fair amount of geographical skewedness amongst the states in terms of both production and productivity in the case of fruits and vegetables. Maharashtra is the leading producer of fruits, with also the maximum area under fruits, followed by Tamil Nadu and Uttar Pradesh. In the case of vegetables, West Bengal is the leading state by a substantive margin, followed by Uttar Pradesh. The reasons for this skewedness range from just historical trends in agri practice to total cultivable

Production Share of leading Vegetable Producing States (2012-13)



Leading Flowers (Loose) Producing States (2012-13)

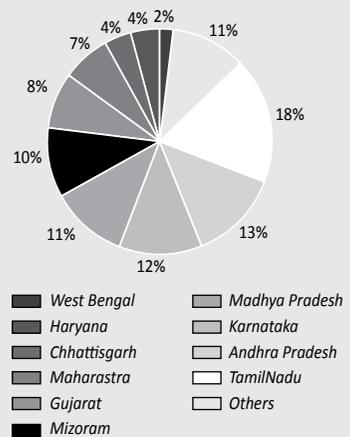


Figure 2: Share of States in Vegetable Cultivation

Leading Fruit Producing States (2012-13)

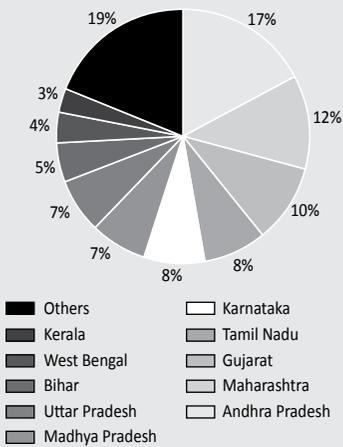


Figure 3: Share of States in Fruit Production

area put under different crops. The more interesting cases are West Bengal where granting of tenancy rights to sharecroppers has led to a spurt in vegetable cultivation through small farms over the last two decades. In the case of Tamil Nadu and Maharashtra a mix of government promotional policies, expansion of irrigation, urbanisation and exports has played a role.

Farm-gate Marketing: For the vegetable farmer and the fruit orchard grower marketing of their harvest at the right

Table 1: Trends in Area, Production and Productivity of Fruits and Vegetables

| Year | Fruits (area) | Fruits (production) | Fruits (productivity) | Vegetables (area) | Vegetables (production) | Vegetables (productivity) |
|---------|---------------|---------------------|-----------------------|-------------------|-------------------------|---------------------------|
| 1991-92 | 2874 | 28632 | 9.96 | 5593 | 58532 | 10.47 |
| 2001-02 | 4010 | 43001 | 10.72 | 6156 | 88622 | 14.40 |
| 2012-13 | 6982 | 81285 | 11.64 | 9205 | 162187 | 17.62 |
| | '000ha | '000MT | MT/hectare | '000ha | '000MT | MT/ha |
| China | 11834 | 137067 | 11.6 | 24561 | 57395 | 23.4 |
| Brazil | 2325 | 38369 | 16.5 | USA-9205 | 35948 | 32.5 |

price and without major price fluctuation is the most critical issue that determines both the net income that the farmer is able to realise from the harvest and the long term incentive system that exists to adopt or continue a particular cropping practice. The price realisation at the farm level compared to the ultimate price of the product at the consumer level is the value, beyond the harvest, that exists in a crop. There has been both concern and debate as to how the problem of market imperfections can be addressed so that the producer/ farmer gets both an enhanced share within the value chain, as well as a more stable share that reduces risk. The complexity of this issue is compounded in the case of fruits and vegetables because of three factors - extreme seasonality of production (usually all production in an area arriving at the market within a calendar month in a particular year), perishability of the product (shelf life being only a few days post harvesting), and bulkiness combined with fragility, leading to storage and transportation problems. Therefore for the farmer, but more so for the small farmer, there is little option but to sell a fruit/ vegetable harvest on the same

day, leaving little option for price negotiation at the farmers end. The marketing channel followed by farmers across India varies widely in the case of both fruits and vegetables. However the most common type of channel, where over 95% of the production goes, is from the farmer to a commission agent or pre-harvest contractor, who in turn sells to a wholesaler who is the primary aggregator. The wholesaler in turn either sells to a mandi or wholesale market and then follow retain chains of different kinds. The dominance of this channel has been brought out in several micro studies (sited in a NIRD report, 2013) done over the last two decades. Just to site two examples. A study of the regulated wholesale markets in the Ahmadabad area (Gandhi& Namboodri, 2009) showed that “in Ahmadabad the direct contact between commission agents and farmers is very low. For vegetables it is 50% and for fruits only 31%. Further, in the system of transaction, secret bidding and simple transaction dominate and open auction is relatively rare. The share of farmers in the consumer rupee at the wholesale level, in Ahmadabad was 41.1% for vegetables and 25.5% in fruits. In the Kolkata markets the share of farmers range from 45.9% to 60.4% for vegetables and 55.8% to 82.3%.” Another study by the World Bank in Bihar (World Bank, 2007) has the following observation for two major fruit crops of Bihar – Litchis and Mangoes: “Litchi is highly perishable crop with a very short harvest period. These two factors make for unstable marketing that is not addressed in Bihar by cold storage and transport. Rather, a vertically coordinated contract system has evolved in Bihar in which orchards are leased by traders, who carry out all pre-harvest, harvest and post-harvest operations. Leases can be transferred from one trader to another. The main achievement of this vertical coordination has been the provision of early income to farmers that does not depend greatly on crop yield. There are limited incentives however, to address wastage and to farmers to maintain their orchards or invest in new varieties. The price retained by the farmer in this system ranges from 25 to 40 % of the retail price within the state.” In the case of Mangoes the study observes that “from 1991-92 to 2003-04, production of mango in Bihar has declined annually by 3.55 driven by a decline in both yields and areas. Bihar’s mango production is constrained by a number of problems. Orchards are neglected and in need of rejuvenation, cultivation technology is old and outdated. Mango is mostly sold on the spot market by farmers; although in some parts of the state a litchi like system of forward purchase of orchards exist. Mango producers

The dominance of this channel has been brought out in several micro studies (sited in a NIRD report, 2013) done over the last two decades. Just to site two examples.

generally are not able to generate credit on the basis of standing crops. Rather they are paid only partially by traders on purchase. Hence Mango producers sell a small volume that precludes sorting or other post-harvest operations. The value chain analysis shows that producers' share in the total margins is 34%. Transportation and wastage costs are high (49%) and clearly influence farmers returns from the crop. It is estimated that 25 to 40% of mango production is lost annually in Bihar due to lack of adequate post-harvest management and infrastructure, improper handling, inadequate transport infrastructure, and absence of storage and marketing facilities.”

Therefore both in more modern and regulated markets like Ahmadabad and more traditional and non-regulated markets like Bihar, there are several market imperfections and inefficiencies. There is a fair amount of debate on whether the farmer is getting an adequate share of the value chain currently and whether the so called middleman is an efficient market integrator or an exploiter (Shivkumar 2015). However there is general agreement that both post-harvest operations and market infrastructure needs to be transformed in the FnV sector if the full intrinsic value embedded in a crop is to be more fully realised. It is towards these issues that we now turn to.

The Problem of Wastage: Market inefficiencies and the lack of infrastructure directly affect the quality and quantum of produce that can be bought and sold in the market. Estimates of total production value lost due to wastage of fruits and vegetables in India ranges from 18% to 30% per annum. There is a direct link of this wastage percentage in specific clusters of production to the kind of market infrastructure available in that cluster. Further the distance from the final market is also an important determinant. The report prepared by Emerson Technologies (2013) has pegged the value of fruits, vegetables wastage due to spoilage in India at \$2 billion a year. The report further concludes that the two biggest contributors to food losses are the lack of refrigerated transport and the lack of high quality cold storage facilities for food manufacturers and sellers. In states like Bihar just simple transport bottlenecks (non-availability of trucks in peak harvest time) and absence of any kind of storage facilities by itself, cold or otherwise, is a constraint. The report citing various other studies goes on to specifically identify the “cold storage” problem that plagues the sector. Currently India has 6300 cold storage facilities, unevenly spread across the country, with an

installed capacity of 30.11 million metric tonnes, less than half the amount of cold storage facilities that India needs for its existing FnV production level. It is estimated that due to the inefficiencies even in the existing cold storages, (electricity being a major bottleneck and outdated technologies being the other) 80% of the installed capacity is used only for potatoes. In addition to the bulky upfront investment required by an entrepreneur in terms land and buildings, there is a very uneven distribution of cold storages across the country with 60% of existing facilities located near the point of production rather than markets. Further 70% of this cold storage facility is currently suitable for and used only to store potatoes, a relatively low value crop. At present only 4 million of the 104 million tonnes of fresh production goes through a cold storage. The Government of India has formulated a series of measures to promote cold storages such as recognising cold storages as a subsector within the Union Budget, setting up of the National Centre for Cold Chain Development, and a subsidy regime for investment. However state government responses have been very varied. The enigma still remains as to why cold storages are not a worthwhile investment for capital from the private sector to flow in adequate volume and value compared to other sectors in India and the cold chain investors in other countries.

The Food Processing Industry and Supply Chain Management:

Post-harvest systems of sorting, grading, storage, transportation, processing and distribution play a critical role in reducing wastage, evening out seasonal fluctuations and value addition to the basic crop harvest. Processing technologies such as thermal drying and dehydration, bottling and canning, freezing, salting through brining and sweetening etc. are various steps for the basic processing of fruits and vegetables. Supply chain management as applied to the FnV sector includes the planning and management of all the activities involved in sourcing procurement, conversion and logistics management through a system of multiple stakeholders. The growth in the fruit processing sector has been consistent over the last decade in India. However it is insignificant compared to other countries. For example dried and canned mushrooms produced in China, currently account for 52% of world trade in processed mushrooms, while canned pineapples produced in Thailand accounts for approximately 45% of the product in world trade. It has been pointed out by various studies (Delliya etal 2012) that the supply chain that connects the farmers to

both the organised, as well as the unorganised, retail sectors in FnV, is highly inefficient with several intermediaries and losses in handling. The food processing sector is fairly large in India and ranks fifth in terms of production value. However this is the situation of the sector as a whole including dairying and food grain processing. Within it the fruits and vegetable sector has a share of X in value terms. The fruits and vegetables processing industry, while growing, particularly in the last decade, continues to be of a decentralised nature. The processing level in India is estimated to be 2% of the total production value compared to 30% in Thailand and 80% in Malaysia. Amongst the standard product mixes in the sector while the cottage sector is dominated more by the chutney/ pickle product mixes, the small and medium scale sector has seen a rising domestic demand and production capacity for fruit juices and canned fruits. The export market is dominated by fruit pulp, particularly mango as well as other citrus fruits. Frozen vegetables are still a nascent sector in India. Retail chains both in the cooperative sector such as Safal promoted by NDDB and in the private sector such as Reliance Fresh have introduced more modern collection and distribution supply chains for fresh fruits and vegetables. However both their share of the total market is very small currently and because of problems of collection and aggregation continues to rely on purchases from wholesale Mandis rather than the farmer level. Interesting micro and small scale businesses has however emerged around cities such as Bangalore, Delhi, Pune, Hyderabad, and Mumbai which integrate the value chain from the farmer to the retailer. Could this be the future for transforming the FnV sector is a question worth asking.

Exports of fruits and vegetables is a subset of the whole food processing sector, and like many other sectors in India, continues to be a sunrise sector for over a decade. During 2014-15 India's exports of fruits worth INR 2771 crores (Mango pulp INR 841 crores) and vegetables worth INR 4702 crores. The major destinations continue to be the neighbouring SAARC countries and the Middle East. Though India's share in the global market is still only hovering around 1 percent, there is increasing acceptance of new horticulture products from the country. This has been possible through much localised modern cold chain infrastructure combined with quality assurance standardisation. APEDA's assistance for setting up several Centres for Perishable Cargoes and

integrated post-harvest handling facilities has also helped develop the export market (APEDA 2015).

1.3 The Small and Marginal Farmer in Indian Agriculture

The share of agriculture in the gross domestic product of India has been gradually going down over the years, but its share of employment continues to be around 56%. Further within agriculture it is estimated that 80% of all land holdings can be classified as small and marginal. Therefore the future of employment, rural poverty alleviation and horticultural growth are all intertwined. Agricultural Census data of 2001 shows that out of 121 million agricultural holdings, around 99 million can be classified as small and marginal holdings. In fact due to land fragmentation the average size of landholdings has declined over the decades (from 2.3ha in 1970-71 to 1.37ha in 2000-01). The positive role of small farms in agri development and poverty reduction is well recognised globally (Lipton2006).

There are several issues facing small farmers working on agriculture in general and several more that are specific to horticulture. These centre on security of tenure, access to inputs such as seeds, irrigation and finance, access to fair trade markets, and access to information and knowledge. All these factors combined leads to a situation where both farm productivity is low and farm level marketing a problem for the small farmer. The gradual decline of the government led extension system (that led to the green revolution in food grains in India in the early seventies) over the years has not been replaced at a countrywide level by any alternative system. In the context of horticultural crops, on the one side farming system knowledge about both new farming practices and new high value crops are not available to the small farmer. On the other side the seasonality, perishability and often higher input costs per unit of area cultivated leads to higher risks for the more vulnerable small farmer.

However both the increasing share of vegetables and fruits within Indian agriculture and the marketable surplus generated within these show that Indian agriculture, and by virtue of the small land holders share within this, is increasingly shifting to the FnV sector because of higher value of production. Specific studies (Birthal et al 2011) conclude from the data comparing cropping patterns to farm size, that small and marginal farmers are allocating larger proportion of their cultivated land to higher value crops like fruits and vegetables. Further

they seem to have a comparative advantage in growing vegetables because of quicker returns combined with higher value. Conversely they allocate lower proportion of land area to pulses and oilseeds.

Hence there seems to be a certain market driven intrinsic comparative advantage that the small farmer enjoys in vegetable cultivation. This seems to be reconfirmed when we find that West Bengal, the leading state in vegetable cultivation, also has 86% of its agri output from small and marginal farm holds. Nationally also small and marginal farm holders contribute 70% of the total production of vegetables and 55% of fruits. The above implies that systematic promotion of vegetable cultivation with small and marginal farm holders may be used as a focused strategy for rural poverty reduction.

Nationally also small and marginal farm holders contribute 70% of the total production of vegetables and 55% of fruits.

A comprehensive research paper by S. Mahendra Dev (Small farmers in India: Challenges and Opportunities, 2011) brings out several specific issues and problems faced by small farm hold agriculturalists in India, a large proportion of whom are also in vegetable and fruit cultivation.

Land Issues: Tenancy security is an important incentive for the small scale agriculturalist to invest in land improvement. The absence of tenancy security in states like Bihar, where a majority of cultivators are sharecroppers on land owned by absentee landlords, is a great impediment and disincentive for investment of a long term nature, as compared to tenancy reform in neighbouring West Bengal. Lowering of agriculture production levels and productivity is a direct result of this factor. Further as noted by Mahindra Dev, “Land relations are extremely complicated and this complexity has contributed significantly to the problems facing actual cultivators. Unregistered cultivators, tenants, and tribal cultivators all face difficulties in accessing institutional credit and other facilities available to farmers with land titles.” Liberalising the land leasing market, combined with legally legitimising tenancy based farming, is a necessary condition if productivity has to increase in a variety of high value vegetable and fruit crops.

Feminisation of Agriculture: The share of women working in agriculture was 83% as compared to 67% men a decade back. These trends have been further accentuated as large scale urban migration of men into urban industry and services has picked up. Increasingly small holder agriculture is women managed in most regions of the country. The same case of land rights and titles apply here. Women

led agriculture is often denied participation in many government programmes as well institutional credit because land titles are never with them. Because of the widespread participation of women in agriculture a lot of home or near home based activities such as dairying and technologies which are labour intensive but suited to small scale landholdings, such as SRI technology in rice, vegetable and other types of nurseries, and more intensive cropping technologies used in organic farming have become popular.

Credit markets: The small and marginal farmers have overall limited access to formal credit institutions like commercial and public sector banks. Because of this limited access, the small and marginal farmers have major problems of managing their seasonal cash flows and make do with whatever credit is available from the informal credit market. Both the absence of clear land titles and “overdues” of past loans, which is the historical legacy of programmes like the IRDP, have virtually blocked them out from the formal institutional credit market. Data from SHG loaning patterns and special programmes of institutions like microfinance companies show clearly that the demand for agricultural credit to buy agri inputs is tremendous among small and marginal farmers but not available due to issues related to land collateral and very old over dues.

There are several other issues faced by the small holder agriculturalist that are related to risk, both in the short and the long run. In the short run the major risk has been the wide fluctuations in farm level prices of fruits and vegetables. There is no Minimum Support Price policy for the horticulture sector. Compared to food grains, the perishability of fruits and vegetables has been a key determinant of higher risk levels. Hence vegetables continue to be a multi-cropping option rather than a mono-cropping option. In their effort to minimise risk the small farmer always look for pre-harvest arrangements, as shown in the case of fruit crops in Bihar, which is a kind of informal contract farming. While this reduces the risk for the small farmer, the trader bearing a part of the risk, it drastically reduces the returns to the farmer from a harvest. The long term risks centre on irrigation. Most small farmers rely on the purchase of water for irrigation purposes. Data shows that such lease markets for water are most developed in areas of ground water irrigation. However with the consistent lowering of water tables, the cost of water has been going up (a socially relevant correcting mechanism though).

To conclude the small farmer has several factors that negatively impact their adoption of horticultural crops ranging from issues of land tenure, credit availability to farm gate pricing and market off take. However, in spite of these disadvantages, it is obvious that they are increasingly adopting higher value crops that can be grown successfully in small plots of land, such as vegetables and fruits. Policies and programmes only need to support these choices through easing of norms and removing major access issues on the one side and relevant knowledge dissemination techniques and systems for adoption of less risky - more productive farming practices on the other side. Marketing channels and fair returns through stable pricing is the overarching need for those farmers already in the vegetable and fruit growing business.

1.4 Identifying the Problems

The subsector overview of the FnV sector, combined with the fact that small and marginal farmers predominate in the sector but have specific problems, provides the backdrop against which we can now identify a set of key issues or problems that need to be addressed. Such a problem listing can often go out of hand and become a long list of several discrete issues. Such an approach, which is where most of the literature on the subject stops at, is not very helpful in solving actual problems on the ground. Hence what is attempted here is to cluster these problems together so that a more unified approach and a set of services that can be bundled together is visualised.

The Productivity Problem: As seen in the sector overview, yields from a majority of the fruits and vegetable crops continues to be low in most geographies where they are being cultivated in India, as compared to other Asian and western countries. As we saw above, the problem of low productivity in Indian agriculture ranges from the lack of tenure rights to farmers which would incentivise investment decisions; the gradual decline of a farmer level extension system to disseminate knowledge and practice that is both relevant and community based; the upgradation of the knowledge base at various research centres and a system to carry research to the farmer's field, especially by the public sector research centres and agriculture universities; the availability of quality inputs in a timely manner and that is affordable, particularly seeds, and new kinds of pesticides and fertilisers. As seen from the field visits by the study team there is a need for a major overhaul in both the knowledge base and extension

methodologies that ultimately determines which crop variety is to be grown and through what farming practices. Horticulture includes a diverse universe of crops and farming practices and just information dissemination would help the farmers in raising yields.

The Problem of Access and Aggregation: Many of the problems that we attribute to the marketing of fruits and vegetables by the small farmer arises because an individual small farmer has extremely limited access to quality inputs, market information, institutional finance, and fair marketing channels. The reverse side of the problem of access is what is often termed as aggregation, that allows for a collection of units, in this case farms and farmers, to act on scale, whether it is purchase of inputs, distribution of credit, or marketing of produce. Aggregation, through a variety of measures such as mobilisation of farmer organisations/ cooperatives, corporatisation through contract farming, establishment of common facility centres such as village level market yards, etc enable the small farmer to access (not necessarily always at a fair price), inputs, finance, knowledge, and markets. The absence of aggregation automatically restricts access to the small farmer dealing with large and often imperfect markets and institutions. Ultimately aggregation is about negotiation power - the aggregator, whoever it may be, being in a better position to negotiate terms of trade.

The absence of aggregation automatically restricts access to the small farmer dealing with large and often imperfect markets and institutions.

The Problem of Integration and Value Chains: Every product or commodity goes through some kind of vertical process which is often termed a value chain. In the case of FnV it is from the basic inputs at the farm level of land, labour, and other inputs where the farmer adds value to produce a crop to a channel for carrying the crop to the final consumer. The crop harvested may be further processed or consumed in the raw form. As seen from the sectoral overview, there are a diverse set of value chain integrators (large farmers, commission agents, traders, mandis, corporate, food processors etc) that create the ecosystem that integrates the value chain. All integrators play a critical role in any non-subsistence level economy. The role played by the integrators, and whether the value added to the crop is fair or just rent seeking, because of imperfect markets is an issue that has occupied all researchers and governments working on agriculture. Much of the policy making related to agriculture marketing has also focused on this issue right from the APMC Act enacted forty years ago.

The Efficiency Problem and Supply Chain Management: As

observed from the sectoral overview, the problem of the FnV sector is not that there is limited number of integrators. This may be the case initially in remote non-agricultural sub regions but not in geographies where FnV production is already taking place, where in fact the problem is of too many inefficient integrators. The whole question is how efficient and effective is the system of vertical integration. The data on wastage and absence of cold chains is one example of this. Supply chain management and the inefficiencies therein locks up tremendous value in the FnV sector in India. In spite of progress in the food processing sector, given the existing production levels and wastages therein in India, this is one area where the focus has to shift if the FnV sector is to become sustainable in the long run. Examples of most other countries where they have a dynamic FnV sector show that farm productivity and production has gone hand in hand with development of a modern and efficient supply chain management system for FnV crops, both through cold chain development and through development of an agro- processing industry. Further in the last decade in more developed economies, the development of the supply chain and use of sophisticated technology to manage it has been led by supermarket retail chains, specialising in food products.

The FnV sector is by its very nature an integrated value chain from as they say “farm to the fork” or farmer to the retail consumer. Hence all the above four problem sets identified above are in some ways interrelated and needs to be treated as such. However, the focus of this study will tend to be biased towards the last three problem sets of access and aggregation, integration of value chains and development of efficient supply chains. The reason for this bias is three fold. First, productivity issues in horticulture are more related to the problem of overall agriculture development in India where a host of issues need to be addressed. Second, learning from the experience of other countries, it seems that the development and modernisation of the FnV sector has to take a trajectory that is related to the problems of aggregation and integrating value chains through efficient supply chains. Just productivity increases will not be enough to sustain the growth of the fruits and vegetable sector, a situation very different from food grains, oilseeds and pulses. Finally, these are the areas where real innovation is happening in the sector and the study has attempted to map these out through case studies.

2.1 Structuring the Subsector- Geography, Commodity, Value Chain

For the purposes of any analytical study, it is necessary to have certain conceptual and methodological tools that form the lens through which the object of study is analysed. In the case of a vertically integrated sector such as the FnV, this can be the **geography** within which production takes place, markets exist, or policy is formulated.

This study, in terms of geography, has looked at the sector at three levels. Firstly, to understand policies and large scale programmes it has looked at the national level and at one state - Maharashtra. It has not looked in detail at the export markets, which would have been another way of analysing the sector. Secondly, economic development in a specific sector usually takes place in a *cluster*. That is why many programmes in development, especially for the SME sector that characterises much of the food processing industry, focus on what is called 'cluster development'. This study has taken this approach and studied two clusters which seem to hold the future of how the FnV sector can develop in terms of integrated value chains. The two clusters chosen are Nasik district in Maharashtra for fruits and Bangalore in Karnataka for vegetables. A mapping of such clusters across the country would be an exercise that would be extremely helpful for developing strategies to assist in the growth of the FnV sector. At the third level, where actual development takes place through enterprises, there is a variety of *enterprise models* that have been studied which are described in detail in chapter 5.

The second way of analysing the sector is through tracking the development of specific **commodities or crops** and how these crops/commodities pan out across the country and how they can be promoted for growth and value chain development. Many experts in the sector feel that such a cut is necessary for developing growth strategies. Hence they would like to follow for example all the clusters of Mangoes and how the supply chain in each can be developed. The export led growth model and exporters of specific commodities take this approach. However because this study is more focussed on the small farmer, such a commodity based approach has not been taken, other than at an enterprise level.

Within both the above approaches it is now being increasingly realised that for the long term development and modernisation of the FnV sector an **integrated value chain** approach needs to be adopted. The value chain approach addresses simultaneously all the four problem sets identified in section 1.4 of productivity, aggregation, integration and efficiency of supply chains. It is towards such a framework that we now turn.

2.2 Value Chain & Stakeholder Analysis

Organisations such as FAO and UNIDO have done fair amount of work in both developing conceptual frameworks and guidelines for value chain analysis and applying these to various country situations and agri-commodities. While this study does not restrict itself to applying the value chain framework, it has borrowed heavily from the concept to develop the various case studies. Hence a brief outline of the main concepts of value chain analysis would be useful here. The author is indebted to the various publications of UNIDO which lays out the parameters for value chain analysis (UNIDO 2010).

The first distinguishing feature of a particular value chain is that it covers the entire range of activities that is required to bring a product from the primary input supply stage, through various stages of production, to the final consumer. The traditional approach of analysing organisations and sectors relied on discretely looking at the production stage separately from the marketing and distribution stage. Thus in agriculture, development strategies and policies have looked primarily at the input supply stage of seed, fertilisers etc that can lead to enhancing production. The value chain approach specifies that this production bias is inadequate and there are a large number of activities and networks that exist beyond the production stage that needs to be taken into account to understand the dynamics guiding a particular product's lifecycle.

An extension of the above approach implies that when we talk about a value chain analysis it is not enough to only understand one stakeholder (organisation, farmer), but need to take into account a network or chain of actors that act to integrate the whole chain. Thus if agricultural policies have to be successful, it is not enough to understand farming systems at the farmer level but the various trader networks from which the farmer buy their inputs

and sell their produce. If we do not understand the motivations, incentives, and power of these other stakeholders there is a high probability of well intended policies failing to achieve their goals. The network of actors participating in a value chain will constitute the stakeholders and analysing their share, actions and reactions to any change in the value chain will also be an integral part of value chain analysis.

The second distinguishing characteristic of value chains is that each part of the chain adds value to the product in terms of costs and prices. The value added in each part of the chain may occur due to additional inputs (such as packaging), services (such as storage and transportation) or information networks (where to sell and at what price) that allow for market linkages. The value added, in terms of price increase of a product at each stage, may be much higher than its costs and there is debate as to how much is fair value addition and how much is rent seeking due to market imperfections. Linking the different elements of the chain, which is what integrators in a value chain do, is itself a service that is priced into the final value of a product.

UNIDO defines value chains analysis as “the process of breaking a chain into its constituent parts in order to better understand its structure and functioning. The analysis consists of identifying chain actors at each stage and discerning their functions and relationship; determining the chain governance or leadership; to facilitate formation and strengthening; and finally identifying the value adding activities in the chain and assigning costs and added value to each of those activities. The flow of goods, information and finance through the various stages of the chain are then evaluated in order to detect problems or identify opportunities to improve the contribution of specific actors and the overall performance of the chain.”

Value chain analysis therefore is a five stage process. At the first level of analysis, for a particular product or commodity, the different inputs/activities are identified. At the second stage, how these activities are linked into a chain or network is then mapped out. At the third stage all the stakeholders in each activity and network is identified and mapped out. At the fourth stage, value is imputed at each activity and link in the value chain in terms of

The value added in each part of the chain may occur due to additional inputs (such as packaging), services (such as storage and transportation) or information networks (where to sell and at what price) that allow for market linkages.

| | Pre processing | | Processing | | | Post processing |
|--------------|------------------------|--------------------------------|-----------------------------------|-------------------------------|-------------------|-----------------------------|
| Value Chain | Fruit tree cultivation | Harvesting & collection | Mechanical processing | Extraction | Packaging | Marketing distribution |
| Description | Planting | Plucking | Grading | Pressing | Filling/Bottling | Promotion |
| | Irrigating | Cutting | Washing | Preservation | | Advertising |
| | Wedding | Storage | Peeling | | | Sales |
| Cost drivers | Pruning | Transportation | | | | |
| | Seeds | Harvesting | Washing Tanks | Extractors | Packaging | Storage |
| | Irrigation | Labour | Utilities | Utilities | Tetrapak | Marketing |
| | Fertilizer | Transportation | Quality Experts | Storage (Cold) | | Transportation |
| Issues | Pesticides | Storage | | | | |
| | Fragmented Farms | Temperature Controlled Storage | Inconsistent Quality and quantity | Unripe produce | Machinery imports | Lack of marketing strategy |
| | Disease and Pests | | Traceability | Access to improved technology | | Limited product development |
| | Water (Irrigation) | | Quality Control | | | |

Figure 4: Fruit Value Chain Analysis

financial value and percentage value of the whole chain. Finally, at the fifth stage a more qualitative analysis is done as to the key issues/problems that are restricting efficiency and value addition at each stage of the process.

The UNIDO report further observes that the analysis of different value chains highlights the need for enterprise development, strengthening the competitiveness of existing value chains by building in greater efficiencies, and promotion of coordinated linkages among producers, processors, integrators and retailers/wholesalers to both improve the competitive advantage of individual enterprises and the subsector as a whole. This is of course easier said than done because often within a value chain there is a direct adversary relationship between different stakeholders in a chain.

Figure 4 below gives the elements of a typical value chain for any fruit crop. The diagram clearly shows that fruit cultivation is only one of the six possible processes that a fruit value chain goes through. Of course in less developed agriculture geographies, cultivation continues to be the primary and most important stage of the value chain. But given India's production and wastage figures in fruits and vegetables, it is time that both analysis and policies and practice move to taking a more integrated approach to the development of the sector which would require some kind of value chain analysis.

2.3 Role of Institutions

Functions such as aggregation of production, integration for markets, and supply chain management that characterise a value chain in the FnV sector can only be addressed through institutions. The

critical role of institutions in overall economic development has long been recognised. However institutions are something much more than just a cluster of organisations. Douglass North in his seminal work on institutions (D. North 1990) has explored the role of institutions in economies and societies. Among other features he states that “institutions are the incentive system that structure human interactions. They make predictable our dealings with each other.... and remove uncertainty”. Further “institutions are made up of formal rules, informal norms and their enforcement characteristics.... In many ways norms are more important than formal rules.”

The above definitional under-pining of institutions can easily be applied to the networks of relationships that exist in a value chain for a particular commodity or product. Traditional networks of farmer-trader-commission agent that characterises much of our agriculture is a case in point. It ensures predictability and long term relationships through certain common known norms acceptable to all transacting parties. On the other hand policies, which establish formal rules of the game, are also institutions. However North states that enforcement is not perfect because at the margin an incremental resource devoted to enforcement at some point is not worthwhile in terms of the increased enforcement obtained. Both the statements taken together imply that it is likely that traditional informal institutions with set norms will always have an advantage over new formal rules made through policies. This is a point to be noted by policy makers.

There are two other dimensions of institutions that need to be taken into account that is very relevant to our developmental analysis. These are concerned with the performance of the economy and the efficiency of institutions. What North is saying is that it is not enough to just have institutions, but that modern institutions are required for efficient economic management. Economic theory and practice is about choices. When we put choices and traditional norms together they often conflict. North maintains that “bad (economic) performance arises from institutions that are inherited from the past and that constrain our behaviour or from a polity that does not work well and has in place people with vested interests in perpetuating inefficient rules of the game”. Hence imperfect markets characterised by traditional trader networks and farmer-market relationships, while providing a strong institutional base is often not good enough for competitive economic performance, because it restrict choices for both the farmer and the

trader. It survives because it is a closed shop with strong barriers to entry. So if performance of value chains and networks are to improve then it is necessary to come with different and new kinds of institutions, as compared to the traditional networks and which gives greater choice to the different stakeholders in the value chain.

The second observation made by North and others on the nature of institutions is that they are characterised by “path dependency”, which is that once a certain set of choices in terms of goals, strategies and rules are made, institutions, over time, become dependent on them and keep repeating them, even if they lead to under performance. Path dependency is common to many large organisations, both in the private and public sector. Institutions either die if they are path dependent for a long time and markets change or they survive through government subsidies if they are in the public sector. In both case their relevance and ‘market share’ decline.

Hence in the development of any sector, more so in agriculture which is dominated by traditional networks, the value chain approach shows that the role of institutions and their efficiency is central to the performance of the sector and competitiveness of its products. Much more so than the establishment of formal rules through policy making which are then difficult to enforce.

2.4 Research Methodology: Cases of Successful Practice Models

Utilising the above theoretical frameworks of value chain analysis and institutional development, as the underlying conceptual base that is relevant for the study of a traditional sector, the methodology used in this study is to write up “case studies” of different types from different locations and levels. The study therefore has case studies on policy making and implementation, value chain development through cluster development, aggregation and integration, and finally on enterprise development.

Public policy formulation is an important determinant of the trends in any sector's development within a country. However, policy making being a political process, it is often messy and final enactment of a particular policy can be a protracted process taking several years, especially in a democratic polity like India.

Public policy always affects different stakeholders in different ways and there are always losers and gainers through the formulation of a particular policy. Further the actual implementation and end impact of a particular policy is also often not known fully till many years. In a diverse country like India, which has both decentralised and multiple systems operating in its economy at any given time, and in a sector such as agriculture, which is a state subject, and where markets are characterised by informal but interlocking systems and relationships that combine finance, input supply and markets together, the impact of policy can be heavily distorted over time. Also where over the half the farmers are out of the formal system, the actual impact of the policy on the ground can be minimal in many cases.

Keeping all these limiting factors of policy making an impact in mind, it is essential that any sectoral study does a policy scan of important policies affecting the sector. This is particularly so in a subsector, such as fruits and vegetables, which is part of agriculture, and which has been a highly regulated sector as far as policies are concerned. Though the focus of this study is not agriculture policy of India, a historical evolution of such policies is important to understand how public policies are regulating, stifling or enabling the development of a particular sector. Comprehensive treatise has been written on the evolution and reform of agricultural policies in India and it is one of the most closely studied subjects as far as policy analysis is concerned (Ghosh 2013). Hence this chapter will probably have nothing dramatically new to say and has also borrowed liberally from other more scholarly works. For the purposes of this study, policies which are primarily about public finance allocation are not as critical as those related to regulating production and trade. For the fruits and vegetables subsector, the most important policy that needs some articulation and analysis is the Agriculture Produce Marketing Committee Act (APMC Act), as much of its reform came because the fruits and vegetable subsector developed rapidly within the broader

agriculture sector. The historical evolution of the APMC Act, and its subsequent reform over the last decade, is a case study on policy making and reform in itself.

3.1 Historical Perspective

The attempt to regulate agricultural markets in favour of the farmer, as well as for better revenue collection, was initiated way back in 1928 by the *Royal Commission on Agriculture*. The Agricultural Produce (grading and marketing) Act was passed in 1937 giving statutory powers to state governments to manage agricultural markets. From Independence in 1947, till a decade later, various legislations were passed in favour of rural equity, by various state governments, to modify land tenure rights (abolition of zamindari system), money lending etc. As a part of this complex, uneven and often non-systematic policy making process, the Agricultural Produce Marketing (APMC) Act was conceptualised.

The APMC Act was passed in a few states in 1963. The aim of the Act was to bring most of the wholesale and primary markets under some kind of state regulation with the purpose of protecting producing farmer interests against 'exploitative' traders, bring in transparency, consolidation and efficiency in agri-marketing, and invest in rural marketing infrastructure. Under the Act all agri-produce were to be sold to and bought by licensed traders. Further the selling/ buying was to happen in regulated markets (*Mandis*) through an open auction process. The *Mandis* were to be managed by a Committee having representatives from different stakeholders. However, at the state level, State Agricultural Marketing Boards were set up to manage both regulation and expansion. Further a fee was charged on all transactions to meet the costs of operating the *Mandis*. Complementary policies to support the farmer such as the minimum support price (MSP) for food grains and the market intervention scheme (MIS) for commodities such as potato, onion, and chillies were also formulated. Various public institutions such as commodity boards, agriculture price commissions etc were also established. The comprehensiveness and extent of policy formulation and institutional development that happened in the agricultural sector in India in the decade of the 1960s is really phenomenal compared to any country in the world.

The APMC Act's formulation and adoption must be viewed in the context of that period, where India was highly deficit in food

production, government control and regulation was the norm in all policy making (often leading to nationalisation as happened in food grains in the early 1970s but later repealed), the public sector was the only large investor and could invest in storage, warehousing etc, and the farmers were emerging as an organised political grouping. Over the next three decades such regulated *Mandis* became the norm for agriculture produce marketing, their numbers in the country increasing to over 7500 by 2005. Salient features of the APMC Act included that all buying selling of agro produce were to take place in regulated *Mandis* through open auctions, the regulated markets themselves were to be managed by elected boards and committees constituted of representatives from different stakeholders, a *Mandi* tax would be levied on all transactions for the upkeep of the *Mandi* operations and infrastructure and a licence was given to a trader/buyer for each *Mandi*.

Over the next three decades the APMC Act continued to dominate the marketing of agro- produce in India, at least at the wholesale level. It helped build a complex physical, and in hindsight social and political infrastructure. However, since the early 1980s the weaknesses of the APMC Act started becoming visible. One part of the problem was that while the Act was implemented in letter, there were major distortions that had crept into the policy's implementation. The other part of the problem was that both the world and Indian agriculture had moved on. Let's take into account the distortions first. The membership of the state and *Mandi* marketing boards were to be elected democratically. However in most states elections were not held regularly, leading to government officials running the boards or a group of market agents continuing to dominate the board. Further membership of the committees continued to remain with a group of traders with strong entry barriers for any new entrant. Secondly, several studies show that the actual transactions at the *Mandis* neither were neither open nor transparent auctions nor were fair prices given to farmers. There were various ways of doing this such as rejection due to wastage, wrong weighing of produce etc. In several *Mandis* there was actually no spot price and farmers received delayed payments. To also avoid the *Mandi* tax, on the basis of which operational costs were to be maintained, large percentage of the transactions in the *Mandis* were not recorded. All these distortions essentially crept in because of cartelisation combined with strong barriers

to entry, which disallowed fair competition on both the buyers and sellers side. Neither could farmers sell their produce to new channels nor could new buyers go in for direct buying from farmers. In order to operate in an APMC *Mandi*, the buyer needs to get a licence from each *Mandi*. The licence however was elusive with strong barriers to entry.

Between the decades of the seventies and nineties a sea change also came into Indian agriculture, many say in spite of the APMC Act. There was a shift in agri production to horticulture crops and more perishable goods such as fruits and vegetables entered the market but also got regulated by the APMC Act. In the APMC Act the definition of what constitutes an agricultural crop was rather broad and all inclusive. However the requirements of the new cash crops, which also did not have a minimum support price, were very different. Further being perishable, even greater opportunities existed for the selected group of traders to exploit the situation. Secondly, in states like Maharashtra, Gujarat and Tamil Nadu a number of large farmers took to intensive agriculture and started finding the regulated *Mandi* structure for selling really constraining. A large percentage of trade started also to take place outside the preview of the regulated markets.

The third factor pushing for change in old systems, was the overall reform process for industry undertaken in the early nineties, combined with the globalisation of agriculture, which included India signing the WTO in 1996. The process of globalisation is best reflected in the apple, grape, and vegetable export story told later in this study. All the above factors started leading to a momentum for change and reform in India's agriculture sector. The change was slow to come and it has still a substantial way to go as far as public policy is concerned.

3.2 Policy Reforms: The Model APMC Act of 2003

The Government of India through the Ministry of Agriculture set up an Expert Committee on 19th December, 2000 to review the present system of agricultural marketing in the country and to recommend measures to make the system more efficient and competitive. The Committee in its Report dated 29th June 2001, suggested various legislative reforms as well as the reorientation of the policies and programs for development and strengthening of agricultural marketing in the country. The committee submitted its

The process of globalisation is best reflected in the apple, grape, and vegetable export story told later in this study.

report “Report of the Inter-Ministerial Committee on Agricultural Marketing Reforms”, in May 2002 and recommended several measures. The report was submitted to an Inter-Ministerial Committee who examined the recommendations and the legislative changes required. This formed the basis for formulating a new model APMC Act in 2003. Agriculture being a state subject, the model APMC Act was circulated to the states for modification and adoption in the respective states.

The model APMC Act recommended a very wide array of measures to free up and deregulate the agriculture sector, particularly relevant to the horticulture sector. There are several features in the model APMC Act which opened up the marketing of agricultural produce. The model act allows farmers to sell their produce to any buyer and there is no compulsion to bring the produce to the regulated market. The model act also allows a variety of new players such as food processors, exporters, and packers etc to buy agricultural produce directly from farmers. A single licence is required by such players, instead of a licence from each *Mandi*. The model Act also allowed private *Mandis* to be invested in and opened. It allowed for private market yards, direct purchase centres, and farmers market. In essence the monopoly of the *Mandis* were sought to be destroyed. The model Act called for encouraging Public-Private partnership in the development and management of agro markets for post harvest handling, cold storages, warehousing facilities etc. It also allowed for contract farming, although with a set of riders to protect the farmers. The model Act sought to establish State Agricultural Produce Marketing Standards Bureau for grading, standardisation and quality certification of produce. It also sought to increase the transparency and accountability of the existing regulated *Mandis*.

While being very comprehensive, the model APMC Act did not do away with the licensing system totally, but liberalised it extensively so that virtually any player in a commodity market chain can participate more directly. The final model Act was formulated with a wide range of consultations and even if we can pick some specific weaknesses in it, was both comprehensive and forward looking. However a policy is as good as its implementation and it is towards this that we now turn. If policy formulation is a political process, policy implementation is even more so. Agriculture being a state

subject, the model APMC Act has to be adopted, legislated and then implemented in each state separately. In the decades that the original APMC Act was in force several vested interests had entrenched themselves in the regulated *Mandi* system. The control of the *Mandi* system had become part of the formal political party system in many states and even provided revenue for election funding. Traders who controlled the *mandi* were both financially and politically strong. Most state governments were also unwilling to make the additional investments required to actually carry forward the implementation of the model Act in its spirit. The kind of private investment that was required and hoped for through the model Act's adoption has still not come forward. Many of the states adopted some of the statutes but not others, leading to an incomplete set of rules and regulations. A status report drawn up by the Ministry of Agriculture, Government of India in 2012-13 showed the following.

The logic of why some states have only adopted some of the statutes and not the others is difficult to understand. Kerala has never had the APMC Act in its original form, while Bihar has totally done away with the APMC Act in 2006. U.P. is one major agri-producing state which has still not amended the old APMC Act. Tamil Nadu is another exception. Amongst the larger states Andhra Pradesh, Maharashtra, Madhya Pradesh and Rajasthan has adopted most of the statutes of the model APMC Act. However, even after a decade since the model APMC Act was brought out, success in reforming has been an uphill task. In Karnataka the amended

Table 2

| Reform Area | No of States/Union Territories amending the APMC Act in the area | No of States notifying the necessary Rules & Regulations |
|---|--|--|
| Establishment of Private Market Yards other than existing market committee | 18 | 10 |
| Allowing direct purchase from farmer by bulk processor/buyer/exporter | 19 | 14 |
| Promotion and permission for electronic trading | 14 | 10 |
| Establishment of farmers markets | 13 | 7 |
| Contract farming | 20 | 12 |
| Single point levy of market fee | 14 | 11 |
| Single registration/licence to trade for transacting in more than one state | 13 | 10 |

APMC Act (the Karnataka Agricultural Produce Marketing Regulation and Development Rules 1968 and implementation of the APMC Act 2014) was challenged in the high court as it called for renewal of trader's licences in the regulated *Mandis*. Strangely the Karnataka Chamber of Commerce and Industry (FKCCI) have also opposed the amendments in the APMC Act 2014. In Gujarat and Maharashtra the APMC Committees have strongly opposed the reduction of licence fees and commission charges paid to the *Mandis* in 2014.

On the positive side, Delhi has taken fruits and vegetables out of the ambit of the APMC Act and the government has both begun buying some inflation sensitive items like onions directly from farmers, as well open a new *Mandi* called 'Kisan Mandi' by SFAC, where farmers and producer organisations can directly participate. Farmers from H.P., J&K and Uttarkhand have started participating in this new *Mandi*. To further push the implementation of the model APMC Act, another State Minister's Committee on Agricultural Marketing was set up which submitted its report in July 2014. Essentially it called for a quicker adoption of the model APMC Act, but also went into specific areas of adoption. In some cases they have also recommended more government bodies and investment.

Hence liberalising agricultural marketing is still an unfinished agenda for India as a whole. In addition, various committees of the erstwhile Planning Commission and inter-ministerial groups have made suggestions for further amendments. Significant among these is that all Horticulture should be removed from the purview of the APMC Act, the existing APMC markets need to open their membership to all kinds of new players, and the licensing process for dealing in agricultural produce should be totally scrapped.

3.3 Case Study: Reforming the APMC Act in Maharashtra

Maharashtra is the largest producer of fruits and one of the leading producers of vegetables in the country. Hence both the need and demand for reforming the APMC Act of 1963 emerged from the state. Also its political leadership has often had a pioneering role in modernising agriculture. The state bureaucracy managing the agriculture and agri marketing systems has also been progressive and supportive of modernising agriculture. Given all these factors, it was one of the earliest large agriculture system states

to go forward for amending the old APMC Act. Based on the model APMC Act of 2003, the Maharashtra State government made amendments to the old APMC Act titled Maharashtra Agricultural Produce Marketing (regulation) (Amendments) Act 2005. The act among other things, stipulates granting licences for direct marketing and establishing private markets for processing of agricultural produce, trade for specific produce, exports, and grading. It also expanded the Committee structure to include more stake holders. Some significant changes were also made on later dates through government notifications such as moving thirty plus fruits and vegetables out of APMC regulation and exemption of market cess on these commodities.

It is interesting to note that the state did not abolish the APMC Act in totality, nor did it adopt the model act fully, but only specific elements. Contract farming remains one of the grey areas. However, even for new players, it retained the power of licensing, although allowing a single licence for the entire state rather than a licence from each APMC market. Further, some of the amendments such as removing fruits and vegetables from the ambit of the APMC Act were done through government notifications and not through the amended Act. As late as 2015, the incumbent CM has had to make a statement that there is a need to introduce new bills in the legislature for more comprehensive reforms in the agricultural marketing sector.

It also expanded the Committee structure to include more stake holders.

3.4 Lessons from Reform

The story of the formulation, reform and reformulation of the APMC Act in India is a classic case of policy making in a complex, diverse, dispersed, and politically sensitive sector like agriculture. The APMC policy also has to be seen in the context of the growth of the fruits and vegetables as a sector over the last three decades. There are several conclusions and lessons that can be filtered from the nearly two decade long process of attempting to bring policy change through the APMC Act. There are other policy areas which also affect the FnV sector, such as food processing industry policy, food safety policy, cold storage policy etc. However all these come into effect for the organised sector and hence have not been analysed as extensively in this study as the APMC act. The study does not attempt to make any policy recommendations, because as seen from the above narrative, policy making is in the end a complex political process. Some of the

conclusions and questions that arise from the narrative of the APMC Act include the following:

Policy Intentions and Policy Results: The road to policy formulation is always paved with good intentions. In the early sixties there were no organised markets in the agricultural sector where farmers could sell their produce. While surplus production was still limited, there was a great need to set up a national grid of regulated markets which could help farmers get both fair prices and a market channel. The APMC Act 1963 set out to do this very systematically and backed this up over the next two decades with public investments to create such a marketing infrastructure. It also attempted to create a democratic system for managing this structure of market through an elected committee system. Hence the APMC Act of 1963 was probably both timely and necessary at that point of time. The problem arose because of two reasons. Firstly, over the years the APMC got (if one may use the term) 'hijacked' by groups of traders in most locations. In most cases the bureaucrats managing the system also colluded with the traders. All this resulted in what is termed as 'closed shop cartels' emerging that came to dominate the system for their own interests and that posed a great barrier to any new entrant- big and small. Second, the development of horticulture with its very different marketing needs collided with the APMC method of marketing. The lesson learnt from this experience is that a public policy can actually be totally distorted over time unless a proper stakeholder analysis and power relationships are taken into account. Secondly public policy needs to be constantly changed and reformed as new needs emerge. The issue of timing is critical. Hence the possible unintended consequences of the reformed APMC Act needs to be looked into and anticipated at this stage, rather than a decade later when it has already been distorted.

Timeliness of Public Policy: The model APMC Act to reform the original Act was formulated as far back as 2003, and yet over a decade later there are still pushes and pulls to adopt it fully. A decade is a long time in the globalised world of today and probably even the modified APMC Act requires several changes by now. India has been effective in initiating policy reform processes but extremely poor in their adoption as formalised policy. Often the gap between the passing of an Act in the legislature and the notification of rules and regulations

The APMC Act 1963 set out to do this very systematically and backed this up over the next two decades with public investments to create such a marketing infrastructure.

has taken over two years. Many blame it on India's federal as well as democratic polity. But this is an oversimplification. Vested interests take over public policies in less democratic societies even more, while many democratic countries are quick to adopt forward looking policies. So the answer as to why this 'inefficiency' in policy adoption occurs in India has to be looked at elsewhere.

Policy Influence: An interesting and often unrecorded fact is that even though the APMC has regulated the market for the whole of agriculture, data confirms that horticulture has been steadily growing over the years. Field studies also confirmed the shift by farmers to horticulture. So the growing of fruits and vegetables has become, in state after state, a profitable business as urban consumer demand has grown. Also field studies shows that innovatively all kinds of marketing channels have emerged to take care of this enhanced production and demand. The conclusion that we can derive from this is twofold. The first is that in the unorganised sector the influence of policy is in reality very limited and the drivers for growth are to be found elsewhere. Secondly, and even more damaging, is that policy is following development rather than it being a driver for development. Only after the sector has developed has the reform in the APMC Act started trickling in. That is why only in India public policy in any field is looked at by any entrepreneur as another bureaucratic hurdle to be crossed. On the other hand weak implementation of regulation is a form of liberalisation.

Public Policy for Public Investment: A positive feature of public policy in India is that it at least draws in public investment. The original APMC Act of 1963 drew in massive public investment in building up an organised market system for agri- produce, where none existed before. Similarly the new version of the APMC Act is drawing in public investment into kisan mandis and other forms of marketing channels. Public investment is always required for building up infrastructure of any kind and formalised public policies channelized through government programmes is the primary means of doing this. The issue is what investment is strategic and what investment is duplicating private investment. In Himachal the rise and decline of the HPMC is a case in point.

Public Policy as Regulation: The APMC Act has been historically both a regulatory policy as well as a developmental and public

investment policy. In its public investment and developmental role it has been positive in its impact. It is in its regulatory role that the APMC has become totally distorted. One of the lessons learnt from the history of the APMC is that these two functions of development and regulation need to be separated rather than clubbed less than one overarching policy. Liberalisation and regulation of the telecom sector is a good case in point. Within regulation, there needs to be more disaggregated analysis of what needs regulation and what needs to be left to market forces. In the case of fruits and vegetables where there is quality, grading, packaging etc, the concept of spot prices and minimum support prices has little value. Also in a lot of steps in the value chain, regulation acts both as an entry barrier as well as a disincentive to investment. Complex state level policies to regulate cold storage establishment and usage have been a great disincentive for investments in the much needed link in the value chain for the FnV sector. The earlier policy makers realise that regulation is always looked upon as a transaction cost by the entrepreneur the better for more realistic and growth oriented policy making.

The above are some of the generalisable lessons for public policy that we can draw from the case of the APMC Act in India. Overall it is not a very positive story. The debate on the APMC Act ranges from its total abolition, lock stock and barrel, to its retention with some modifications. The truth lies where you sit.

4.1 HIMACHAL: The Present Scenario

Samuel Evan Stokes, came to India at the age of 21 with the intention of working for a lepers home in the Shimla Hills in the early 1900s. In 1916, he imported from USA and planted a few saplings of the apple tree in his Barobagh orchard in Thanedar, near Shimla, and expanded it to an orchard of apples soon after. So began the story of Himachal apples.

India Context: The market for apples has seen a steady growth over the years in India, as is borne out by the fact that an estimated 2.7 million tonnes was imported from various countries to meet the gap in domestic demand and domestic production. The import of apples has shown not only the growth in volume of demand for fruits in India but also the readiness of the Indian urban consumer to pay higher for quality, better packed, and branded fruits. It has shown that as far as demand is concerned, the fruits' market has evolved from a simple commodity market to a differentiated market that can be branded and that is not seasonal but perennial. The problems and opportunities that exist for the Himachal apple is looked at here in this new context. The Indian apple market is valued at INR 25000 Crores per annum.

The import of apple is growing approximately at 7% annually. This shows the unmet demand for apple in the country. There is a 50% import duty on apple which is the second highest in the world, but even after such high import duty the market price of imported apple is only 25-50% higher than the local apples. Recently apples imported from China are capturing the market in India. Chinese apples are bright in colour, retains the taste and texture over a longer period and only 15-20% costlier. If the apple grown in India does not become more competitive in the future, Chinese apples might replace Indian apples.

Apple is one of the major fruits in India, both in terms of production and consumption. It is primarily grown in hilly areas - mainly in Jammu and Kashmir, Himachal Pradesh, and Uttarakhand. Almost 90% of the apple crop is grown in these three states. J& K alone produces about 65% of the total apples in India, followed by 30% by

HP and rest 5% by Uttrakhand and Arunachal Pradesh. Surprisingly the yield varies a lot across the states. It is about 10 MT per ha in J&K and only 5.2 MT per ha in HP. Uttrakhand has even lower yields. Total apple production in India varies a lot year to year (as it is highly susceptible to weather conditions) and it averages about 2 million MT annually from 274 thousand ha of orchard land.

Almost 90% of the apple growers in India are small and marginal farmers having less than 1 ha of apple orchards. Their orchard farm lands are often in scattered holdings. Most of the standing apple trees in the orchards are about 30 years old and the plants have already peaked in production. The lack of infrastructure like roads further put the growers at a disadvantage in transporting their produce to markets on time and the lack of cold storage chain aggravates the situation. Apple farmers being in the hilly terrain have limited banking network and therefore lack access to finance. The unpredictable weather and almost nil insurance coverage of apple crop make the economics of apple production highly risky from year to year.

Internationally, India is the seventh largest apple producing country in terms of quantity of produce and second in terms of area under apple cultivation. This implies that in terms of productivity India ranks much lower amongst the major apple production countries. The apple yields are about 32-40 MT per ha in countries like Italy, France, US, Chile, and Germany, while in India it averages about 7MT per ha.

The major reasons for low yields in India are the age of the trees in a majority of the orchards where the trees have already peaked in their production cycle and no investments are being made to change them; the tree intensity is low due to both the hilly terrain and dispersed holding pattern; the package of practices adopted at the field level are traditional and new scientific knowledge does not go to farmers from research institutions; and farmers lack capital investments in new technology.

Apart from low yields, wastage of fruit is an important issue in the case of apples. As per literature available, almost 30-35% of apple produce is wasted from the harvesting stage till it reaches the final consumer. There are various factors leading to the wastage beginning from bad practices of picking by untrained labour; faulty methods of packing (25 to 30 kg of apples are put in the boxes having 20 kg capacity to save on transportation cost); over loading of the trucks carrying apples

to the market; lack of cold storage chain; rough handling of apples at every stage (mostly while loading and un-loading) and so on. If only wastages are controlled in apples, both farmers and consumers can get an additional margin of 10%.

Himachal Pradesh- Trends in Apple Production: Himachal Pradesh has approximately a total area of 55.67 lakh hectare of which about 11% i.e. 6.15 lakh ha is cultivated. Area under fruit crops is approximately 20% of the total area under agriculture in the state. There are about 4.64 lakh individual farmer orchards, producing 5.92 lakh MT of temperate fruits. Apples constitute about 91% of all temperate fruits. Fruits contribute Rs. 1500 Crores and vegetables contribute about Rs. 500 Crores to the state GDP annually. The State, despite undergoing an encroachment removal drive ordered by the High Court, is expecting to pack around 4 Crore boxes of 20 kg of apples each in 2015. Though a majority of the business is carried out in the private sector, the government has also opened procurement centres. With an expected production of around 8 lakh tonnes, about a million boxes or about 2,000 trucks of some early varieties of fruit like Red June and Tydeman's have already been transported out of the State.

The State, despite undergoing an encroachment removal drive ordered by the High Court, is expecting to pack around 4 Crore boxes of 20 kg of apples each in 2015.

Apple is the main fruit crop in Himachal Pradesh. Almost 75% of the apple is grown in three districts – Shimla, Solan and Kinnaur. Major varieties are Royal Delicious, Red Delicious, and Golden Delicious. Apple constitutes about 49% of the total area under fruit crops and about 74% of the total fruit production.

Although all the problems listed above that plague Indian apple production in general also characterise apple cultivation and marketing in Himachal, there is still a vast untapped potential that exists in the state for fruits and vegetables. The State focus paper of NABARD (2014-15) lists a number of issues that need to be addressed like availability of quality planting material at reasonable cost, paucity of storage especially cold storage and controlled atmosphere storage, improper package of practices in harvesting, handling, transportation etc. The State has a CA storage capacity of 36123 MT both in the private and public sector, whereas even if 25% of the apple produce is to be stored, the requirement is of 1.2 Lakh MT. Therefore there is a need for at least 0.9 Lakh MT CA storage capacities which in turn needs an investment of about Rs. 435 crores. The question is who is going to invest in building this capacity.

Surprisingly, the planting of apple orchards in Himachal has been increasing over the last decade. Though there is no official data available on the trends of productivity but the overall production of apple is increasing. Farmers during field visits for this study said that in the last ten years, farmers are taking better care of their orchards and their income has also increased.

There are two major factors that have contributed to the increased interest of farmers in apple growing. One, the road condition has improved during the last 10-15 years (mainly link roads under PMGSY) and secondly, new market places (mandis) have come up in Himachal where they can easily sell their produce. Earlier, the farmers used to send their produce to Chandigarh or Delhi. All farmers were not able to send their produce to such far off places so they were selling their apple to middlemen who were buying at lower prices. A large number of local mandis have come up with the reform of the APMC Act which has allowed the farmer to sell directly to the market locally.

Productivity and Apple Farming Practices: It is very difficult to accurately estimate the yield for apples per ha or per tree over a period of time, as farmers generally do not keep systematic reports. Apples are one of the few remaining fruit crops in India which are still sold without weighing. Apples are sold as per the box. The box is also not of standard weight. A box varies from 25 kg to 28 kg and sometimes goes up to 30 kg. Because of this non standardisation, the rate in the market also varies. The bigger boxes get slightly better price.

The yield also varies depending on the age of the apple trees. A single orchard usually does not have trees of the same age. Every year, farmers keep on replanting a few saplings in place of trees that have died. Earlier, in the traditional way of apple growing, a tree used to give fruits from the 8-9th year onwards and the commercial production started from the 12th year. Now with improved varieties of apple, trees give fruits from the 6-7th year onwards and commercial production starts from the 10th year.

The official figures of apple productivity in Himachal is 5.5 MT /ha. Farmers said that they easily get 9-10 MT/ ha in better years. However they also added that every year a specific tree does not give the same quantity of apples. The apple tree gives fruits till 32 years of age. It

starts bearing fruits in the 6th year but the commercial production starts from 9th or 10th year. Flowering starts from March and goes on till May and it takes 85 to 115 days for the fruit to ripen, so the harvesting of fruits starts in July and goes on till September. Apples are what are called a cross pollinated crop and honey bees play an important role in fruiting. The fruits are picked normally three times a year. The second picking gives the best quality of fruits.

To enhance the productivity of apples, there are three major areas that need attention.

Availability of good quality planting material: Farmers mainly purchase apple saplings from private registered nurseries. Farmers said that the private nurseries are registered but the saplings are not registered; meaning that the quality of the saplings is not assured. The government nurseries also make planting material available to farmers. Though there are 104 government and 629 private nurseries in Himachal, the quality of planting material continues to be a problem and is a big issue in apple farming. During the last ten years, a few entrepreneurs like Rajat Biotech, Gariba Nurseries and others have come up in the business of supplying quality planting material. Rajat Biotech, based in Hamirpur in HP is producing apple plants by 'tissue culture' technique and farmers are happy to buy plants from them. Gariba Nurseries is the Indian arm of an Italy based hi-tech nursery company of fruit trees and they are also selling planting material in HP. Gariba Nursery sells its saplings at Rs. 450 per plant, which is 3-4 times costlier than government and most private nurseries, but farmers are readily buying the plants from them because their plants are of best quality. This shows that if quality supply is available to the apple farmer, they are willing to pay for it.

Agricultural Extension for adoption of improved package of practices: Most apple growers learn about the new apple growing techniques from fellow progressive farmers in Himachal. The Government Department horticulture extension services exist but are largely ineffective. The department lacks human resources and the existing personnel lack motivation. The hilly terrain and lack of road connectivity also act as impediments in frequent visit of extension agents to farmers. The potential of alternative mechanisms such as Information and Communication Technology (ICT) is yet to be used for extension in state. Some private players like Adani Agrofresh have started their

extension services to help apple growers to grow quality apples and farmers are extremely appreciative of these services. Similarly the GARIBA nursery has their consultancy services which are provided to anyone against payment and large farmers and organised orchards have started availing of these consultancy services.

Timely availability of quality inputs- fertilizers, pesticides, farm equipments, and credit: Farmers have been facing the problem of timely availability of good quality inputs and this has also been resulting in poor quality of apples and reduction in yields. There is a need for a proper distribution system for various inputs, where apple growers, especially small farmers, get necessary pesticides and farm equipments to spray the pesticides as per recommended spray schedules. Soil testing facilities and availability of necessary micro and macro nutrients is also extremely important to enhance quality and yields.

Apple Marketing and Returns: The Indian domestic market is characterized by an oversupply of apples in the peak season and shortages in the off-season, resulting in off-season prices that are often three to four times peak-season prices. The lack of appropriate storage and logistics infrastructure ultimately results in high prices for low-quality apples during non-peak periods and visa versa in peak periods. There are many systems of marketing of apples prevalent in Himachal Pradesh. Traditionally, in one system the orchard picks the apple and sells his produce directly in the local market. Larger orchard owners hire labour and get their produce picked. The labour will pick/harvest the fruits, grade/sort them and pack them in boxes of approximately 25-28 kg size). The other system is where the buyer/trader bargains for a fixed price for the full harvest with the orchard owner and based on mutually agreed estimation of produce and prices, the trader pays the agreed amount of money to the orchard owner and takes the entire produce. Usually the trader pays 10% of the agreed amount on finalisation of the deal and the balance amount is paid as the apples are sold in the market. Earlier the primary market was limited to Chandigarh and Delhi. Small farmers did not have the capacity to send their produce directly to distant places like Delhi so they used to be totally dependent on selling their produce in advance to the traders.

The labour will pick/harvest the fruits, grade/sort them and pack them in boxes of approximately 25-28 kg size).

At present, three different systems for the procurement and distribution of apples in Himachal Pradesh are prevalent.

Commission agents in traditional APMC markets: After harvesting, the apples are sorted and packed in cardboard boxes and transported by small trucks to the nearest Mandi, traveling an average of about 20 kilometers from their farm. A commission agent in the market works as a liaison between the farmers and buyers. There are major inefficiencies in this model. From the grower's perspective the major disadvantage is that he does not know beforehand the prevailing price of apples in the market. Once the farmer arrives at the market with the produce, he discovers the price. In most cases, the farmer must sell at whatever price the apples get at the auction on that day, which is organized by the commission agent. Farmers are left with few options for two main reasons. First, storage opportunities are not available due to the absence of cold chain infrastructure. This means that farmers must sell their fruit immediately following harvest. Second, farmers lack financial training and do not understand that transporting their apples to the market and incurring the transportation costs generally puts them at the mercy of whatever price the commission agent offers. Reliance on a commission agent makes the entire transaction very asymmetric where the farmer has very little power.

Semi-direct company buyers: Retail companies such as Reliance, Mahindra and Mahindra, and Spencers have hired their own agents in the state. These agents buy from farmers on behalf of their company and compete aggressively in the field for larger volumes of good quality apples. Since most of the growers produce small quantities of apples, the purchasing company needs many sellers and buying agents to handle the large volume of purchases. Moreover, since the packing and grading of apples is not standardized, a great deal of time is spent finalizing the deal with farmers. This makes it difficult to monitor and control the entire operation of apple procurement. Semi-direct company buyers purchase approximately 30% of overall apple production.

Direct company buyers: At present, the direct company buyers include Adani Agrifresh and Fresh & Healthy Enterprise Limited of the Container Corporation of India (CONCOR, Ministry of Railways, and India). Unlike commission agents and semi-direct company buyers, direct company buyers work throughout the year to train farmers in scientific cultivation practices and post-harvest management. These training sessions are organized by company personnel, who send experts hired by the company to periodically visit villages and invite farmers to participate in training sessions free of charge. Both Adani Agrifresh and Fresh & Healthy own CAS facilities, which are technically far

superior to conventional cold storage, as the former controls the entire atmosphere and not just the temperature.

The typical value chain in the case of apples may be shown as below.

Table 3: Value chain and Issues in Traditional Apple Marketing

| Stages | Costs and value addition | Issues |
|---|--|---|
| Farmers- Production | Farmers get about 65% of the price that is realized in wholesale market Net price of approx Rs. 900 per box of 20-25 kg | Yield is very low compared to other countries Old trees, lack of proper package of practices |
| Harvesting | Harvesting is done by labour which is largely from Nepal and other places | Labour is not trained well. As the labour get the payment on per box basis, tendency is to harvest maximum fruits |
| Sorting, grading and packing | The cost of grading sorting and packing is included in harvesting which is Rs. 35/ box The cost of packing material is about Rs. 100 per box | Labour get the payment on box basis and therefore tendency is to put the required minimum no of apples in a box irrespective of quality. |
| Transportation to local Mandi | The cost depends on the distance of orchard to the local market but on an average it is Rs. 30-50 per box | The road quality is the major factor here. Recently the road conditions have improved but still there are many villages which are not connected with good roads |
| Transportation to Delhi/ Chandigarh mandi | Earlier almost 90% of the apples were transported to markets out of HP, but now in last decade about 50-60% of the apples are sold in local markets. Cost is Rs. 70/ box | Overloading of trucks which results in to 5-10% wastage |
| Handling- unloading, auction, etc. and market expenses including commission agent's charges | Rs. 50/ box, the market tax is 1%, commission agent charges 5% of the sale proceeds | Now Delhi government has abolished CA charges but the handling charges have been increased by traders |
| Storage—partly in cold chain and mostly sold fresh | About 5% of the market prices i.e. Rs. 60/box, | The important issue is the wastage in storage and handling |
| Transportation to wholesale markets across country | About Rs. 50-80/ box but depends on the distance from storage to the market | Transportation at ambient temperature and therefore wastage |
| Sale to retailers | The cost of retailers is about 15% (handling, waste, etc.) and their margins are about 25% - total margin is about 35-40% i.e. Rs. 400-500/ box or Rs. 20 to 25 per kg. | Retailers pick up the apples from the wholesaler as per their demand. Now some produce is sold in retail chains like Reliance Fresh, Big Bazaar etc |
| Vendors | The margins of vendors is included above in the margins of the retailers | The vendors take the apples from retailers/ corner shops or from small wholesalers and sell the produce door to door |
| Consumers | Consumers pay about Rs. 100 to 180 per kg (Rs. 2000 to 3600/ box) depending on the season | |

On an average a farmer gets about 65% of the sale proceeds at local market as net profit after incurring 35% as cost on production and marketing. Farmers told that currently the cost of cultivation (including replanting in place of dead trees, maintenance, etc but excluding packing material) is Rs. 1.2 Lakh per ha and a farmer earns about Rs. 3-4 Lakh from one ha of apple orchard. Overall, apple producer gets about 40% of the value that a consumer pays for the apple.

Summarising, there are primarily three areas in apple cultivation and marketing which need to be addressed on a priority basis - increasing productivity and quality, reducing wastage and streamlining marketing. As the fruit is mainly consumed as fresh fruit, there is no apparent need for the processing at this stage of market development.

For streamlining the marketing of apples, Himachal Pradesh has taken two major and appreciable initiatives. It has amended the APMC Act, 1963 in 2005 and allowed the establishment of parallel private markets for apples, permitted contract farming and allowed procurement of apples directly from the farmers. Secondly HP government has focused on construction of rural roads under PMGSY during the last 10-15 years. The road connectivity has reduced the time of transportation of apples from interior orchards to local markets from 3-4 days to 4-5 hours in many cases. The major dimension of streamlining that needs attention now in the apple market is to reduce the wastages and for that there is a need for integrated cold storage/ Controlled Atmosphere Storage chain and standardization in packaging, transportation etc. Adani Agrifresh Ltd and some of the other corporate who have entered the apple business in the last decade, have successfully controlled the wastage of apple through better handling, improved packaging, storage in controlled atmosphere storages(CAS), automated sorting and grading, etc. However the transportation of apples is still not under complete cold chain. Large part of apple sale to consumers is through small retailers – corner fruit shops, push carts, and so on who sell apples at temperatures of up to 40-45centigrade degree and under extremely low to very high humidity.

4.2 Case Study: Adani Agrifresh: A Corporate Intervention

The Adani Group of companies is a first generation global integrated infrastructure player with interests in ports, mining, power, edible oil and

gas exploration, logistics, agribusiness, etc. **Adani Agrifresh Limited** – a company set up by the Adani Group has forayed into the horticulture sector with a vision to harness the untapped potential and opportunities available in India. The aim is to be a dominant player in the fresh fruit and vegetables industry by developing world class infrastructure to purchase, store, package, transport and market fresh produce in India.

The company exports Grape and Pomegranate to Middle East and Europe. The farmers who supply such fruit are Global Gap certified producers and follow the strict spray schedules to ensure that pesticide residue is within the limit of the importing countries. After having firmly established itself in the domestic fruit segment, Adani Agrifresh has forayed into the imported fruit segment in India. The company has tied up with major fruit exporters of USA, China, Australia, New Zealand and Chile to import Apple, Pear, Kiwi and Grape.

In H.P. the company is directly buying fruits, mostly apples, from about 11000 farmers and has provided extensive training on pre and post-harvest practices to about 15000 apple growers. The apple fruit purchased by Adani fresh is stored, sorted and graded and then sold in the market through an extensive network of dealers across India. Adani Agrifresh Ltd (AAFL) has also introduced the concept of Apple Punnets (a 6 piece packaging) and a 2-layer Box at their Cash N Carry store in Azadpur Mandi. The same is receiving overwhelming response from fruit dealers. The apple sold by AAFL is of the Delicious variety from Himachal and Kashmir. The company also directly sells the apple to the modern big retailers in the metro cities. In addition to apple, the company also markets Indian pomegranate, grape, banana, cherry, litchi, kinnow and orange. All the fruits are sold under the brand name 'Farm-Pik'. The company also imports apple, pear and kiwi from China, US, New Zealand and Chile and markets in India using its distribution network.

When the Himachal Pradesh Government amended the APMC Act to allow purchase of fresh produce directly from farmers, Adani saw this as an opportunity. The company leveraged its strength of its distribution and procurement and set up 'Adani Agrifresh's operations in Himachal Pradesh to create an integrated cold supply chain for apples.

Apple is the main fruit crop in Himachal Pradesh. Almost 75% of the apple is grown in three districts – Shimla, Solan and Kinnaur. Major varieties are Royal Delicious, Red Delicious, and Golden

Delicious. Apple constitutes about 49% of the total area under fruit crops and about 74% of the total fruit production. State focus paper of NABARD (2014-15) lists a number of issues that need to be addressed to harvest full potential of apple in HP, like availability of quality planting material at reasonable cost, paucity of storage especially cold storage and controlled atmosphere storage, improper package of practices on harvesting, handling, transportation etc. State has CA storage capacity of 36123 MT both in private and public sector whereas even if 25% of the apple produce is to be stored the requirement is of 1.2 Lakh MT. Therefore there is a need of at least an additional 90,000 MT CA storage capacity in H.P. just for apples.

Adani Agrifresh Ltd. first diagnosed the apple production and marketing system in Himachal Pradesh and identified the critical gaps in the value chain.

Adani Agrifresh as a company has set up three Controlled Atmosphere Stores (CAS) with an investment of around Rs. 2 Billion at three locations in Himachal - Rampur, Sainj and Rohru. These Storages have a storage capacity of 18000 MT of apple, the largest of its kind in India. It has recently expanded their CAS storage capacity by another 5500 MT. Thus presently Adani Fresh has a total CA storage capacity of 23500 MT. Each store is equipped with colour and size sorters and modern packaging facilities.

Adani Agrifresh Ltd. first diagnosed the apple production and marketing system in Himachal Pradesh and identified the critical gaps in the value chain. The most important issues identified were the highly inconsistent 'quality' of apples being produced and the colossal wastages in handling, transportation and storage. The quality of apples coming in the markets was so bad that the company felt it could not have procured the apples as they were directly from the wholesale Mandis. Therefore AAFL decided to procure the apples directly from the farmers. But farmers had no incentive to either produce good quality apples or to separate the good quality apples while selling because the market prices were not as per the quality. AAFL has made a series of changes in the way that apple is procured, packed and stored.

AAFL decided that to procure quality apples, the farmers will have to be provided a set of services like training, timely inputs, agricultural inputs, reusable plastic crates etc. AAFL is providing following services to apple growers in its areas:

Horticulture Experts at Farm Gate: Services of expert scientists on improved package of practices, spray schedule, etc are provided at

the orchards by the company. The government agriculture extension is almost non-existent and therefore the orchard owners are highly appreciative of these services.

The company organizes interaction events between scientists and farmers at village level wherein farmers are instructed on approved package of practices, trained on right method of planting, pest control, and handling of the fruits to minimize wastage. It also organizes bigger events at its fruit storage facilities where a panel of experts answers the queries of farmers. Such events also establish trust and faith in AAFL operations.

Farmers Service Centres - FarmPik Shoppe: Company has five agri input supply centres through which it provides agriculture inputs like insecticides, fungicides, tree spray oils, bio fertilizers/ micro nutrients, plant growth regulators, seeds of vegetables; Farm Equipments – sprayers, tools (saws, knives, scissors), nets, multure; Packing Material – boxes, trays, strap rolls, BOPP tape etc. The company has also tied up with a reputed company for dissemination of weather, crop advisory, Mandi prices and important events and related information to registered growers. The growers are assured of genuine input products because the company sources all products from reputed companies directly at competitive prices.

AAFL has also linked with a quality planting material supplier – Gariba Nurseries and the farmers buy the sapling even though the price of Gariba is Rs. 450/- per sapling which is about three times than that of other nurseries. This also shows that farmers are ready to pay for the quality.

AAFL is also providing medical facilities to farmers' families through its CSR initiative of Adani Foundation. There is a need of providing quality and timely medical services to the apple growers. It is an area with difficult terrain with no transport facilities and poor road connectivity. Usually the outreach and institutional services of PHCs are not to the expected standards. This has resulted in gross under utilization of services. To overcome this problem, Adani Foundation has taken a lead in launching mobile van in the Controlled Atmosphere Storage Unit of Sainj. This van will go to clearly identified central points on fixed days and provide comprehensive health services including RCH services to a cluster of villages.

Apple Procurement System: Adani Agrifresh has built up a procurement team at each facility. The procurement team contacts orchard owners and explains to them about the importance of quality

in operations. AAFL buys fruits on weight basis. This is a major innovation in marketing of apples for the farmer. The apples are not only purchased on weight basis but also the rate varies as per the quality of the apples. The farmers willing to supply apples to AAFL are registered as 'suppliers' and the details of their bank accounts are obtained and kept in a database. AAFL also declares its procurement prices for different quality of apples in advance for a weekly period. All registered farmers get SMS about the rates. AAFL makes payment to the farmers directly in their bank accounts within 10 days of the receipts of the produce.

Fresh Apples are brought in crates, just after harvesting, by growers at the company's CA Units in Himachal and these are tested for approved quality. Acceptable lots are immediately sorted and graded by state of the art automatic sorter-grader machines. The sorted-graded produce is collected in bins and stored in CA Chambers.

Quality Control and Storage: Apples which are firm have good storage life. A random sample is taken from Apple consignment brought by a grower and its firmness is tested by pressure meter. Apple is further tested for ripeness. After passing all quality norms at CA Unit, the filled apple crates are put on a conveyor belt to feed the Sorting-Grading Machine. The filled crates are emptied at specific locations and apple moves on the conveyor belt and empty crates come back for further movement.

The apples are sorted by automatic machines as per different quality. The quality of apples is differentiated as per the colour, size and spots. The red colour being the good quality, similarly bigger size and spotless fruits are of good quality. The small size, green and apples with spots of diseases or injury are of bad quality.

Before passing through grading sorting mechanism, the defective/damaged apples are picked manually at quality inspection belt. Apple is sorted-graded in an 8-lane automatic Sorter-Grader machine. The size, colour and other parameters are defined in the control panel of the machine and produce is sorted-graded as per specified parameters. The sorted graded produce is collected in bins during procurement. The sorting grading process is kept in CA chambers for storage and chambers are sealed to operate the CA system for maintaining the quality. After opening of CA Chamber, the filled apple bins are brought to the washing section of packing machine.

Apple after passing through flume channel is dried and brushed which thoroughly cleans and shines the produce. As per requirement, some apples are waxed with approved food grade wax material.

The sorted-graded apple from packing machine is packed in 20 kg packing. Other packing, as per requirement is also done. Adani Agrifresh has also introduced consumer pack of apple for 6-piece and 12-piece packing. These are sold through Cash-N-Carry sales point in different cities across India. The packed apples are dispatched in refrigerated vehicle to maintain cold chain till the unloading point.

AAFL has procured about 26000 MT apples in 2015. This is about 5% of total apple production of HP. AAFL has reach out to 15000 farmers through its agriculture extension services and input supply across Shimla, Kinnaur and Kulu districts. About 11000 farmers supply apples to AAFL.

Use of Modern Technology: One of the key interventions of AAFL in Apple sector is the use of modern technology. It has the largest Controlled Atmosphere Storage system for apples in the country. CA Storage involves carefully placing the apple in large airtight refrigerated rooms where temperature, oxygen, carbon dioxide and humidity are carefully monitored. This controlled atmosphere slows down the respiration rate of the fruit which in turn slows the ripening process. Eating crispy, juicy AAFL apple around the year is possible due to Controlled Atmosphere Storage. The benefits of CA storage system are: extending storage life making round the year availability of apple, keeping the firmness of apple by application of CO₂ on pectin degrading enzymes, stops the development of certain storage disorders such as scald in apples, and slow the growth of decay organisms, realization of higher degree of turgidity so that fruit appears juicier and crunchier, better retention of nutrients, effective control of disease causing micro organisms

The pre storage unit is also extremely important in AAFL facilities. It has the latest high end 8 lane automatic equipment and has provision of automatic crate dumping. The produce is sorted according to size, color and weight. Infrared CCD cameras are used for sorting by size and a color CCD camera system is used to sort the fruit by color. It has integrated software, and has special cups suitable for sorting the Apples of different shapes and sizes. Special Bins are used for storage of Apple. Gentle Bin Fillers are there to avoid fruit damage and all the contact parts of machine with fruit are made of food grade material.

CA Storage involves carefully placing the apple in large airtight refrigerated rooms where temperature, oxygen, carbon dioxide and humidity are carefully monitored.

Packing System has latest high end 4 lane automatic equipment where the fruits are sorted according to weight. There is a provision of Apple Washing in Bin Dumper with Chlorine treatment before packing and here also special cups suitable for sorting Apples of different shapes and sizes are used.

AAFL has made many interventions in Apple Value Chain like buying apples on weight and quality, introducing apple transportation from farm to facility in reusable plastic crates and reducing wastage considerably, supply of quality inputs at less than market prices and thus reducing cost of apple production.

Strategic Collaborations: AAFL has strategically collaborated (invited the nursery to start its operation in AAFL procurement area) with a hi-tech nursery company (Gariba Nurseries) to make high quality planting material available to its registered farmers. The quality trees will start bearing quality fruits in next 7-8 years. It has also collaborated with horticulture input suppliers to procure the inputs at lower than market prices (buying directly from factory) to supply the inputs to its registered farmers - USP best inputs at best prices. It has collaborated with a company for providing IT based information to the growers.

But the most important intervention is buying apples directly from farmers and storing them in controlled atmosphere storage. These two interventions have removed a chain of intermediaries on one hand, shortened the chain and improved the efficiency and have reduced the wastage of apples in a significant way. The wastage in AAFL stores is less than 2%. The changes brought about in the traditional value chain of apples is shown below

Table 4: Apple Value Chain after Intervention of AAFL

| Stages | Costs and value addition |
|---|--|
| Farmers-Production | Farmers get about 90% of the price that is realized at AAFL facility. Average price farmers get is about 20% higher than they get in traditional market |
| Harvesting and transportation to AAFL facility in reusable plastic crates | Harvesting is done by trained labour, thus reducing wastages The cost of packing material is totally saved (which was about Rs. 100 per box earlier) |
| Storage – in Controlled Atmosphere | Removed seasonality and wide price fluctuations from the apple crop |
| Packing, transportation and Sale to Dealers across country | The apples are dispatched to dealers as per the demand. AAFL receives the payment along with the orders, packs the material as per the specification of the purchase orders and transport through cold chain |
| Retailers | Most of the dealers sell the apples through their own retail chains. Some of the apples are also sold through retailers. |

The integrated cold chain remains an important issue still. AAFL is not able to transport its total apple supply through refrigerated trucks. Also a large portion of apples are still sold through petty vendors on push carts at ambient temperature and wastage remains in that part of chain.

The combined interventions of AAFL, when compared to the traditional system, has overhauled the apple farming, procurement, storage and marketing system in Himachal. The salient features of the changes brought in may be summarized as follows.

- The first and foremost is the effort of Adani Agrifresh to set up a new system of buying apples on weight cum quality basis. This intervention alone has sent a clear message to farmers to produce 'quality' apples if they have to get better prices. There are farmers who sell the best quality apples to AAFL and low quality apples to HPMC in local market.
- The second change that AAFL has brought in apple procurement is transparency. Farmers can actually see their produce being graded as per colour, size and spot free quality at the AAFL facility.
- The third change is regarding the payment being online and within 10 days (provided the farmer has provided correct bank account). While the payment in traditional system was in cash and usually after 'cuts' and 'rounding off' by traders, AAFL pays the farmers actual amount in their bank accounts.
- Fourth and most important intervention of AAFL in apple marketing is the 'controlled atmosphere - CA' storage. So far the apples of HP were stored in simple cold storage and that too in places like Rai in Haryana. There was considerable wastage of the produce in simple cold storage system.
- Fifth intervention is around 'extension services to apple growers' by AAFL. Earlier farmers did not have access to information like quality of planting material, spray schedules for controlling insects and pest, good package of practices on production, maintenance, harvesting, handling and packaging of the produce. AAFL has provided extension services through a dedicated team and a panel of experts to apple growers. AAFL has also started the supply of quality inputs to apple growers at reasonable rates through its agri input supply centres. It has also collaborated with Gariba Nurseries to make available quality planting material at reasonable

rates (though the rate of Gariba nurseries is three times that of government or certified nurseries). But farmers are buying from Gariba nurseries as they are willing to pay for the quality.

- One of the most important interventions of AAFL is the ‘application of state-of-art technology at every stage of handling the fruit to reduce the wastages. The plant of AAFL is equipped with latest technology to sort/ grade the fruits, handle the fruits with minimum/ negligible chances of injury to fruit, put them in storage bins, pack them in a way where the handling damage is minimized. Where the normal wastage in storage is about 5%, AAFL has the wastage of 2 to 2.5%.
- AAFL directly procure apples from farmers, puts them in CA storage and markets them directly to its chain of wholesales across the country. In this process, it removes a number of middlemen and therefore is able to pay better prices to apple growers. The rate of the apples is declared about three days in advance to apple growers. It is done through SMS on mobile phone of all registered farmers. Farmers make an informed decision to harvest and market their apples. It is a great step in apple marketing because the apple growers come to know about the price of their produce in market in traditional system.

There are several generalisable lessons from the overall experience of the AAFL intervention in H.P to which we now turn to.

4.3 Lessons from Practice

There are certain generalisable lessons for the FnV sector as a whole that we can draw from the interventions in the apple value chain by Adani fresh as contrasted with the general situation prevalent in the apple subsector in Himachal. These are:

Enabling Environment of Public Policy: The reform of the APMC Act in H.P. allowed for both corporates like Adani and others to enter through getting a single license for the entire state, as well as a number of smaller local mandis to emerge. On the other hand government’s attempts to directly intervene and take up programmes such as nurseries, input supplies, and marketing through HPMC has over the years not yielded very good results both due to lack of sustained investment and weak management. Therefore the role of the government in today’s environment needs to be rethought strategically

as compared to what it was two decades back when the private sector was weak. Its primary role may become to create a positive enabling environment for private investment to crowd into a particular sector.

Connectivity: The importance of connectivity and efficiencies therein cannot be more emphasized for a sector like horticulture which has perishable products. The expansion of the road network through PMGSY in Himachal has brought back farmers to apple farming and led to the expansion of area under apple orchards.

Transformation requires investing in the full value chain: The interventions show that unless the incentive structure at each stage of the value chain changes, the subsector (as defined by a commodity) does not transform itself. For example without a procurement process on the one side and market for apples on the other, that values quality, it would have been difficult for Adani Fresh to both convince and pay orchard owner higher prices, as well as realize higher prices from apple dealers who are retailing and wholesaling apples. The farmer is willing to pay higher for better saplings today because he is also assured that returns from better quality of apple harvests are much higher. Further if higher value at the two ends of the chain are to be realized, there is a lot of investment that needs to be made in the intermediate links of the chain, such as better picking, grading, sorting, storage quality and packing - all sub-processes that ensures that quality is maintained. Hence incremental change in only one process in the value chain will not be sustainable in the long run. The question remains how this investment is going to come in.

Strategic Partnership and Creating Dynamic Ecosystems:

While there always existed an apple sector in Himachal and J&K, it had become stagnant to the extent that it could not even respond to the overall rising demand for apples in India and compete with imported apples which were priced after 50% import duty. The whole traditional value chain is biased against investment. Adani fresh, while intervening in and managing the whole value chain, did not make all the investments and attempt to do everything themselves. It entered into strategic partnerships with Garcia nurseries for planting material, weather forecasting companies and other input suppliers on the production side and retail chains and wholesalers on the marketing side. It made the strategic investments in the CA storage and related sorting facilities. Hence transformation can come through integrating different new players in building a new kind of value chain or new ecosystem.

Use of Modern Technology: At every step of the value chain, modern technology and its adoption has played a part. The most critical ofcourse was the CA facility of storage, but equally important was the investment made by Gariba and other new nursery entrepreneurs in tissue culture for planting material, the increasing use of cold chain vans now by Adani in the summer months for transportation. Technology can enable a traditional sector to leapfrog through inorganic growth. The principles that are applicable to telecom are also applicable to a sector like horticulture.

Integrating the Value Chain: One of the key roles of Adani Fresh has been that of an integrator. Once the catchment of 11000-15000 farmers have been identified and brought on board, everything that is required to transform the apple cultivation and marketing process with them is introduced. Training, plantation material, input supply, new way of harvesting and procurement are all managed by the company even before the apple gets into the CA facilities. The three CA storage faculties that the company runs is also the nucleus for integrating the value chain. In the traditional system each stakeholder only was interested and had investments in that part of the value chain where the immediate returns lay.

Transparency and Predictability are Key to Farmer

Participation: The fact that after the intervention small orchard owners who saw apple growing as a season to season activity requiring no long term investment (hence aging trees), are today investing in costly planting material and other intensive methods of cultivation for a crop that gives returns only after nine years, show that the game has changed. The confidence of the farmers that AAFL is a long term stakeholder has come about because of the investments made by them in training, changing procurement and payment practices, and investments made in the quality grading process has all led to them to predict with confidence the future of the apple growing activity. Transparency in procurement has also enabled the company to gain the farmers trust.

All the lessons listed above are applicable to the whole FnV sector and although drawn only from one commodity and one institutional intervention, repeats it in other locations and commodities. The need for large scale financial investment however still remains.

5.1 NASHIK District: The Emergence of a Fruits and Vegetable Cluster

The emergence of what is termed “Clusters” is both common and well researched in the case of industrial development. A majority of industries develop following a natural path of cluster development. The most recent examples being the Silicon Valley and Bangalore for the IT industry. UNIDO has systematically studied clusters dominated by small firms, both globally as well as in India, under its cluster development programme.

Usually government policies and strategies can play some role in cluster development, but a cluster’s development is primarily a function of a variety of historical and market forces that has little to do with government. Entrepreneurship has an important role to play in cluster development, particularly in its early stages of development.

Cluster development does not follow a linear path of development but has certain elements that are common to all clusters. Clusters have a large variety of firms at each stage of a value chain in a particular industry or product group that are both competing and cooperating with each other. Further a whole system of suppliers develops for the inputs required by a product. For example for a cluster making cars (e.g. Coimbatore), there will be a variety of car component makers who sell too many car manufacturers in the cluster. In turn there will also be a supply chain with many players in the chain for the products manufactured. There will also be skills, knowledge, and trained labour available to manage the various functions in a value chain. Buyers or the market usually comes to a cluster as the buyer gets both a choice and guaranteed supply. Hence a cluster will have an entire ecosystem that has developed around a certain product group or process, with limited barriers to entry for a new player but also with competition for all players. Because of competition, clusters are said to promote innovation, cost efficiencies and a constant search for new markets. The whole process is driven by both entrepreneurship and capital accumulation and reinvestment within the cluster.

The concept of cluster development is not often applied to agriculture, but many of the principles of cluster development are also applicable to agriculture as it moves from subsistence through early market

development to maturity. Agricultural clusters also show dynamic growth once new markets open up such as for exports or there are demand spurts for a particular commodity. As the horticulture sector has developed in India, we can look at certain clusters in the fruits and vegetables subsector that has emerged. One such cluster that has emerged is the district of Nashik in Maharashtra. While Nashik has a long tradition of horticulture, it is only in the last two decades that the subsector has taken on a new shape as a cluster. The characteristics of Nashik as a cluster is laid out in this section and then three very different case studies are presented that shows the role of different types of entrepreneurship that makes Nashik an unique cluster within the F&V Sector. Some general lessons are then drawn from these practices.

By India's development parameters, Nashik can be termed a well developed district in terms of both industry and agriculture. Situated in North West Maharashtra it is accessible and close to major consumer markets and industrial hubs such as Mumbai, Pune, and Aurangabad. Nashik itself is a well-developed city with a floating market due to religious tourism. While Nashik as a district is urbanised with 58 percent of its population living in urban areas, it is a large and diverse district, with over sixty percent of its labour force still engaged in agriculture. Access to large markets give Nashik a natural advantage in particular crops such as vegetables.

Agri Production and Crop Mix: From the agricultural point of view, Nashik's climate is well suited for horticulture because it is situated on the slopes of the Western Ghats. However it is diverse agro-climatically also, as part of it falls in the rain shadow area where both irrigation facilities and rainfall is low. So when we talk of Nashik as a horticulture cluster, we are only looking at specific locations within Nashik district. About 60% of the total cultivable area is irrigated. However, like rainfall, when we look at irrigation, there are some locations (talukas of Nashik, Yevla, and Sinnar) where the irrigation percentage of cultivable area is over 95%, while some locations are totally rain fed. The average landholding in the district is 1.67 ha, but there are many smaller landholders, particularly in the irrigated areas, making for intensive agriculture. Hence both agro-climatically and by irrigation coverage Nashik have some natural advantages in fruit and vegetable cultivation.

Nashik district as a whole has an interesting crop mix. While Maize continues to be the largest grown both in terms of area and volume,

maize is primarily a rain fed kharif crop grown in the poorer talukas of the district. The cropping mix changes dramatically as irrigation becomes available, as seen in the Devnadi Producer Company case study below. The largest horticulture crop grown in Nashik is onions. In 2013, it is estimated that 1.30 lakh hectares (14% of the total gross cropped area) was devoted to onion cultivation. Nashik is a traditional onion producing area, and has also developed as the largest aggregator and trading point for onions. Forty three percent of all onion production in Maharashtra goes through the regulated Mandis of Nashik district. Price fluctuations in these onion markets are the political barometer of national politics many a time.

Grapes are the second largest horticultural crop after onions. Nashik has traditionally been a grape growing region of the country, and is the largest cluster of grape farming within India. The returns from grapes are also very high, even though price fluctuates widely year to year. It is around grapes that Nashik as an agri-export cluster emerges and the grape story needs to be told in detail separately. The new emerging horticultural crops that are coming to characterise Nashik include tomatoes and pomegranates. Irrigated intensive small farming has picked up in the last decade and as urban demand picks up it is also emerging as a producer of a wider variety of vegetables. It is interesting to note the changes in the cropping pattern of the district as new techniques of cultivation and new markets have emerged. There is a decline in the area under cultivation of both wheat and sugarcane, as more profitable crops such as onions, grapes and vegetables have emerged. Grape exports grew from 117 thousand tonnes in 2009-10 to 160 thousand tonnes in 2013-14. During the same period, price of grapes increased in the export market from Rs 36,000 per MT to Rs 89,000 in 2013-14. The story of grape exports and the money made from it is the basis of the second case study on Sahyadri Farms. **The changing crop mix in Nashik as changes take place either in technology or demand is what makes Nashik a dynamic cluster in the FnV sector. The ability to adapt quickly cropping patterns and mixes is only partly a function of the farmer's higher awareness level. The other enabling factors available are what make Nashik a classic cluster case study in agriculture.**

The returns from grapes are also very high, even though price fluctuates widely year to year.

Agri Markets: Nashik over the decades has emerged as very large commercial market for agri produce in the state of Maharashtra and also India. Over the period when agriculture was regulated by the

APMC Act, massive investments were made to build the public market infrastructure in agriculture in Nashik. At present it has 16 market yards and 321 sub market yards. These accounts for just over 50 percent of the total agri trade in the district. With both deregulation and emergence of horticulture this percentage is going down with a larger number of farmers directly dealing with exporters, corporates, upcountry traders and other channels. However what is interesting about the regulated Mandis in Nashik district is that they have also become major re-trading points for commodities such as onions. Onions grown in most other parts of Maharashtra and Karnataka get re-traded through the Mandis of Nashik. Onions, tomatoes and maize account for over 90% of all traded commodities in the APMC mandis of Nashik, with onions dominating. Grapes, by its very nature, required a different kind of market to develop. Grapes need careful picking, grading and packing with minimum spoilage and this can only be done at the farm level itself. Hence in the case of grapes a standing crop is evaluated, valued, graded, and packed by buying traders and exporters at the field itself. The same trend has emerged for pomegranates. In the case of vegetables, such as tomatoes, chillies and European vegetables the trend is also for buyers to aggregate at the village level directly and sell in other city markets. As these markets have developed for horticultural products, such products not being standardised commodities, different systems for grading of each crop quality has also developed - the most formalised and sophisticated being for grapes for the export market and the least formalised for vegetables. Proper grading and pricing continue to be areas where farmers continue to be dissatisfied. For better price realisation, small farmers sell part of their produce on a daily basis in the network of rural markets established in the district.

Therefore in Nashik, whatever emerges as a crop product, the market moves in to both sell the crop but also to develop a system of grading, pricing, and logistics. The market to farm and back communication and adaptability linkage is strong making for dynamism in the cluster.

Agri- Input Supply Network: Nashik is a leading consumer of plant protection materials in the country and over the years a well established network of suppliers from the private sector companies in seeds, fertilisers and pesticides have developed, with private companies often having vans to go from village to village to demonstrate the use of their products. Even in the remote villages of the district the supply chain for inputs exists. This is in so much at variance compared to

the less agriculturally developed districts in the country, where input supply is one of the major bottlenecks for increasing agri production. However both price and correct usage is a different matter. With new more intensive, non-chemical, technologies emerging in horticulture, all farmers expressed a desire for services of competent agronomists.

Agri-Extension Services: Agri- extension services is another area which is a necessary prerequisite for development of new farming practices and new crops. Nashik over the years has, relative to other districts developed a fairly good agri extension service network both in the public and private sector. The public sector has the standardised model of KVKs and the Agriculture department's extension system through the ATMA structure. Interestingly a Kisan Call centre has been opened by the Maharashtra Agriculture Department in the district. Its effectiveness is however not known. A private sector service Aicus has also been opened to access information through SMS on market prices and technical issues. However all these services have limited reach? What is interesting is that a variety of private consultants have emerged in the district that provides such services. These emerged around grape exports initially but access to them is currently limited to the larger farmers who can afford to pay. In this regard one of the main roles that are necessary for producer companies to play in the district was pointed out to be agricultural expertise and advice to members through the company.

Agri-Processing and Post Harvest Services: Because of the developed nature of agriculture, a variety of agro processing units have come up in the district over the last two decades. These units are not just reliant on the production base of the district but also import their raw materials from other districts. The latest data shows that there are 81 units processing pulses and paddy, 8 sugar mills, 28 spice processing units, 343 dry fruit making units, 40 fruits and vegetable processing units, 7 cattle feed units and 36 wineries. At the farmer level there are still several issues related to post harvesting activities. Awareness and skill at sorting and grading is still limited and because of this often leads to lower price realisation. Storage continues to be a major issue for farmers. Overall also storage capacity is limited in the district. In terms of cold storages Nashik as a district has 145 cold storages with a total capacity of about one Lakh MTs. Both for onions and grapes the two main crops of Nashik, this capacity is grossly inadequate.

The appropriateness of this cold storage capacity to the different crop mixes is however not known. As a visit to the Sahyadri farms new integrated processing centre showed that cold storage for the fruits and vegetables sector cannot be seen simply as can be done for crops like onions and potatoes, but needs a more integrated view of the process such a ripening centres for fruits, IQF freezing for vegetables, etc. Hence Nashik district, while having weaknesses such as inadequate warehousing and cold storage facilities, is a classic case of a progressive cluster in the FnV sector. What is interesting about the cluster, is that unlike many other clusters from both industry and agriculture, which has reached a certain level and either declined or remained stagnant, the Nashik cluster has continuously looked for new market opportunities such as grape exports and vegetables, and changed the cropping mix and related technologies to suit new market needs.

5.2 Updating the Grape Story

Grapes has been traditionally grown in Nashik district for centuries and hence grape production per se is not what makes Nashik interesting as a cluster. What makes it interesting is how a traditional centre for fruit production renewed and modernised itself to become an export led cluster within agriculture.

Traditionally the domestic market was the only one for selling the grapes that were mostly of the seeded varieties. Farmer's primary means of getting higher returns was to increase the production of these varieties. Like in other fruit clusters, quality parameters were given little consideration as there was no differentiated market. The domestic market was sufficient for the off take of the total production and everyone seemed satisfied. Two significant changes took place in the 1980s. First, some large farmers introduced the seedless variety of grapes. Second and more significant a new generation of farmers entered the scenario. Several exposures cum marketing visits were made by some educated farmers to the Middle East and Europe to see grape farming and the potential for exports. However two bottlenecks, amongst others prevented exports. First, the air cargo system for a commodity like grapes was underdeveloped in India. Second, technologically the pre-packing cooling technology that extended the fresh life of a grape was not available. The early experiments at exports failed.

In the meantime a forward looking Grape Growers Association had been formed in Nashik. Also they formed an association specifically

for exports called Mahagrapes which established a unit with pre-cooling technology for sorting and packing the grapes. As exports first from a single unit and then from more farms slowly picked up, grape varieties and cultivation practices suited to export markets began to be adopted. Indian grapes were introduced in the English supermarkets for the first time. From the early 1990s to 2000, grape exports grew steadily and new markets, particularly the European Union were opened. However the growth rate was slow and steady. Initially, due to high cost of investment and risk, only big farmers would enter into this business while the small ones and the landless labourers would work only on daily wages. However, with the spread of irrigation more and more small farmers purchased new fallow lands and have developed it for grape farming. Small grape farmers got into some informal system of contract farming for grape cultivation with the larger farmer cum exporters. The economic pull of grape exports was so strong that it broke caste barriers in terms of who got into grape farming.

Early experimentation, opening of new markets, technology adoption and better cargo handling facilities all started paying off from 2004-05 onwards. It took fifteen years of sustained effort by a dedicated group who saw the potential of grape exports and converted it into a concrete opportunity, not just for one farm or company but for an entire cluster. There has been a phenomenal rise in exports of grape from India since then. In 2004-05 the total value of grape exports from India was Rs 214 crores, to Rs 545 crores in 2009-10 to Rs 602 crores in 2011-12 and Rs xxx crores in 2014-15. There was a dip in 2010-11 due to the crop spoilage due to diseases as well as massive rejection by EU due to not meeting pesticide norms. However the cluster quickly changed production practices and bounced back the year after. What is interesting is that India is actually only ranked 18th in terms of grape production in the world. Hence the export of grapes is not just because of a high domestic production base, but is essentially cluster led that globalised.

A record 192,000 MTs of grapes was exported from India in 2014-15, out of which 65000 MTs was to the European Union. Farmers and exporters have mastered the stringent norms for cultivation, packing, and documentation required for exporting agricultural commodities to the EU. For example the third party certification process of Global Gap has been adopted by all farms involved in the grape export business, the government opened APEDA and within it Grapenet

to provide up to date information on norms and documentation procedures. Registering of farms under Grapenet is mandatory for all farms growing grapes for exports and such registration has been growing year after year.

To increase yields and protect the crop from vagaries of weather, and ensure more efficient use of water, the profile of grape cultivation has changed in the Nashik district. Drip irrigation, plastic covered green houses and other new techniques of plantation have been adopted. This has made grape cultivation a high investment-high return game, but also it has made it much more labour intensive and suitable for smaller sized farms. These changes in turn have led to a large number of small farmers adopting grape cultivation, but when linked to larger exporters.

To increase yields and protect the crop from vagaries of weather, and ensure more efficient use of water, the profile of grape cultivation has changed in the Nashik district.

The above quick review of the Grape sub cluster shows the role played by opening up export markets in changing the whole profile of the cluster. The high profitability from grape exports has in turn led to internal capital accumulation which is being reinvested to expand the success to other crops. (See case study of Sahyaadri Farms below).

5.3 Case Study: Sahyaadri Farms Producer Company Ltd (SFPCL)

Mr. Vilas Shinde completed his masters in agricultural engineering in 1999 and started working with a voluntary organisation on water management issues. However he found the dependence on grants troublesome in the watershed model and sought out a more financially self reliant model. After visiting Amul in Gujarat he got motivated to start a dairy farm. Along with a group of close friends he started a dairy business in his village in 2000. The dairy business did not work out and he had to close it down with a debt of Rs. 65 lakhs. Grape exports were at that time an upcoming farming business in Nashik and Vilas started the business of packing grapes for an exporter. Soon he understood the grape export business and started exporting grapes directly under his proprietary firm Vilas Vishnu Shinde (VVS) in 2004. The profit margins in the grape export business were good and he soon cleared his outstanding debt.

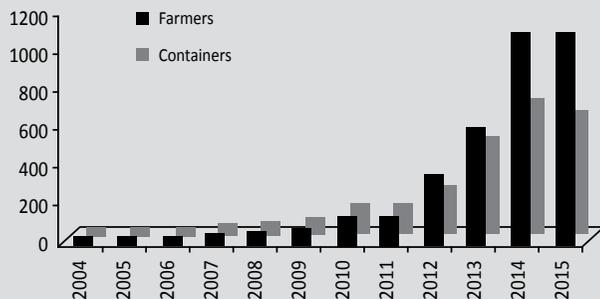
In 2006, USA had made its quality standards for food imports more stringent, but the information about this reached late to the farmers and exporters of Nashik and the whole consignment of grapes

exported by VVS to the US got rejected and he suffered a loss of Rs. 6 crores. Most exporters incurred heavy losses that year and exporters passed on the losses to farmers as they did not pay the farmers, citing the reason that their consignments had been rejected. VVS was the only exporter who paid the farmers their dues and took the whole loss on himself. This single act of Vilas earned a formidable goodwill and reputation for him amongst all the grape farmers of Nashik. Grape farmers were now loyal towards cultivating and supplying grapes for exports to him and he soon had an excellent catchment of farms from where he could procure grapes.

Growth Phase: In spite of the loss, VVS continued in the grape export business and in a short span of five years (2006 to 2010), emerged as one of the largest grape exporters of the country. Mr. Shinde believes that his business of grape exports has been successful because of the productivity and loyalty of the farmer base that he has created. The grape export business is particularly risky, as in case the farmers do not produce quality grapes as per the standards (particularly the permissible limits of chemical residue) of importing countries in Europe and the USA, the whole shipment can be rejected as happened to a lot of farmers and grape exporters in 2010. Being aware of this and having suffered once, VVS ensured that this was not repeated. This enabled VVS to remain profitable and expand his business in the next five years. The growth of the company is highly impressive. Even before when it was working as a private enterprise under the name of VVS, its turnover grew by more than 100% from Rs. 23.33 crores in year 2011-12 to Rs. 53.3 crores in year 2012-13. Mr. Vilas Shinde gives the credit to its team and its strategy of working with small and marginal farmers. He has complete faith in the members' loyalty towards the company. After formation of the company in 2011, the growth has been even better as seen from the graph above. It can be seen from the graph and table that the export of grapes and number of farmers supplying grapes to the company increased almost by 100% every year till last year. During the current year, it remained same and the number of containers exported has come down slightly (by 5%).

Formation of Producer Company: In the meantime, Mr. Shinde had a commitment to farmers that he has retained and wanted to share his profits with the farmers and also wanted them to own the

Farmers & Containers exported over the years



| Year | Farmers | Containers |
|------|---------|------------|
| 2004 | 10 | 4 |
| 2005 | 10 | 13 |
| 2006 | 15 | 21 |
| 2007 | 25 | 35 |
| 2008 | 35 | 45 |
| 2009 | 56 | 81 |
| 2010 | 140 | 163 |
| 2011 | 147 | 156 |
| 2012 | 327 | 221 |
| 2013 | 550 | 450 |
| 2014 | 1007 | 625 |
| 2015 | 1007 | 570 |

Figure 5

business along with him. So he set up the Sahyadri Farms Producers Company Ltd (SFPCL) in 2011 and transferred all of his personal capital accumulated in his propriety firm VVS (about Rs. 50 crores) to SFPCL. Participating farmer members were given shares of the company free of cost. In addition to the farmers’ lands, the grapes are also grown in company owned 100 acre farm in Malegaon. Company has also taken another 650 acre farm on 10 years lease from government for fruits and vegetable cultivation.

SGPCL today has more than 1000 members and the company exported 8500 MT grapes worth Rs. 102 crores in 2014-15. The company has a state-of-art processing, storage and packing plant for grapes. All grape farmers’ members and suppliers of the company are Global Gap Program certified farmers and produce high quality grapes. The company supports its member farmers to get the Global Gap Certificate. A Rs. 10-15,000 expense on the certificate is also borne by the company.

Mr. Shinde firmly believes that the capital needed by Farmer Producers’ Company should come from the business itself.

He also believes that the cost of getting subsidies and grants is too high for farmers and the farmers should rather spend the energies on their business rather than wasting their time and efforts pursuing grants. That is the reason that the SGPCL has not obtained any government grant.

Diversification - Establishment of Integrated Processing Facility for FnV:

Grape export is a very short duration business, starting in May and ending by July-August. Thus the grading, storing and packing facility established by SGPCL is effectively used for grapes only for 3-4 months. Hence SGPCL decided to expand through diversification to new crops, new facilities and new farmer members. SGPCL has now

expanded its operations to vegetables growers and it has reached to about 10000 farmers across the state.

It purchased a 67 acre wasteland plot to set up a modern integrated facility for the grading, processing and packaging of fruits and vegetables near the Nasik cargo airport. A large agricultural mall is also being added to the processing facility. This large sized facility has a Handling Capacity for Fruits and Vegetables of Fresh: 350 MT/day; Processed: 250 MT/day. It also has a large cold storage capacity of 2000MT that can produce equal weight of frozen products through the IQF method. It has a testing and certification laboratory. The facility has 6 pre cooling rooms to handle 50MT each of fresh fruits, a Vacuum Pre Cooling for leafy vegetables, 8 advanced and fully controlled ripening chambers of 25MT cap each, 8 semi controlled ripening chambers for mango of 250 MT each capacity, IQF facility of 50MT capacity per day and Plate Freezer Facility of 40MT per day capacity.

The facility is primarily funded from the internal accruals and capital accumulated over the last five years in the grape export business and is impressive by any standard. The facility shows both the vision and risk taking investment ability of Mr. Shinde. It has now to prove its profitability. SGPCL has set up a separate company - Sahayadri Agro Retails Ltd. - for the vegetables business.

It has started the Agricultural Mall where agricultural inputs like pesticides, fertilizers, drip irrigation system; agricultural inputs, growth promoters/ regulators, micro nutrients etc. are sold to farmers at reasonable rates. SGPCL has tied up with reputed companies supplying these inputs which ensure quality as well as better rates. SGPCL has also started mobile based farmers' advisory services application where farmers can post their queries and seek specific information/advice. The company is regularly doing research and development on enhancing self-life of perishable vegetables and different ways of processing. They have been exporting table grapes as fresh after proper grading, quality checking and packing. Since last two years, their major intervention is in the tomato crop where more than 2000 farmers are involved growing tomato on about 5000 acres. The SGPCL procures tomato from farmers and supplies it to Pune, Nasik and Mumbai. SGPCL has declared a minimum price in advance to tomato growers so that the farmers feel confident in taking up tomato cultivation. The Company has set up chemical free ripening

It purchased a 67 acre wasteland plot to set up a modern integrated facility for the grading, processing and packaging of fruits and vegetables near the Nasik cargo airport.

chambers for Banana. It procures Banana from farmers and put them in chambers under controlled temperature, humidity and CO₂ to have chemical free ripened banana which it sells in major markets of Maharashtra. Pulp of many fruits like mango, guava, custard apple etc. is made and stored under very low temperature and sold round the year. Now the company has started storing cut vegetables like carrot, capsicum etc. under deep freeze to sell round the year. All of these operations are fairly recent and are yet to be upscaled, (except mango pulp which is done on commercial scale).

Building the Team: Mr. Shinde has built up in the last few years a highly dedicated and skilled team as its top management. Some of them are old friends of Mr. Vilas Shinde and some he has handpicked from the market. The company and particularly Mr. Shinde believe that every link in the value chain is a different business and every business can be made profitable by hard work and by use of technology. Considering the success that the company has got in grape production and export, he has faith it would also excel in vegetable processing and marketing. Now the strategy of the company is to replicate the success story of grapes with vegetable growers and to focus on the retail business. It is developing an integrated supply chain for fruits and vegetables. One of the important factors contributing to the success of the company is its 'global perspective' be it in terms of quality standards or market access. It benchmarks itself against the international norms for both quality and technology.

5.4 Case Study: Sula Wines

While Nashik is the largest grape-growing region in India, traditionally only table grapes were grown there. Wine grape growing was introduced there about 20 years ago by an enterprising, Stanford-trained engineer named Rajeev Samant who quit his hi-tech Silicon Valley job in 1993 to come home and do something different. He started farming mangoes at his family's 20-acre plot in Nashik, and then tried his hand, mostly unsuccessfully, at various crops like roses, teakwood and table grapes and also selling them through existing market channels. In 1996 Rajeev realized that Nashik had the perfect climate for grapes but no one was making wine.

A little research quickly showed that the Nashik climate was not only perfect for wine grapes, but was also on par with winegrowing regions in Spain, California, and Australia. His determination doubled and

Rajeev returned to California in search of a winemaker. In Sonoma County he found Kerry Damskey, an eminent Californian winemaker, who enthusiastically agreed to help start a winery on Rajeev's 20 acre family estate in Nashik.

In 1997, the duo took the revolutionary step of planting French Sauvignon Blanc and Californian Chenin Blanc, varieties of grapes that had never before been planted in India before. The first Sula wine hit the Indian market in 2000. It was a historic move and today Nashik is considered India's "wine capital". Sula Vineyards is today globally renowned as India's premier quality wine producer, and Rajeev and Sula have been pioneers ever since, introducing for the first time varieties such as Sauvignon Blanc, Chenin Blanc, Zinfandel and Riesling, and techniques such as refrigerated winemaking which brought fruit-friendly wines to India. Since its inception, Sula has rapidly established itself as India's Leading Premium Wine Producer, helping spark a wine revolution that has seen domestic consumption grow at 25% annually and several new wineries come up in the Nashik area.

Growth: In 1999 Sula Wines made 500 cases of wines and it took one year to sell this small quantity as the awareness about wine drinking was minimal in India. Starting with a sale of 50,000 bottles in the first year, Sula is today India's largest wine producer with over 60% market share in India and sales of over 7 million bottles in 2013. In 2014-15 SULA produced about 8.5 lakh cases of wines and its turnover was Rs. 270 crores.

As sales picked up, a second winery with three times the capacity of the first was completed in late 2004 to keep up with demand, and a third million litre winery started operations in 2006. Sula has also expanded from the original 30 acre family estate to about 1,800 acres (owned and contracted) under plantation, both in Nashik as well as in nearby Dindori, India's upcoming wine region. Varietals planted include Cabernet Sauvignon, Shiraz, Zinfandel and Merlot along with Chenin Blanc, Sauvignon Blanc, Viognier and Riesling. In addition to having a wide distribution network within India, Sula also exports its wines internationally. In 2005, Sula proudly launched its first reserve wine, the Dindori Reserve Shiraz, as well as India's first dessert wine, the Late Harvest Chenin Blanc.

Sula procures grapes from its own fields (about 350 acres in Nasik and about 300 acres in Dindhori) and it has contract with farmers for

procurement of grapes. Sula Vineyards is also a leader in sustainable winemaking and has created employment opportunities for thousands of disadvantaged rural youths, and has been instrumental in significantly raising farm incomes. Sula Vineyards import arm, Sula Selections is one of the leading importers of wines and spirits into India representing iconic brands such as Remy Cointreau, William Grant & Sons, Hardys and Cono Sur. The Sula wine is completely a green industry as it does not produce any effluent. There is no waste and every by product is recycled as manure for the vineyards. It has installed solar panels to provide electricity and 15% of its power consumption comes from solar energy. It has also installed rain water harvesting systems in factory as well in vineyards

Sula was attempting to change wine making from grapes grown in a subtropical climate as compared to the older wine making firms operating in temperate climates.

Challenges-Building Up a Wine Grape Cultivation base: As grape cultivation for wine making is very different from table grape cultivation, it required a tremendous amount of R&D in cultivation techniques to match climate, soil, cultivation practices, harvesting and finally wine making. Any mistake in the cultivation process would result in bad quality wine. Further each type of wine required a different type of grape with its own cultivation nuances and techniques. For the first time Sula was attempting to change wine making from grapes grown in a subtropical climate as compared to the older wine making firms operating in temperate climates. 90 percent of the wine quality is a function of the harvested grape quality.

As the sales and production increased, Sula had to move beyond its 20 acre farm vineyard to farms owned and cultivated by other farmers. The loss of direct control was another challenge. Traditionally farmers were used to working towards enhanced tonnage per ha, but in the case of wine making there is a trade off between yields and quality. Farmers had to be convinced individually on this changed perspective, by getting returns based on quality rather than quantity. Technical expertise from California and Australia was brought in to assist Sula wines. Ten year written contracts were entered into with each farmer who joined Sula wines as a supplier. Initially this was extremely difficult as returns were not assured, as a gestation period of 3-4 years are required between plantation and harvests. However once the first cycle was over and returns came into the farmers it was much easier to expand the farmer base. Currently around 350 farmers have contracts with Sula wines. In addition the company itself has leased in land in

neighbouring districts and Karnataka. Wineries which had opened in the district and which had underestimated the technical challenges made losses and have now closed down.

Challenges-Promoting the Art of Wine Drinking: India traditionally is not a wine drinking country. For Sula wines to compete directly in the international market with traditional wine making countries as a new entrant was also not a viable option. Hence for Sula wines, it was not only a case of being a pioneer in India in making wines, or the traditional marketing challenge of building up a brand image of a known and traditionally consumed product, but also to be a pioneer in promoting generically the art of wine drinking in India. As someone in a winery in Nashik said “in India people drink to get drunk”. So promoting wine drinking as something which is natural is a big uphill challenge.

Also India is a price sensitive market for most products. Because of this Sula produces wines in different ranges of prices starting from the price of Rs. 150/ bottle to Rs. 1750/ bottle. This price range in general is what Indians currently spend on alcohol drinks. The price ranges as per the age of the wine; as the older wine get better price. The minimum time for wine preparation is 6 months and the oldest wine that Sula produces is 10 years old. The imported wines from Europe are comparatively cheap and it is the biggest threat to Indian wine industry. Sula is trying at policy level lobbying to get import duty rationalised in such a way that the Indian wines are able to compete with imported wine.

A variety of ways had to be thought of by Sula wines to market its wine in India. This included providing complementary small bottles of Sula wine in hotel rooms, making the winery and vineyards open to the public for educational tours, and promoting wine tourism. The globalisation of Indian tourists and the IT industry where young people are exposed to Europe and other wine drinking countries has helped in exposing a different generation to wine drinking. As advertising of alcohol is illegal in India, and wines get clubbed as an alcohol drink in India still, Sula has to depend on more personalized communication methods. Government policies on excise etc have not helped either, although the state government has taken a step in drafting a more progressive wine policy.

Related Diversification-Wine Tourism: Sula is also a pioneer in India's wine tourism. It has opened the first tasting room at Sula vine

yards in 2005, a restaurant and recently a 30-room vineyard resort. With 170,000 visitors in 2013, Sula is one of the most visited wineries in the world and the number one place where Indians taste wine for the first time. The nearby Sula amphitheatre is where the Sula festival has been promoted which draws musicians and youngsters- the future more mature wine drinkers, who will not just drink to get drunk.

5.5 Case Study: Devnadi Valley Agricultural Producer Company Ltd.

Devnadi Valley Agricultural Producers' Company Ltd. (DVAPCL) is a farmer producers company (FPO) in Sinnar block of Nashik district. The company was set up in 2011 by 11 farmers with facilitation of a local NGO called Yuva Mitra. Yuva Mitra was established and is managed by Mr. Sunil Pote, a local from a village in the area. Yuva Mitra had been working in the Valley of Devnadi River since 2000 on restoration of traditional water management systems. The valley had a very old system of diversion based irrigation system where the river water was diverted and taken to agricultural fields by gravity and the surplus water re-entered the river downstream. Traditionally, farmers themselves were maintaining and managing the system. But in the decade of the 1980s, the government took over the responsibility of development and the diversion based irrigation system got defunct.

Yuva Mitra negotiated with the state government to return the traditional system of irrigation to the community, and within about seven years, from 2005 onwards, the farmers in the valley were successful in restoration of Devnadi and its diversion based irrigation system. Once the water availability increased, the next issue was how the income of farmers could be enhanced in a sustainable way by using the available water. The Producer Company formed, with guidance of its promoting agency Yuva Mitra, decided to address two problems that the farmers in this remote tauluka faced - first, timely availability of quality agricultural inputs to farmers and second, linking farmers with markets.

Membership: Initially only 11 farmers came together to form the company. The first initiative of DVAPCL was to set up an AgriMall – Devnadi Agricultural Mall, essentially a centre cum shop which could make agricultural inputs available to farmers in the area (Devnadi Valley) at fair prices, of good quality and on time. 'Quality and price' of agricultural inputs is such an important issue in the area that a large

number of farmers came to the inauguration of the mall by District Collector. On the inauguration day itself 59 more farmers came forward and took up the membership of the company. Within the next one month another 203 farmers became members of the company, each member subscribing to Rs. 1000 share capital in the company. At present the producer company has 950 farmer members from 16 villages of the Devnadi Valley.

After rolling out its first successful initiative in the form of the AgriMall, DVAPCL started promoting exotic vegetables with farmers so that they get high prices in up end markets in Mumbai and Nasik. But soon they realized that the market for exotic vegetables is very limited in terms of volume and a large number of farmers cannot be benefited through its adoption. It was therefore decided that they will switch over to promoting more conventional vegetable like tomato, chilli, cauliflowers, etc. which is the major crop mix of the farmers who are members in the company.

The Rs. 1000 per day per farm model: Majority of the members of the company are small and marginal farmers. The Company and its promoting organisation Yuva Mitra realized that there is too much risk in agriculture for the small farmer in long duration crops with a single yearly harvest and therefore the idea of an annual income does not appeal too much to such farmers. Also the farmers need cash very often, whereas the income from agriculture in traditional crops is only after 5-6 months when the crop is harvested and sold in the market. They came up with the novel idea of Rs. 1000/- per day harvest and income for small farmers by growing short duration cash crops, primarily vegetables in a rotational manner so that some crop will be available for marketing in small lots on a daily basis and will be able to fetch at least Rs. 1000/- per day to the farmer from half an acre plot. This was possible with increased availability of water from diversion based irrigation, using improved technology of drip irrigation, and intensive planting.

Most members of DVAPCL are small and marginal having less than one ha. Members are encouraged to take up intensive vegetable on 1/5th of ha (half acre) and on remaining area the farmers continue growing fodder and food grains. Though many farmers have increased vegetable growing to 2/5 (one acre) area now.

Input Supply: DVAPCL has tied up with a number of reputed companies supplying quality vegetable seeds, fertilizers, pesticides, micro nutrients, growth promoters/ regulators, bio fertilizers, animal medicines, animal

On the inauguration day itself 59 more farmers came forward and took up the membership of the company.

feed, and agricultural equipments (even tractors) to make available agricultural inputs to members as well as to non members. They get the best price (good discounts and dealers' rates) from the companies and the best part of this arrangement is that they get good quality products. The Producer Company is able to ensure high quality inputs at reasonable rates (save retailers' margin) for its members. However there are some multinational companies who require higher annual turnover to make them as their dealers and they do not supply their material directly. In such a case, DVAPCL has to buy some products from these dealers. As members are getting income on almost daily basis, banks have also come forward for provide loans to the members of DVAPCL.

Agricultural Extension Services to members: The DVAPCL believes in a strong system of knowledge transfer and agricultural extension services to its members. It arranges training programs/ seminars for farmers on vegetable cultivation, and on other allied activities like dairy, vermi compost, green house etc. It educates farmers and encourages them to take up crop insurance, cattle insurance etc. to mitigate risks. It has its own soil testing lab and encourages farmers to get soil and water tested and to go for specific application of micro nutrients and fertilizers. Company has plans to arrange warehouses, cold storage, leasing of bigger agricultural equipments for members who can't buy them and to encourage contract farming and so on.

Agriculture Information Centre: DVAPCL runs the information centre from its AgriMall and provides information on new agricultural developments, government schemes and subsidies, different loan options

Yuva Mitra was established in 1995 by Mr. Sunil Pote who belongs to village Lonarwadi in Sinnar Taluka of Nashik District. Mr. Pote himself belongs to a farmer family and after his education he started working as sales executive at a pharmaceutical company. He realized that he should be working for the community, especially with local farmers for their overall development and thus he set up Yuva Mitra along with his friends. Yuva Mitra is engaged in Water Resource Development, mobilizing farmers into Framers Producers Companies, and enhancing the life skills of adolescent girls. Yuva Mitra works in 11 Talukas of Nasik district and support other NGOs in 11 districts of Maharashtra. NABARD and Small Farmers' Agri-Business Consortium (SFAC) has recognized its work and have appointed Yuva Mitra as Resource Support Agency for promoting and strengthening Farmers Producers' Companies in state and beyond. Members of Framers Producers Companies from states like MP, Gujarat, Bihar, Maharashtra regularly visit Yuva Mitra and its promoted Farmers Producers Companies for exposure and training.

available to farmers, improved farm practices, new varieties of different crops, weather forecasts and market prices for vegetables and other crops.

Marketing: The company had also started marketing of fresh vegetables directly to about 30 residential buildings in Nasik city through vans – Devnadi Vegetable Express. The vegetables from members' fields were supplied fresh to the consumers. This operation started well initially but soon it started making losses. The main reason for the loss was wastage as almost 20-25% of the vegetables were unsold and the Company had no storage facility to keep the vegetables. Additionally there were operational and managerial issues like few farmers taking control of the operations, pilferages and so on. The company has discontinued the Devnadi Vegetable Express.

Now DVAPCL is selling some of the vegetables (about 4 MT per day) to a social enterprise making Mid Day Meal for schools. The exotic vegetables are supplied to hotels in Goa, Hyderabad, Mumbai and other cities. It is interesting to note that the exotic vegetables are transported in Volvo passenger buses. The samples of the vegetables are sent to potential buyers via smart phone (WhatsApp) and the rates are negotiated before supplying the consignments. But large portion of the

Mr. Anil Shinde who is Chairman of the company was earlier working in a factory nearby. He along with his brother own 2 ha land. He is one of the 11 farmers who initially came forward and set up this company. After adopting 'Rs. 1000/- day from half acre' model he realized that agriculture is far more profitable than the job. He left the factory job and started intensive vegetable cultivation. Today he has tomato on .75 acre plot and he is expecting a net income of Rs. 4.5 lakh from it within 4 months. He annually earns about 7-8 lakhs from agriculture. He also manages the company's AgriMall along with CEO of the company. For initial 2 years he was volunteering there but now the company has started paying him monthly honorarium/ salary.

vegetables are marketed by farmers themselves directly to consumers and in local markets. Since 2011, DVAPCL had been making small losses but last year i.e. 2014-15 it has started making small profits. Major revenue of the company comes from AgriMall which has annual turnover of Rs. 2.55 crores now from one Mall. The Company has added another AgriMall last year and now it has planned to add three more AgriMalls.

It is real heartening to see young people taking up agriculture as a profession in the DVAPCL's area unlike in other places where farming is no more attracting the youth. The 'Rs. 1000/- per day from half acre' model has transformed agriculture in area – at least

in the member families and now people are taking agriculture in a 'corporate' way. The DVAPCL story gives an important lesson that agriculture can be highly remunerative if all or most of the loose ends are tied up properly – like increasing water availability, use of modern technology, good inputs supply services, good agriculture extension services and support in marketing. The focus of the company on extension services is such that the agricultural graduates from pesticides or seed companies visiting them are regularly sent to farmers' field to advise the farmers. When most producer companies are seen after grants and financial support, DVAPCL is seeking only skilled agricultural graduates as support from outside. Though DVAPCL is in its early stages and there is a long way to go but the beginning is very impressive and it looks like a model worth up-scaling and replication elsewhere.

5.6 Lessons from Practice

The historical development of Nashik as a cluster and its recent expansion and diversification, as seen from the three case studies presented, throw up some important lessons as to how clusters develop in a sector such as horticulture. Some of the generalisable principles and lessons are:

- While the origins of a cluster may be historical and solely dependent on agro-climatic zones, the renewal of a cluster, so that it goes on to a new orbit, is a function of a variety of factors, primary amongst which is the **opening up of new markets that are quality driven** combined with the ability of the cluster to muster resources to take the new market opportunity in terms of developing a new value chain. The case of Nashik grape exports is a classic case study of this. In spite of repeated setbacks periodically, the Nashik farmers continuously and successfully changed technology, farming practices, and related practices to meet the new requirements, because they saw value in it. Simultaneously, because of this need a variety of new services also emerged such as for input supply and specialised extension services to farmers. This created an entirely new value chain around grapes as a commodity.
- A cluster around a whole subsector, such as Nashik for horticulture, will have multiple products and crops. Each of these crops will have a different supply chain. However what this density

of multiple value chains does is that it makes the **farmers and farming systems adaptive to quick change**. This is repeatedly seen both in the cluster overview and case studies. Farmers switched from grape farming for the domestic market to grape farming for exports and some to grape farming for wines. However several of the farmers, who couldn't invest in grape farming, shifted to vegetables. Within vegetables as tomatoes emerged as a value crop they switched to it and so on. Pomegranates emerged as a new fruit crop that farmers could grow on their fallow land and farmers took this up. Therefore the more sophisticated a cluster becomes by virtue of differentiated products going into new markets, the more adaptive (we often call them progressive, but every farmer seemed progressive in Nashik) farmers become in changing crop mixes and cultivation practices. The corollary of this is that **crop diversification is a good strategy for cluster development as it brings in new knowledge and technology that can be transferred across crops**. Monoculture of cash crops therefore is not an ideal strategy for the long run development of horticulture.

- Technology adoption and adaptation is obviously an important variable for any cluster or value chain to develop. But this is stating the obvious. What kind of technology and for what purpose. **Technology adoption can be approached from two angles - the farmers or production side and the market side**. On the farmer's side the need for water conservation has led to a widespread adoption of drip irrigation by all kinds of farmers in Nashik, big and small. The adoption of drip irrigation in turn has allowed for greater flexibility for the farmer to switch among different crops. Also the logic given by Sahyadri farms for investing in the cold storage and other processing technologies at their facility is that the farmer gets a better choice in terms of price and crops to cultivate. On the other hand, some technologies are purely market driven, such as farming practices and chemical use by grape exporting farmers. Technology also has the issue of divisibility and scale. The more a technology can be divided into small packages requiring less investment, the more it can be adopted by small farmers. Food processing through IQF freezing may require a very high level of aggregation and investment, but the adoption of drip irrigation by even marginal farmers in Nashik shows that new

technologies can be adopted even by small farmers if it is divisible and usable in small plots of land.

Food processing through IQF freezing may require a very high level of aggregation and investment, but the adoption of drip irrigation by even marginal farmers in Nashik shows that new technologies can be adopted even by small farmers if it is divisible and usable in small plots of land.

- The three case studies clearly bring out the role of **entrepreneurship led innovation** in taking a particular cluster to new directions. This is irrespective of where the entrepreneurship is coming from. Sula wines, a purely private sector venture, took grape farming from table grapes to wine grapes, the new IQF facility build by Sahyadri farms has allowed farmers to see traditional vegetables in a new light, while the entrepreneurship by Yuv Mitra, a NGO, has allowed marginal farmers in an erstwhile rain fed area to go in for intensive cultivation in small plots of land. All three has pioneered change in the cluster and brought in farmers to a new more lucrative value chain.
- The development of Nashik as a horticultural cluster, the history of grape exports, and the three case studies show that the **transfer of value to the farmer is not simply about getting a higher percentage of the value chain as it exists, but of creating greater value in a particular chain through adopting new markets, crops, and cultivation techniques**. Only if the size of the cake grows will the value transferred to the farmer increase. Attempting to change existing traditional markets and value chains is difficult without changing the nature of the crops being cultivated. Hence transferring greater value to farmers in crops like food grains and sugarcane is much more difficult than in new crops. The farmers realise this also and are willing to take the calculated risk of shifting cropping mixes and farming practices. The question is how the incentive system for farmers to change can be introduced also in more traditional and backward areas.
- Finally, is the question of whether clusters can only develop historically through layers of innovations and new service providers entering a cluster over an extended period of time OR can the process of cluster development be planned for and induced through specific interventions? There are several cases of the latter from industry where industrial zones/estates and special economic zones has attempted to create clusters through government intervention. Sometimes it has worked and sometimes not. There are not many cases where it has worked in the case of fruits and vegetables.

6.1 Trends and Context

The development of agriculture in Bihar is vital for the state's overall development. Bihar continues to be one of the least urbanised states in India as well as one of the poorest.

Within agriculture, Bihar while being an important producer of many fruit and vegetable crops, particularly Litchi, Mango, and Potato, horticulture has yet to become the dominant subsector. Over the period 2004-5 to 2014-14 Bihar's agriculture has shown a growth rate much higher than the national average. From 2004-05 the value of agricultural output of Bihar has grown from Rs 20673 crores to as much as Rs 66419 crores in 2013-14 at current prices. Even taking out the inflationary factor in this ten year period, Bihar's agricultural growth rate has averaged 7.9 percent per annum.

The story in fruits and vegetables has however not been so exciting. The net sown area overall under agriculture over the decade has largely been constant (7646 thousand hectares in 2011-12) and so has the net sown area under vegetables (rising from 824.16 thousand hectares in 2006-07 to 844.98 thousand hectares in 2011-12). Hence no dramatic shift in the cropping mix has taken place, at the aggregate level, between food grains and horticulture. In terms of production of vegetables, between the years 2006-07 and 2009-10 there has not been much growth (ranging between 13.5 and 13.9 million Mts). However since 2011-12 there has been a slight pickup. While diligently collated statistics are available for each vegetable crop, the trends do not show any particular crop's production picking up rapidly over a short period

of time. The story is the same for fruits. The trends in production of the four major fruits crops of Bihar are given in the table below. In fact the production from year to year fluctuates slightly on both the negative and positive side in the case of fruits.

The reasons for this stagnancy, in spite of a rising domestic and global demand for horticultural

Table 5: Bihar-Production of Food Crops '000Mts

| | Mango | Litchi | Guava | Banana |
|---------|-------|--------|--------|--------|
| 2005-06 | 1223 | 200 | 198.95 | 959 |
| 2006-07 | 1307 | 212 | 247.96 | 1125 |
| 2007-08 | 870 | 223 | 255.72 | 1329 |
| 2008-09 | 1339 | 228 | 262.80 | 1418 |
| 2009-10 | 996 | 215 | 231.48 | 1435 |
| 2010-11 | 1335 | 227 | 235.15 | 1517 |
| 2011-12 | 1242 | 236 | 245.16 | 1560 |
| 2012-13 | 1343 | 234 | 238.08 | 1414 |
| 2013-14 | 1274 | 234 | 238.62 | 1436 |

products therefore needs to be looked at beyond aggregate statistics. On the negative side a whole set of informal networks' stranglehold on horticulture does not allow for rapid growth. On the positive side, disaggregated analysis does show that some sub-regions, especially around Patna and Nalanda district have picked up as emerging vegetable clusters.

The issues that hinder the sustained development of the fruits and vegetables sector in Bihar can be best illustrated by the case of two commodities - litchis in fruits and potato in vegetables.

Litchi: India is one of the largest producers of litchis in the world and Bihar leads with over 70% of total national litchi production. Productivity in litchis has been stagnant for several decades, and area has only increased marginally. The system that is followed in litchi cultivation and sale is the primary factor responsible for this situation. Litchi orchards are leased in by traders, on a per tree basis, from orchard owners, who are largely absentee landlords. All pre-harvest, harvest and post harvest operations are managed and controlled by the trader. Agreements between the traders, orchard owners and cultivator/ labourers are verbal and often the traders and intermediaries trade orchards amongst themselves within a season. This transferability of 'leases' makes it impossible for processors to enter into direct contracts with the actual cultivators. There is also no incentive for either the actual cultivator or the orchard landowner to invest in the orchard in terms of quality care and capital investment. The traders also have short term seasonal stake in the orchard. Hence the problem of productivity is not addressed at all in litchi cultivation. Wholesale prices of litchi in Bihar are the lowest in the country and their quality is the best. The prices are nearly half of what it is in Dehradun and Kolkata, the other centres of litchi wholesale. However the picture changes totally as we move through the supply chain. The price of litchi at the retail level doubles between Muzzafarpur (the premium litchi producing district) and Patna city, a distance of 100 km. It further trebles between Patna and Delhi. Wastage is also a major factor. In season a short supply of trucks leads to tremendous wastage at the orchard level itself. A value chain analysis done for a World Bank study (World Bank- Bihar Agriculture, 2007) found that 27 percent of the total margins in fresh litchi are for transportation and wastage. It is however interesting to note that in spite of all the problems, the litchi cultivator still retains over 40 % of the total value.

Hence while Bihar has been traditionally the largest producer of the best quality of litchis in India, and it is agro-climatically best suited for litchi cultivation, its productivity and production have continued to be low. There has been virtually no investments or even expenses incurred for improving plantation practices for litchi cultivation. The post harvest scenario is even worse with no investment in storage and conservation of quality. This is in spite of the fact that Bihar litchis have retained its competitive advantage in pricing domestically and globally (unlike apples). Without a change in the rules of the game which would change the incentive structure for investment at the cultivation level and post harvest level, transformation in litchi cultivation and processing will be difficult to come by.

Potato: Bihar share in India's total production of vegetables is ten percent. Within Bihar, potato is the single largest vegetable crop, which also accounts for just over 10% of the national production of potatoes. Unlike fruits, potato cultivation is dispersed throughout Bihar. Area under cultivation, productivity and production has not seen any significant change in the case of potato in Bihar over the last decade. Production hovers around 6 million Mt/annum. Potato yields are significantly lower than the leading potato growing states such as U.P. and West Bengal (less than 50% of West Bengal). While the cost of production is also lower in Bihar, potato is a seasonal crop, and due to the lack of cold storage facilities, prices are much lower in the peak harvest season of January to April. However, unlike in litchis, wholesale prices of potatoes were higher for Bihar compared to other states. Potato is a staple vegetable in a poor country and is often termed as an inferior good in economics, implying that its demand remains relatively constant or even goes down as its price goes down and supply increases. For the small and marginal farmer potato is both a marketable crop and used for self-consumption.

As to the marketing chain for potatoes, while regulated Mandis take some of the produce, unlike other states where there are many more Mandis, less than a quarter of the harvest goes through the regulated Mandis in Bihar. Although overall cold storage capacity in Bihar is limited, it is estimated that 80% of this capacity is used for storage of potatoes. For the farmer, seed costs constitute 45% of the cost of production and irrigation 21% of the total farm level cost. However high seed costs has not ensured good quality seeds for the potato cultivator of Bihar and this is one of the primary reasons why productivity is low in the state for potatoes. In terms of value retention

also, the World Bank study estimated that only 15 to 20% of the value is retained by the farmer. The wholesale and cold storage business retains the biggest margins totalling upwards of 50% in the case of potatoes.

There are little backward and forward linkages that are modern for the potato farmer in Bihar. Seed supply and production materials remain in poor quality, and there are no large processing units such as chip/powder makers. Potato farming continues to be stuck in its traditional groove and there is no modern contract farming mechanisms to transform it, as has happened in parts of Punjab and U.P. Basic cold storage and transportation continues to be issues.

The above diagnostic of the horticulture sector in Bihar shows that even though Bihar is highly suitable for development of fruits and vegetable cultivation and marketing, because the enabling ecosystem and infrastructure is absent, the sector is stuck in a stagnancy trap. The way forward has to be through creating entirely new value chains for the same set of crops, be it vegetables or fruits, that Bihar have a competitive advantage in. However for this to happen a certain break with tradition would be necessary and a massive transfer of knowledge, investment, and entrepreneurship willing to invest is required. The case studies below offers reasons for hope.

6.2 Case Study: Samriddhi

Samriddhi, a joint initiative of KNIDS GREEN Pvt. Ltd. and KAUSHALYA Foundation, was started by Mr. Kaushlendra, with the goal of transforming the vegetable and fruit supply chain in Bihar that would result in enhanced income for the marginalized farmers on the one hand and street vegetable vendors on the other. A gold medallist from the prestigious Indian Institute of Management- Ahmadabad, Kaushlendra gave up lucrative job offers from the corporate sector and dedicated himself to formulating and implementing a business model that would create sustainable livelihoods for the economically underprivileged by removing inefficiencies in the agricultural supply chain in his home state. Bihar, despite having large tracts of fertile land is one of the poorest and most populated states of India, with close to 85% of its population dependent on agriculture. Even though it was one of the largest producers of vegetables and fruits in India, agricultural productivity was low and majority of farmers were either landless or small holders who were at the receiving end of exploitation from several layers of intermediaries.

It is not uncommon to find five levels of intermediaries between the small holder vegetable farmer and the urban vegetable vendor, comprising of the village level aggregator, transporter, commissioning agent, wholesaler and the semi-wholesaler. Apart from acting as demand aggregators, these intermediaries remove information asymmetries that typically exist between the farmer and the vegetable vendors. Because they are disaggregated, the farmer and the vegetable vendor have low bargaining power and therefore become critically dependent on the intermediaries, many of whom exploit such dependency to extract significant margins from within the value chain. For example, since vegetables are perishable, many of the transporters collude to delay shipment up to a point when the farmer is forced to sell his produce at very low prices out of fear that the produce would decompose. On the other hand, when the produce reaches the vegetable vendor, he has very little margin left because of the price escalation that has happened in the process of paying off the intermediaries. The vegetable vendors, who often operate from unauthorized spaces without proper vending licenses need to bribe the local police and mafia to retain their rights of selling. Since they sell their produce from open carts and do not have access to refrigeration facilities, they are forced to sell their produce at throwaway prices towards the end of the day.

It was the plight of the grower at one end of the supply chain and the vendor at the other end that made Kaushlendra conceptualize Samridhhi as an honest intermediary that would provide all the necessary inputs to the farmer and the vendor in order to match supply and demand in a more efficient manner, and thus, maximize the farmer and the street vendors income. In 2007, after passing out of IIMA, he set up a not-for-profit organization, Kaushalya Foundation with the intention of organizing the small farmers and the street vendors, to empower them and to provide them with financial services and social security.

After studying the life of the push cart vendors it was realized that every vendor seemed to be unique, and each brought a different value proposition to the customer. Their customers, often housewives, were very loyal to a particular vendor and bought vegetables from the same vendor regularly. There was a relationship that was built between the customer and the vendor, which pointed towards the possibility of creating a brand. This provided the idea that vegetables were not really a commodity and it was possible to build customer loyalty around a brand. There was a lot of wastage at the vendor's end also. The pricing

model developed by Kaushalya Foundation assumed that 20% of the vegetables will be rotten and another 20% would have to be sold at lower than purchase price towards the end of the day. That meant that he needed to recover price and profit on only 60% of his product.

These interactions, both with farmers and vendors enabled him to crystallize his thoughts and in December 2007, he established Samriddhii™, a comprehensive vegetable supply chain system that would eliminate the existing intermediaries and establish a brand representing fresh and high quality vegetables grown by farmers in Bihar. For this, he decided to organize small scale farmers into producer groups, link them directly to local vegetable vendors as well as legitimize the role of the vegetable vendors in the supply chain.

Mobilizing and organizing the vegetable growers, farm labourers and vegetable vendors turned out to be a challenging task for Kaushlendra. In the early days, he found it difficult to earn the farmers' trust without any tangible benefit to demonstrate to them. He visited the Mandis in Patna to assess demand and interacted with farmers in Patna and Nalanda districts to understand the supply sources. While the farmers were very warm and encouraging, none of them were willing to sell vegetables to him, because they were apprehensive of leaving their existing buyers. Kaushlendra tried several methods to gain their trust and to prove to them that he was serious about what he set out to do. This included asking his elder brother to become his first supplier as well as selling vegetables himself. Finally, after almost nine months of persistence, he was able to convince some of the farmers to sell him vegetables. Samriddhii made its first noteworthy business transaction in December 2007. From then onwards, it has never looked back even though there were plenty of challenges on the way. For example, some vendors never returned the credit that they availed from Samriddhii. However, Kaushlendra decided not to fight with them. Instead, he took it as a lesson to be more careful in selecting business partners in the future.

In 2008, Kaushlendra founded Knids Green Private Limited (KGPL) that would focus on marketing and supply chain management of vegetables. This was necessary because Kaushalya Foundation being an NGO could not engage in commercial activities, take loans or work as a business entity. Knids Green bought vegetables from the farmers, used rented trucks to carry the vegetables from the villages to the cities and supplied the vegetables directly to vegetable vendors. In

order to coordinate with the farmers at the village level, Samriddhii Grameen Kendras (SGK) were setup, each of which was responsible for procuring vegetables from a cluster of villages. Vegetables were graded and sorted at SGK and subsequently transferred to distribution centres. At the distribution centres, the vegetables were further sorted, graded and packaged with a bar code. With increasing volumes, a centralized Primary Processing cum Distribution Centre (PPD) was setup in Patna, which acted as the sorting/grading, packaging and distribution center for the vegetable vendors by processing their orders.

Over and above procurement, the SGKs supplied inputs and information to the farmers. In every village, farmers formed knowledge sharing groups called Kisanclubs. The farmers were given group membership cards and were expected to abide by basic group principles, formulated by growers and facilitated by Kaushalya Foundation. Forming groups also enabled the farmers to have access to institutional financing, which are not available to individual farmers. For example, Financial Institutions like NABARD and RRBs provide loans for farming, input purchasing, equipment purchasing and related activities to farmers on easy terms, largely because the farmer groups have the backing of Kaushalya Foundation and Knids Green.

Vegetable Retailing Intervention: These farmer groups elected coordinators who worked with Samriddhii as collection agents and sent the vegetables on a daily basis to the processing centre at Patna. Samriddhii extension workers advised the farmers about the kind of vegetables that they should grow so that supply matched demand and the farmers could maximise profits. For example, farmers thought that heavier and longer gourd would fetch more money, but in reality, because of shrinking family sizes, customers did not want to buy big gourds. It was the task of the extension workers to convey such market information to the farmers so that they could adjust their produce accordingly.

Kaushalya Foundation worked with the extension services wing of Bihar's agricultural department, which till then was not perceived to be very effective in providing service to the farmers. Informally through persuasion and formally by means of workshops, Kaushalya Foundation facilitated meaningful interaction between the department and farmers. The best agricultural staff as assessed by the farmers was rewarded. This, on one hand, gave relevance and importance to the small farmers, while on the other hand made the

extension agents proactive in helping the farmers. KGPL educated the farmers on organic farming methods and provided them good quality seeds with direct linkage to the seed companies at 25% discount below the market rates. Thanks to efforts made by KGPL, the government of Bihar adopted a number of villages for organic production.

At the other end of the supply chain, the vegetable vendors were also provided with group membership cards that enabled them to have better bargaining power with the local authorities. In order to prevent them from reducing prices towards the end of the day, Samriddhii bought back vegetables that were left-over. Vendors were also asked to use time-stamped receipts to ensure freshness of Samriddhi branded vegetables. Consumers were informed, through their interaction with the vendors, that the vegetables were not adulterated, artificially coloured and informed them about the locations from where the items were sourced. Such branding of vegetables backed by the assurance of quality ensured that customers did not bargain over the prices. This made it easier to assure certain price to the farmer and margins to the vendor.

However, the most significant innovation that Samriddhii introduced was refrigerated retail carts, rechristened as Samriddhii™ AC Green Carts, for the vegetable vendors. These push carts have been developed by Samriddhii where each cart has 10 compartments that are lined with panels of solidified ethylene glycol – a coolant often used in mobile ice-cream carts or for transferring certain vaccines, which extended the shelf life of vegetables for up to five days. The single mold fiber carts are capable of transporting 200 kilograms of vegetables. Every night, the packets are returned to the Primary Processing cum Distribution Center, which then goes to the different channel of distribution the next morning. Thus, when the vendors took delivery of vegetables from the centre the next day, the carts were refilled with fresh vegetables and lined with re-solidified ethyl glycol packets. Samriddhii bought 50 such push carts using a collateral free loan of US\$ 100,000 from Punjab National Bank. Vendors usually rented the carts for a fixed daily charge which was deducted from the commissions that they received for their daily sales. In order to improve its functionality, the push carts have undergone several design changes over the past few years.

Samriddhii is flexible in their contracts with the vegetable vendors. While some of them work only on commissions, typically 10-12% of

the sales, there are others who have a fixed salary and earn a lesser commission, 5-7% of the sales. Both these models are followed because not all vendors are in a position to take the risk that is associated with entrepreneurship. Apart from the push carts, Samriddhii sold vegetables through mom-and-pop stores, departmental stores and supplied directly to restaurants and some institutions such as the hostels of Birla Institute of Technology in Patna. While earlier, to sell Samriddhii brand of vegetables, mom-and-pop stores and departmental stores had to pay a one-time membership fee, today they only pay an advance for the vegetable. KGPL have annual fixed price contract with the restaurants and vegetables are delivered daily to them. The fixed price contract insulates the restaurants from price fluctuations and the fact that they get bills from KGPL for vegetable purchase helps them in their accounting.

In 2012, Samriddhii established its first exclusive retail store – Bihar Fresh, conceptualized as standalone air conditioned outlet for selling farm fresh products. Bihar Fresh stores, with their controlled environment, offer a unique experience to customers who otherwise have the experience of shopping vegetables from places that are characterized by unhygienic conditions and unfair practices. This also provided KGPL with a platform where they can experiment with packaging and product differentiation. The investment – about a million rupees, was made from internal accruals of the company.

Producer Company Formation: As a result of the cost savings and various support services that Samriddhii provided to the farmers and vegetable vendors, they were able to successfully develop a network of around 4000 farmers from villages in five districts of Bihar – Nalanda, Patna, Arra, Vaishali and Jahanabad. Kaushalya Foundation has also formed 4 Farmer Producer Companies, namely Bakhtiyarpur Vegetable Producer Company Ltd, Barh Vegetable Producer Company Ltd, Ekangarsarai Vegetable Producer Company Ltd and Harnaut Vegetable Producer Company Ltd. They also have a network of 600 vendors operating in the city of Patna. Not only did the farmers and vendors enhance their income - KGPL estimated that farmers' income went up by 25% while the vendors' income became risk-free, prices for the end consumer remained competitive and even lower than prevailing market prices in many cases. This made everyone in the supply chain happy. For example, Gulab Chand Singh¹, a farmer from Yusufpur village in Patna district was happy because the price

that he was receiving for his produce was 20-25% higher than what he earned before, KGPL paid him in cash instead of credit and he had the assurance that KGPL will buy from him whatever quantity of vegetables that he produced. Incidentally, KGPL does not have any contract with the farmers. The relationship is based on trust and KGPL buys all the produce of their growers.

Sales and Profitability: Knids Green suffered losses during the first three years of its operations, largely because sales did not take off as expected. Customers were reluctant to buy branded vegetables where they could not bargain for prices. To attract the customers, Samriddhi offered them free home delivery as well as other incentives such as one kilogram of potato free with purchase of 2.5 kg. However, customers gradually started to appreciate the value that Samriddhi delivered in terms of freshness and cleanliness of vegetables. It also provided the customers with a cash memo for the purchases, something that was unprecedented – given the informal and unorganized nature of the business. Sales picked up soon after and by 2011, Knids Green started to sell vegetables worth INR 1.5- 2 lakhs per day, clocking an annual revenue of INR 4 crores and breaking even. Wastage of vegetables was reduced to between 7-10%.

Partnerships: In order to develop the ecosystem, Samriddhi worked with various partners. While its social arm Kaushalya Foundation continued to work with farmers helping them to form producer companies, financial institutions such as NABARD, Punjab National Bank and State Bank of India provided loans and other suitable financial products to various members and organizations involved in the supply chain. ATMA and BAMETI provided training and identification to the partners and Women Development Corporation helped in women’s empowerment by forming women’s enterprises. Their other partners included Maharashtra State Horticulture and

Medicinal Plants Board, Bihar Rajya Beej Nigam Limited and National Horticulture Mission.

Kaushlendra and his team’s efforts have been widely recognized and they have received several awards such as Villgro Awards in 2010, Sankalp Awards in 2011, Best Agro Logistics Service Provider of the Year 2012 by Supply

Table 6: Sales of Knids Green

| Financial Year | Turnover in INR Million |
|----------------------|-------------------------|
| 2007-08 ¹ | 0.76 |
| 2008-09 | 8.56 |
| 2009-10 | 20.88 |
| 2010-11 | 34.88 |
| 2011-12 | 41.22 |
| 2012-13 | 37.93 |

¹ Quoted in “Branding Greens”, D Goel, Outlook Business, 3rd September, 2011

Chain Logistics Council and Inclusive India Award in 2013 given by ICICI Bank Foundation and CNBC TV 18. Kaushlendra has also been recognized as an Ashoka Fellow and Forbes magazine recognized Knids Green as one of the 50 World's Best Sustainability Ideas.

Kaushlendra wants more players like Knids Green to come to this space to fulfil his dream of organizing the sector and supplying vegetables from Bihar to the entire country. He is confident that more competition will result in better products for the customers as well as greater opportunities for the farmers. He has started an initiative to mark the vegetable packets with nutrition information and more players would imply that customers can choose the brand that delivers higher nutritional content. Kaushlendra emphasizes that while he is in the vegetable business to make money, he seeks to share profits with farmers and generate enough employment to make Bihar the vegetable capital of India. To this effect, he wants to establish a cold chain from Bihar to Delhi and subsequently to the rest of the country. Knids Green was setting up partnerships with ice manufacturing companies along the Patna – Delhi route so that trucks carrying vegetables would be able to recharge their refrigeration packets. They also started to mobilize and work with farmers from other regions of Bihar, which could be used as alternative sources of supply in order to meet the demand for expanding operations.

Samriddhi's model of scaling involves working extensively with partners because he has realized that the entre model is very people centric and deeply embedded in the local socio-cultural context. Unless and until the farmers feel that he belongs to their community, they would not prefer to do business with him. While he has been able to win the trust and confidence of farmers and vendors in Bihar, he is unlikely to be able to gain the same kind of trust in another state. Even in Bihar they have worked extensively with local people when it came to farmer mobilization. Most of the time it was the social ties rather than commercial considerations that determined how the farmers and vendors decided. Therefore, Samriddhi would like to restrict itself to being facilitators for local entrepreneurs who would set up their own businesses. For example, they moved into Uttar Pradesh through a subsidiary company, Orvem Marketing Private Limited that was a 50-50 joint venture between Knids Green and a local partner. Likewise they have tied up with Veggie Kart Marketing Private Limited in Bhubaneswar as an entry into the Orissa market.

6.3 Case Study: Farms n Farmers

Farms n Farmers(FnF) is a not for profit organization set up by two IIT graduates from the Vaishali district of Bihar to help small farmers in Bihar come out of their drudgery and raise their income levels. FnF started working with a few farmers in 2010 and today has reached out to thousands of small and marginal farmers in seven districts of Bihar. The main objective of FnF is to support farmers through providing new and affordable technologies on the one hand and create critical awareness about the market amongst them on the other. Later on, when it started doing business directly through selling agricultural commodities, it floated another for profit entity named Green Agrevolution Pvt. Ltd in Feb, 2012.

FnF is cofounded by Shashank Kumar and Manish Kumar who are childhood friends. Having hailed from lower middleclass, rural, agricultural family backgrounds, both of them had observed the sad state of agriculture in rural Bihar very closely and long cherished the dream of improving the situation of small and marginal farmers. Their education in an elite institute like IIT and exposure to progressive countries like Belgium and China expanded their perspective of how this improvement can be brought about. Shashank gave up a financially comfortable job with a multinational company after a couple of years of working and Manish joined him. Both of them started the venture from their own small personal savings and some help from college friends.

Both of them made a thorough diagnosis on why farmers in Bihar fail to earn good income from agriculture. They realized that the farmers conventionally go for water and labour intensive crops like paddy and wheat even with smaller land holdings, instead of going for high value crops, to reduce risks, but at the expense of higher income. Further the farmers lacked knowledge on how to diversify their farm produce and had little idea about the market value chain for agri-produce.

Initially gaining the trust of the farmers itself was the greatest challenge. Farmers were not inclined to experiment with anything new as they had been cheated in the past. Many seed, fertilizer and pesticide companies used to send their salesmen to convince the farmers for buying their products through promises of higher yields through higher investment. But the companies never reappeared after one or two seasons and neither did the yields go up. Thus resisting any

change in the farmers' cultivation practices, suggested by two urban educated young boys with no ground level experience in agriculture was a most rational decision for the farmers.

Technical Expertise and Cropping Mix Changes: Taking the help of some experts in agriculture from agricultural universities and KVKs they managed to convince some farmers in one village of Vaishali district to change the cropping pattern from wheat to rajma (known as Red Kidney Beans). The yield was good and financial return was much higher for the farmers, making them more confident for change. The second experiment happened in a village of Purnea district where farmers grew baby corn and got a premium price in the market, and a much higher return than the one they got from potato and corn. FnF also started receiving generous technical support from experts in IIT Kharagapur, Rajendra Agricultural University, Bihar, Birsa Agricultural University, Jharkhand, and line departments. Currently FnF has well established working relationships with all these institutions. Besides, it has built collaborating partnerships with CRS (an NGO), NABARD, and Krishi Vigyan Kendras. On field technical assistance to the farmers, helped both FnF and the farmers in trying out new crop mixes and cropping practices, and FnF has now entered into a wide range of crops including papaya, litchi, medicinal herbs, basmati rice, maize, baby corn, mushroom, turmeric, mangraila, rajma, moong, gram and seasonal vegetables. FnF sells the farmers' produces to many retail giants as well as Mandis.

Agri Extension: To provide agri-extension and other services to participating farmers at different locations, FnF has created local centers, which are known as 'DeHaat'. Each 'DeHaat' is run by micro-entrepreneurs trained and guided by FnF on a franchise model. These centers contact the individual farmers and disseminate information about the support being provided by FnF. They collect the profile of the farmers- the land holding, existing cropping pattern, availability of irrigation, their affordability to initiate new cropping pattern etc. Awareness and training camps are organized for the potential farmers at cluster or district level about crop diversification, scientific practices and new potential crops are selected based on the soil quality. Continuous support services are provided by FNF to the farmers who chose to join. FnF's priority area has been filling the huge gap in the availability of information to the farmer. It plans to set up call centers and sms services to advise farmers on weather forecast, crop diseases

and pest management, planting schedule, and market intelligence. A wide range of services are being delivered to farmers through the mechanism of DeHaat like soil testing, seed distribution, field visit by extension agents, and produce marketing. DeHaat coordinators get a commission (approximately around 75%) on the service charge or margin paid by the farmers to FnF for various transactions such as seed supply and produce marketing. In exchange for the complete basket of services, the farmers initially agreed to pay FnF 10% of their total sale value. Now this responsibility has shifted to the buyer companies where a service charge is recovered from them and the farmers pay a nominal annual fee of INR 200 for the services they receive.

Farming Practices: As far as farming methods are concerned FnF encourages farmers to pursue organic methods of farming so as to reduce the cost of production and maintaining soil fertility. FnF has successfully adopted various innovative techniques from practices in the other part of the country including techniques of producing organic fertilizers at the farm itself. However the percentage of farmers adopting a comprehensive package of organic farming is still small. FnF expects that there would be a growing demand for organic produce in the future and therefore is in the process of building collaboration with companies providing organic packages to farmers.

Sales and Reach: In the year 2013-14 FnF's total turnover was approximately INR 3 million. At present FnF is working with more than 4000 farmers and on an average farmers realize 15%-20% incremental income due to the interventions.

FnF is adding new services to the DeHaat model, and at the same time, is also focusing on increasing the number of DeHaats to reach new locations. It is planning to set-up 100 DeHaats within the next 3 years which would have a membership of around 100,000 farmers. Adoption of organic farming on a larger scale is also being proposed. The major challenge for FnF is getting adequate human resources. It is very difficult for FnF to find talented, skilled and passionate people who want to work in rural Bihar.

FnF has so far not experienced any direct competition from any individual or organization, as most of the players do not work on the entire value chain of the produce. Though it has been quite challenging to meet the rising expenditure, FnF does not want to deviate from its mission. Shashank feels though fund is always

a challenge, it will never be an issue for FnF. He says, “It can be managed from somewhere if our will power and determination for some good work are high. As we are doing well, many IIT alumni are sending us money from different parts of India and the world.”

6.4 Lessons from Practice

There are several lessons to be learnt from the two practice based case studies of Samriddhi and FarmnFresh in the background and context of Bihar and its existing social setting and agricultural status. Some of the key lessons include the following:

- States which are traditionally agriculture based but low on overall development have very strong informal networks that mitigate against dynamic change that can transform horticulture. This is most clearly visible in the case of fruits such as litchis and mangoes where the whole land tenural system and cultivation/marketing arrangements are controlled by non-cultivators with short term stakes that go against investment and improvement of cultivation practices. The overall system leads to a situation where there is no incentive structure for any single stakeholder in the value chain to improve productivity. Working towards long term leasing of land by the cultivators directly (farmers/ corporates/ NGOs) through creation of a new orchard/land leasing market seems to be the first step in reforming agriculture.
- Farmer awareness and trust base is extremely low. This is not only because of low investment and risk taking ability by small farmers in Bihar, but because of sheer non-availability of correct information and past experience of being cheated. Both the case studies highlight the effort and challenge of gaining the farmer’s trust to change, even in a small portion of their land, the cropping mix and cultivation practices. The whole environment of lack of information and absence of extension advice leads to a vicious cycle of stagnancy. Hence investment in this is a precondition for introducing change in horticulture in states like Bihar. Expecting social entrepreneurs like Samriddhi and FarmnFresh to do this on scale is not realistic.
- The two case studies, but more so that of Samriddhi, brings out clearly that, irrespective of scale (they are still working with a catchment of less than 10,000 farmers), if interventions have to be made in the backward regions of the country there are a large number of interventions and services that need to be bundled

together, with a farmer focus, to straddle the whole value chain. A single, vertically scaled up intervention, (such as just seed supply or vegetable sale), is not possible, as in other more developed regions where other services are already available. However small one's operations are, to have impact it has to cover the whole gamut of services and interventions.

- Without devaluing the contribution of the two social entrepreneurs, the two case studies show that while success is possible in changing the whole value proposition for the small farmer in such states like Bihar, their success is like building 'tunnels' through a whole mountain range that needs to be dismantled. To bring about change on a significant scale will require both massive public investments but also bringing about complex changes in issues around land tenural laws and land leasing markets. It is said that West Bengal's primary position in vegetable cultivation in the country is because of the permanency of tenancy for small share cropper farmers through 'operation barghadar' that changed the incentive structure for them to invest in agriculture rather than other things like development of regulated and fair markets(interestingly West Bengal remains one of the few states which has not reformed the APMC act even though the regulated market structure there also has got totally controlled by traders).
- The two case studies again highlight the role of entrepreneurship, this time of a social nature that is required for spearheading change. It also highlights the role that such entrepreneurs play as both aggregators and integrators of the value chain. Enabling policy combined with dynamic entrepreneurship seems to be the mantra for transforming horticulture in India today.

7.1 Revisiting the Subsector

Considering that agriculture still continues to be the largest employer in the Indian economy, F&V as a subsector of agriculture is critical for generating employment and income. Indian agriculture is predominantly based on small farms.

There are several issues facing small farmers working on agriculture in general and several more that are specific to horticulture. These centre on security of tenure; access to inputs such as seeds, irrigation and finance; access to fair trade markets; and access to information and knowledge. All these factors combined leads to a situation where both farm productivity and income is low and farm level marketing a problem for the small farmer. The gradual decline of the government led extension system over the years has not been replaced at a countrywide level by any alternative system. In the context of horticultural crops, on the one side, farming system knowledge about new farming practices and new high value crops are not available to the small farmer. On the other side, the seasonality, perishability and often higher input costs per unit of area cultivated for fruits and vegetables, leads to higher risks for the vulnerable small farmer. What is worrying is that the increase in production from horticulture in the last two decades at the country level has primarily come from an increase in the area under production and only secondarily from productivity increases.

However this is only partially the macro picture. As this study has shown, there is tremendous diversity within the fruits and vegetable sector across regions. At the state level, both production and productivity varies widely across states. A further level of disaggregation shows that there are several clusters that have emerged within different states that have shown dynamism in taking horticultural development forward. These clusters, just one of which is Nashik in Maharashtra, as well as specific interventions for single commodities, such as for Himachal apples, and by different sets of actors, such as by producer companies, social entrepreneurs and farmer associations, show that even the small farmer can gain tremendously through adoption of fruits and vegetables as a source of livelihood, if the right ecosystem is created for them to participate proactively. These models of development provide specific pointers as to how the F&V sector can move Indian agriculture forward towards a new orbit.

As we revisit the F&V sector in India, we can place the lessons learnt from these practical success stories within the context of the initial four problem sets that were identified for the subsector - the problem of productivity, the problem of access and aggregation, the problem of integration of the value chain, and the problem of efficiencies in the supply chain.

The Productivity Problem: Yields from a majority of the fruits and vegetable crops continues to be low in most geographies where they are being cultivated in India, as compared to other Asian and western countries. The problem of low productivity essentially derives from the problem of an incentive system that inadequately compensates the farmer for their investment, risk and effort. Unless the farmer sees agriculture as a long term profitable business, s/he will minimise risk and investment for low safer returns or move to more rewarding sectors for employment.

The problem of low productivity in Indian horticulture starts from the lack of **long term tenure rights to cultivators which would incentivise investment decisions**. States which are traditionally agriculture based, but low on overall development, have very strong informal networks that militate against dynamic change that can transform horticulture. This is most clearly visible in the case of fruits such as litchis and mangoes in Bihar where the whole land tenure system and cultivation/marketing arrangements are controlled by non-cultivators with short term stakes that go against investment and improvement of cultivation practices. The overall system leads to a situation where there is no incentive structure for any single stakeholder in the value chain to improve productivity. Working towards long term leasing of land by the cultivators directly (farmers/corporate/NGOs) through creation of a new orchard/land leasing market seems to be the first step in reforming horticulture.

As the case of Bihar shows, both in fruit orchards, as well as small farm potato farming, there is no tenure security for the cultivator. Hence there is neither an incentive to invest in better practices nor is access to credit available. Contrast this with vegetable productivity in West Bengal, where permanency in tenure rights led to enhanced productivity, albeit in sub-regional pockets. In a cluster like Nashik, the small farmer with clear land titles has gone on to the next level to invest in drip irrigation and take high value multi-cropping through intensive farming. Farming essentially is a private business and without clear land ownership has not much incentive for investment.

The second major reason for slow adoption of new practices by the farmer that can raise productivity has been a **trust deficit in dealing with different players by the small farmer**. Both the case studies from Bihar highlight the effort and challenge of gaining the farmer's trust to change in the initial stages, even in a small portion of their land, the cropping mix and cultivation practices. One of the major reasons given for the initial success of Sahyadri Producer Company in grape exports was that in a year of crisis the company did not leave its farmers and paid them their full dues. **Transparency and predictability are key to farmer participation**. The fact that after the intervention by Adani Fresh, small orchard owners who saw apple growing as a season to season activity requiring no long term investment, are today investing in costly planting material and other intensive methods of cultivation for a crop that gives returns only after nine years, show that the rules of the game can be changed. The confidence of the farmers that Adani Fresh is a long term stakeholder has come about because of the investments made by them in training, changing procurement and payment practices, and investments made in the quality grading process. These in turn has all led to the farmer to predict with confidence the future of the apple growing activity. Transparency in procurement has also enabled the company to gain the farmers trust. NDDB promoted Safal's success in procurement has also come about because of proper grading, pricing, and payment systems.

The third major reason for low productivity is the **lack of information and knowledge on 'best practices' in terms of crop mix, farming methods**, and related farm management know how for the small farmer. Farmer awareness and trust base is extremely low. This is not only because of low investment and risk taking ability by small farmers, but because of sheer non-availability of correct information and past experience of being cheated. The whole environment of lack of information and absence of extension advice leads to a vicious cycle of stagnancy. Hence investment in this is a precondition for introducing change in horticulture.

In every successful case reviewed by this study, be it of grape farming in Nashik, where the know how is provided by the exporters through the Grape Exporters Association, or individually through buy back arrangements like Sula Wines and Sayhadri Farms; or in Himachal through the advice to farmers provided by Adani Fresh, **expert advice through an in-house extension system** has been a key intervention. The larger the operation, the larger the scale of the extension system. The

need for agronomists was the one need that was expressed by most producer organisations met with. It however needs to be clarified here that extension service is often taken by many promoting organisations to be synonymous to posting personnel in the field. However this is just not adequate. There is need for quality know how in the sector, as seen from grape farming for exports and wine making, where overseas experts were brought in. Expecting social entrepreneurs to do this on scale is however not realistic. The upgradation of the knowledge base at various horticulture research centres and a system to carry research to the farmer's field, especially by the public sector research centres and agriculture universities, is a must but is currently not happening either in terms of quality or scale.

A related issue in most sub-regions, where the whole ecosystem for horticulture has not yet developed, is the **availability of quality inputs** in a timely manner and that is affordable. Quality seed and plantation material availability, combined with new kinds of pesticides and fertilisers has been a major bottleneck to vegetable cultivation. That is why the first intervention that most producer companies established make is to set up a supply system for its members for seeds and other inputs. Simply put, the farmer is clear that you reap as you sow. The Devnadi Producer Company increased its membership and effectiveness when it opened what it terms an Agri Mall that gave quality inputs to its members. This has been the case for several other producer companies established in Maharashtra and Madhya Pradesh. Unfortunately even while there is a strong regulatory system in place for trading in agri-inputs that requires multiple licensing, there is no quality assurance system in place to ensure that small farmers get quality inputs. Much of the mistrust mentioned as a reason for low productivity above comes from fraudulent practices in input supply.

Productivity increase in horticulture in a sustained manner and as a natural dynamic process is actually linked to developing a whole cluster around a subsector that will have multiple products and crops. Each of these crops will have a different supply value chain. However what this density of multiple value chains does is that it makes the **farmers and farming systems adaptive to quick change**. This is repeatedly seen both in the cluster overview and case studies of Nashik. Farmers switched from grape farming for the domestic market to grape farming for exports and some to grape farming for wines. However several of the farmers, who couldn't invest in grape farming, shifted to vegetables. Within vegetables as tomatoes emerged as a value crop they switched to it and

so on. Pomegranates emerged as a new fruit crop that farmers could get into on their fallow land and farmers took this up. Therefore the more sophisticated a cluster becomes by virtue of differentiated products going into new markets, the more adaptive (we often call them progressive, but every farmer seemed progressive in Nashik) farmers become in changing crop mixes and cultivation practices. The corollary of this is that **crop diversification is a good strategy for productivity increase as it brings in new knowledge and technology that can be transferred across crops.**

Hence, not only is lack of productivity increase a result of multiple weaknesses that have crept in to the overall rural agricultural system, but also productivity increase in horticulture can be achieved through multiple routes that converges on building a new ecosystem within a whole cluster, that gives farmers both choice and profitability to adapt to change.

The Problem of Access and Aggregation: Many of the problems that we attribute to the marketing of fruits and vegetables by the small farmer arises because an individual small farmer has extremely limited access to quality inputs, market information, institutional finance, and fair marketing channels. To overcome this problem of access by individual small farmers we need what is termed as aggregation that allows for a collection of units, in this case farms and farmers, to act on scale, whether it is for purchase of inputs, distribution of credit, or marketing of produce. There is a fair amount of debate on whether the farmer is getting an adequate share of the value chain currently and whether the so called middleman is an efficient market aggregator or an exploiter. This is not the right question to ask. The real issue is that **whether the present market aggregator has enough long term stakes in the value chain to invest for its modernisation or are they trading to profit from the existing product/production system.** Hence aggregation is a problem only if we want to bring about change, otherwise even the traditional trader system is a good aggregator.

An efficient method of aggregating small farmers is a prerequisite for bringing about change within the subsector. Aggregation can happen through various mechanisms and there is not one sequence of going about it. Most producer companies start the aggregation process through better input supply and slowly graduate to aggregating for marketing. On the other hand, larger interventions such as Safal and Adani Fresh, as well as smaller market led aggregators such as Samruddhi aggregate through better collection, procurement and grading methods. Some

kind of contract farming methods are used as aggregation when there is a single specialised commodity value chain such as for grapes for wines and exports. The APMC Mandis and agents supplying to them, with all their imperfections, are major aggregators.

The Problem of Integration within Value Chains: Every product or commodity goes through some kind of vertical process of trading which is termed a value chain. As seen from the case studies, there are a diverse set of value chain integrators (large farmers, commission agents, exporters, traders, Mandis, corporate, food processors etc) that create the ecosystem that integrates the value chain. All integrators play a critical role in any non-subsistence level economy. The role played by the integrators, and whether the value added to the crop is fair or just rent seeking, because of imperfect markets, is an issue that has occupied all researchers and governments working on agriculture. Much of the policy making related to agriculture marketing has also focused on this issue right from the original APMC Act enacted fifty years ago.

Transformation requires investing in the full value chain. The two case studies from Bihar, Samruddhi and FarmnFresh, brings out clearly that, irrespective of scale (they are still working with a catchment of less than 10,000 farmers), if interventions have to be made in the backward regions of the country **there are a large number of interventions and services that need to be bundled together, with a farmer focus, to straddle the whole value chain.** A single, vertically scaled up intervention, (such as let's say just seed supply or vegetable sale), is not possible, as in other more developed regions where other services are already available. Hence value integrators under one organisation, is necessary if the system has to be transformed. One of the key roles of Adani Fresh has been that of an integrator. Once the catchment of 11000-15000 farmers have been identified and brought on board, everything that is required to transform the apple cultivation and marketing process with them is introduced. Training, plantation material, input supply, new way of harvesting and procurement are all managed by the company even before the apple gets into the CA facilities. The three CA storage facilities that the company runs is also the nucleus for integrating the value chain. In the traditional system each stakeholder was only interested and had investments in that part of the value chain where the immediate returns lay. In the case of Himachal apples without an improved procurement process on the one side and a new method of packaging apples that values quality for the market on the other, it would have been difficult for Adani Fresh to both convince and

pay orchard owner higher prices, as well as realize higher prices from apple dealers who are retailing and wholesaling apples. Further if higher value at the two ends of the chain is to be realized, there is a lot of investment that needs to be made in the intermediate links of the chain, such as better picking, grading, sorting, storage quality and packing - all sub-processes that ensures that quality is maintained. Hence incremental change in only one process in the value chain will not be sustainable in the long run.

However this need not be the case once an area or a commodity has reached a certain momentum for change. This is clear in a developed cluster such as Nashik, and a commodity such as grapes. In such a situation an **ecosystem for sustainable development** has already been created over many years, and hence any change in one part of the value chain automatically brings in a large number of players in other parts of the chain. Integration through creating a new ecosystem is therefore the alternative strategy for development, but it is more difficult and longer term. In this context, the **ability to build strategic partnerships within a value chain is critical.**

While there always existed an apple sector in Himachal and J&K, it had become stagnant to the extent that it could not even respond to the overall rising demand for apples in India and compete with imported apples which were priced after 50% import duty. Adani fresh, while intervening in and managing the whole value chain, did not make all the investments and attempt to do everything themselves. It entered into strategic partnerships with Garcia nurseries for planting material, weather forecasting companies and other input suppliers on the production side and retail chains and wholesalers on the marketing side. It made the strategic investments in the CA storage and related sorting facilities. Hence transformation can come through integrating different new players in building a new kind of value chain to build a new ecosystem.

The Efficiency Problem and Supply Chain Management: The problem of the FnV sector is not that there are a limited number of integrators. This may be the case initially in remoter non agricultural sub regions but not in geographies where FnV production is already taking place. In fact the problem is of too many inefficient integrators with no long term stakes in changing the subsector. The whole question is how efficient and effective is the system of vertical integration. The data on wastage and absence of cold chains clearly brings out the nature of this problem. Supply chain management and the inefficiencies therein locks up tremendous value in the FnV sector in India. In spite of progress in the food processing sector, given the existing production levels and

wastages therein in India, this is one area where the focus has to shift if the FnV sector is to become sustainable in the long run. Examples of most other countries where they have a dynamic FnV sector show that farm productivity and production has gone hand in hand with development of a modern and efficient supply chain management system for FnV crops, both through cold chain development and through development of an agro- processing industry. Further in the last decade in most developed economies, the development of the supply chain, and use of sophisticated technology to manage it, has been led by supermarket retail chains, often specialising in food products. This has not been the case in India. Most supermarket chains selling fruits and vegetables in India continue to buy their products from the Mandis and are not interested in transforming the production base of fruits and vegetables. Building of efficient supply chain management within the FnV subsector is one area where India has to learn a lot from other country experiences.

The FnV sector is by its very nature an integrated value chain from as they say “farm to the fork” or farmer to the retail consumer. Efficient supply chain management however is directly related to certain basic infrastructure development at the first level. We have seen how improvement in road connectivity has brought back farmers into apple growing. The development of dry ports for exports is another investment that has paid off. APEDA’s investments in certain infrastructure in specific locations has helped, but is only a drop in the ocean. Amongst the case studies, only a few larger corporates have been able to invest in efficient and integrated supply chain management systems that include cold chains. Amongst the pioneers, the case of NDDB promoted Safal is an obvious example. The case of Adani Fresh and Sahyadri Producer Company are two cases in recent times. However there are several more such as Global Green in Bangalore and other selected large corporate houses. The major bottleneck is the upfront investment that is required for establishing an entire new supply chain management system. Large scale private investment in such integrated supply chains has been hindered by the absence of an aggregated source of production of fruits and vegetables. Dispersed production base in agriculture compared to setting up an integrated industrial production plant is obviously very different in terms of management practices.

This brings us back to the integrated nature of the FnV sector. All the above four problem sets identified above are in some ways interrelated and needs to be treated as such. Productivity issues in horticulture are

more related to the problem of overall agriculture development in India. Learning from the experience of other countries, it seems that the development and modernisation of the F&V sector has to take a trajectory that is related to the problems of aggregation and integrating value chains through efficient supply chains. Just productivity increases will not be enough to sustain the growth of the fruits and vegetable sector, a situation very different from food grains, oilseeds and pulses. Finally, these are several areas where real innovation is happening in the sector and the study has attempted to map these out.

7.2 Scaling up Success: Vertical Scaling Up vs. Creating Ecosystems

The above section shows that aggregation and integration of value chains in an efficient manner is the path to make fruits and vegetables an engine of growth for development. Further that even the limited field studies conducted for the purpose of this study shows that there are several successful models on the ground for doing this. However it seems there are limits to playing an integrator role for any single organisation however big. Safal has reached a sales turnover of only Rs 600 crores after so many years, Adani Fresh has only captured 5% share of the apple market of Himachal, Samriddhi has reached less than 10,000 farmers in Bihar and so on. So the question for a policy maker obviously is how does one go about scaling up/replicating successful models.

There are three pathways to do this. First, is to get really large private and public sector players to enter into the sector. Such a strategy is unlikely to be feasible due to the very high upfront investment by one player that is required and because of the diverse production base of small farms that characterise the subsector. Hence vertical scaling up is not a feasible option if the subsector as a whole has to be developed.

The second strategy is to bring in a large number of medium sized players into the subsector. This has started happening in the sector as more and more corporate players have started entering the sector as integrators for specific sets of commodities such as Adani Fresh for apples and Global Green for gherkins. As domestic demand for fruits and vegetables picks up and becomes more quality conscious more such players will hopefully enter. Interesting the large integrators in the sector are also global players and see themselves as such.

The third strategy is to develop localised ecosystems which have a large number of players that form what is termed a cluster. Historically this is

how many industrial sectors have developed all over the world. As the case of Nashik shows, this seems to be happening in the case of horticulture also. The question for a policy maker is how can the process of development of such clusters be induced or speeded up and can the government assist in this process. The first thing to understand in cluster development is that it primarily has to be entrepreneur led. The second, that while it needs common infrastructure, such infrastructure is related to connectivity (roads in the case of horticulture, broad bandwidth in the case of IT), and not markets or supply vendors. It is important that the government does not step in with micro management of programmes or regulation. The case studies highlight the role of entrepreneurship that is required for spearheading change. It also highlights the role that such entrepreneurs play as both aggregators and integrators of the value chain. Enabling policy combined with dynamic entrepreneurship seems to be the mantra for transforming horticulture in India today. A methodology for cluster development in F&V needs to be worked out that will include mapping of emerging clusters and a diagnostic of each such cluster and what can help it grow.

7.3 Policy Reform: Role of the State vs. Free Market

We have talked very little about public policy in this concluding section, even though the study has devoted an entire chapter to it. This is because of three reasons. The first is that our survey of the sector right across the country showed that the fruits and vegetable sector as it is developing today shows that direct public investment has a very marginal role to play in developing the sector in different locations. It is farmer-entrepreneur led. The second is that where public investment has helped the sector is actually through indirect investment in such basic infrastructure as rural roads rather than in subsidised schemes or direct programme intervention. The third positive influence has been of public policy through roll back of unnecessary regulation. The enactment of amended APMC Act has been the greatest reform that the agriculture sector has seen for many decades. It has created a more competitive environment for many players and eased major barriers to entry. It is interesting that in spite of opposition from specific interest groups a majority of the state governments have seen the logic of deregulation. Agriculture is essentially a private good practiced by millions of farmers and well thought through policy sets of where government is required and where market forces should play a role is critical to the future of the subsector.

One area where the public investment had played a proactive role and that seems to have withered away is in research and extension systems.

This was very evident in all the field visits where knowhow was actually coming from private institutions rather public institutions. How to revive the whole agricultural research system is a critical question within the public policy debate.

The above may be construed as controversial statements, as many of the developed countries actually have even greater regulation in their agriculture sector. However considering that policy change is so difficult and time consuming in India, it would require far greater analysis than what this study has been able to provide for deciding on what is best done by the state and what is best left to the market. For once a policy is made in India it seems to be cast in stone.

7.4 Transferring Value: Unlocking the Value Chain for the Small Farmer

If there is one central question that this study has tried to answer, it is how the small farmer benefits from the development of the FnV sector. Hence the whole study has looked at the sector in many ways from the farmer's point of view. The conclusion that the study reaches, after all the field studies is, that transferring value to the small farmer is not just about transferring a greater percentage of the value within a chain to the farmer from the exploitative middlemen. It is in fact about first creating greater value within the chain through enhanced productivity and more efficient integration. Traditional horticulture as practiced in Bihar does not leave a share of the value chain with the cultivator that is drastically less than in other more developed markets, but the whole value created by a commodity is limited due to wastage and low productivity.

In contrast, the development of Nashik as a horticultural cluster, the history of grape exports, and the three case studies show that the **transfer of value to the farmer is not simply about getting a higher percentage of the value chain as it exists, but of creating greater value in a particular chain through adopting new markets, crops, and cultivation techniques.** Only if the size of the cake grows will the value transferred to the farmer increase. Attempting to change existing traditional markets and value chains is difficult without changing the nature of the crops being cultivated. Hence transferring greater value to farmers in crops like food grains and sugarcane is much more difficult than in new crops. The farmer realise this also and is willing to take the calculated risk of shifting cropping mixes and farming practices.

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The recent spike in fruits and vegetable prices in urban areas has been a burden to the large and expanding urban population in India and the reasons for this price rise are multifold. Over the years, several research studies of a statistical nature have been undertaken to highlight these constraints, but have been conducted in a fragmented manner. Despite the growing demand and high prices of fruits and vegetables, the primary producer continues to receive little and there are distortions of value chains in different commodities and different sub-regions. This study seeks to address this lacuna in a more comprehensive way so that the study becomes relevant and useful to institutional practitioners working in the sectors of fruits and vegetables in different regions of India.

