

INDIA
POST-HARVEST MANAGEMENT AND AGRIBUSINESS

Background Report: Apples Case Study

South Asia – Agriculture, Irrigation and Natural Resources

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Chapter 1: Background

Apple – the best suited horticulture crop for investments in preservation

Apple (*Malus pumila*) is commercially the most important temperate fruit and is fourth among the most widely produced fruits in the world after banana, orange and grape¹. Compared with most other horticulture crops, apple possesses natural characteristics (low respiration rate², thick skin / peel etc.) that endow it with a longer natural shelf life and greater extendibility under controlled conditions.

Apple can be stored between 7-26 weeks³ in a normal temperature controlled (cold storage) environment and up to 12 months⁴ in a controlled atmosphere storage in which other parameters besides temperature like humidity and oxygen levels are also controlled. Apple's consumer appeal as a healthy and popular fruit also gives rise to its year-round demand across economic strata and propensity of consumers to pay premiums for its availability in off-season times.

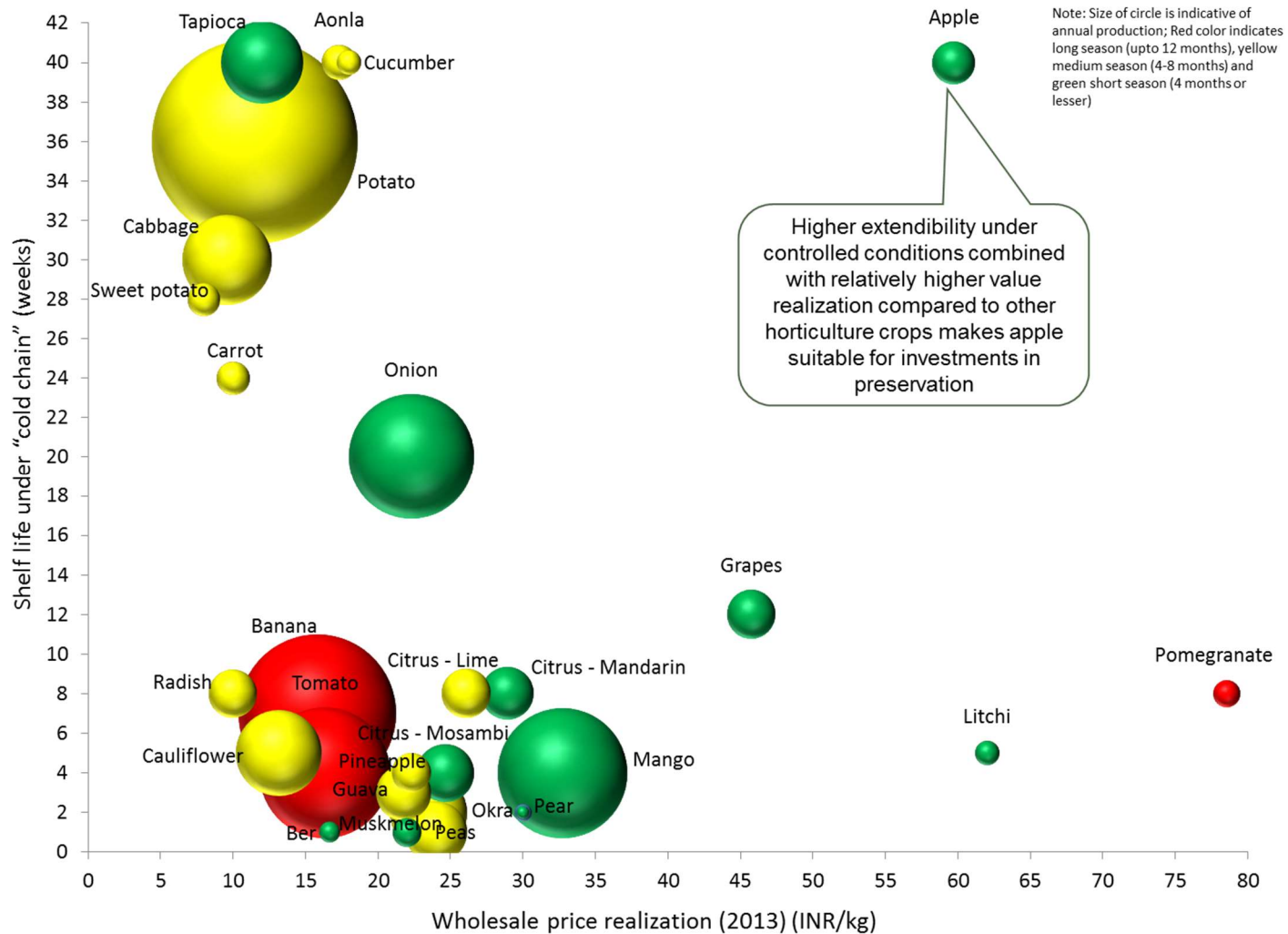
Figure 1: Suitability of various horticulture crops for investment in preservation

¹ National Horticulture Board (NHB), Government of India (GoI)

² Production Guide for Storage of Organic Fruits & Vegetables, New York State Dept. of Agriculture & Markets; available at <http://www.nysipm.cornell.edu>

³ Ministry of Micro, Small and Medium Enterprises, GoI; available at <http://www.dcmsme.gov.in/publications/pmryprof/food/ch7.pdf>

⁴ Northwest Horticulture Council, USA; available at <http://nwhort.org/about/description-of-council/>



Source: Prepared from data compiled from NHB, Agricultural and Processed Food Products Export Development Authority (APEDA), Directorate of Marketing and Inspection (DMI), Ministry of Agriculture (MoA), GoI

A look at “Figure 1: Suitability of various horticulture crops for investment in preservation”, makes it easy to comprehend why potato and apple are the two horticulture crops for which the maximum dedicated cold storage capacity exists in India. The chart compares a host of fruits and vegetables on four key parameters that together influence the suitability and viability of investments in preservation viz.

1. Value realization - indicative of gross margins between farm and consumer price)
2. Length of extension of shelf life of produce possible with available technology - indicative of the period beyond the end of harvesting that the produce can be made available for consumption
3. Length of harvesting season - indicative of period for which the produce is anyway available for consumption without using preservation
4. Total volume of production – indicative of the availability of scale to justify large investments

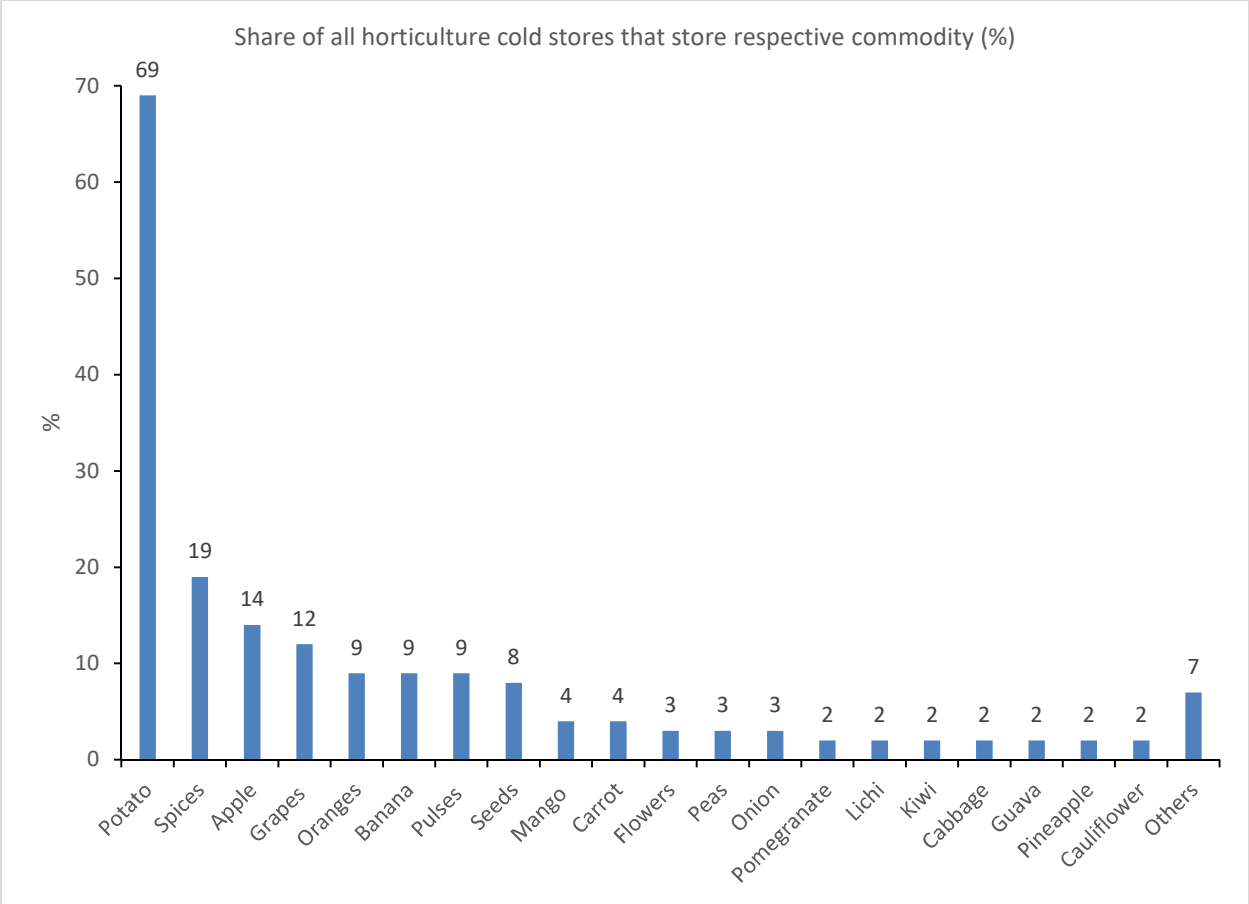
Fruits and vegetables that are high on factors 1, 2 and 4 above while being low on 3 (short harvesting season) would lend themselves best to commercial investments in preservation since they present the greatest upside potential in value were they to be preserved. Further, the physical distances between key growing and consuming areas is another influencing factor, though less so than those listed above.

With a relatively short harvesting season, availability of technology to extend its life by up to 10-12 months, high value realizations vis-à-vis most other fruits (especially when made available in offseason), high volumes of production (over 2.5mn MT in 2014) and location of mainly urban high consumption markets at significant distances from the growing areas of states of Kashmir and Himachal Pradesh, it is not surprising that apples is one of the best suited fruits for cold storage investments.

In the case of potato, even though value realization is comparatively much lower, its position as a staple vegetable and therefore sustained high demand along with its higher life extendibility makes it a suitable candidate for investment in its preservation.

An extensive study sponsored by the National Horticulture Board (NHB) involving a survey on all cold storage facilities in the country in 2013 found that apples are the 3rd most commonly stored horticulture produce after potato and spices (see Figure 2). Amongst these, apple is the only product that has witnessed investment in a technology (Controlled Atmosphere (CA) Storage) that is at least twice as much capital intensive than normal cold storages.

Figure 2: Share of storage of key horticulture commodities



Source: Prepared from data compiled from NHB

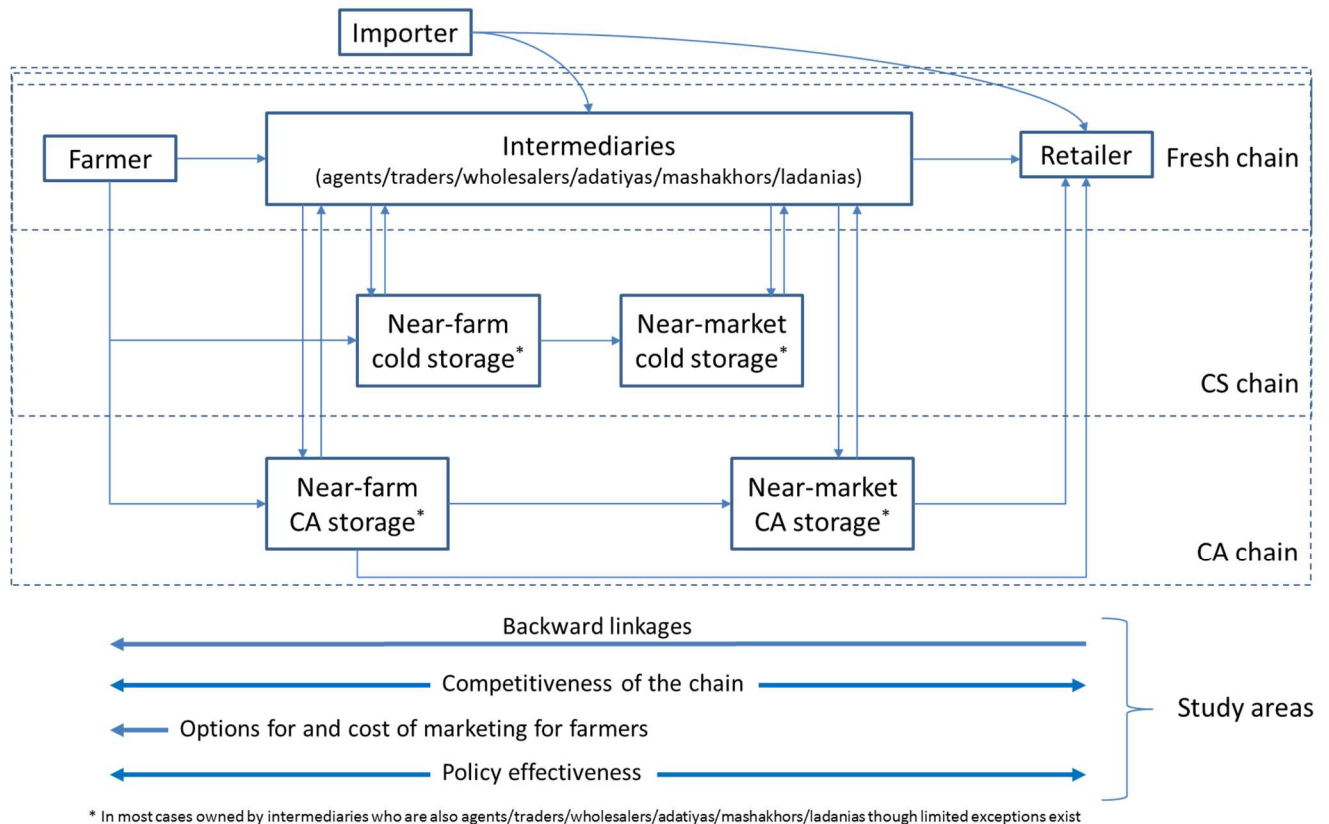
Note: Includes number of cold stores that store the respective commodity at any time during the year.

Objective

This background paper investigates reasons for the spurt in investments in apple storage over the last decade and leverages these findings to develop insights for informing government policy and investments for stimulating cold chains in horticulture crops that are beneficial to farmers.

Value chain analysis framework

Figure 3: Value chain analysis conceptual framework



Though apple's intrinsic characteristics and value realization potential make it amenable for investments in preservation, state-of-the-art technology to achieve the maximum possible lifespan of the fruit have only been deployed in India in the last 10 years and even now are sufficient to cater to only about 4.7%⁵ of the annual production. Of this, share of CA capacity located near farms is even lower at 3.1%⁶ (see Figure 4).

Value chain analysis carried out for this background report has therefore focused on other non-intrinsic factors that have driven and constrained the quantum and pace of development of controlled atmosphere (CA) technology storage for apples, particularly that which has come up close to the growing areas. These factors include, inter-alia, the policy environment, quantum and nature of apple demand and supply and market structure of storage service providers along the chain.

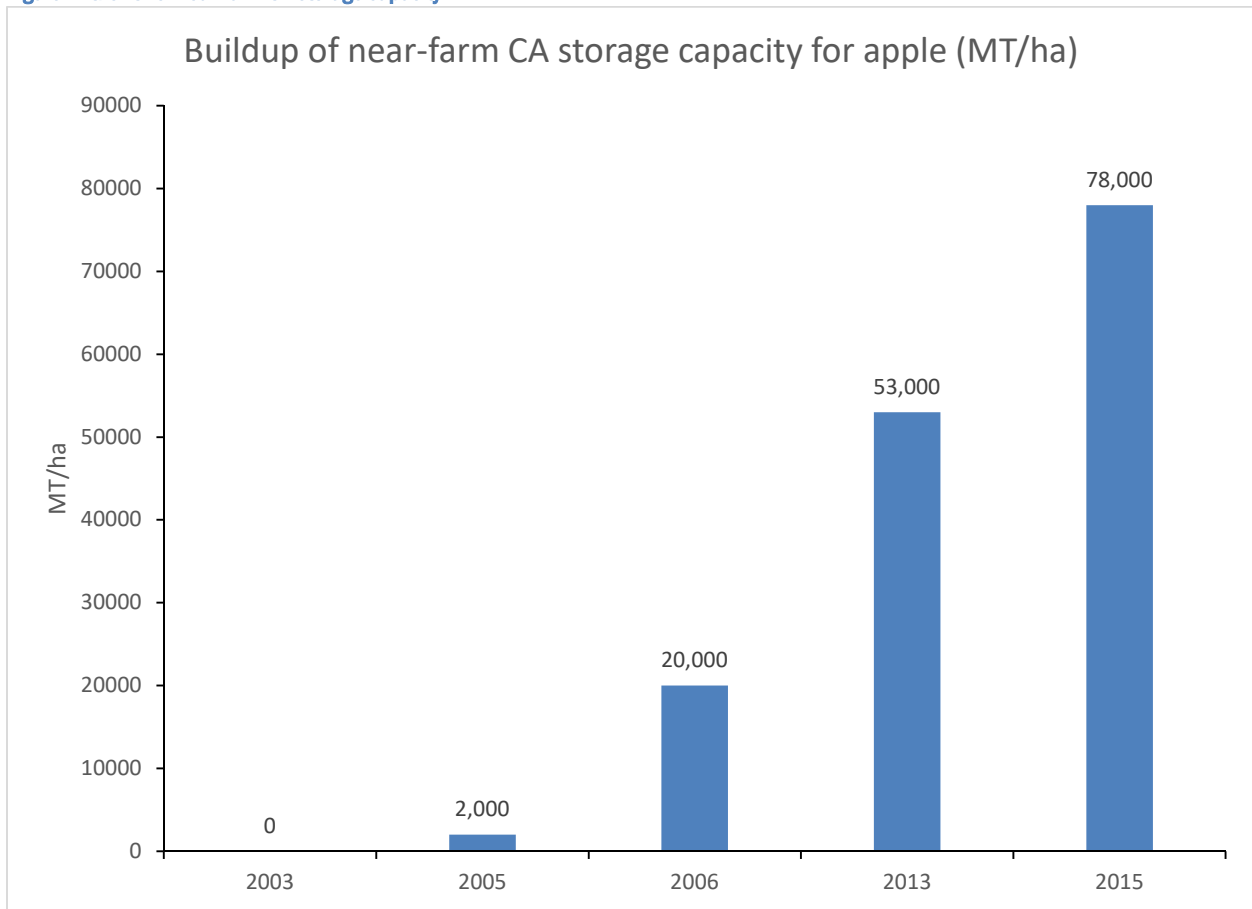
The analysis further aims to assess the impact development of CA storages has had on supply chain actors (particularly farmers) by comparing the qualitative and quantitative aspects of the key value chains that involve the use of CA storages with those value chains that do not involve the use of any storage or use only normal cold storage. The quantitative aspect has been captured by tracing the value chain from farmer to consumer capturing the (marketing) costs and margins added along

⁵ Includes only CA storage capacity. Normal cold storage capacity is typically multi-commodity and not dedicated to apple. Estimates of non-CA cold storage capacity that is available for apple range from 45,000 to 55,000MT making this figure around 6.7%. Total production for this calculation has been taken as the production in 2014-15 i.e. 2.5mn MT.

⁶ According to a study referred to in various government reports and carried out by the National Spot Exchange Limited in 2010, normally 50% of the capacity is recommended for storable surplus for select fruits and vegetables

the way while the qualitative aspects have been drawn from key informant interviews. (see “Figure 3: Value chain analysis conceptual framework”).

Figure 4: Growth of near-farm CA storage capacity



Source: Prepared from data compiled from field visits and discussions with select CA stores and CA store equipment manufacturers and news reports

To meet the study objectives, we study the structure of production (Chapter 2), dynamics of global trade in apples (Chapter 3), policy environment (Chapter 4), specific value chains that allow for comparison between the fresh and CA / cold chains (Chapter 5), the impact of these on apple prices over the years (Chapter 6) and finally conclusions on and recommendations for implementing lessons learnt from the study to further improve the state of post-harvest management in apple and to replicate the same across other horticulture products (Chapter 7).

For the value chain analysis, as described above, we have examined four specific chains – one involving the usage of CA storage, one involving the usage of cold storage and two that involve the use of neither. These chains have been traced from origin (farm) to destination (consumer) with the specific objective (as against a generic value chain study) of deriving insights for informing policy and investments to stimulate cold chains in horticulture crops that are beneficial to farmers. Key questions discussed at a broad level include

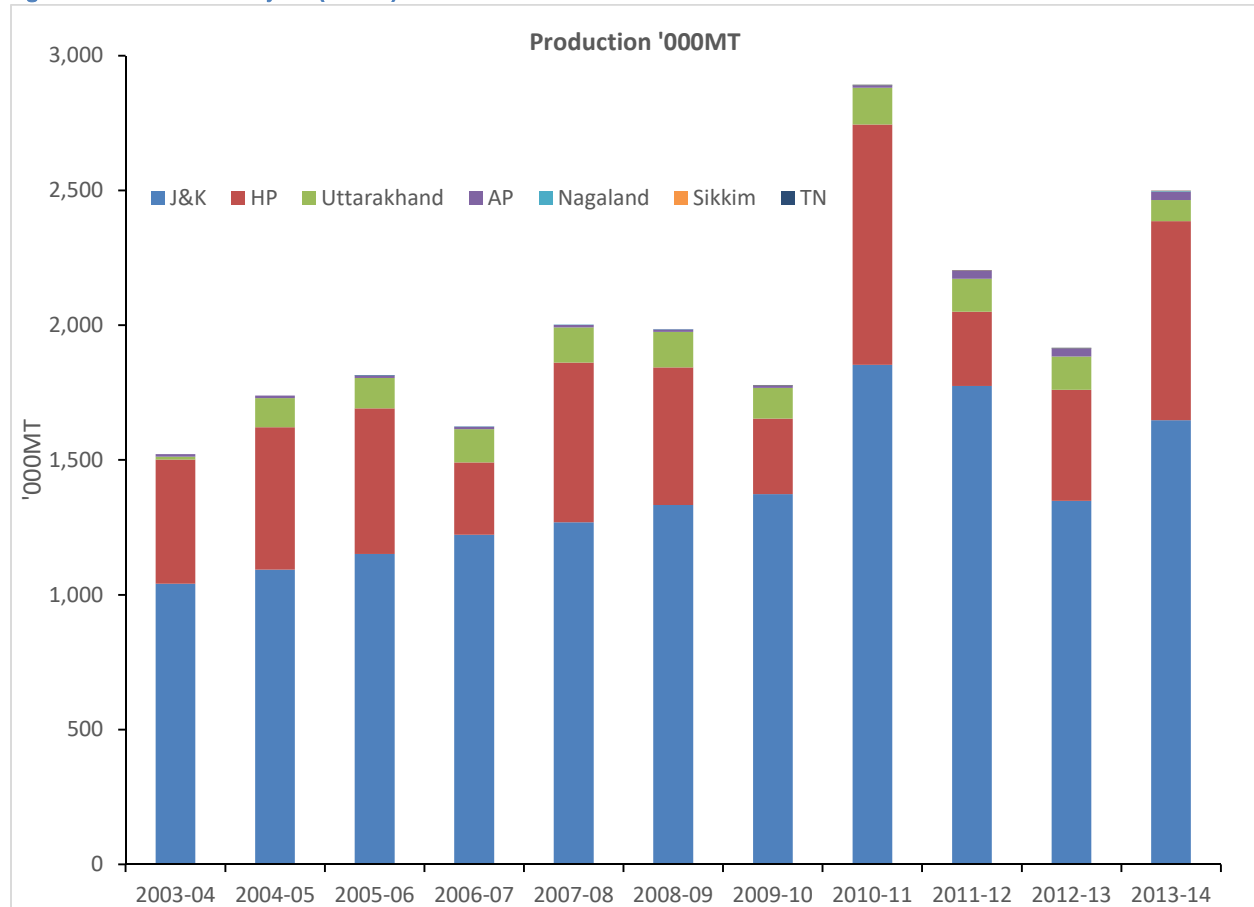
- Is the prevailing overall policy environment and specifically, the incentivization of cold storages, serving its developmental purpose in terms of better farmer realizations, lower waste in the chain, better prices and availability for consumers?
- If yes, what could be done enhance and accelerate impact in the apple chain? If no, what needs to change?
- What lessons can be drawn to replicate success across other horticulture crops?
- Is the domestic apple chain competitive (on quality and price) versus the imported Chinese and American apple chain? Why / why not?

Chapter 2: Structure of production

Apple production in India is concentrated and irregular

Apple production is primarily limited to the hilly states of Jammu & Kashmir (J&K), Himachal Pradesh (HP) and Uttarakhand. J&K accounts for the majority of apples produced followed by HP and Uttarakhand, while contributions from the other states like Nagaland and Arunachal Pradesh are negligible.

Figure 5: Production over the years ('000MT)

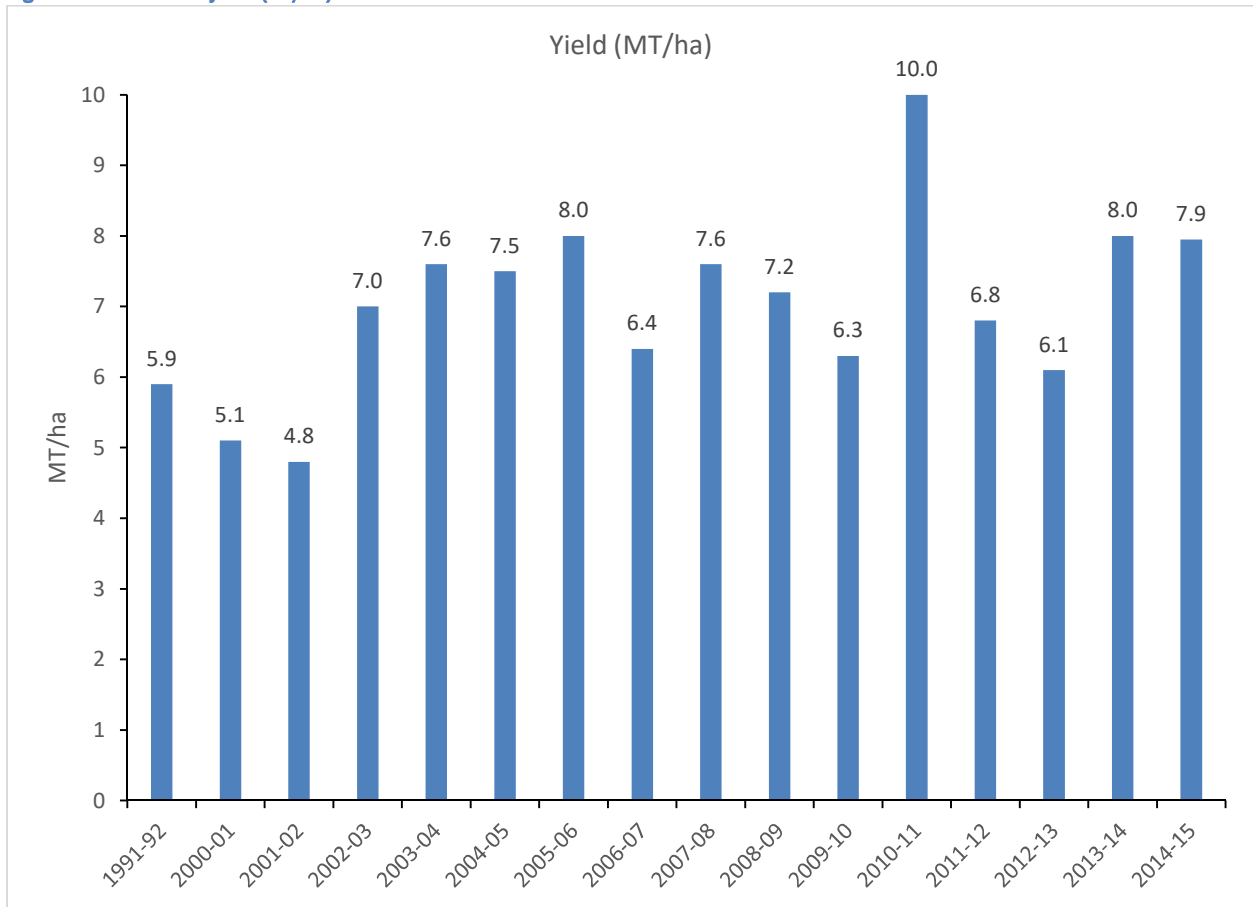


Source: Prepared from data compiled from NHB and APEDA

As can be seen from “Figure 5: Production over the years (‘000MT)”, production of apple in India has grown overall but has been quite irregular despite an almost steady increase in area under apple cultivation (see “Figure 6: Yield over the years (MT/ha)” and “Figure 7: Area under cultivation of apple”) being heavily dependent upon temperature and monsoon conditions in addition to the risk of large scale damage due to the occasional hailstorm. Also, most of the orchards, focusing on the popular Red Delicious, Royal Delicious and Rich Red varieties, are 30 to 35 year old (USDA, 2013).

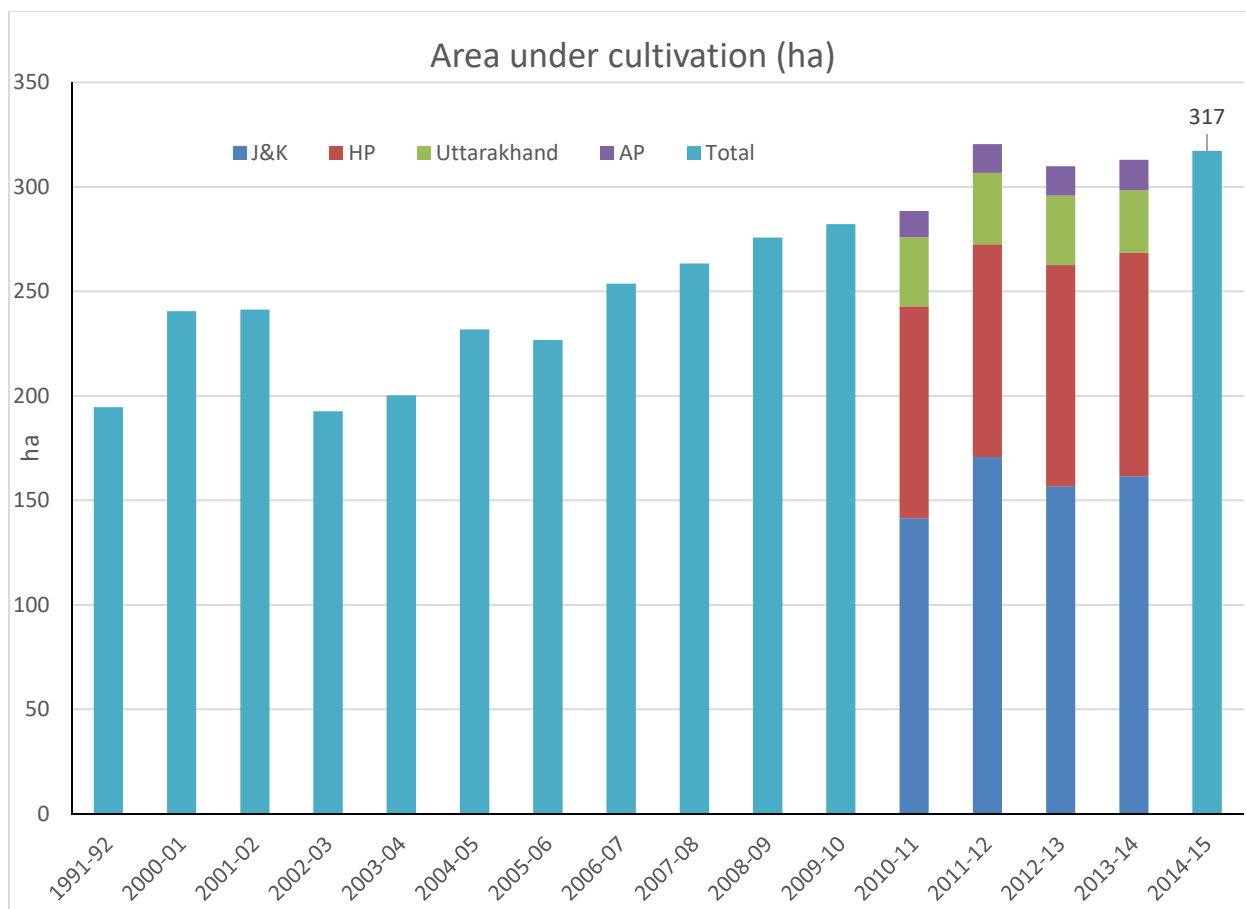
For example, apple production in HP in 2011-12 fell 70% from the previous year on account icy weather in spring which damaged the flowering apple orchards in addition to spells of hailstorm that struck many parts of the apple growing belts in the state (Business Standard, 2011).

Figure 6: Yield over the years (MT/ha)



Source: Prepared from data compiled from NHB and APEDA

Figure 7: Area under cultivation of apple (ha)



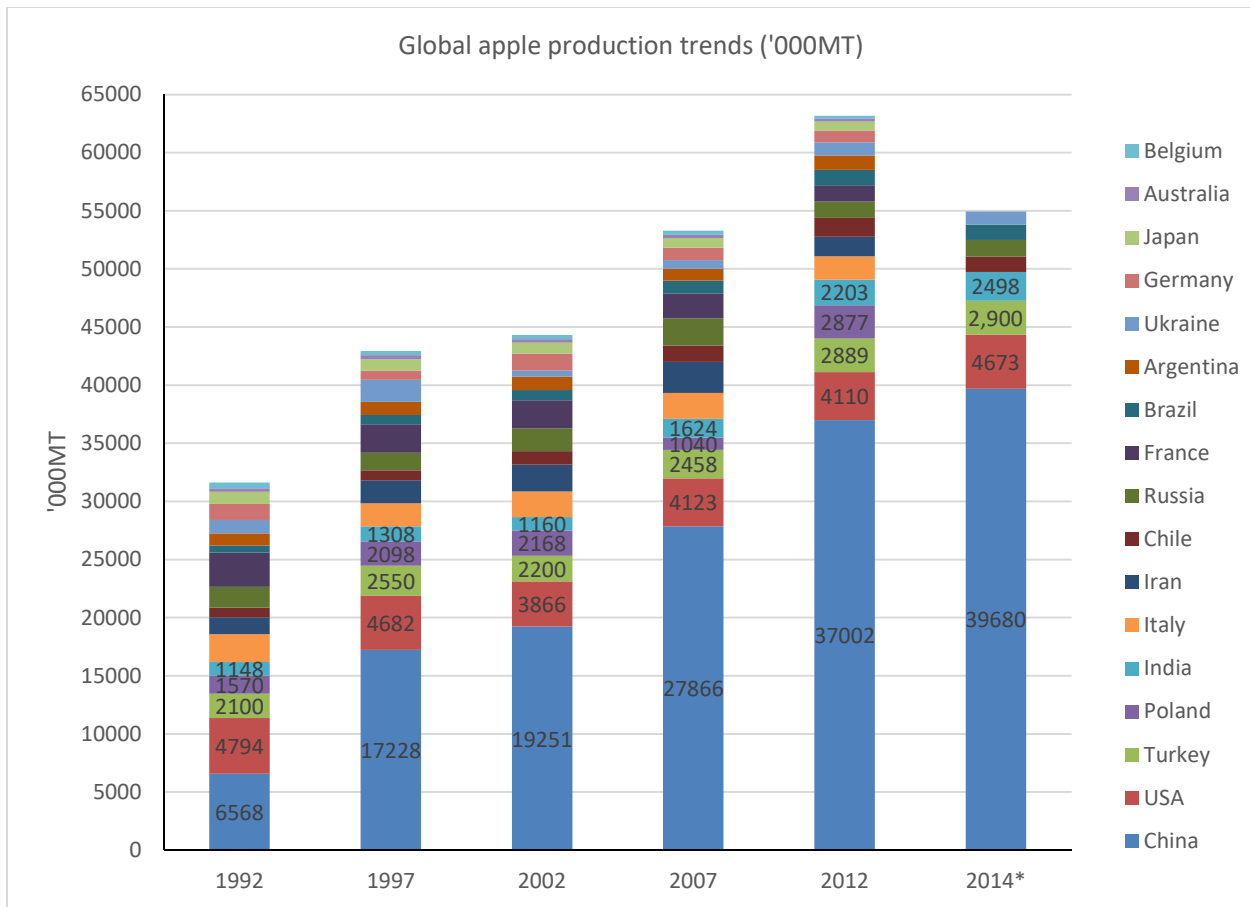
Source: Prepared from data compiled from NHB and APEDA

India has done well in terms of overall production growth over the last two decades

Over the last two decades, India's position has risen from the tenth largest to the fifth largest producer of apples in the world. As of 2014, India's production, at 2.5mn tonnes, was behind that of China, the USA, Turkey and Poland⁷. Amongst the top 10 producing countries, India's production has grown at the third highest rate between 1992 and 2012 with a CAGR of 3.3% behind China (9%) and Chile (3.4%) in this period. Production in some other large producing countries like the USA (-0.8%), Italy (-0.9%), France (-3.7%) and Russia (-1.2%) has fallen or remained largely stagnant in this period. Other countries that have grown in this period include Poland (3%), Turkey (1.6%) and Brazil (4%).

Figure 8: Global apple production trends

⁷ Based on data compiled from Food and Agriculture Organization (FAO)



Source: Prepared from data compiled from Food and Agriculture Organization (FAO)
 Note: Data for 2014 includes only China, USA, Turkey, India, Chile, Russia, Brazil and Ukraine

However, yields in India are the worst globally

At 8 MT/ha, apple yield in India is amongst the lowest globally which is in contrast to other leading producers both in the developed and emerging world. Compared to Chile's 49 MT/ha, Italy's 40 MT/ha, USA's 34 MT/ha and even China's 20 MT/ha, Indian yields fall short by a wide margin (see Figure 9: Yields (MT/ha) in key producing countries). If India's yields were to improve even to the level of China's - without any change in the area under apple cultivation – total production would rise to over 6mn MT lifting India's rank in global production to the second place and, given India's current and likely future apple consumption levels (around 2.2-2.5mn MT), turn India into one of the primary exporters of apple.

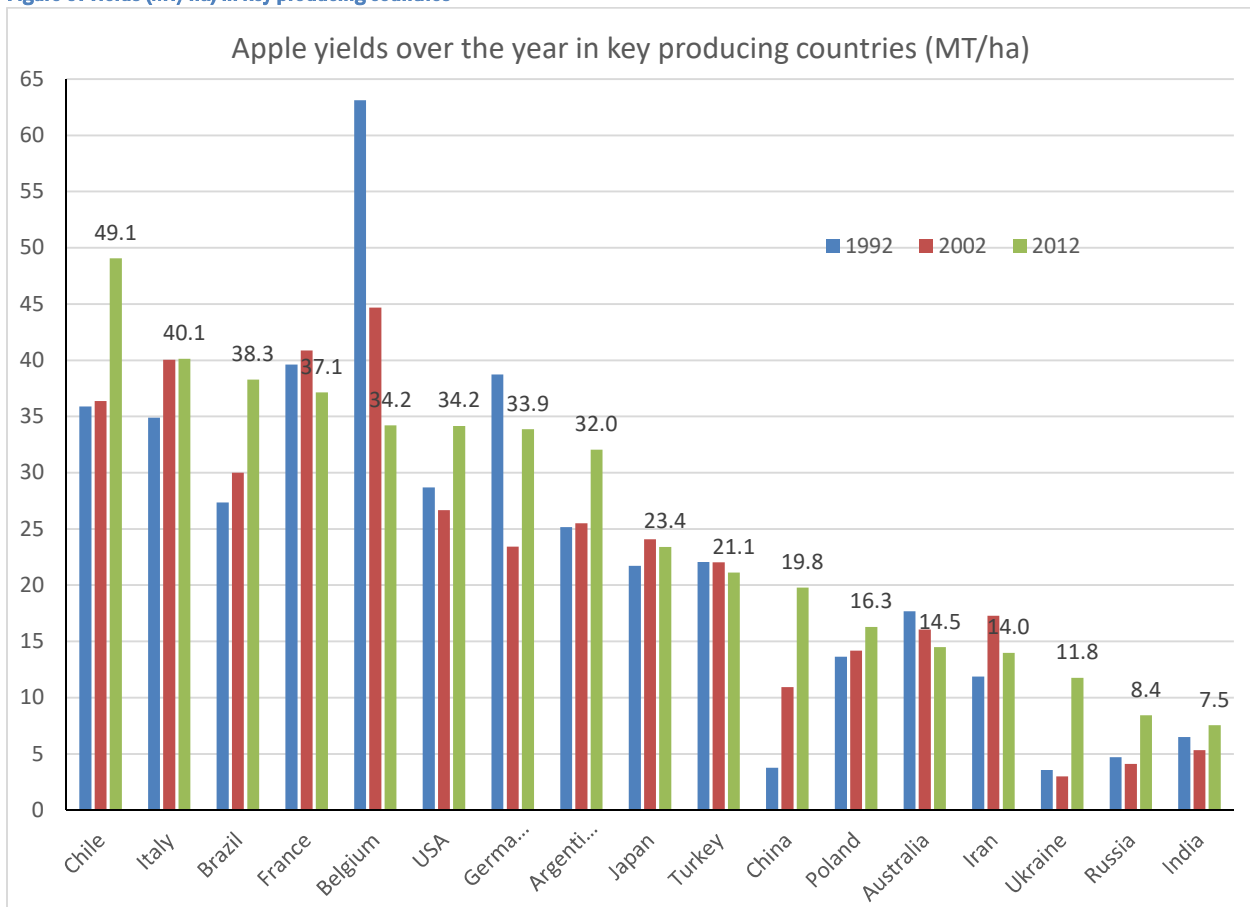
While other leading producers like China and Chile have improved yields dramatically over the last two decades and some like the USA, Italy and Poland have maintained or improved yields to an extent, yields in India have remained stagnant at the lowest level amongst peers.

Low productivity is said to be linked to a host of factors including⁸

⁸ Compiled from Economic survey 2014-15 of GoI, NHB, FAO

- Monoculture of a few old cultivars that have degenerated over the years. For example, in Himachal Pradesh, only a few old cultivars, such as Royal Delicious and Rich Red account for most of the area under apple cultivation.
- Non-availability and lack of awareness of clonal rootstocks and advanced apple varieties along with lack of adequate extension services for the promotion of technology up gradation
- Limited awareness of advanced apple farming techniques like high density apple plantations on clonal rootstocks.
- Seasonal and erratic rainfall in apple producing areas and the mountainous conditions which reduce efficiency with which available moisture is used by the crop.
- Low use of organic fertilisers and the low nutrient uptake because of the terrain.
- Weather conditions, such as spring frost and hailstorms also reduce productivity.
- Lack of concern for soil health and with very few farmers going for soil analyses tests.

Figure 9: Yields (MT/ha) in key producing countries



Source: Prepared from data compiled from Food and Agriculture Organization (FAO)

Rising production despite stagnant low yields has been mainly achieved by rapid expansion of the area under cultivation giving rise to concerns around large scale deforestation in the growing areas, especially in Himachal Pradesh⁹.

Availability of domestic apple is largely limited to 4-5 months of harvesting season

Planting is usually undertaken in the months of January and February and, though harvesting may extend from June up to November, the peak harvesting season is limited to July to October (see Figure 10: Harvesting season in producing states).

In Himachal Pradesh, which was the focus for field studies for this background paper, harvesting begins as early as June from the lower altitudes (~1500m) and extends up to November from higher altitudes (>2500m).

Figure 10: Harvesting season in producing states

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
J&K							Lean	Lean	Peak	Peak	Lean	
HP						Lean	Lean	Peak	Peak	Lean	Lean	
Uttarakhand							Peak	Peak	Lean			
AP									Lean	Peak		

 Lean season  Peak season

Source: NHB

Over the years, consumption patterns had aligned to the pattern of availability and that continues to a large extent today, with a majority of domestic production being consumed within season. However, the influx of imported apple from the mid-2000s (discussed in detail in the next chapter) revealed substantial latent demand for apple consumption in the offseason months of December to June.

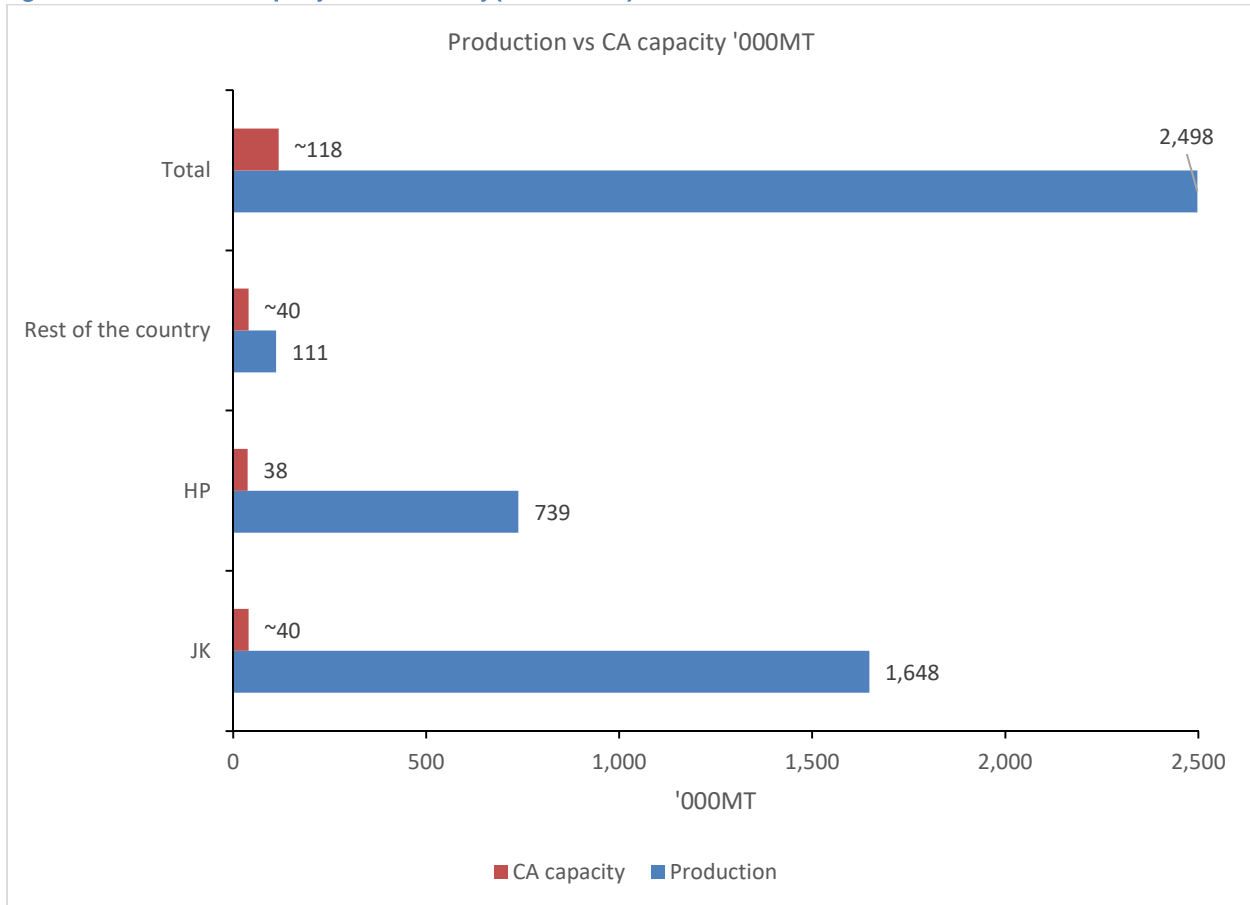
Though apples have been stored in cold storages for long, extension of availability afforded by normal temperature controlled storages (typically between 4-8 weeks) was limited making domestic apples unavailable for most of the first half of the calendar year. With the development of Controlled Atmosphere (CA) technology¹⁰ storages over the last decade, which have the ability to extend the life of apples by upto 12 months, year round availability of even domestic apple has become possible. In the recent past, consumption patterns have therefore slightly smoothed out through the year not only on account of imports but also the relatively greater availability of domestic apples in offseason periods. Though the rapid development of CA storage capacity has been a key driver of this, the quantum of such storage capacity remains small compared to overall production volumes. For example, while production in 2013-14 was 2.5mn MT, a total capacity of only about 118,000MT of CA storage was available spread across around 30 storages throughout the country. About 30% of this capacity was near the markets while 70% closer to the

⁹ Compiled from interviews with farmers in Himachal Pradesh; Report “Deforestation and Village life”, Ramesh Kumar Jha, 1999 and “Not so delicious” article in newspaper, Mint, 2012.

¹⁰ CA storage involves careful control of not just temperature but also of oxygen, carbon dioxide and humidity levels. These storages employ a non-chemical process where Oxygen levels in the sealed rooms are reduced, usually by the infusion of nitrogen gas, from the approximate 21 percent in the ambient air to 1 percent or 2 percent with temperatures being kept at a constant 32 to 36 degrees Fahrenheit. Humidity is maintained at 95 percent and carbon dioxide levels are also controlled. Exact conditions in the rooms are set according to the apple variety.

farms in HP and J&K¹¹. In addition to this, the capacity of normal cold storages that is utilized for storing apples can vary widely depending upon production levels, expected and actual availability of imported apples and prevailing prices^{12,13}. (see Figure 11: Production vs CA capacity across the country (as of 2013-14))

Figure 11: Production vs CA capacity across the country (as of 2013-14)



Source: Prepared from CA capacity estimates derived from compilation of data from NHB, several interviews (see Annexure 1: List of meetings), ICE Magazine, Jan-Mar 2014 and news reports

Note: CA capacity under “Rest of the country” is located close to consumption centers or hubs – primarily Delhi, Chandigarh while rest of the production is mainly from Uttarakhand and Arunachal Pradesh

Thus, in the case of Himachal Pradesh, except for the ~5% apples that are sold directly to HP-based CA stores, almost all the produce gets pushed through the fresh apple distribution channel which is spread primarily between mandis located in Delhi, Chandigarh and HP (Dhalli, Parwanoo, Rohru). Over the last few years, some produce also gets channeled through “private mandis” located in and around the growing areas and some that is sold directly to traders from all over the country who come and buy at the farm ever since HP reformed its APMC Act. In addition, some

¹¹ CA capacity estimates based on data from NHB, several interviews (see Annexure 1: List of meetings), ICE Magazine, Jan-Mar 2014 supported by Global Cold Chain Alliance (GCCA) and news reports.

¹² Cold storage capacity is often used by traders even during season for short term storage of apples that have already arrived at the mandi in response to prevailing prices. This is a key reason for substantial cold storage capacity of apples at and near the Azadpur and Chandigarh mandis which have traditionally been hubs for redistribution of apples from Kashmir and HP to the rest of the country.

¹³ According to an estimate by consultancy firm, Deloitte around 15000-20000MT of cold storage capacity is utilized for apples in HP. A rough estimate of overall such capacity across the country can be obtained by extrapolating this number using the total production. This would result in an estimated capacity of 45000 – 55000 MT of cold storage being used for apples.

portion of the produce is also directed towards CA and cold storages located outside HP by commission agents on behalf of farmers and / or by traders after direct or mandi purchase.

The ~5% of HP's production that finds its way into CA stores located within HP is procured starting mid-August up to the time that either capacity is fully utilized or the harvesting season closes, whichever happens earlier.

The pace and exact period over which CA stores ramp up storage volumes is highly variable each year depending upon the CA store owner's perception of their ability to make reasonable markup on the sale in offseason. This in turn is dependent upon several variables that change each year including

- Production volumes
- Expected global apple demand-supply scenario
- Expected landed price of imported apples at key consumption centers
- Total available CA capacity
- Expected production volumes of other key fruits¹⁴

For example, in the harvesting season of 2011, Adani Agrifresh, the largest CA storage capacity owner and operator in HP, was not able to procure enough apples to utilize its full capacity. A poor harvest resulted in relatively higher prices during season making it challenging for the company to match prices farmers were getting at the mandis. These prices were perceived to be uncompetitive given the expected offseason prices thus raising doubts about the sufficiency of the expected offseason markup to cover the costs of storage with a desirable margin¹⁵.

Irrespective, typically CA stores in HP start buying from farmers in mid-August¹⁶ and continue procurement up to the end of the season around end-October. Since CA storage is not equally effective for all grades and varieties of apples and typically the quality conscious buyers of apples in off season demand superior quality, the stores are highly selective in the grades of produce they procure. As the best quality of produce comes from the highest altitudes where harvesting is carried out towards the later part of the season, procurement typically continues throughout the season.

Similarly, the ~2.5% of Kashmir's produce that finds its way into CA stores located within Kashmir, is procured starting mid-September.

As far as release of apples from CA stores is concerned, the exact timing varies for each store and based on the store owning company's expectation of future prices, prevailing import prices and desired margins. In most years, release of apples from CA stores commences in large quantities only from January though small quantities may be released as early as November. In case large quantities are stored in normal cold storages¹⁷, CA stores are likely to start releasing their quantities

¹⁴ Apple consumption reduces during offseason if the supply of mango and other fruits is abundant and / or starts early. Source: Industry interviews

¹⁵ Interview with management

¹⁶ Even though harvesting starts in July, CA stores' procurement picks up in August since the first harvest from the lower altitudes is not considered suitable for CA storage.

¹⁷ Quantities actually stored in normal cold storages depends upon traders' expectations of imported apple availability and prices – higher quantities will be stored if imported apples are not expected to be abundantly available at comparable prices to that which they would be able to offer absorbing the cost of cold storage in addition to their margins

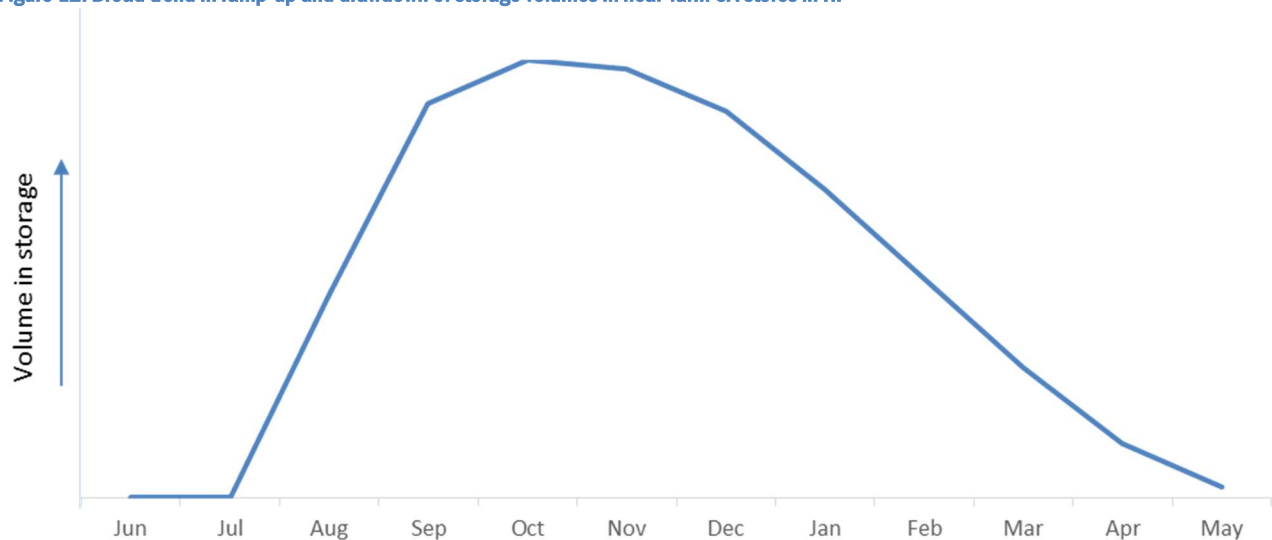
later. The decision on when, how much and at what price to release apples from CA stores depends upon the following key factors:

- Prevailing availability and prices of imported apples
- Assessment and expectation of quality deterioration in storage¹⁸
- Company’s internal targets on margin and returns
- Expected harvest of substitute fruits like mango

Stakeholders, including the key CA store owners in HP who were interviewed, mentioned that most Indian apples, even of the best grade, start deteriorating beyond 8-9 months in CA storage. For this reason and the increasing availability of substitute fruits as summers approach, CA store owners drawdown stored apples from CA stores in such a way that the stores are typically empty by end of May.

A broad pattern of utilization of CA storage capacity over the months for near-farm stores in HP is provided in “Figure 12: Broad trend in ramp-up and drawdown of storage volumes in near-farm CA stores in HP”

Figure 12: Broad trend in ramp-up and drawdown of storage volumes in near-farm CA stores in HP



Source: Interviews with key CA stores

“We try to sell out our stock by April, maximum going up to May; after that quality deterioration is high and mango crop starts to come in the market so demand tempers; after this only very selected people buy apples and they buy imported apples”

- Business Development Head of prominent CA storage in HP

¹⁸ Whether and to what extent apples stored in CA stores maintain their freshness and quality is dependent upon a host of factors including maturity and quality at the time of harvesting, variety, size and grade of apple stored, maintenance of required parameters for storage efficiency etc.

Chapter 3: Trade in apples

Demand in India, especially in offseason, outstrips supply leading to rising imports

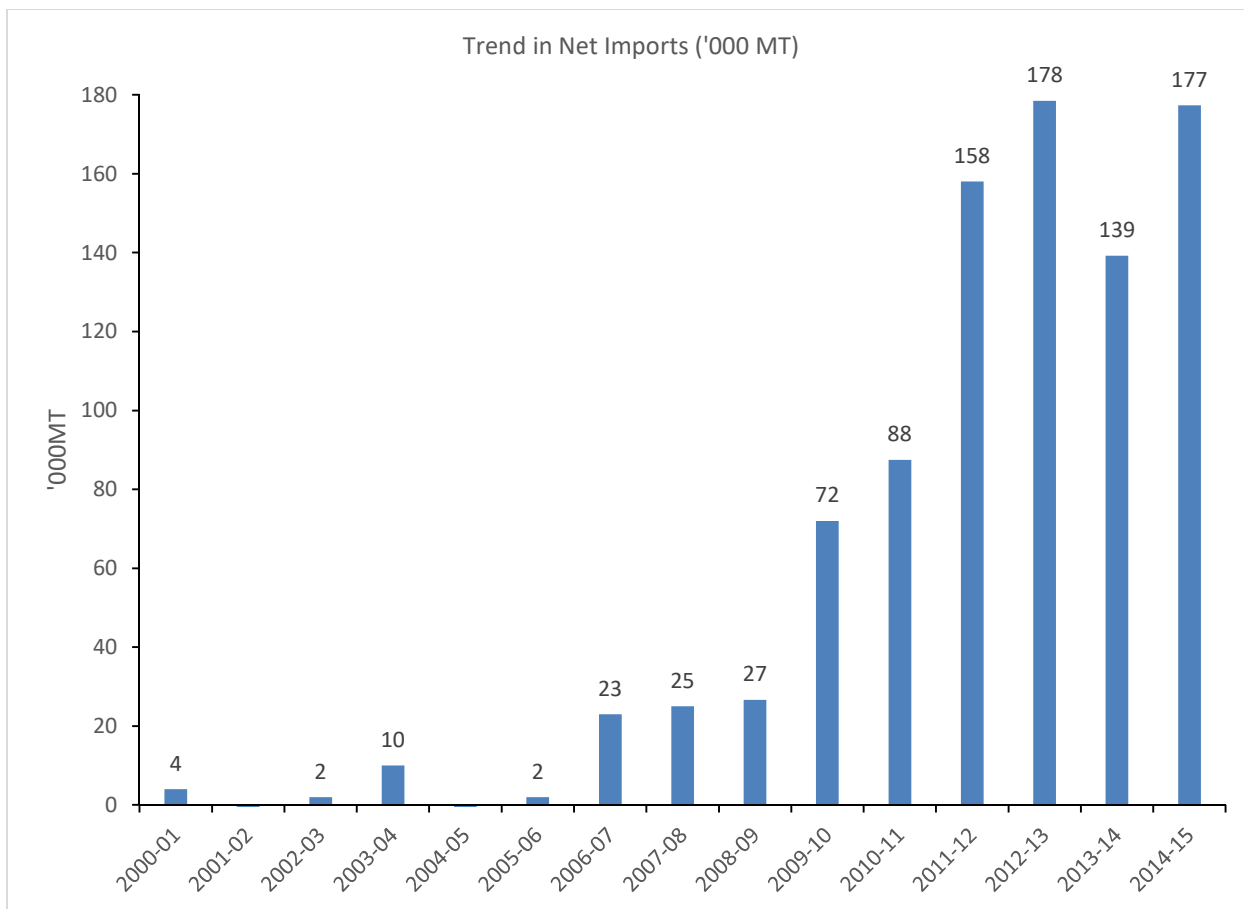
Apple is currently the most heavily consumed imported fruit in India with rapidly rising demand. The major factors fueling apple demand are increasing population, growing disposable incomes, improving lifestyle, health awareness and India's tradition of vegetarianism.

Despite being one of the largest producers of apple in the world, India faces a supply gap in its domestic apple market as increasing demand from the growing middle class meets limiting factors such as seasonality, geographical separation between cultivation and consumption areas and limited infrastructure (USDA, 2013).

With stagnant yields set against rapidly rising consumption and India's low per capita apple consumption (1.35 kg per year compared to 36.8 for Turkey, 16.2 for France, 14 for China and 9.7 for the USA), the gap is only expected to increase going forward.

It is not surprising therefore that the share of imports in total apple consumption in India has witnessed a steady rise from negligible in early 2000s to 7-9% by mid 2010s despite imports being subject to the highest permissible slab of import duty of 50%. (See Figure 13 and Figure 14: Trend in production, imports and exports)

Figure 13: Trend in net imports



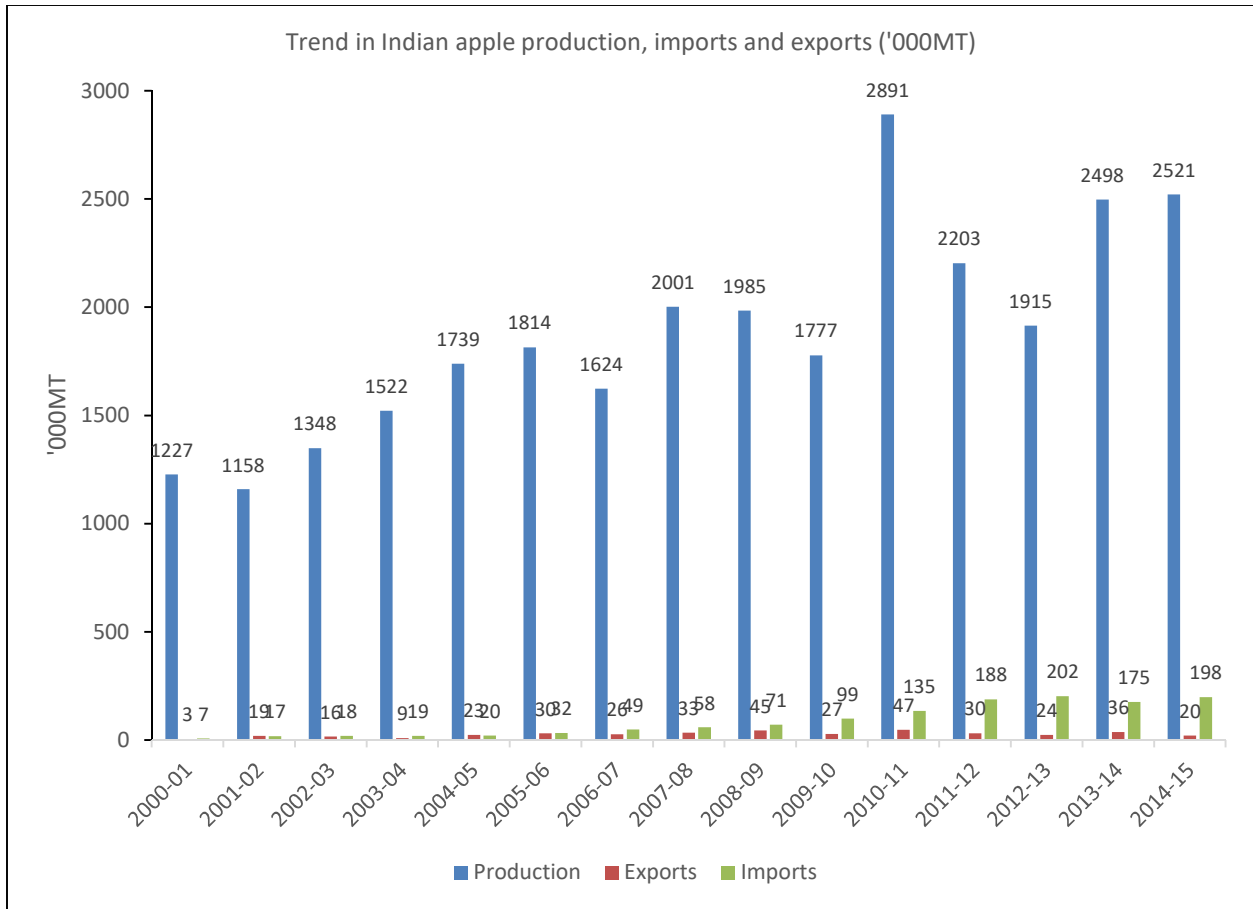
Source: Prepared from data compiled from APEDA

While India’s imports comprise premium quality apples (average import price INR 70/kg¹⁹), exports are typically low to average grade apples (average export price INR 26/kg²⁰) that are exported primarily to the neighboring countries like Bangladesh and Nepal indicating a rising demand for premium quality apples in India that remains unmet by domestic production.

Figure 14: Trend in production, imports and exports

¹⁹ APEDA, 2014-15

²⁰ APEDA, 2014-15



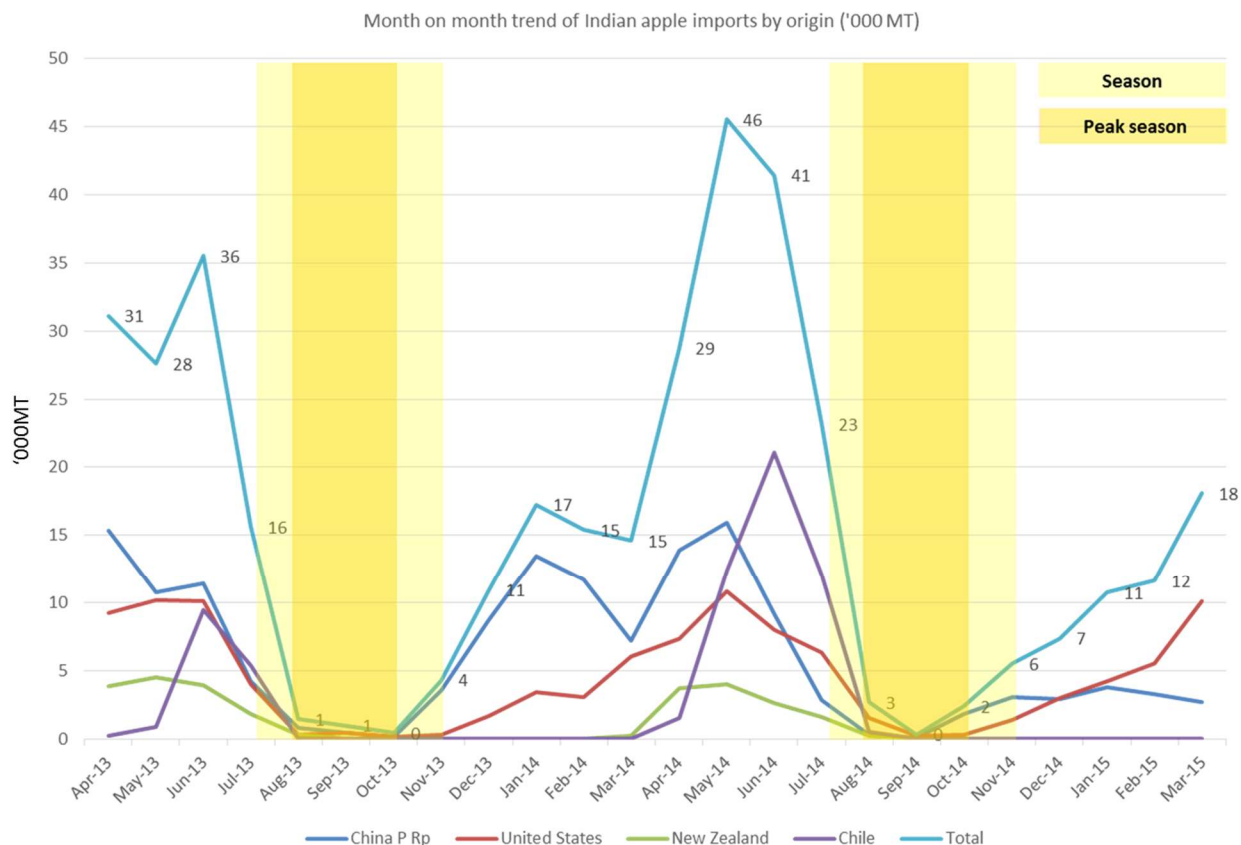
Source: Prepared from data compiled from APEDA

As can be seen from “Figure 15: Pattern of import inflow”, import volumes start picking up in November when the domestic harvesting season is near closure and availability of domestic fresh apple starts to dwindle, and peaks in May-June just before fresh domestic produce of the subsequent season starts to reach the market in July. Exports, on the other hand, are concentrated during the season months (August – November) indicating that while there is excess supply during season, supply falls short of demand during offseason months²¹.

The resilience of imported apple demand is also substantiated by the fact that even in the year that witnessed a historic bumper harvest – 2010-11 – imports rose by 35%!

Figure 15: Pattern of import inflow

²¹ APEDA



Source: Prepared from data from APEDA

Quantum, quality, price and source of imported apples are driven by various factors

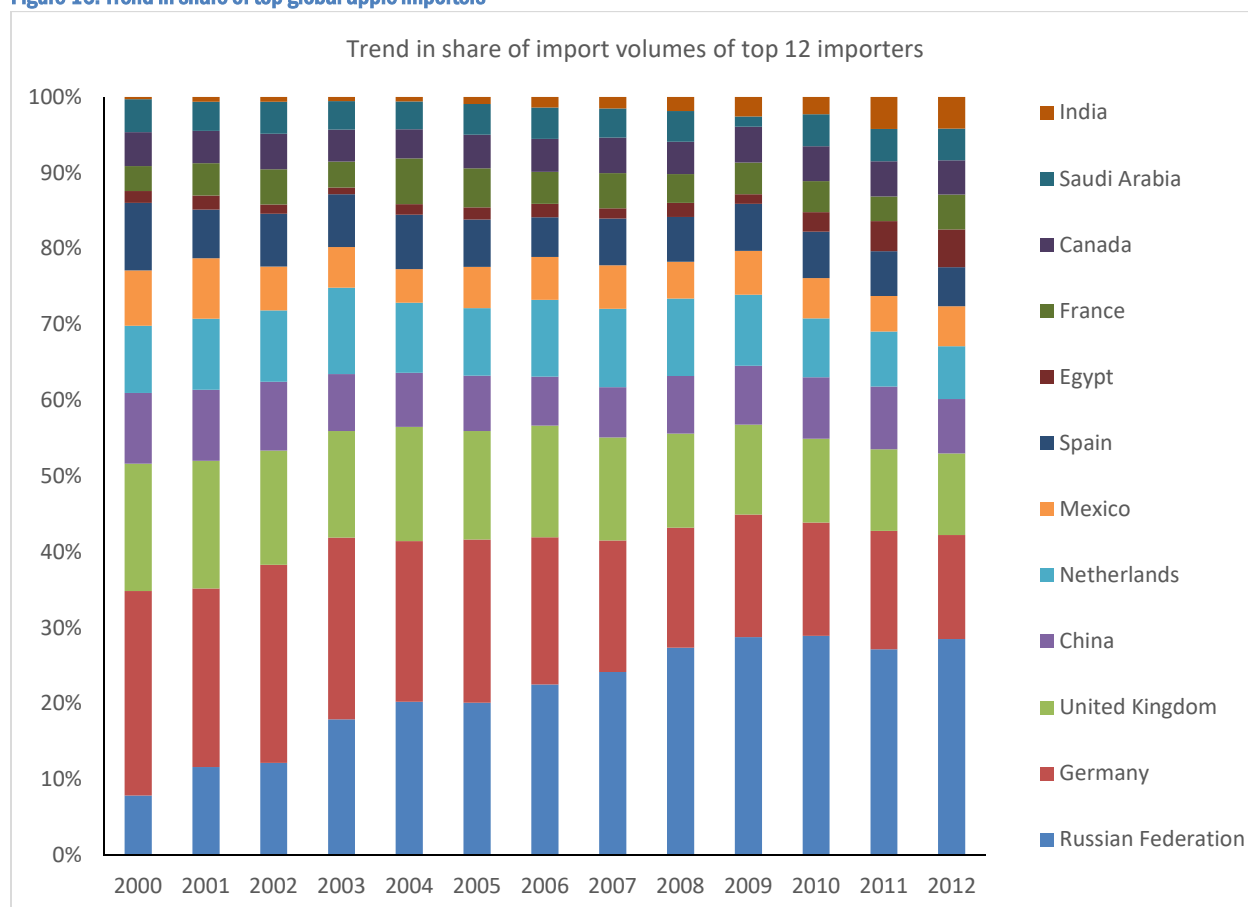
The rise of imports served the useful purpose of opening the eyes of domestic traders and farmers to the potential for realizing higher value from domestic supplies, provided that the supplies could come close to imported apples in terms of quality and availability in offseason months²².

Not only did this ignite private sector interest lured by the attraction of benefitting from the markup on apple prices sold during offseason, it led the government to also aggressively support development of infrastructure for preservation of apples for long term storage besides pushing through the larger reform process in agriculture marketing. Specific initiatives of the central and state governments and the investments made by private sector in this regard are discussed in the next chapter.

Notwithstanding these developments, the current trend of India accounting for larger and larger share of global apple imports (see Figure 16: Trend in share of top global apple importers) demonstrates that this progress has perhaps been too little and / or too late.

²² During interviews with traders and farmers, this was consistently highlighted as a key reason for the efforts seen over the last 10 years for improvement in post-harvest management including development of Controlled Atmosphere storage capacity and reform of agriculture marketing (discussed in the next chapter)

Figure 16: Trend in share of top global apple importers



Source: FAO

The primary sources of Indian apple imports are China and the US, followed by Chile with relatively smaller volumes being imported from New Zealand, Italy, Iran, Afghanistan, France, Belgium and Turkey.

While imports first started from the US where the variety closest to the Indian palate – Red Delicious – is abundantly grown, Chinese imports overtook those from the US on account of several factors including

- lower delivery lead times²³ and competitive prices²⁴
- better availability of other premium varieties not available in India like Fuji and Gala varieties²⁵ and
- increasing availability of the main Red Delicious variety from China as against a decreasing share of this variety grown in the USA²⁶

²³ 20 days voyage time from China versus 50 days from the US

²⁴ Average import prices from China in 2013-14 were INR 62 versus INR 77 from the US. Source: APEDA, Department of Commerce, Ministry of Commerce and Industry

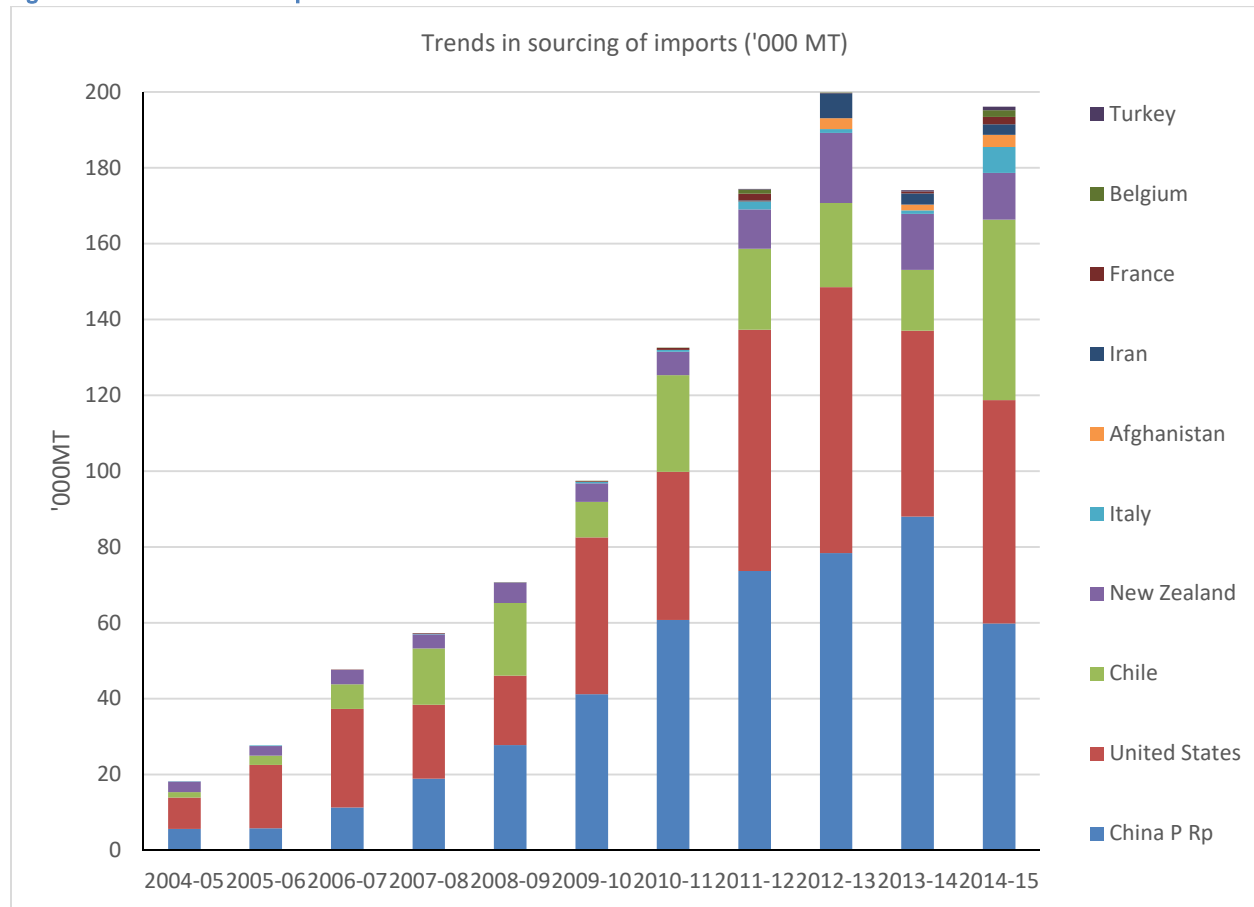
²⁵ Fuji apples are the most commonly grown variety in China accounting for 70 percent of apple production. Gala's account for 6 percent of Chinese production, while Delicious and Qinguan, a local variety, account for 9 percent and 7 percent respectively. Source: USDA, 2014

²⁶ Production of Red Delicious variety in the USA has fallen from 31% to 25% of total production between 2004 and 2012; Sources: World Apple and Pear Association, Belgium and The Atlantic Magazine, USA

However, given the dynamics of global trade which is impacted by production uncertainties, evolving tariff and non-tariff trade barriers and variations in consumption patterns by variety, there can be large inter-year variations. For example, in the current year, the supply of Chinese apples for Indian imports has been limited on account of the recent opening up of US markets for Chinese Red and Golden Delicious apples²⁷. On the other hand, US apples have become more easily available after the Russian Federation – the largest apple importer in the world – banned imports from the US and EU.

Nevertheless, over an extended period, it is clear that Chinese share of Indian imports have steadily risen and could remain one of the most substantial sources of import for India (see Figure 17: Trend in sources of imports).

Figure 17: Trend in sources of imports into India

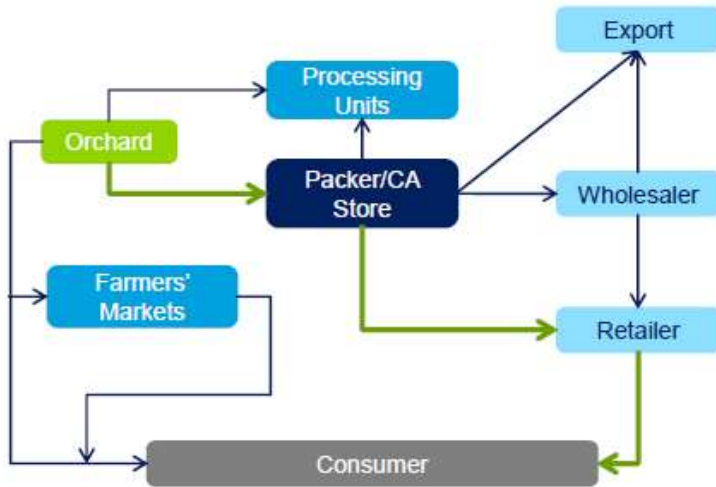


Even though harvesting season in the US and China largely coincides with the season in India, excess production and superior post-harvest management including the availability of sufficient capacity of cold and controlled atmosphere storage enables exporters in these countries to deliver apples to India much beyond the end of their harvesting season. Imports from both the US and China start around the end of October, peak between the months of March to June and continue

²⁷ The Packer, Fresh fruit and vegetable news magazine, USA, 2015

till July even though harvesting season closes latest by between November – December in both countries (Reynolds et al, 2005).

Apple Value Chain in the USA



Description

Packhouses with CA / Cold Store are an integral part of chain apple value chain in the US. A small percentage of sale (15-20%) is done directly from the farm through farmers' markets with the balance moving through an organized packhouse which caters to the requirements modern retailers, wholesalers and exports. The most important intermediary in the value chain is the packhouse which typically is integrated with a CA / cold store.

Apples are stored in CA facilities for durations ranging from 6 months to 1 year. The number of CA storage facilities in the US is estimated to be almost double the number of cold stores. (Source: USDA)

Legislative requirements

- An annual license and annual license fee is required for CA store operations
- The oxygen content and temperatures in the CA stores are maintained in accordance with the guidelines set by the State Legislatures
- The minimum length of time of CA storage for different fruit varieties has also been prescribed
- Daily determination of air components and monitoring tests carried out in the facility have to be maintained and submitted to the State Legislature
- Maturity and condition standards for various grades of fruits have been defined
- The identity of fruits stored in a CA store are monitored post CA storage through the channels of distribution
- Penalties for CA store operators not following any of the defined legislations is levied

Apple Value Chain in China

Storage methods

Traditional Storage

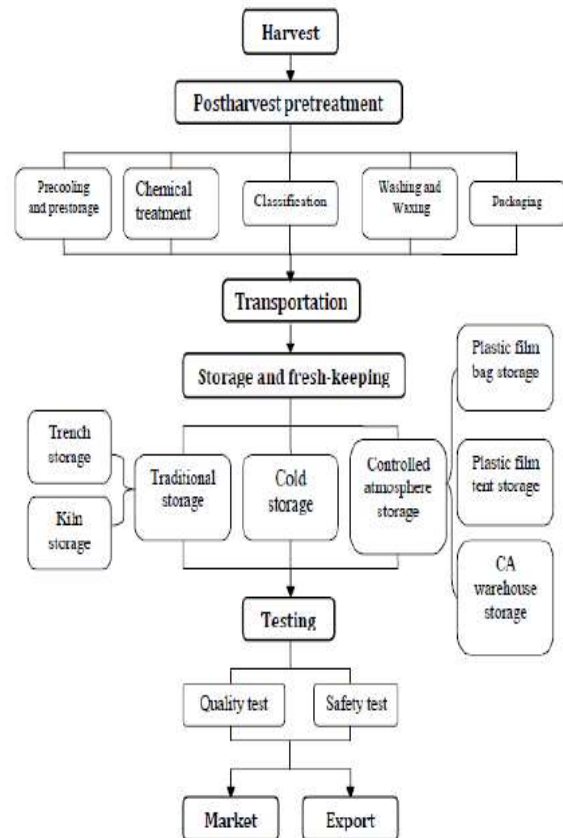
- Most widely used, especially in North China
- Used in areas, where the temperature remains low (Average temperature is 4-13 deg. C)
- Low value apples
- Low construction costs
- Apples can be stored for 2-5months

Cold Storage

- Used for 30% of fruits in China
- Used in Southern China, because of natural high temperatures
- Mechanical refrigeration
- Short term storage (3-5months)

Controlled Atmosphere Storage

- Used for high value products
- Long term storage (more than 6 months)



Source: Extract from "Post-harvest storage of apples in China", Guipu Li and Duo Li (2008), Department of Food Science and Nutrition, Zhejiang University, China

Apples from Chile and New Zealand however start flowing in in March and peak around May-June which is the period coinciding with the harvesting season in these countries indicating that these apples are exported fresh from the source (see Figure 15: Pattern of import inflow).

Even though domestic apples stored in CA stores in India are available between November and April, the supply does not appear to be sufficient to cater to the demand giving rise to the substantial imports in this period.

Thus not only has the existing capacity of CA storage in India been insufficient to cater to the volumes demanded in off season, it appears to have been unable to maintain supplies beyond April. Interviews with all the large CA stores owners revealed their reluctance to maintain supplies beyond April for the following reasons:

1. Greater risk of spoilage beyond 8 months even in CA storage
2. Greater costs of distribution and / or more spoilage as the rising ambient temperatures make it challenging to cost effectively transport apple over long distances
3. Lack of confidence about sustained demand on account of availability of substitute fruits and warmer weather (which purportedly reduces preference for apples)
4. Uncertainty on availability of imported apple which can depress prices

It is not surprising therefore that total import volumes peak in the months of May and June. While the third and fourth concern above is part and parcel of the risk inherent in any trading activity, addressing the first and second concern through improved harvesting practices, more effective use of technology and logistics improvements can make Indian apples more competitive.

It could be argued that imports may continue despite the availability of domestic apples (assuming the above concerns are addressed) if the consumer demand is specifically for imported apples in preference to domestic apples. However, interviews with stakeholders across the board (retailers, traders, agents, CA store owners) revealed that while imported apples are undoubtedly perceived to be of better quality²⁸, demand is loaded in favour of domestic apples on account of one, a

“Until CA stored apple is available, imported apple does not sell! Indian consumer prefers Indian apple; also shelf life of imported apple is lower”

- Large organized fresh fruit importer and wholesaler

“Only about 20% of consumers ask for imported apples specifically. Only if the price difference between imported and domestic apples goes below INR 20/kg then imported apples may start replacing domestic apples.”

- Large organized retailer

“Only 5-10% of the market buys imported apple exclusively”

- Large organized retailer

preference for the familiar domestic apple taste and two, the quality difference between the apples that are actually stored in CA stores in India and imported apples is not substantial enough to justify the premium at which imported apples are available. This is because CA stores follow stringent acceptance procedures including fine grading before buying from farmers and procure only the best quality of produce²⁹.

On the flip side, this can be seen as a challenge for the development of more CA stores given that stakeholders’ estimates of the share of apples which are of comparable quality with imports ranges from 25-50% of the total production.

Table 1: Broad grading and average prices paid (INR/kg) to farmers in 2014/2013 season for apples purchased by CA stores

Size	Color	80-100%	55-80%	< 55%
S,M,L,XL		65/45	55/40	20/10
XS		55/40	40/35	20/10
XXS		40/10	30/10	20/10
Pittu		20/10	20/10	20/10
S - Small; M - Medium, L - Large, XL - Extra large, XS - Extra small, XXS - Extra small				

Source: Interviews with CA store owners, farmers and intermediaries in HP

²⁸ Some of the quality differences cited include better shine, richer red color, better and consistent shape and thicker skin, making it last longer at the consumer’s end. Shine is attributed to waxing which is not preferred by traders for Indian apples since waxing exposes any small abrasions, defects on the apple more prominently. Given that post-harvest management in India involves significant handling and often poor packaging leading to relatively much more abrasions and defect, adoption of waxing has not taken off even though it can potentially enhance competitiveness vis-à-vis imported apples. This is further elaborated in Chapter 5.

²⁹ This process is explained in more detail in chapter 5

This argument is valid to the extent that Fuji and Gala varieties are imported into India since these varieties are not grown domestically. However, estimates obtained from interviews indicate that these varieties comprise less than 10% of total import volumes in India.

Since 44%³⁰ of the total imports in 2014-15 came in the two months of May and June, there clearly are significant volumes of imports that can potentially be replaced with domestic supply if it were available in quantities and quality comparable to those of imports. It is therefore imperative to identify and implement initiatives that can boost supply by enhancing the capacity of the post-harvest chain in the near term and boosting yields over the longer term. This becomes all the more important with increasing volumes of imports coming not only from the traditional sources of USA, China and Chile but emerging sources like Iran (some of whose volumes are apparently channelled through Afghanistan to benefit from preferential customs duty enjoyed by Afghanistan under a PTA between the two Afghanistan and India³¹), Poland, EU (where exporters have started giving credit incentives to Indian importers to push volumes³²).

As of now, importers in India have clearly, over the years, developed a basket of sources across the world that can satisfy the burgeoning demand in India taking into account the varieties, preferences and patterns in volumes of demand. Thus exports from US and China to India include practically all varieties though dominated by the Red Delicious variety (which the Indian palate is most familiar with given that domestic production is dominated by this variety). Other varieties like Fuji are imported primarily from China, while Gala and Braeburn varieties comprise a relatively greater share of imports from New Zealand and Chile³³.

Apple – a few facts on varieties and preferences

- In the US, from the major exporting region of Washington state, close to 2/3rd of production is of the Red Delicious, Gala and Fuji varieties. While the consumption share of Red Delicious has declined over the years, exports of this variety dominate. Source: http://www.bestapples.com/facts/facts_crop.aspx and <http://www.theatlantic.com/health/archive/2014/09/the-evil-reign-of-the-red-delicious/379892/> (2014)
- In China, Fuji apples are the most commonly grown variety accounting for 70 percent of apple production. Gala's account for 6 percent of Chinese production, while Delicious and Qinguan, a local variety, account for 9 percent and 7 percent respectively. (Source: USDA, 2014)
- Fuji variety is pinkish in colour and relatively more sour in taste. It is believed that this variety only enjoys a niche market in India since redness of colour and sweetness in taste are believed to be of high preference for the Indian palate.
- In contrast, cultivation of the Red Delicious apple, which is more aligned to this palate is witnessing a fall in the share of consumption in the USA, leading to greater surplus availability for exports for the Asian markets, where it is more preferred.
- Nevertheless, Indian consumers are believed to prefer the Indian Red Delicious (when available) over the American Red Delicious since the latter has a thicker skin. Also, extra

³⁰ Derived using data from Directorate General of Foreign Trade and APEDA

³¹ Central Board of Excise and Customs, Gol

³² Source: Interviews with key apple importers

³³ Compiled from various sources including <https://www.zauba.com/importanalysis-fresh-apples-gala-report.html> and <http://www.enzafoods.co.nz/growing-facts/apple-varieties>

Apple – a few facts on varieties and preferences

large sized apples are not preferred by the trade in India on account of its greater susceptibility to damage and spoilage.

- In line with the above, prices paid by CA stores to farmers are directly proportional to the richness of red colour of the fruit and size (refer Table 1: Broad grading and average prices paid (INR/kg) to farmers in 2014/2013 season for apples purchased by CA stores)
- Regional taste preferences and logistical challenges also play a role in choice of variety and source of imports. There is a relatively greater preference for the Fuji variety in the Southern part of the country which is believed to be on account of both taste preferences and the fact that the South Indian port of Chennai is logistically more convenient for importing Fuji apples from China vis-à-vis the largest (Mumbai) port on the West Coast where most other imports come in.
- Larger apples are preferred in North India while in the East, small and relatively cheaper apples are more in demand.

Steady rise in imports despite the imposition of 50% import duty reveals the extent of uncompetitiveness of Indian apples. While the imposition of this high level of duty is purportedly to protect the interests of the Indian farmer, in the absence of sufficient supply from domestic farms, the increasingly demanding consumer with rising disposable incomes appears to be forced to pay through the nose for having access to apples throughout the year.

A study carried out by the Indian Institute of Management Studies, Ahmedabad in 2006 and another by USDA around the same time claimed that high costs and margins of domestic importers and traders were more to blame for high consumer prices of apples in offseason than the customs duty. While a look at the recent financial statements of the large Indian importers does not reveal very healthy margins³⁴, if the conclusions of this study were valid today, it would mean that a high customs duty is ending up benefitting traders more than the farmers by giving traders the leeway to price CA apples at a premium in the offseason months to the extent that the existing capacity can supply these.

Irrespective, as India moves further on the path of liberalization of trade, there will be increasing pressure to reduce customs duties³⁵. The only way to do that without negatively impacting domestic farmers would be to enhance domestic supplies, especially in the offseason months. And, as is demonstrated later in this report, this would not only require much greater storage capacity but also transformational improvements in post-harvest management practices like packaging, grading and transportation to ensure a greater share of production can reach consumers at a quality level that matches that of imported apples. Over the longer term, this would not be possible without improvements in farm productivity – after all a situation where a large proportion of fresh supplies go into storage for offseason sale could be counter-productive as it could raise consumer prices and reduce availability during season. (Refer Chapter 6)

³⁴ Margins observed from publicly available financial statements of key importers. Since the largest importers like IG International, Devbhumi etc are not pure play importers, the estimates are rough. However, various interviews with importers and other stakeholders (traders, wholesalers) in the import value chain confirmed this.

³⁵ Economic Times, February, 2015

Are high import duties really protecting the farmer?

Discussions with stakeholders across the apple supply chain reveal that for the large part the Indian customer prefers to buy domestic apples as long as these are available. The main reason for which imported apples sell more is their better availability as against their perceived better quality.

“Offseason availability of Indian apples will impact imports; we prefer to place domestic apple on our shelves, if available because the consumer prefers it. After March Indian apple is just not available and we have no choice but to go for imported apples”

- *Large organized retailer*

However, this could change if imported apples were to start coming in cheaper which in turn would likely happen in case import duties are reduced. Currently imported apples are 50% more expensive than domestic apples on an average though the premium often goes beyond 100%. As far as other varieties not grown in India are concerned (Fuji, Gala), the premiums are even higher though these varieties enjoy a relatively smaller niche market.

Nevertheless, as of now, even when the price difference between imported and domestic apples narrows to 10-20% in the months of March and April (on account of increased prices of domestic CA apples) offtake of domestic apples significantly outstrips that of imported apples. It is only in the months of May and June and to an extent early July, when domestic apple supply goes down to a trickle that the share of imported apple offtake rises sharply. This is especially true for apple from Kinnaur in HP which enjoys a very premium positioning in the minds of consumers. Apple from Kinnaur sells at par or only at a small discount to imported apple prices.

From the above, it appears that while strong consumer preference gives domestic apples an edge, the sheer non-availability of the same is the key reason for imports. Thus it can be hypothesized that the import duty is only ending up raising consumer prices for consumers that are relatively less concerned about the price and are willing to pay premiums for availability of quality apples. On the other hand, high cost of imported apple could end up providing headroom to domestic CA store owners to push up their markups beyond “fair” margins for apples that they make available in off season.

The extent to which the high import duty on apples is protecting farmers vis-à-vis the extent to which it is perhaps benefitting already heavily subsidized CA store owning traders is a question that deserves deeper study.

Chapter 4: Policies affecting marketing of apples

Disabling regulatory setup and poor infrastructure have limited efficiencies

Like in the rest of the country, the agriculture marketing setup in the major apple growing states in India – Jammu & Kashmir and Himachal Pradesh – has traditionally been fragmented, disintegrated and unorganized. Agriculture marketing regulations conceived with the intent of providing a fair marketing setup have ended up becoming restrictive and have fostered inefficiencies³⁶.

Until the late 1990s, a vast majority of apples from both these states, which together comprise 90-95% of production, were marketed through the Agriculture Produce Marketing Committee (APMC) mandi in Delhi – the Azadpur fruit and vegetable market. The sale of produce taking place at distances of over 900 and 400 kilometres from the farms (J&K and Shimla (HP) to Delhi respectively) became necessary because

- Adequate marketing infrastructure in the form of a regulated trading platform like the mandi was limited or non-existent in the growing areas
- Regulations required sale to be made only at such a mandi
- Delhi being centrally located, en-route to the large consumption centers (the metro cities of Mumbai, Kolkata, Chennai, Bangalore etc) besides being a major consumption centre itself, was suitable as a hub and transshipment point

Since farmers, especially the small and marginal ones, had neither the resources nor the inclination to travel all the way to Azadpur for making the sale, they had no choice but to count on commission agents to make the sale on their behalf. With no large or organized players operating in the space, it is not surprising that this setup led to very low transparency in transactions and rampant exploitation of farmers at the hands of agents and traders.

With no mechanisms to ease information flow, there was no way for farmers to know the actual transaction price struck by the agent at the mandi. Abundant literature exists on how this system led to farmers getting pulled into a perpetual debt trap by the commission agents who would often also act as money lenders for farmers to procure inputs and other working capital (Raj et al, 2006). While this situation perpetuated across almost all agriculture produce, the limited availability of marketing infrastructure near the farm, remote and difficult terrain and long distance from the consumption centres accentuated this in the case of apples.

Himachal Pradesh

Until the HP APMC Act was reformed in 2005, largely in accordance with the Model APMC Act released by the central government to drive agriculture marketing reform across the country, the

³⁶ For a detailed discussion on the setup and its pitfalls, please refer Chapter 2 in the background report on Modern Retail

state functioned under the archaic provisions of the existing APMC Act which exacerbated the situation described above.

Not only did the existing setup described above lead to farmer exploitation, by giving only licensed market functionaries the right to purchase directly from the farmer, the existing APMC Act ended up creating a long chain of intermediaries. Farmers often sold their produce to middlemen who would resell the produce to wholesalers at the Azadpur APMC market. At Azadpur, the produce passed further on to sub-wholesalers or other traders who would in turn sell the produce to sub-wholesalers or retailers in other consumption centres across the country (Singh, 2008).

By forcing intermediation, only auction based spot sales to be carried out only at designated market areas, the system built inherent barriers to information, money and produce flow between the producer and the ultimate consumer, prevented supply chain efficiencies and risk reduction from longer term price and offtake arrangements by institutional buyers and created a high level of dependence of farmers on intermediaries while limiting their options for channels through which to make sales.

The result was an inefficient system in which farmers were divorced from market feedback and often had to wait for months to be paid. It is not surprising therefore that when imported apples started flowing in, traders and farmers in the chain were caught unawares that the consumer was willing to pay premiums for better quality and availability of apple – basic market feedback on consumer preferences was thus largely absent which, if available, could have over the years driven improvements in packing, grading and even cultivation if the intermediaries and farmers had realized that the cost of these improvements would pay off in premium prices.

While the apple suffered deterioration and waste as it passed through multiple hands (several of these hands being only agents who had little incentive to maintain quality since they never owned the produce and could simply pass on the cost of waste to the consumer), flow of information through the chain back to the farmer got distorted or lost while flow of money to the farmer got delayed and eroded paying for the margins of each intermediary, not all of whom added commensurate value to the produce³⁷.

Often even the core premise for bringing about the regulation – provision of a fair price to the farmer – was severely compromised when the licensed intermediaries colluded and corruption led to barriers being created for entry of new players into the market. Further, studies have reported that often funds collected at the market by way of issuance of licenses and fees for transactions is siphoned off Public Ledger Account of State governments as against being deployed for its intended purpose of market development³⁸.

Jammu and Kashmir (J&K)

Unlike most other states in India, the state of J&K had never implemented agriculture marketing regulation in the form of an APMC Act. While an act to regulate agriculture marketing – the APM (D&R) Act exists, it has not been implemented.

³⁷ Refer Chapter 2 in background paper for Modern Retail

³⁸ Economic Survey, Government of India, 2014-15

The state of agriculture marketing has nevertheless historically been the same in J&K as it has been in HP. The absence of marketing infrastructure and lack of organized large volume buyers close to the farms left farmers with little choice but to use the same archaic channel available for sale through pre-harvest contractors, commission agents, forwarding agents and traders primarily through the Azadpur mandi for a majority of their sale (Malik, 2013).

Recent regulatory reform and strong incentives are fostering improvements

The HP APMC Act was amended in May 2005 which has since led to the establishment of several direct purchasing arrangements including those that Controlled Atmosphere storage companies like Adani Agrifresh and Devbhumi have leveraged for buying apples directly from farmers.

At least one private market with a permanent structure has also been established with several others coming up as temporary setups during season largely for direct purchase by traders. This is in addition to the state government's plans for upgradation and capacity building at existing mandis close to the growing areas³⁹.

Reform and development of market infrastructure close to the farm in the form of mandis for spot sales in addition to storage infrastructure have led to the development of multiple options for the farmer to sell their produce over and above the Azadpur mandi^{40,41}.

The government of Himachal Pradesh has also made attempts in the recent past to develop and enforce standards in packaging of apples. To save on logistics and packaging costs, farmers have traditionally packed more fruit into boxes than the boxes' rated capacity, of their own volition or at the behest of traders and agents they sold through. However, this caused bruising and spoilage of apples packed tightly especially when they were transported, typically in overloaded trucks, over poorly maintained mountainous roads⁴². The government's initiative to enforce standardized packaging has the potential to go a long way in limiting damage and spoilage of the fruit in transit⁴³.

In J&K, since there were no overt restrictions on direct buying and selling from the farm, when the influx of imports opened the eyes of traders and farmers to the potential for greater value realization from the apple business, J&K witnessed the development of farm-based apple packhouses and controlled atmosphere storages procuring directly from farmers before HP⁴⁴. The

³⁹ HP State Agricultural Marketing Board

⁴⁰ Estimates by some large apple traders and commission agents interviewed for this study put the share of apples that were sold through Azadpur mandi at over 90% until late 2000s which has now reduced to between 30-60%. Some of these volumes may come via-local mandis in the growing states

⁴¹ However, the state continues to levy market fees on all apple produce that is sold in the state irrespective of the location of its sale. While this levy was abolished for a short period, the decision was overturned (for apples while being retained for most other fruits and vegetables) within months in May 2014, just before the harvest season, apparently on account of the significant revenue loss the state would have had to contend with if the levy on apples had been withdrawn.

⁴² The author recalls a 70 kilometer journey that took 5 hours from Shimla to Jubbal, a key apple growing area in Himachal, because the road was in very poor shape with massive potholes as much as to discourage most commercial taxi drivers from taking their vehicle to this area. The author was informed that the state of this road had been as bad for more than a year. It is not surprising how even the best harvested apples get spoiled and damaged when they are carried on trucks on these roads all the way up to Mumbai where imported apples arrive after having been minimally touched and going through an end to end cold chain. This demonstrates how competitiveness of domestic apples vis-à-vis imported apples, while certainly a function of cultivation practices, is undoubtedly equally, if not more, impacted by post-harvest management and logistics.

⁴³ Hindustan Times, May 2015

⁴⁴ Economic Times, September 2013

first controlled atmosphere storage for apples was established in J&K in 2004 by FIL Industries⁴⁵ as against the first in HP being established in 2006 by Adani Agrifresh⁴⁶.

J&K has taken further initiatives to improve the state of marketing infrastructure by focusing on the developing near farm markets and promoting fruit growers cooperative marketing societies⁴⁷.

Among other initiatives, to encourage the fruit growers and to promote trade, the state government abolished toll tax on export of fruit was from 2002-03. Sprayers and pumps are also provided to fruit growers on subsidized rates.

Both the states of J&K and HP provide support to farmers by implementing a Market Intervention Scheme (MIS) scheme wherein C-grade (culled, badly damaged) apples are procured at guaranteed prices. In HP, these apples are largely used for processing by the state owned fruit processing company.

To provide a cushion to farmers from the threat of crop loss, which has proven to be a significant issue on account of frequent hailstorms that cause extensive destruction or damage to the apple crop, HP has implemented a Weather Based Crop Insurance Scheme (WBCIS) since 1999-2000. The J&K government also announced in mid-2015 that it intends to cover 70% of the area under apple cultivation under this scheme. The HP government also provides an 80% subsidy for anti-hail nets.

HP is also implementing a project on Apple rejuvenation under Rashtriya Krishi Vikas Yojna in which old apple orchards are being rejuvenated and replaced with the new, improved and regular bearing spur varieties.

While the above mentioned state-level initiatives have impacted post-harvest management positively, the most profound impact has come from the various direct and indirect incentives supported⁴⁸ by the central government particularly with respect to cold storage infrastructure, not only for apple but also for the complete range of perishables (see box titled “Disproportionate emphasis on cold storage infrastructure development versus improvement in overall post-harvest management”).

The total quantum of government-supported investment that has gone into the development of CA storages is estimated to be over INR 1300cr of which close to INR 400cr has come in the form of subsidy⁴⁹.

⁴⁵ Greater Kashmir (newspaper), April 2010

⁴⁶ Interview with management

⁴⁷ Economic Survey, 2014-15, Government of Jammu and Kashmir

⁴⁸ Schemes supported by the central government under the Mission for Integrated Development of Horticulture (MIDH) are funded 85% by the central and 15% by the concerned state government. In the case of North Eastern and Himalayan states (which include the key apple growing states of J&K and HP) the central government funds 100% of the total outlay. MIDH covers a whole host of schemes spanning cultivation and post-harvest management. Complete details can be found at [http://midh.gov.in/PDF/MIDH_GL\(E\).pdf](http://midh.gov.in/PDF/MIDH_GL(E).pdf)

⁴⁹ INR 62 cr investment with subsidy amount of INR 26cr has come since 1st April 2010. Source : NHB; figures before 1st April 2010 estimated by extrapolation

Disproportionate emphasis on cold storage infrastructure development versus improvement in overall post-harvest management

Over the years, a multitude of schemes have been launched to address the shortage of cold storage capacity driven by a belief that the sheer lack of cold storage capacity was primarily responsible for the high levels of food wastage prevalent in horticulture produce.

While estimates of food waste have varied widely depending upon the source, the most recent available government sponsored study on the subject - a study published in 2012 by Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana - estimated overall losses in fruits and vegetables during operations such as harvesting, cleaning, sorting/grading, packaging, transportation, storage channels, weight loss in storage etc. to be in the range of 5.8 to 18% (Another study to update this one has been commissioned in 2014, the results of which are expected to be released sometime in 2015). As against this, the estimates of waste that were widely published and believed to be accurate before this study were upwards of 30%.

The belief that plugging the gap in cold storage capacity would address this waste in part led to aggressive support for the development of cold storage infrastructure over the years. A summary of these schemes highlighting key elements of support available and the amount spent by the government on the development and facilitation of cold storages is summarized below. Full details can be obtained from the website of Mission for Integrated Development of Horticulture (MIDH) - [http://midh.gov.in/PDF/MIDH_GL\(E\).pdf](http://midh.gov.in/PDF/MIDH_GL(E).pdf) with further details being available on the websites of respective departments (NCCD, NHB, MOFPI, APEDA, DAC, NCDC, NHM, MIDH)

- Schemes for subsidy assistance
 - o Assistance by Department of Agriculture and Cooperation:
 - Credit linked back ended assistance to attract private companies for the creation of integrated post-harvest infrastructure, including setting up of cold storages, modern pack-houses, transportation, processing units, ripening chambers and retail infrastructure. Subsidy @35% of the admissible cost in general areas and @50% in case of hilly and scheduled areas is provided to beneficiaries.
 - Integrated Scheme for Agricultural Marketing (ISAM), through the sub-scheme Agricultural Marketing Infrastructure (AMI), subsidy is available for construction of cold storages when created as part of Integrated Value Chain (IVC) Projects. Subsidy @33.33% in case of North Eastern (NE) States, Sikkim, Andaman & Nicobar and Lakshadweep Islands, hilly areas, Registered FPOs, Panchayats, Women, SC/ST entrepreneurs & their cooperatives and Self-help groups. Subsidy is @25% for all other categories.
 - Credit linked back ended subsidy @ 35% of the admissible cost of New Reefer Vehicle(s) in general areas and 50% in hilly and scheduled areas
 - o Assistance by MoFPI:
 - Grant-in-aid @ 50% of the total cost of Plants & Machinery and Technical Civil Works in general areas and 75% for NE Region and difficult areas subject to a maximum of Rs.10.00 crore for (any two of the first three or the fourth)

Disproportionate emphasis on cold storage infrastructure development versus improvement in overall post-harvest management

- Minimal Processing Centre at the farm level with facilities such as weighing, sorting, grading waxing, packing, pre-cooling, Controlled Atmosphere (CA) / Modified Atmosphere (MA) cold storage, normal storage and IQF.
- Mobile pre-cooling vans and reefer trucks.
- Distribution hubs with multi product and multi CA /MA chambers, cold storage /Variable Humidity Chambers, Packing facility, CIP Fog treatment, IQF, Ripening chamber and blast freezing.
- Irradiation facility
- Grant-in-aid for development of common infrastructure for mega food parks, upto 50 crores. Common infrastructure has cold-chain components
- Assistance under NATIONAL MISSION ON FOOD PROCESSING (NMFP)
 - Capital Investment Subsidy at 35% of bank/FI appraised project cost excluding the cost of land, pre-operative expenses, margin money for working capital and contingency, subject to a maximum of Rs. 5 crore in general areas. For difficult areas such as North Eastern States, hilly and ITDP areas, this is 50 % of the eligible project cost, subject to a maximum of Rs. 5 crore.
 - Interest subvention on the term loan availed from banks / financial institutions: 6% per annum for first 5 years of operation or repayment period, whichever is less with a cumulative limit of Rs. 2.00 crore in general areas. For North Eastern States, Hilly and ITDP areas, it would be 7% per annum, with a maximum ceiling of Rs. 3.00 crore.
 - Grant-in-aid at 50% of the eligible project cost for the general areas and 75% in North-East Difficult Areas respectively for Primary processing and collection center in rural areas up to Rs. 2.5cr
 - Credit linked back ended grants-in-aid @ 50% of the cost of New Reefer Vehicle(s)/ Mobile pre-cooling van(s) upto a maximum of Rs. 50.00 lakh
- Assistance by APEDA: 100% grant in aid to APEDA or any other Government or Public Sector agency and at 25% of the cost subject to maximum of Rs. 10 lakh per beneficiaries in other cases for setting up specialized storage facilities such as CA / MA cold storages, deep freezers etc
- Assistance by National Co-operative Development Corporation (NCDC): Subsidy at 20% and 25% of the project cost for Under Developed (UD) and Least Developed (LD) states for setting up of New Cold Storages/ CA stores/ MA stores, Expansion/ modernization of existing cold storages with facilities such as drying, sorting, grading, waxing, packing, pre-cooling, etc.
- Fiscal incentives
 - Section 80-IB of the Income Tax Act provides deductions in respect of profits from industrial undertakings related to Cold Chain. For the first 5 years the deductions are at 100% and then at 25/30% for next 5 years
 - Under Section 35-AD of the Income tax Act 1961, deduction @ 150% is permitted for expenditure incurred on capital investment in setting up a cold chain facility

Disproportionate emphasis on cold storage infrastructure development versus improvement in overall post-harvest management

- Concessional rate of custom duty @ 5% on imported equipment for cold chain facility under the project import benefits
- All refrigeration machineries and Parts used for installation of cold storage, cold room or refrigerated vehicle, are exempted from Excise Duty
- Many activities pertaining to cold chain are included in the exempted and the negative list for the purpose of service tax
- Other initiatives
 - National Centre for Cold Chain Development (NCCD) , an autonomous centre for excellence, has been established as a registered society to work in close collaboration with industry and other stake holders to promote and develop integrated cold chain in India
 - Allocation of Rs. 5,000 crore for the Warehousing Infrastructure fund for the year 2014-15. This fund is made available as a low interest funding window to cold-chain stakeholders and is operationalised through the National Bank for Agriculture and Rural Development (NABARD)
 - Reserve Bank of India in its guidelines dated 23.04.2015 classified loans to food & agro-based processing units and Cold Chain under Agriculture activities for Priority Sector Lending

Number and value of investment proposals received and approved for setting up of cold chain/ storage facilities during last three years and the current year

(Rs. in crore)

2011-12		2012-13		2013-14		2014-15 (upto Feb)	
Number	Investment	Number	Investment	Number	Investment	Number	Investment
232	1728	193	1159	289	2688	138	847

Source: www.loksabha.nic.in

NABARD disbursed Rs. 17,353 crore under Rural Infrastructure Development Fund during 2013-14, a growth of 6.51% over the previous year. A total of 3706 dry warehouses, cold storages and bulk milk cooling units were sanctioned during the year under Warehousing Infrastructure Fund (WIF), fully utilizing the allocation of Rs. 5000 crore. These projects, when implemented would create an additional capacity of 10.07 million MT in the dry storage, 8260 MT in cold storage and 6.61 lakh litres of bulk milk cooling capacity

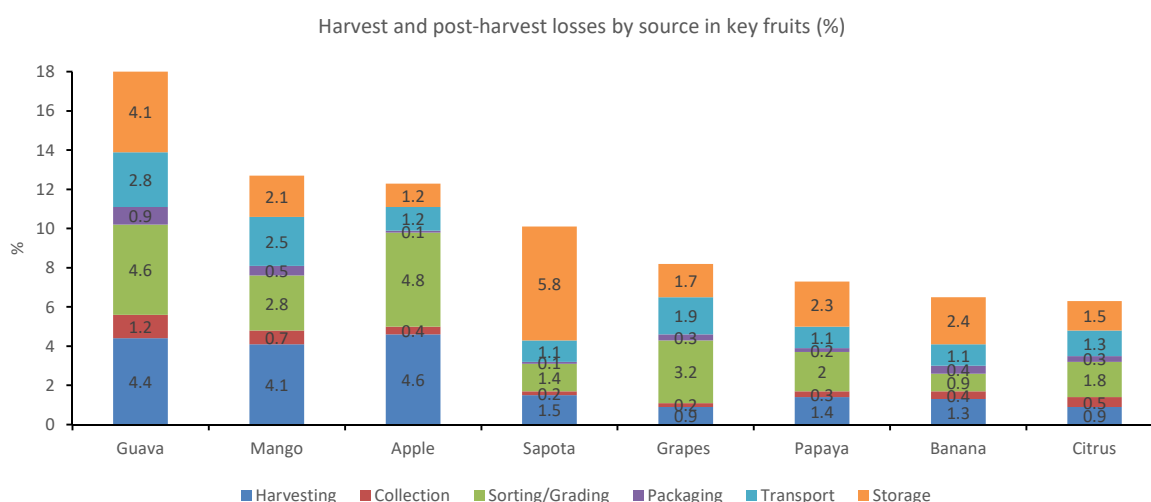
While initiatives to expand the scope of assistance beyond cold storage infrastructure to include integrated post harvest aspects has been made, the government remains largely focused on plugging the remaining gap in cold storage capacity between existing capacity of 33mn MT

Disproportionate emphasis on cold storage infrastructure development versus improvement in overall post-harvest management

(This figure includes cumulative capacity created; excluding non-operative/closed storage capacity, the existing capacity comes to 27mn MT) as estimated by a recent comprehensive study sponsored by the National Horticulture Board (NHB) vis-à-vis that which is recommended as required (61mn MT) by a study carried out in 2010 (Source: <http://nced.gov.in/PDF/ComprehensiveNote.pdf>).

Reform and incentives beyond cold storage have however been limited

Figure 18: Harvest and post-harvesting losses by source in key fruits



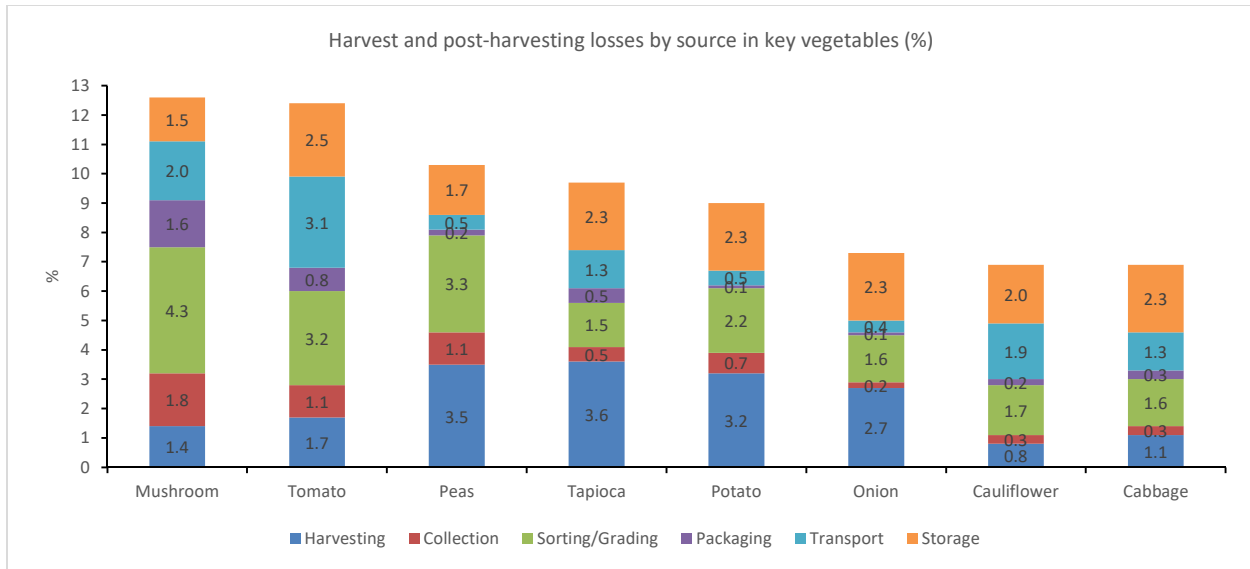
Source: “Estimation of quantitative harvest and post-harvest losses if major agricultural produce in India, All India Coordinated Research Project on Post-Harvest Technology”, Central Institute of Post-Harvest Engineering and Technology (CIPHET)

The availability of sufficient cold storage capacity is a necessary but certainly not a sufficient, and in some cases even a primary, condition for reducing wastage of horticulture produce including apple. As can be seen from Figure 18 and Figure 19, between 40-90% of the total quantity losses in fruits and vegetables take place during the activities that cannot be addressed by storage infrastructure alone – harvesting, collection, sorting/grading⁵⁰, packaging, and transportation.

Creating awareness and providing incentives and facilitation for addressing these other challenges will be necessary to actually deliver the savings that appear to be expected to come off of cold storage alone at present.

Figure 19: Harvest and post-harvesting losses by source in key vegetables

⁵⁰ Value loss is expected to be even higher in case no or limited sorting/grading is carried out which is the case for most vegetables



Source: “Estimation of quantitative harvest and post-harvest losses of major agricultural produce in India, All India Coordinated Research Project on Post-Harvest Technology”, Central Institute of Post-Harvest Engineering and Technology (CIPHET)

The cold store is but a link in the chain that perishable produce traverses in its journey from farm to consumer. Directing initiatives along the chain as against this link alone will help to optimize investments and lead to greater overall impact.

As seen from Figure 1: Suitability of various horticulture crops for investment in preservation, the holding life of most fresh produce, even in the cold chain, ranges from a few days to a few weeks only. Thus when it comes to developing cold storages it is imperative to take a supply chain view and identify specifically the purpose the cold store will serve in preserving quality, reducing waste and / or maximizing value of the produce and, more importantly, what other conditions need to be met before and after the storage link in the chain to ensure the purpose is served. Directing incentives to address these conditions across the chain are likely to result in more optimal deployment of investment.

The excessive concentration on incentivizing cold storage infrastructure vis-à-vis these other elements has led to a situation where private entrepreneurs rush to create infrastructure often without understanding the produce supply chain thus leading to cases of either wasted investment or cases where the investor is forced to build a trading model as against a storage services provision model to ensure utilization of the asset created, for servicing debt and operating costs. Prevalence of trader owned storages limits the farmers’ option to retain ownership of produce while in storage which can actually lead to him, as against only the trader, benefitting from better prices in offseason.

In addition, skewed incentives towards infrastructure creation have led to the deployment of non-viable technologies installed with a view to obtain the subsidy without crossing the threshold defined for maximum subsidy to be released, as against being tightly linked to market requirements over a longer term⁵¹.

⁵¹ Initiatives to link the quantum of subsidies provided to the technical standards deployed and an audit of the same enforced by NHB in the recent past is beginning to address this issue to an extent (Source: National Horticulture Board, ICE Magazine)

So while plugging the gap in cold storage infrastructure is a useful objective to have for driving waste reduction, moves in the recent past to broaden to the scope of support to include improvements in other elements of the chain not just in the case of apple but all horticulture produce will magnify impact.

Chapter 5: Mapping and characterization of key apple value chains

Approach to the value chain studies

As mentioned in Chapter 1, the value chain study was carried out with a specific focus to understand the role of key variables, particularly the policy environment, on the development of CA storages and the impact that this development has had on supply chain stakeholders, particularly farmers. This understanding has been leveraged to draw learnings on improving the performance of post-harvest management in the apple and other horticulture supply chains.

The study focused on one of the two key apple growing states – Himachal Pradesh - and within the state the key growing area – Shimla district - where the managers of key near-farm CA stores were interviewed first using a structured questionnaire containing quantitative and qualitative questions aligned with the study objectives mentioned earlier⁵².

Farmers selling to (or renting space at) each CA store were identified and these farmers were interviewed using a customized structured questionnaire. These farmers were also asked for references of some other farmers who were

- selling their produce through the traditional chain using intermediaries for fresh sale without the use of any CA storage
- selling their produce through the traditional chain using intermediaries for fresh sale but involving use of normal cold storage at least at one point in the chain
- selling their produce through pre-harvest contractors

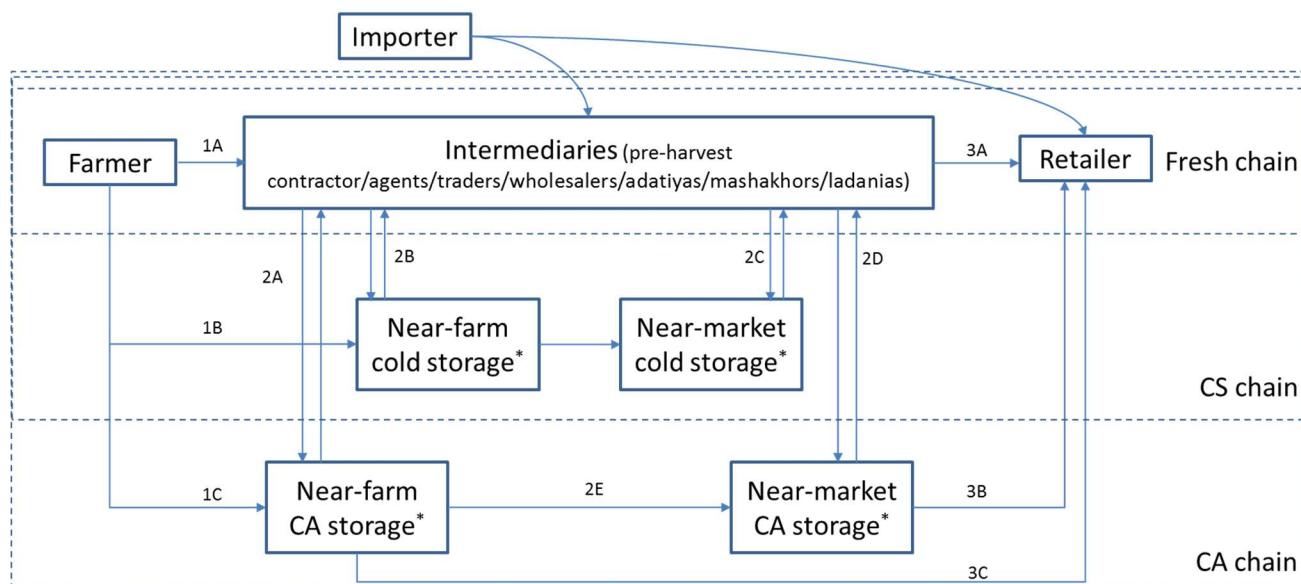
These farmers were in turn interviewed separately and through them, references were obtained of intermediaries (commission agents, wholesalers, traders, cold store managers) who were also separately interviewed using customized questionnaires⁵³.

The supply chain was similarly traced forward from the CA stores and the farmers thus tracing the complete chain from farmer to consumer for four key flows highlighted in Figure 20. While, in practice, several value chains operate between farmers and retailers, the four chains for this study have been chosen to ensure that the objectives of understating the impact of the policy environment on development of controlled atmosphere storage and comparison between the fresh and offseason chains (using controlled atmosphere storage) can be met.

Figure 20: Selected value chains for study

⁵² Share of India's apple production from HP ranges from 15-30% with an average over the last decade of 25%. Shimla and nearby areas accounts for roughly 65% of HP's apple production.

⁵³ Questionnaires used for interviews with each stakeholder are appended in Annexure 2: Questionnaires



* In most cases owned by intermediaries who are also agents/traders/wholesalers/adatiyas/mashakhors/ladaniyas though limited exceptions exist

Himachal Pradesh was selected for the study because of the perceived greater proportion of production from the state being amenable for storage at CA stores vis-à-vis J&K, besides a greater comparability / competitiveness of the apple from this state to imported apples⁵⁴.

The total number of interviews undertaken with various stakeholders across the identified chains is summarized in Table 2. Interviews were conducted as one-on-one sessions extending between 45 minutes to 2 hours each. The study covered multiple growing areas in the Shimla district not only to cover diverse perspectives but also to ensure that farmers and intermediaries dealing with different qualities of apple (which is strongly correlated to the elevation of the orchard) were covered. A map of the villages visited and their elevation is provided in Figure 21.

Table 2: Actors and interviews carried out in selected value chains

Chain	Flow	Actor	Number of interviews
I	1A -> 3A <i>Fresh produce chain through pre-harvest contractor</i>	Farmer	2
		Preharvest contractor	2
		Wholesaler/Trader/sub-wholesaler	0
II	1A -> 3A <i>Fresh produce chain without pre-harvest contractor</i>	Farmer	12
		Commission Agent	2
		Wholesaler/Trader/sub-wholesaler	7
III	1C -> 3C 1C -> 2A -> 3A <i>Offseason chain through CA store</i>	Farmer	10
		CA store	4
		Wholesaler/Trader/sub-wholesaler	5
IV	1B -> 2B/2C -> 3A 1A -> 2B/2C -> 3A	Farmer	5
		Cold Store	0
		Wholesaler/Trader/sub-wholesaler	3

⁵⁴ Interviews with apple traders

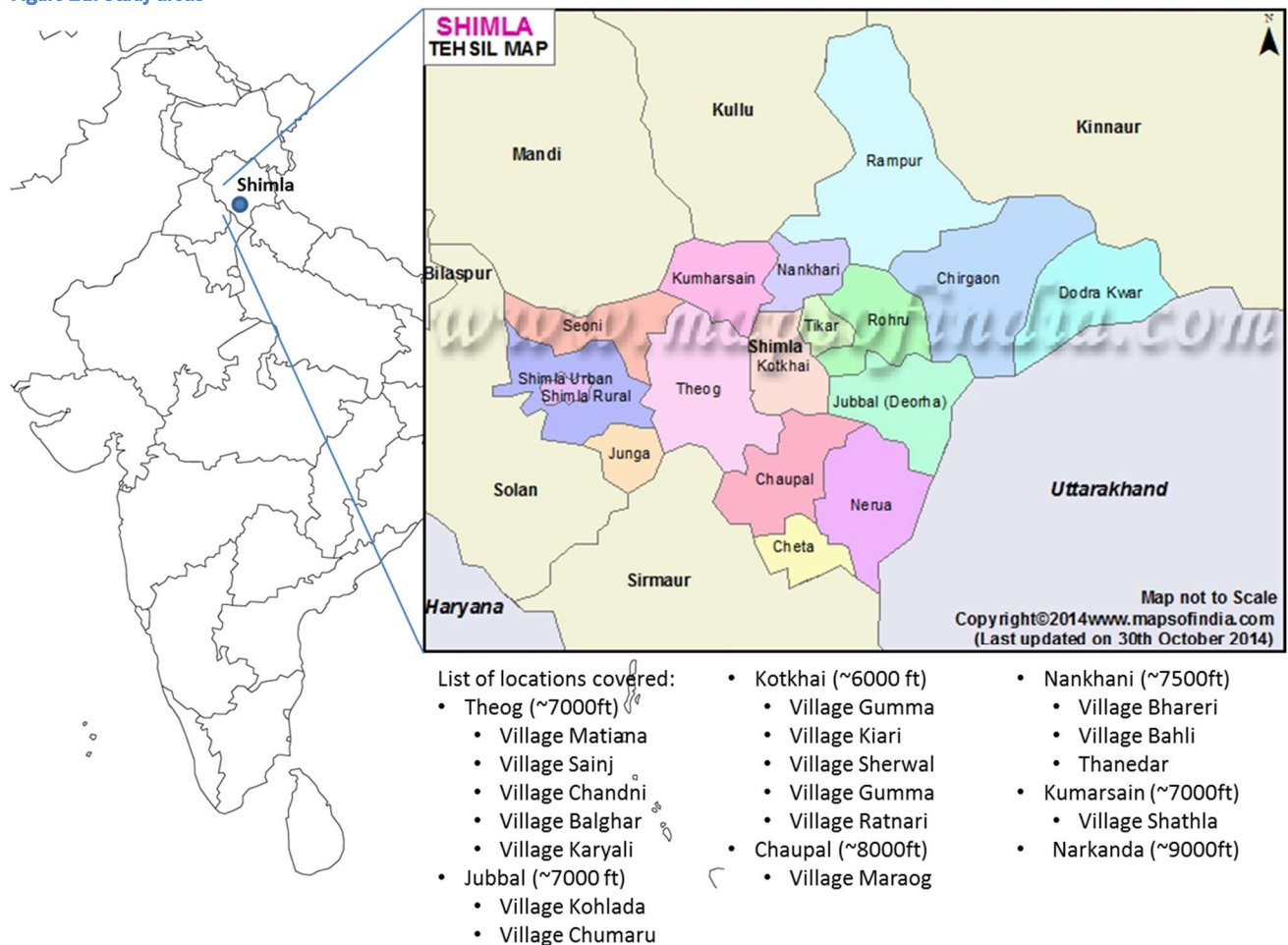
Chain	Flow	Actor	Number of interviews
	<i>Fresh and short offseason chain through cold store</i>		
Overall		Retailers	5
Total			39

Note: Total number of interviews do not match sum of stakeholder-wise interviews because some stakeholders were part of more than one chain

The field study was carried out primarily in November 2014 which is around the time of completion of and after harvesting, in order to ensure that feedback on the most recent harvest could be collected while it was fresh in the minds of the stakeholders.

A follow-up was carried out in March 2015 with the same stakeholders to capture information on the sale of apples in offseason months so as to complete the offseason value chains (Value Chain III and, to an extent, value chain IV).

Figure 21: Study areas



Limitations of approach used

The study relies primarily on key informant interviews using structured questionnaires that capture qualitative and quantitative inputs. However the sample size does not afford the ability to derive any conclusions on overall average value chain cost build-up.

Value chain cost build-up has been obtained for specific instances where the link from one actor to the next, starting from the farmer and up to retail, could be traced. While absolute cost numbers can vary significantly by various factors including the quality of cultivation (which in turn depends on elevation, cultivation practices, nature and quantum of inputs used etc.), grade mix, demand supply dynamics in the study year versus earlier years⁵⁵ etc, the cost build-up for the instances obtained are expected to serve as a useful benchmark for comparison of relative marketing costs and margins between the chains studied.

Care has been taken to ensure that non-recurring or one-off cost items are not included in the selected instance traced. Some of the farmers interviewed leveraged all the four value chains studied for some share of their produce and served as a good sanity check on the comparison between chains.

It is also important to note that cost numbers include primarily variable and semi-variable costs and may not account for some fixed overheads (like administration, communication, stationery etc). The costs in the value chain build up also do not include any capital investment (depreciation) and interest costs. The results of the value chain assessment should therefore not be used to assess net profitability of stakeholders in the chain.

Value Chain I: Fresh produce chain through pre-harvest contractor

In this chain, the farmer cultivates his land but outsources everything else starting from harvesting up to final sale to a pre-harvest contractor (“*thekedar*”). A pre-harvest contractor is often another farmer from the same / nearby village who maintains networks with agents and traders. The contractor collates volumes from several small farmers who may not have the inclination (or resources) to deal with the traditional multi-layered marketing system which involves the hassle of carrying one’s produce to the nearest regulated market or entrusting the produce to an agent, waiting to hear back on the price of sale and waiting further for actual payment to come through.

In this case, the farmer carries out the cultivation activities in-house unlike in another prevalent model where the farmer may contract out the entire chain from production to sale to a third party in exchange for a lumpsum payment⁵⁶. Unlike this model which, for all practical purposes, is an informal “contract farming” arrangement, used typically by large farmers, the value chain that we discuss here is mostly used by small farmers who, while they can tend to the farms themselves, are disinclined to get involved with the vagaries of marketing inherent in the existing system.

The pre-harvest contractor typically visits the farmer’s orchard a few days before the harvest to inspect and agree with the farmer on a lumpsum amount that the contractor would pay the farmer

⁵⁵ Overall, in the study year (harvest of July-October 2014) farmer realizations were better compared to the previous year on account of perceived and actual short supply of apples from Kashmir arising from floods and widespread incidence of scab disease in Kashmir. In addition, greater availability of CA storage capacity this year, which the owners were under pressure to utilize, led to competition between buyers to procure the farmers’ best produce, thus raising prices.

⁵⁶ In the latter model, end-to-end outsourcing is done often on account of the fact that the orchard owner does not reside on or near the farms and may have migrated to the metro cities.

for buying the expected produce. The contractor then carries out the marketing processes from harvesting up to final sale, his margin being the amount that he earns from sale less the lumpsum amount paid and his marketing costs. Thus the contractor takes a calculated risk on harvesting losses, market price and marketing costs for which he earns a margin.

While this practice was prone to exploitation of farmers in the absence of freely available price information in the remote growing areas, in recent times, with improved communication systems, farmers have greater bargaining power.

Also, reform of the APMC act which permitted direct purchase has led to buyers from all over the country coming to the growing areas over the last few years, often establishing temporary setups near the growing areas, to procure directly from farmers during season months.

Table 3 captures the value chain cost buildup of an instance of this chain where the preharvest contractor picks up produce from a farmer in Shimla district and sells it to wholesaler/s⁵⁷ through commission agent/s in Azadpur mandi in Delhi who in turn sell to retailers. The entire transaction completes within 10-15 days without the use of any cold storage and the use of ambient transportation.

Figure 22: Value Chain I



Table 3: Cost buildup for Value Chain I

INR/kg	Costs	Price	Actor's gross margin*	Actor's marketing cost ⁵⁸	Actor's share in final price
Farmer			28	0	50%
Fertilizer	5				
Pesticide	4				
Labor	3				
<i>Total costs</i>	13				
<i>Sale price</i>		53			
Pre-harvest contractor			4	13	16%
Paid to farmer	53				
Grading and packing	9				
Primary transport	4				
<i>Total costs</i>	66				
<i>Sale price</i>		70			
Commission Agent				4	4%
Commission	4				
Wholesaler			4	6	10%

⁵⁷ Often, this link in the chain includes more than one entity. For example, the wholesaler may sell to a sub-wholesaler (*mashakhor*) who in turn would sell to the retailer.

⁵⁸ Including cost of logistics

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁵⁸	Actor's share in final price
Purchase price	70				
APMC Fees	1				
Cost incurred	1				
Other costs	5				
<i>Total costs</i>	<i>76</i>				
<i>Sale price</i>		<i>84</i>			
Retailer			13	9	21%
Purchase price	84				
Cost incurred	9				
<i>Total costs</i>	<i>92</i>				
<i>Sale price</i>		<i>106</i>			
<i>Total marketing cost</i>				<i>32</i>	
<i>Total marketing margin</i>			<i>21</i>		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs.

Value Chain II: Fresh produce chain through commission agent

In this chain, in addition to cultivating his land and harvesting the produce the farmer also gets involved with marketing. Farmers often have relationships with a dedicated agent or agents with whom they transact for selling their apple on their behalf at the APMC mandis. The commission agent arranges for the pickup of harvested, graded and packaged apples from the farm, transport and sale transaction of the produce at the mandi for which he gets paid a commission over and above the costs incurred.

In practice, commission agents play a role that goes much beyond that of a handing and transaction agent. These agents, especially the larger ones, often “finance” the transactions on behalf of farmers by paying the farmer a part of the estimated sale value upfront before a sale is made and then adjusting the same when the sale is actually made. This payment could even come in the form of an interest bearing advance that the farmer avails of from the agent for procurement of inputs and other working capital for running the orchard.

This is by far the most prevalent chain for sale of apples from HP and, until a few years ago, was practically the only available channel (along with its variants Value Chain I and Value Chain 4) for sale and distribution of apples.

Table 4 captures the value chain cost build-up of an instance of this chain where a farmer from Shimla district sells his primarily A-grade⁵⁹ produce through a commission agent at Delhi mandi to wholesaler/s who sells to retailer/s

⁵⁹ Since VC III primarily accepts the best produce and VC II is used for all grades, to ensure comparability for analysis the value chain for only primarily A-grade apples has been traced

The entire transaction completes within 10-15 days without the use of any cold storage and the use of ambient transportation.

Figure 23: Value Chain II

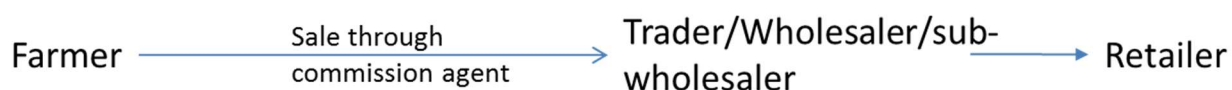


Table 4: Cost buildup for Value Chain II

INR/kg	Costs	Price	Actor's gross margin*	Actor's marketing cost ⁶⁰	Actor's share in final price
Farmer			41		61%
Cost of production	7				
Fertilizer	2				
Pesticide	2				
Labor	3				
Harvesting	2				
Cost of logistics	4			4	
Transport	2				
Others	1				
Cost of marketing	7			7	
Grading	1				
Packaging	5				
Others	1				
<i>Total cost incurred</i>	<i>19</i>				
<i>Sale price</i>		<i>61</i>			
Commission agent					3%
Commission	3			3	
Wholesaler			10	4	14%
Purchase price	61				
APMC Fees	1				
Other costs incurred	3				
<i>Sale price</i>		<i>77</i>			
Retailer			12	10	23%
Purchase price	77				
Costs incurred	10				
<i>Sale price</i>		<i>100</i>			
<i>Total marketing cost</i>				<i>28</i>	
<i>Total marketing margin</i>			<i>22</i>		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs.

⁶⁰ Including cost of logistics

Value Chain III: Stored produce chain through controlled atmosphere storage

This chain gives farmers the option of making a sale close to their farms directly to near-farm CA storage owner - operators who also function as traders. While this chain came into being about 10 years ago with the commencement of operations of the first CA store in HP in 2006, the volumes traversing through this chain have witnessed a quantum jump in the last 4-5 years only.

The preparation for procurement starts at least 3 months before harvest, typically from the month of May, when CA stores carry out a survey on the farms, decide on hubs and identify hub operators in villages to perform the role of coordination, dissemination of price information and for distribution of crates in which farmers would bring their produce to the CA store.

Procurement officers are full time staff who maintain relationships with farmers and regularly survey farmers' orchards and meet with the farmers, at times involving agriculture experts (mostly scientists retired from the government or institutes) to advise them on cultivation and harvesting practices.

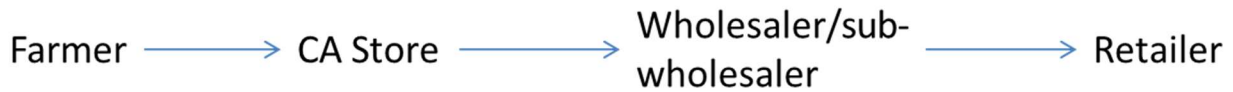
The hub operator works with procurement staff to collect groups of farmers with whom discussions are held and their feedback on the previous years' experience and the current year's expectation of harvest is taken.

By 1st week of June, an estimate of the likely volume of production is taken and a procurement strategy is outlined based on the same. Around July end farm visits are undertaken again to check various parameters like starch levels for which field staff carry handheld equipment. A few days before the harvest starts, around 10th August, another visit is undertaken and if issues are found in some orchards' produce, the respective farmers are told not to bring their produce.

Farmers carry their produce to the CA store which is located within or close to the growing areas (within the hilly areas of HP) based on price offered for purchase by the CA store valid for a particular period lasting from a day to a week. Price information is disseminated through local media and text messages cascaded through the hub operators appointed by the CA store located in key growing areas. These hub operators also provide farmers who choose to bring their produce to the CA store with crates that are owned by the CA store for a fee paid to them by the latter. Quality specifications (grades) along with price offered for each grade are clearly laid out by the CA stores based on which farmers typically bring only that share of their produce which is likely to be accepted. CA stores overtly discourage farmers from carrying low grade produce to the store either by offering below market prices for the same or by rejecting outright a lot with low grade produce beyond a threshold percentage. Farmers bear transport cost while unloading cost at the CA store is borne by the store. For a store of 6,000MT, a total of 1500-2000 farmers may be engaged from within whom, 700-800 may actually bring produce.

A visual check is undertaken at the store gate as a first level quality check after which accepted produce is loaded onto state-of-the-art mechanised grading lines, usually imported from their international manufacturers, for a thorough and finer grading.

Figure 24: Value Chain III



A clear and finer grading is undertaken in this chain to ensure that only produce that is likely to be able to survive in the CA store is accepted. This is also because the premium-paying buyers of offseason apples, who have the choice of buying imported apples easily available in offseason, are more discerning when it comes to quality of produce. CA store owners, being also traders, therefore naturally apply a fine grading to ensure that the maximum possible markup may be obtained after loading the costs of expensive capital equipment and operating costs on the purchase price. (Refer Table 1: Broad grading and average prices paid (INR/kg) to farmers in 2014/2013 season for apples purchased by CA stores).

Based on the grading determined by the automated grading equipment, payment as per the declared price is released to the farmer for each grade accepted, typically either as a cheque on the spot or through electronic clearing to the farmer's bank account.

Figure 25: Chamber inside a CA store



The apples are stacked in boxes (bins) inside chambers of the CA store (see Figure 25) where they stay until the store owners decide to start releasing them. Quantum and price at which apples are released periodically is a decision based on the store owner's knowledge of prevailing prices of apples available either from the import chain or, up to 2-4 months after close of harvest, from the normal cold stores and their perception of the availability and movement of these prices in the coming days / weeks. In any particular year, CA stores may start release as early as November or as late as February and mostly exhaust supplies by April depending upon the actual and projected demand supply situation in addition to a judgement on the actual expected shelf life extendibility in CA stores for apples procured in the last harvest.

The apples thus released are distributed through a distribution network of agents and wholesalers though there have been a few instances of direct sale by the CA stores to large institutional buyers like organized retailers.

Table 5 captures the value chain cost build-up of an instance of this chain where produce harvested in the season months of 2013 is sold to CA stores and sold during offseason months of 2013-14 (December – June).

Tables 5-8 capture the value chain cost build-up of an instance of this chain where produce harvested in the season months of 2014 is sold to CA stores and sold during offseason months of 2014-15 (December – March).

Since the field study was carried out in 2014-15⁶¹, the month on month offseason prices were obtained from wholesalers who purchased from CA stores for this year. Since these prices for the previous years were not available month on month, the weighted average price across the off season months have been taken for the previous year.

Table 5: Cost buildup for Value Chain III - Apple harvest of 2013 (weighted average sale prices across offseason months)

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶²	Actor's share of final price
Farmer			30		31%
Cost of production	6				
Harvesting	1.1				
Cost of logistics	1.6			1.6	
Cost of marketing	0.2			0.2	
<i>Total cost incurred</i>	8.9				
<i>Price realized</i>		39			
CA Store			29	12	32%
Purchase cost	40				
Payment to hub operator	3				
Unloading at CA store	2				
Retrieval and loading	3				
APMC fees	0.5				
Secondary transportation (to markets)	4				
<i>Total cost incurred</i>	12				
<i>Price realized</i>		81			
Wholesaler			2.5	12	11%
Purchase cost	81				
Cost incurred	12				
<i>Price realized</i>		95			
Retailer			25	10	27%
Purchase cost	95				

⁶¹ Field studies were carried out in November 2014 and followed up in March 2015 to obtain the offseason sale prices

⁶² Including cost of logistics

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶²	Actor's share of final price
Cost incurred	10				
<i>Price realized</i>		130			
<i>Total marketing cost</i>				36	
<i>Total marketing margin</i>			57		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player. Net margins of existing CA store owning and operating companies have been highlighted in Chapter 6.

Table 6: Cost buildup for Value Chain III - Apple harvest of 2014 (sale prices for the month of December 2014)

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶³	Actor's share of final price
Farmer			55		54%
Cost of production	6				
Harvesting	1.1				
Cost of logistics	1.6			1.6	
Cost of marketing	0.2			0.2	
<i>Total cost incurred</i>	8.9				
<i>Price realized</i>		64			
CA Store			7	12	16%
Purchase cost	64				
Payment to hub operator	3				
Unloading at CA store	2				
Retrieval and loading	3				
APMC fees	0.5				
Secondary transportation (to markets)	4				
<i>Total cost incurred</i>	12				
<i>Price realized</i>		83			
Wholesaler			3.4	12	13%
Purchase cost	83				
Cost incurred	12				
<i>Price realized</i>		98			
Retailer			10	10	17%
Purchase cost	98				
Cost incurred	10				
<i>Price realized</i>		118			
<i>Total marketing cost</i>				36	
<i>Total marketing margin</i>			21		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily

⁶³ Including cost of logistics

and have the overheads that come with being an organized player. Net margins of existing CA store owning and operating companies have been highlighted in Chapter 6.

Table 7: Cost buildup for Value Chain III - Apple harvest of 2014 (sale prices for the month of January 2015)

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶⁴	Actor's share of final price
Farmer			55		52%
Cost of production	6				
Harvesting	1.1				
Cost of logistics	1.6			1.6	
Cost of marketing	0.2			0.2	
<i>Total cost incurred</i>	<i>8.9</i>				
<i>Price realized</i>		<i>64</i>			
CA Store			5	12	14%
Purchase cost	64				
Payment to hub operator	3				
Unloading at CA store	2				
Retrieval and loading	3				
APMC fees	0.5				
Secondary transportation (to markets)	4				
<i>Total cost incurred</i>	<i>12</i>				
<i>Price realized</i>		<i>81</i>			
Wholesaler			8.4	12	16%
Purchase cost	81				
Cost incurred	12				
<i>Price realized</i>		<i>101</i>			
Retailer			12	10	18%
Purchase cost	101				
Cost incurred	10				
<i>Price realized</i>		<i>123</i>			
<i>Total marketing cost</i>				34	
<i>Total marketing margin</i>			26		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player. Net margins of existing CA store owning and operating companies have been highlighted in Chapter 6.

Table 8: Cost buildup for Value Chain III - Apple harvest of 2014 (sale prices for the month of February 2015)

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶⁵	Actor's share of final price
Farmer			55		44%
Cost of production	6				

⁶⁴ Including cost of logistics

⁶⁵ Including cost of logistics

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶⁵	Actor's share of final price
Harvesting	1.1				
Cost of logistics	1.6			1.6	
Cost of marketing	0.2			0.2	
<i>Total cost incurred</i>	<i>8.9</i>				
<i>Price realized</i>		<i>64</i>			
CA Store			17	12	20%
Purchase cost	64				
Payment to hub operator	3				
Unloading at CA store	2				
Retrieval and loading	3				
APMC fees	0.5				
Secondary transportation (to markets)	4				
<i>Total cost incurred</i>	<i>12</i>				
<i>Price realized</i>		<i>93</i>			
Wholesaler			5.4	12	12%
Purchase cost	93				
Cost incurred	12				
<i>Price realized</i>		<i>110</i>			
Retailer			25	10	24%
Purchase cost	110				
Cost incurred	10				
<i>Price realized</i>		<i>145</i>			
<i>Total marketing cost</i>				36	
<i>Total marketing margin</i>			48		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player. Net margins of existing CA store owning and operating companies have been highlighted in Chapter 6.

Table 9: Cost buildup for Value Chain III - Apple harvest of 2014 (sale prices for the month of March 2015)

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁶⁶	Actor's share of final price
Farmer			55		41%
Cost of production	6				
Harvesting	1.1				
Cost of logistics	1.6			1.6	
Cost of marketing	0.2			0.2	
<i>Total cost incurred</i>	<i>8.9</i>				
<i>Price realized</i>		<i>64</i>			
CA Store			17	12	19%

⁶⁶ Including cost of logistics

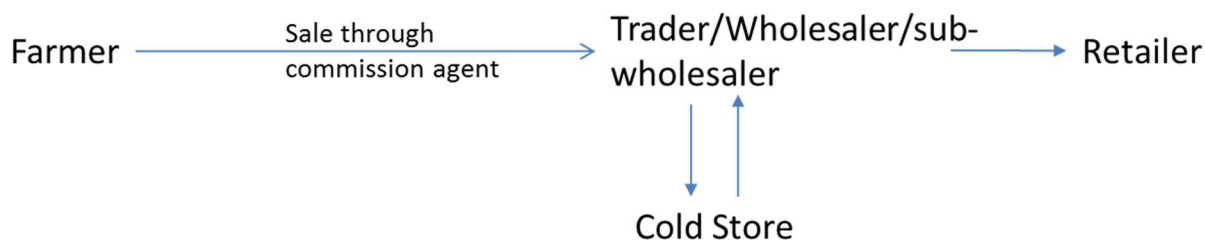
INR/kg	Costs	Price	Actor's gross margin*	Actor's marketing cost ⁶⁶	Actor's share of final price
Purchase cost	64				
Payment to hub operator	3				
Unloading at CA store	2				
Retrieval and loading	3				
APMC fees	0.5				
Secondary transportation (to markets)	4				
<i>Total cost incurred</i>	12				
<i>Price realized</i>		93			
Wholesaler			10.4	12	14%
Purchase cost	93				
Cost incurred	12				
<i>Price realized</i>		115			
Retailer			30	10	26%
Purchase cost	115				
Cost incurred	10				
<i>Price realized</i>		155			
<i>Total marketing cost</i>				36	
<i>Total marketing margin</i>			58		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player. Net margins of existing CA store owning and operating companies have been highlighted in Chapter 6.

Value Chain IV: Stored produce chain through normal cold storage

Unlike CA stores, normal cold storages have long been used in the apple supply chain in a variety of ways. While normal cold storages are limited in their ability to extend life beyond 2-4 months and may not be as consistent in terms of quality retention vis-à-vis CA stores, these storages are significantly cheaper to setup⁶⁷ and operate given their much more basic technology involving only refrigeration as against the CA store's multi-parameter control. Normal cold storages also lend themselves better to frequent replenishment and withdrawal from the store affording traders greater flexibility in their usage.

Figure 26: Value Chain IV



⁶⁷ Estimates of the share of capital investment required to setup the same capacity of normal cold storage versus CA storage range from 25% to 50% depending upon specifications

For these reasons, cold storages may be used at multiple points in the supply chain depending upon the supply chain actor's individual preferences and market scenario. So a trader may buy produce at the mandi following the Value Chain I or 2 described above and then sell some volumes right away, store some volumes in a cold store rented or owned by him for a few days near the market in anticipation of a favourable movement in prices to withdraw and offload the stock as soon as this happens within season and store some more volumes in a cold store for a longer term (2-4 months) with the intent to benefit from price rise in offseason.

As against this, apples stored in CA stores can only be withdrawn in larger lots (the minimum quantity to be withdrawn being the capacity of a single chamber in a multi-chamber CA store⁶⁸) making CA stores amenable only to longer term storage (at least 2 but upto their maximum potential of 10-12 months) for offseason sale.

While cold storages, like CA stores, are often owned and operated by traders as against being third party storage service providers, unlike in the case of CA stores, there is no practice of farmers carrying produce to cold stores for purchase by the cold stores directly. Cold stores are typically used as an additional link opportunistically in the prevalent chain (Value Chain I and II above) as against giving rise to a distinct and independent channel in its own right.

Table 10 captures the value chain cost build-up of an instance of this chain where primarily A-grade⁶⁹ produce harvested in the season months of 2014 is sold by the farmer to a trader/wholesaler through a commission agent (like Value Chain II) at the mandi. The wholesaler uses cold storage for 1 month before making his sale to a retailer.

Table 10: Cost buildup for Value Chain IV

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁷⁰	Actor's share of final price
Farmer			47		59%
Cost of production	7.4				
Fertilizer	2.5				
Pesticide	1.8				
Labor	3.1				
Harvesting	1.6				
Cost of logistics	3.5			3.5	
Cost of marketing	6.9			6.9	
Grading	1.0				
Packaging	4.6				
Others	1.3				
<i>Total cost</i>	<i>19</i>				
<i>Sale price</i>		<i>66</i>			
Commission agent					

⁶⁸ A single chamber is typically 100 - 200MT. So a 5000MT CA store may have 34-35 chamber. For the investor in CA stores, smaller size of each chamber translates into a greater cost per MT of total capacity.

⁶⁹ Since VC III only accepts the best produce and VC II is used for all grades, to ensure comparability for analysis the value chain for only primarily A-grade apples has been traced

⁷⁰ Including cost of logistics

<i>INR/kg</i>	Costs	Price	Actor's gross margin*	Actor's marketing cost⁷⁰	Actor's share of final price
Commission	3.3			3.3	3%
Wholesaler			16	5.1	18%
Purchase price	66				
APMC Fees	0.7				
Storage	1.4				
Others	3.0				
<i>Sale price</i>		90			
Retailer			12	10	20%
Purchase price	90				
Costs incurred	10				
<i>Sale price</i>	112				
<i>Total marketing cost</i>				29	
<i>Total marketing margin</i>			28		

* Note: Actual profit margin will be lower depending upon each actors' overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player

Key observations and takeaways

A key purpose of this study was to ascertain the impact heavy investments in Controlled Atmosphere storages subsidized by the government have had on

- the key parameters of post-harvest management viz.
 - o costs of marketing
 - o distribution of final realized value amongst actors (in terms of how commensurate the value and margin is with the actors' costs, risks and level of value addition)
 - o the incidence of waste.
- welfare of farmers

While aggressive government support for the development of cold storage infrastructure has accelerated its development over the last decade, this comparison is intended to assess the efficacy of this support in order to identify improvements required to enhance and scale impact.

A summary of findings on these parameters is provided in Table 11.

Table 11: Comparison of cost buildup between various value chains

		VC I	VC II	VC III								VC IV
				2013 harvest avg sale price	2014 harvest Dec' 14 sale price	2014 harvest Jan '15 sale price	2014 harvest Feb '15 sale price	2014 harvest Mar '15 sale price	2014 harvest	2014 harvest	2014 harvest	
Farmer	Share of final price (%)	50%	61%	31%	54%	52%	44%	41%	59%			
	Marketing costs (INR/kg)	0.0	11	1.8	1.8	1.8	1.8	1.8	10			
	Gross margin (INR/kg)	28	41	30	55	55	55	55	47			
Preharvest contractor	Share of final price (%)	16%										
	Marketing costs (INR/kg)	13										
	Gross margin (INR/kg)	4										
CA Store	Share of final price (%)			32%	16%	14%	20%	19%				
	Marketing costs (INR/kg) ⁷¹			12	12	12	12	12				
	Gross margin (INR/kg)			29	7	5	17	17				

⁷¹ Marketing costs captured here do not include cost for CA storage given that this value chain covers only CA stores that are owned and operated by traders and, as mentioned in the note under the table, costs and margins do not include overheads, capital expenditure and interest elements. Nevertheless, even in the case of the few rental stores that the author came across, the cost of rental charged was the same for up to 5 months of storage.

		VC I	VC II	VC III					VC IV
				2013 harvest avg sale price	2014 harvest Dec' 14 sale price	2014 harvest Jan '15 sale price	2014 harvest Feb '15 sale price	2014 harvest Mar '15 sale price	
Commission Agent	Share of final price (%)	4%	3%						3%
	Marketing costs (INR/kg)	0	0						0
	Gross margin (INR/kg)	4	3						3.3
Wholesaler	Share of final price (%)	10%	14%	11%	13%	16%	12%	14%	18%
	Marketing costs (INR/kg)	6	4	12	12	12	12	12	5.1
	Gross margin (INR/kg)	4	10	2.5	3.4	8.4	5.4	10.4	16
Retailer	Share of final price (%)	21%	23%	27%	17%	18%	24%	26%	20%
	Marketing costs (INR/kg)	9	10	10	10	10	10	10	10
	Gross margin (INR/kg)	13	12	25	10	12	25	30	12
Consumer sale price		106	100	130	118	123	145	155	112
Wastage		<p>1. Volume loss of 3-7% takes place at the retail level and 2-3% (weight loss) during storage</p> <p>2. There is negligible volume loss at any other stage across chains</p> <p>3. Loss of value in VC I, II and to an extent IV, is however greater and not estimated.</p> <p>4. Loss of value arises from damage due to poor handling, packaging, transportation on bad roads, wrong or only broad level grading in addition to reduced quality from ageing in the absence of sufficient cold and controlled atmosphere storage and transportation.</p>							

Note: Marketing costs and margins do not include overheads (including waste), capital investment and interest costs. These other cost elements will be most pronounced in the case of CA stores given that these are the only players that invest in capital equipment heavily and have the overheads that come with being an organized player.

From the comparative assessment in Table 11, it is clear that for the harvest of 2014, farmers have received about the same absolute price for their produce when selling through the traditional chain (VC II, INR 61/kg) and selling to CA stores (VC III, INR 64/kg). However, this is with two important differences

- The costs of marketing for the farmer in the case of VC III are substantially lesser resulting in better margins for him
- The share of final consumer price that has accrued to the farmer is lesser in the case of VC III

The share of final consumer price that accrues to the farmer keeps going down for sales made later in the season. Benefit of higher offseason realizations are thus not accruing to farmers. This is understandable given that farmers are not taking any price risk or making any investments for the sale in offseason. These investments have been made by the private CA store owners and the price risk is also entirely taken by them. However, given that the government has subsidized private investors heavily for their investments in CA stores, it will be also be fair to assert that a portion of this risk exposure is taken by the public exchequer.

Farmers selling to CA stores that were interviewed were unanimous in their view that the development of CA stores has benefitted them by

- Giving them a choice of channels to sell into (as against only VC II and its minor variant VC I and IV that existed earlier) thus creating some level of competition amongst buyers of their produce (the agents, traders and CA stores) leading to improved and relatively stable realizations for them⁷²
- Reducing not only their marketing costs⁷³ but also the inconvenience and lack of transparency they had to deal with in the existing system
 - o the farmer typically gets to know the price a few days in advance and can make an informed decision for his sale as against in the mandi where price discovery takes place at auction time by when, having carried the produce to the mandi already, the farmer has little option but to accept the price
 - o payment by CA stores is made by kilogram using better weighing measures than those available at the mandi while payments at the mandi are by box and hence less standardized
 - o CA stores typically pay the farmer upfront or within 10 days as against payments from buyers at the mandi which may come anywhere between a few days to weeks later. Even when payment is upfront for a mandi sale, it is likely to come as an “advance” from the commission agent whose obligation the farmer has to take

⁷² The next chapter presents an analysis of the impact of CA stores on real prices realized by farmers over the year

⁷³ Farmers save the cost of packaging since they carry their apples to CA stores in crates that the stores provide free of charge. They also save on transportation cost in carrying apples up to a near-farm CA store as against the mandi which may be as far as Delhi or nearer, in Shimla.

However since CA stores primarily buy the best A grade produce, these benefits are largely limited to that proportion of the farmer's production which is A grade, estimates of which are estimated to be in the range of only 50-60% of the total production in HP⁷⁴ leaving the farmer with no option but to resort to the traditional chain for selling non-A grade apples. In addition, vast numbers of farmers whose orchards do not produce CA-worthy apples (particularly those with orchards below 6000ft in height) are completely excluded from this chain.

The farmer's realization in selling to a preharvest contractor (VC I) has been lesser (at INR 53/kg) and his share of the final consumer price has been lower in this case. This is again understandable given the even lesser risk and effort undertaken by the farmer and the presence of another intermediary in the chain over and above the commission agent, wholesaler and retailer.

However, the important takeaway from the study of this chain is that often the farmers who sell through pre-harvest contractors do so only because they have no other low-touch option. For example, the author met a lady farmer in Jubbal near Shimla who mentioned that she had to resort to selling to a pre-harvest contractor even though she was not sure of whether she was getting a fair deal because she, being single, did not have any trustworthy option to deal with the marketing setup. She could not sell to CA stores because her orchard was below 6000ft and therefore incapable of producing CA-worthy apples. Even so, with CA storage capacity of less than 40,000MT (of which close to 10,000MT has come up only in the last 1-2 years) for a production of between 500,000 to 700,000MT in HP, the option afforded by VC III is currently a drop in the ocean.

VC IV is very similar to VC II except to the extent of addition of cost of cold storage. As mentioned earlier, cold storage is therefore either used for short periods only if the trader expects prices to move favourably over a time period of a few days during season (which may happen on account of intermittent demand-supply mismatches) or for 2-4 months close to the end of season to be able to sell at higher prices when completion of harvesting results in dwindling supply of fresh apples.

For the harvest of 2013, again the farmer's realizations were comparable⁷⁵ between VII, VC III and VC IV and his marketing costs were lower in the case of VC III. However, the farmer's share of consumer price in the case of VC III for this year was relatively much lower than for the 2014 harvest year (31% based on the weighted average sale price across December 2013 to June 2014 as against 41-52% based on average sale prices between December 2014 and March 2015).

Discussions during the field study with stakeholders across the chain shed some light on the reason for this difference. The harvest year of 2013 witnessed a bumper crop with the second highest production in HP since the harvest year of 1991. Oversupply led to depressed prices, as is to be expected in the absence of matching demand during season. However, while depressed prices were witnessed in season right up to the retail level when compared to retail prices in 2014, the upside of off season prices (Dec 2014-June 2015) did not percolate down to the farmers.

⁷⁴ Estimates from interviews with farmers and farmer association in HP; In Kashmir this proportion is even lesser at 30% A grade, 40% B grade and 30% C grade production

⁷⁵ Though this study did not cover VC I, II and IV for the 2013 harvest, a look at the published price and arrivals data at key mandis made available by the Department of Marketing and Inspection, Ministry of Agriculture, GoI (at www.agmarknet.nic.in) reveals that farmer realizations at mandis in Shimla were comparable to those for sale made to CA stores (~INR 40/kg)

Again while the upside from offseason prices leading to better margins of CA store owners is fair given the investments made and exposure to price risk that they take, the above discussion raises a question about the efficacy of government investment in subsidy towards the achievement of its development objective since the farmer continues to be deprived of the gains from better prices and lesser waste achieved by the smoothening of supplies to better match the pattern of demand.

Farmers can partake in these gains if they have the option to retain ownership of the produce while it is stored in the CA store as against having to sell it to CA store owners-cum-traders. This option is very minimally available currently in HP – either through government owned capacity in the form of CA capacity setup by Horticulture Produce Marketing and Processing Corporation (HPMC) or newer privately owned capacity that has come up only in the last 1-2 years⁷⁶.

In order to assess whether distribution of final realized value amongst actors is commensurate with the costs they incur and risk exposure they take, comparison of the total cost of each actor's services with their net margins would be necessary. However, while the study captured gross margins of each actor, none of the actors were willing to share cost elements pertaining to their overheads and capital investment.

The overheads and capital investment are the highest in the case of CA stores and farmers (if one were to consider the market price of their land and the risk of cultivation) while in the case of pre-harvest contractors, commission agents and wholesalers, these costs are limited given that they are asset light and are largely part of the unorganized sector.

One way to get around this challenge is to study the financial statements of these actors. Since financial statements were available only for two of the largest near-farm CA store companies – Adani Agrifresh and Devbhumi Cold Chain – these have been analysed in the next chapter. However, as we will see, since these players also trade in imported apples and do not report the financials of the import operation separately, like to like comparison becomes challenging. In the next chapter we have attempted to build a model for a standalone trader-owned CA store from first principles to overcome this challenge to an extent.

Some of the other key issues and qualitative takeaways from interviews carried out with each actor are summarized below:

Farmers

Impact of CA stores positive, but limited

Though farmers selling to CA stores were happy about having the option to sell to CA stores and clearly alluded to the fact that their income has risen after the CA stores came about, in a few cases there were concerns around the high-handedness of CA stores in rejecting produce that the farmer carried all the way from their farm to the store. Over the years, CA stores have actively discouraged farmers from bringing to their store any produce that is unlikely to meet their stringent quality requirements. They do this either by rejecting the produce outright in case there is more than a

⁷⁶ Several farmers interviewed were of the view that even these new stores that have offered space for rent initially will start using the entire space for trading once they establish themselves. They also mentioned that rental space was available in the study year because of the relatively higher prevailing prices and when procurement prices are low, for example in the year of a bumper harvest, storage space on rental will be hard to find

minimum threshold (~15%) of B grade produce in the lot brought to the store⁷⁷ or by buying the B-grade produce at prices lower than what the farmer would be able to obtain at the local mandis. Over a period of time farmers have adjusted themselves to this system and only carry produce that they believe will have less than the threshold level of B grade produce. For the rest of the produce, they use the mandi channel (VC II).

While this practice makes sense from the CA stores' point of view since B –grade produce may neither be able to sustain shelf life in CA stores nor is it demanded by the typically premium paying offseason apple buyers who have the quality of imported apples on offer as an alternative, it excludes small farmers from the CA store option. This is because the quantum of A-grade produce with smaller farmers is limited not making it viable for them to carry it to the store and the CA stores' limitation in dealing with very small lots in the rush of peak season.

Even if these farmers were to carry their small lots to the CA store and they were to be accepted, the farmers are then left with even smaller quantities of B-grade produce in which the local commission agent may not be interested or may not be of minimum economic size either to carry to the Delhi terminal market or even for sale at the local HP mandis. As against this if the farmer carries his entire produce including all grades to the mandi, the existing system which does not grade so finely, accepts the entire lot at an average price thus giving the farmer a more viable option.

Further, as mentioned earlier, vast numbers of farmers with orchards below 6000ft in elevation do not have access to the CA store channel since CA stores do not accept apples from these orchards. Thus while the benefits of CA stores are clear, there are sizeable limitations in terms of the scale of impact they have had and the target beneficiaries they have impacted yet.

Dealing with C-grade apples

When it comes to C grade produce which includes “culled” or damaged apples, farmers complained of only having the option to sell these to the state government under the MIS scheme in which these apples are bought at rock bottom prices of around INR 6/kg.

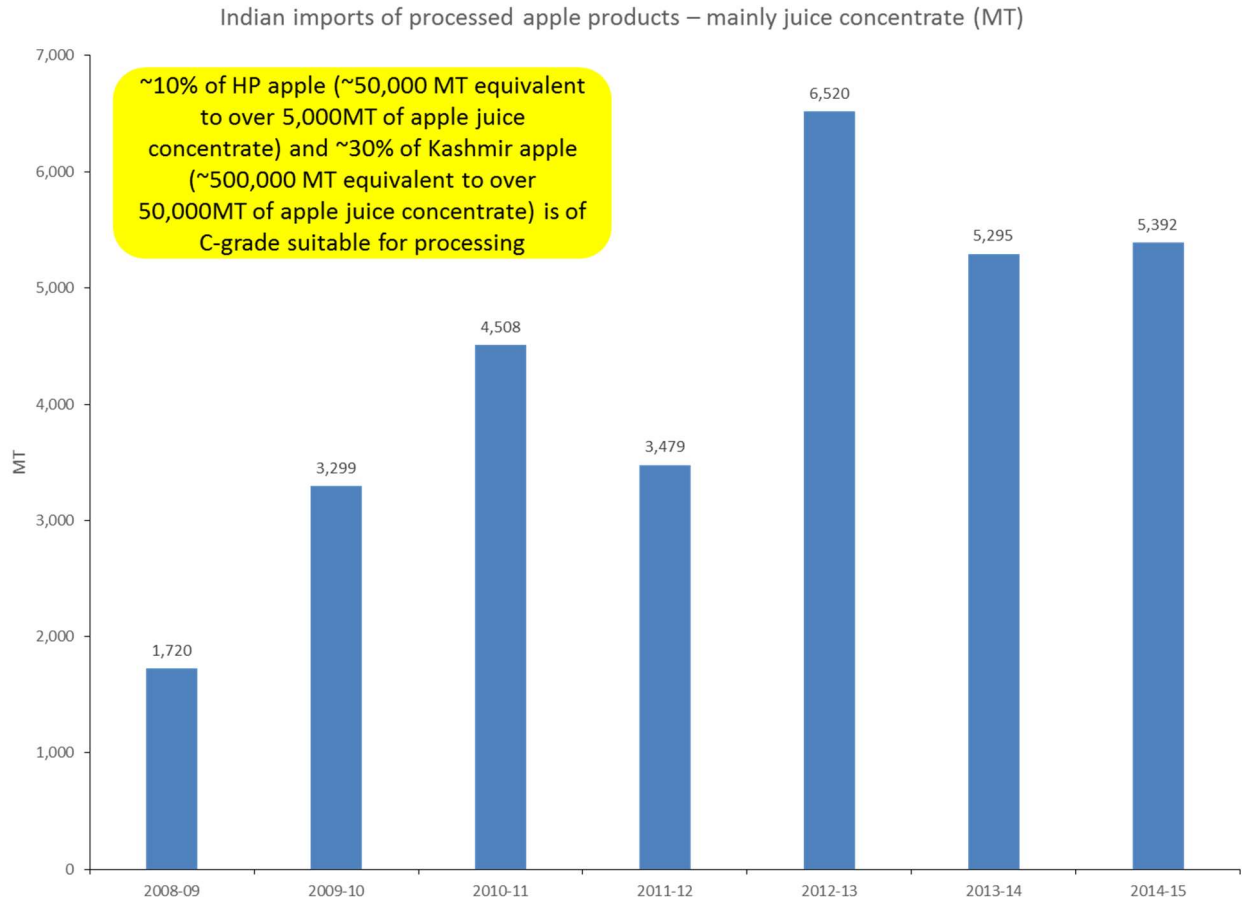
Some farmers mentioned that small traders also often pick up these apples for sale in 2nd and 3rd tier towns or to the economically weaker sections in urban areas.

Except for the processing facilities owned by the government, the author did not come across any instance of sale of these apples to processing units which is the norm for such apples globally. Given the relatively greater proportion of C grade apples in India vis-à-vis globally⁷⁸ in addition to the fact that apple juice concentrate is heavily imported and growing in India, the absence of large scale purchase of these apples by processing units to feed local demand appears to be a glaring gap. (see Figure 27)

Figure 27: Indian imports of processed apple products

⁷⁷ This first level quality check is done visually before accepting the lot for finer grading on the automated grading machines

⁷⁸ Estimates of C grade apples in Kashmir are in the range of 30% of the total production while in Himachal it is in the range of 10%



Source: Prepared from data from APEDA

Lack of packaging standards

Farmers often overpack apples into boxes meant for lesser quantities. It is a very common practice to pack 25-28kg of apples in boxes that are designed for carrying 22kgs. The perceived savings in packaging and transportation costs by doing this appear to overshadow the less directly visible quality loss due to damage that this causes to the apples especially when they travel over roads in poor condition to distant markets.

“Supply chain losses are a bigger factor in spoilage of HP apple and reducing their competitiveness vis-à-vis imported apples (mixing, lack of standardization) than poor quality of production”

- Major wholesaler of apples in Mumbai

However, farmers are beginning to recognize this fallacy and recent attempts by the government to standardize packaging have been well received by farmers. However, these attempts have not

been very successful hitherto, allegedly⁷⁹ on account of the intermediaries' reluctance in addition to the lack of clarity in and strict enforcement of the same by the government.

Significant losses in the post-harvest chain that compromise the quality of apples substantially, especially when they move to distant but very large markets like Mumbai, Chennai and Bangalore where imports come fresh off refrigerated containers before which they have gone through an organized chain from farm to packhouse to CA / cold store, is a key reason for uncompetitiveness and lower price realization of domestic apples vis-à-vis imported apples even when consumer tastes are more aligned to domestic apples.

Limited grading early in the chain

After harvesting, farmers typically undertake a broad level of grading into A grade and B grade for sale in the mandi while the culled or damaged apples (C grade) are either sold under the MIS scheme of the government or to traders that focus on selling this produce to the economically weaker sections in 2nd and 3rd tier towns. The price realized by the farmer is thus limited to 3-4 price points corresponding to these grades.

At the consumer end however, there are several price points depending upon the finer quality grade (color and size primarily), location of sale, format of storefront etc. The benefits of better value realization from finer grading between the farmer and the consumer are thus captured by intermediaries who carry out this grading. The availability of near-farm mechanized grading facilities operating as third party service providers is limited but increasing giving farmers the option to grade more finely and seek differentiated returns by grade. However, until the grading system is standardized and enforced, this is unlikely to be of much benefit.

Border "tax"

Himachal Pradesh charges a levy on produce that goes beyond the state's borders. Checkposts are setup with the purpose of collecting this levy at the borders. This levy is over and above the APMC fees which is often incurred if the sale is made at a destination mandi. Not only does this add another cost in the chain, it also leads to delays at the border contributing to deterioration in the quality of apple being carried in ambient conditions.

Non-availability of financing options for small holders

In the year of this study – 2014-15 – some new private sector CA store capacity which was rented out (as against being used only for storing apples bought by the CA store owner) came online for the first time. While some farmers have been availing of such facilities owned by the government⁸⁰, the share of capacity available for rent has been miniscule. The farmers using this capacity have typically been larger farmers who have the financial capability to sustain for a few months without the need for immediate liquidity from sale of their produce. The absence of any organized facility for giving loans to farmers against their apple stocks stored in a CA store in addition to the

⁷⁹ Hindustan Times, August 2014 and May 2015 and USDA, 2013

⁸⁰ The Tribune, April 2015

difficulties associated with storing small lots of apples in large CA chambers has kept small farmers away from leveraging these rented facilities.

Absence of a mechanism to consolidate, or to provide a disaggregated solution

The study found that while cooperatives exist amongst apple growers in HP, their role is typically limited to providing a cushion for exigencies like loss of produce in a truck accident, managing the process of arranging for transport, bulk buying of fertilizers and packing material etc.

When it comes to the actual sale transaction, each farmer practically operates independently with no cooperative action. While the feedback from interviews indicated that this arises from a cultural disinclination of the farmers to cooperate for sales, it is reasonable to expect that cooperatives can play a larger role in bringing the benefits of reform and of the availability of CA store capacity to the small holders.

Cooperation at an informal level has already started to take place when farmers came together in the study year of 2014-15 by pooling their produce to be able to rent a full chamber of CA storage capacity.

On the other hand, some farmers were inquisitive about technologies that permit long term storage of small quantities at the farm itself so as to enable control and visibility of the produce with them until prices rise in the offseason.

Perceived “collusion” and “market power” issues

Some farmers alleged “collusion” between CA stores buying from farmers in deciding the price of purchase and deliberately keeping it lower which, if there was perfect competition, can be expected to rise beyond mandi prices. However, with the increase in number of CA stores in the recent past, this phenomenon was cited more as a thing of the past than a current concern.

CA store owners, besides trading in domestic apples are also ramping up their trading volumes in imported apples and some of them also operate as commission agents. Some farmers feel that this led to a concentration of market power with these players which they could use to extract undue profits. For example, it is hypothetically possible for a CA store owner to maximise the supply of imported apples as against domestic apples if the margins realized on the former are greater. This would harm the interests of domestic farmers at the hands of CA store owners who are subsidized by the government for the opposite purpose.

However, in practice, this would be tough for CA store owners to execute given the reasonably high competition in the relatively low entry barrier business of imports and the even more intense competition amongst traders of domestic produce. However, given that this competition is prevalent only during season, becoming limited to only CA store owners during offseason, the possibility of this phenomenon taking place during offseason exists.

Additionally, the credit-linked backended nature of the subsidy helps investors in CA stores to significantly reduce interest and debt costs which lends them greater liquidity. If this liquidity is deployed towards working capital for imports, it would defeat the very purpose of the subsidy.

Investigation of these issues to establish how real they are is however perhaps the subject of another in-depth study which goes beyond the scope of this one.

Emergence of a “profit share” model

Some of the intermediaries interviewed, particularly one that functions as a trader, commission agent and CA store owner, have introduced a system of “profit-sharing” with farmers for sale of their produce during offseason.

Under this model, the intermediary procures apples from the farmer paying an upfront price which is comparable though lower than the prevailing price during season for the CA-worthy apples. These apples are stored in the CA store and sold during offseason. The profit realized after adjusting the costs of storage, handling, transportation etc. from the sale in offseason is then shared between with the farmer and the intermediary in a 50:50 ratio.

In case a loss is incurred in the offseason sale, the farmer is not required to share the same with the intermediary. This model gives the farmer an option to partake in the potential returns from better prices in offseason. Adoption of this model has however been slow perhaps on account of the trust deficit that exists between farmers and intermediaries. Nevertheless, there is no doubt that this is an innovative model that can potentially ensure better returns to the farmer.

Awareness and APMC reform moving markets closer to the farms⁸¹

As mentioned earlier, over the years, the dependence of HP farmers on the traditionally prominent APMC market of Delhi has reduced, with volumes of sale moving first to the APMC market of Chandigarh, then to Parwanoo (a town in HP close to the state border) and, since the APMC Act in HP was reformed, increasingly to markets very close to the actual growing areas.

The HP government’s initiatives in upgrading the mandis in the state⁸² has also helped in this transition. Reform of the HP APMC Act in in 2005 which permitted direct purchase has led to a widespread prevalence of buyers or their agents setting up makeshift “buying centres” near farms during season from where they make direct purchases from farmers. At least one mandi with a permanent structure has also come up in Narkanda in Shimla district. This mandi is doing very well with volumes going up to 10,000 boxes (~250 MT) per day⁸³ during season.

While farmers were generally appreciative of this trend, several farmers had burnt their fingers in dealing with some of the makeshift “buying centres”. Since these centres were setup temporarily, cases of them disappearing with the farmers’ produce with a promise to pay later were not rare. While these centres also procured a license from the relevant authority to operate the centres, apparently sufficient controls to check such unethical practices are absent.

Encroachment of forest land

Some smallholder farmers expressed a concern arising from the alleged high levels of encroachment on forest land that is purportedly carried out by larger farmers. In their view, this

⁸¹ The Times of India, August 2011

⁸² HP State Agricultural Marketing Board

⁸³ Interview with promoter of the mandi, Mr. Rajan Dogra

leads to production beyond what is expected leading to more acute glut conditions thus harming smallholders.

CA stores

Payment of APMC fees

The government of HP delisted fruits and vegetables from the mandi in early 2014 which meant that this fee would not be levied for transactions consummated outside APMC mandis. However, just before the harvest of 2014, in the month of May, apple was declared as an exception to this.

While CA stores use the price information from APMC mandis (which continue to be the channel for the vast majority of apple production from HP) as a benchmark to determine the prices they offer to farmers for selling their produce to them, mandi infrastructure or facilities are not used by the apples stored in CA stores. All CA stores interviewed raised the concern about having to pay APMC fees of 1% even when they made direct purchases without leveraging any APMC mandi infrastructure.

“Contracts” with farmers

Large CA store owners like Adani Agrifresh have agreements with farmers which are entered into before the harvest. This enables the CA store to have greater confidence on their ability to procure sufficient quantities of apple for utilizing their capacity before the competition between CA stores for procurement begins when harvesting starts. These agreements specify the minimum and maximum quantities to be procured by the CA store for which the agreed price, typically at a slight premium to prevailing mandi prices, will be paid by the store. Adani also offers advise to these farmers on cultivation and harvesting practices by leveraging experts who may be retired scientists.

High risk arising from uncertain production and imports

Procurement of sufficient quantities at a price on which they can earn a sufficient markup to cover costs and earn a margin is central to the business model of CA stores. However, each year can be very different from the last when it comes to this. For example, while bumper production in 2013 made it easy for CA stores to procure sufficient quantities at low prices, thus earning healthy margins for sale in offseason months of 2014, the trend reversed in the subsequent year. Perceived and actual shortage of supply from Kashmir on account of the floods and losses to the scab disease created fears of short supply raising procurement prices which made CA stores less confident of being able to make money this year. This was exacerbated by the expected oversupply of apples in global markets arising from Russia’s ban on import of US apples along with a bumper harvest in the US in addition to the persistent threat of imports from China.

It was learnt from interviews that some of the space that was made available on rent this year was on account of the fact that smaller and / or risk averse CA stores offered their space for rent as against buying apples for trading this year. While this is not unexpected in a market that is still not mature and is evolving fast, it raises a concern on the further limited availability of third party rental space for farmers in years when the possibility of making profits from trading will be higher.

Mixing of B-grade apples

A persistent problem that the CA stores have faced is that of “mixing” of B-grade produce that is not CA-worthy with A-grade produce that the farmer brings for sale at the CA store. CA stores complained of having to suffer losses on account of accepting such B-grade produce which the farmer intentionally concealed under layers of A-grade produce. It is to specifically to discourage this practice which either leads to greater waste in CA storage or to prevent the same, more rigorous acceptance checking, that CA stores pay lesser than market prices for B-grade produce that they end up procuring.

Improvements in yield and quality

All CA stores were unanimous in their view that for the benefit of CA stores to expand and percolate to the maximum number of farmers, improvement in farm productivity (yields) and consistently better quality of production would be necessary. While making apples available in offseason does improve realizations and helps to counter imports, unless overall production rises significantly to fill the gap between overall demand and supply, more CA capacity will simply lead to higher consumer prices during season and perhaps even imports during season to fill the sheer gap in demand.

Buildout of CA capacity should be commensurate with the increase in production, especially the share of production that is CA-worthy and comparable in quality to imports.

Issues in transportation

CA stores typically use non-refrigerated trucks for transportation of apples from their CA stores to the markets at least until the ambient conditions are not very hot. However, after February-March when all prominent markets start to experience rising temperatures, using non-refrigerated trucks can result in greater losses. CA stores mentioned the limited availability and high cost of reefer transportation as reasons for not using them more extensively.

To get around this issue, Adani Agrifresh has procured some reefer vehicles on its own account to supplement the limited capacity available in the market. Given that apples that have spent several months in CA storage deteriorate faster in ambient conditions than fresh apples, this concern assumes significance.

Wholesalers, preharvest contractors and commission agents

Wholesalers, preharvest contractors and commission agents are discussed together because these actors often perform their roles interchangeably and there exists a high level of overlap in the activities of actors that can be categorised in this bucket.

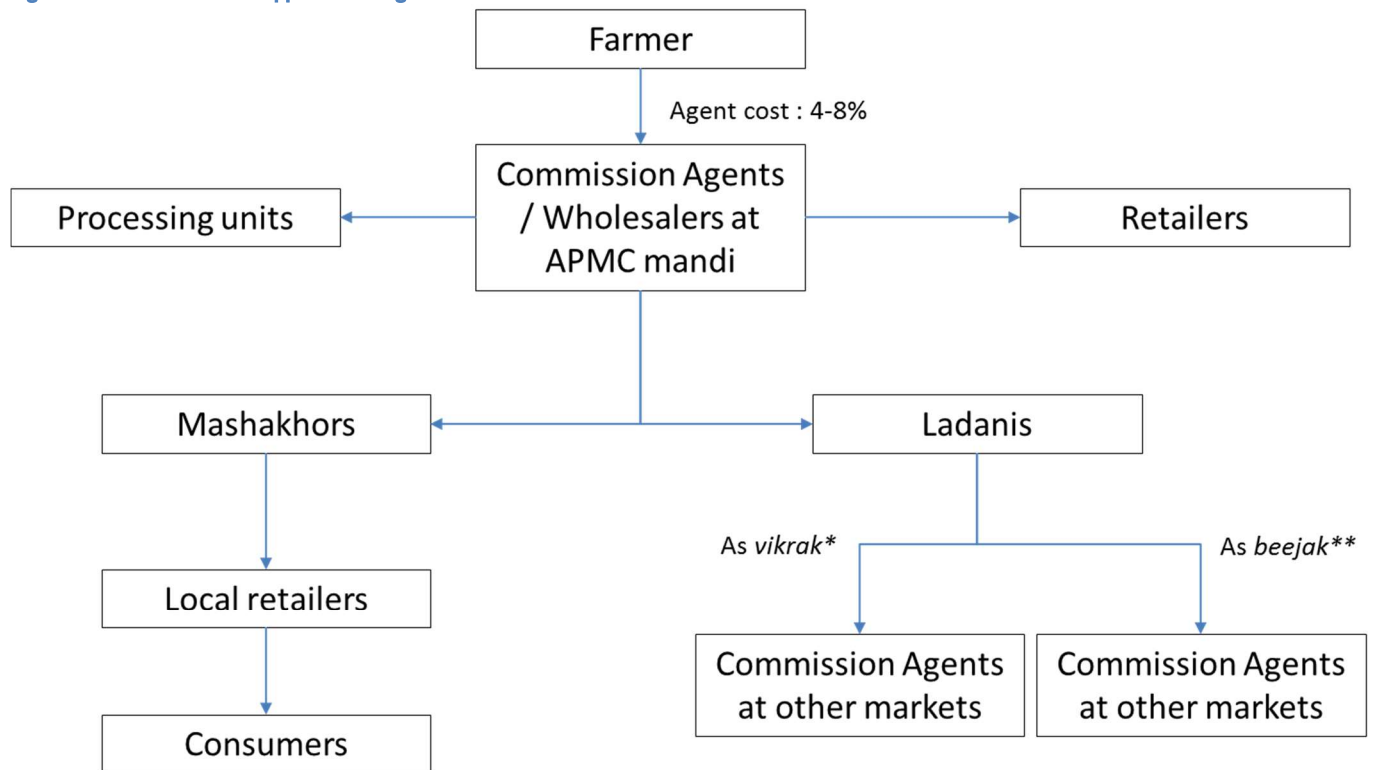
Wholesalers can be of two main types – viz “ladanis” and “mashakhors”. Ladanis are traders who typically perform the role of forwarding produce purchased from mandis to distant markets. Mashakhors, on the other hand, buy from ladanis and other larger wholesalers, disaggregate and sell to retailers in a particular area and can thus be termed as sub-wholesalers.

“Commission agents” do not take ownership of the produce and instead only arrange the transaction between buyer and seller in exchange for a fees.

In practice, however, while mashakhors are a fairly independent category of sub-wholesalers who buy and sell produce on their own account, ladanis can often behave like commission agents by not taking ownership and instead forwarding the produce on behalf of other ladanis or traders in exchange for a commission.

At the same time, commission agents often end up practically taking partial or total ownership of the produce by giving part payments as advances or, in case the farmer needs immediate payment while prevailing prices are not favourable, they may buy the produce and sell it when their expectation on price is met. The line between the supply chain functions performed by these actors is thus very blurred in practice.

Figure 28: Basic structure of apple marketing chain



* Ladanis charge 3-5% commission from wholesalers / agents

** Ladanis charge 3-5% commission to wholesalers / agents

Source: “Distribution pattern of apples in the Indian subcontinent: Constraints and strategies”, International Journal of Engineering and Management Sciences, 2012

Tightening of subsidies for cold storages

Some of the larger agents and traders interviewed were concerned with about “tightening” of subsidies for cold and CA storages that was carried out by the government in early 2014.

Subsidies were linked more tightly to the technical standards deployed by recipients to ensure only genuine applicants were approved and that policy support would encourage technology adoption as against just creating infrastructure that may not be aligned to best practices. Administration of

the subsidy which was hitherto done by a gamut of national and state level bodies offering subsidies in one form or the other was also streamlined.

This was done under an initiative of the Mission for Integrated Development of Horticulture (MIDH) in April 2014 with the specific intent of bringing about clarity and greater accountability in the administration of subsidies⁸⁴. However, some of the medium sized players already working in the chain as intermediaries who had earlier made plans to invest in CA stores pulled back on their plans or were concerned about the status of their applications given these changes. Some felt that the guidelines were too stringent and amounted to forcing more expensive investment when it was not needed, besides raising compliance costs.

Packaging malpractices

These actors complained of malpractices by farmers primarily involving the packing of low grade apples in the lower layers of a box that is labelled as that with high grade produce in an attempt to secure higher realizations on low grade apples.

Defaults by buyers

Most agents and wholesalers interviewed complained of bad debts of up to 5% of their total sales in addition to very long periods, extending up to 6 months, before their due payments were released by buyers. This is a clear manifestation of the prevalence of small scale and unorganized buyers in the chain.

Evolution of business model

The changing scenario of apple marketing over the years has led to an evolution in the business models of actors in the chain. A fair share of the CA capacity that now exists has been developed by some progressive entrepreneurs who were traditionally operating as small scale agents, wholesalers or cold storage owners.

One element of this evolution is worth highlighting in the context of this study. For the distribution of their produce in offseason, CA stores have leveraged the existing network of agents and ladanis by contracting with them as their distributors. These distributors not only help in disaggregation and distribution of the large volumes released by CA stores, they also play an important role in providing credit to small retailers that procure CA apples which the CA stores would themselves not be willing to provide.

Even for sale to large organized retailers, these distributors are leveraged to meet the retailers' requirements which are typically of a lesser lot size than what larger CA stores are willing to cater to. Distributors are also necessary for absorbing the quality losses that take place in transit from the CA store to the Distribution Centres of organized retailers since organized retailers currently only retail the best quality CA produce. While these distributors are able to find buyers for the apples that deteriorate in transit, organized retailers are unable or unwilling to sell them.

⁸⁴ Further details can be found at [http://midh.gov.in/PDF/MIDH_GL\(E\).pdf](http://midh.gov.in/PDF/MIDH_GL(E).pdf)

Retailers

High level of waste on the shelf

A volume loss of 3-7% on the shelf is observed in the case of apples and is higher for other fruits. A key reason attributed to this is the propensity of Indian consumers to touch and often press each fruit to check it for its firmness and quality. Repeated touching by multiple customers even on good quality fruit causes abrasions which leads to faster deterioration and greater losses.

To circumvent this issue, retailers are increasingly switching to pre-packaged units of apples which by virtue of their being in packaging are not accessible to rough handling by customers. This also provides an opportunity to brand the apples – something which some of the larger intermediaries including Adani Agrifresh have started doing.

Availability and quality

The common refrain of all retailers interviewed was the limited availability of domestic apples in offseason, particularly of the quality desired by their customers. Even though there was a greater demand pull for domestic apples when compared to imported apples, retailers were concerned about not being able to supply the same in sufficient quantities.

Some retailers were also of the view that while improved cultivation practices and revitalized orchards will impact apple quality positively and is indispensable, much of the deterioration that takes place in quality can be addressed by improving harvesting and post-harvest management practices that arise from poor packaging, handling, grading and transportation.

Reliability of intermediaries

Most retailers mentioned that there was a shortage of reliable and organized suppliers because of which the few that are present command premium margins. The common complaint repeated across organized retailers was their inability to place their faith on suppliers and instead having to carry out strict checks on quality of produce received.

Chapter 6: Price analysis – before and after setup of CA stores

In order to specifically assess the impact that development of near-farm CA stores has had on improving performance of post-harvest management and in serving their developmental purpose, it is essential to analyze the movements in producer and consumer prices in relation to the setting up and operations of CA storage capacity. Since all existing CA capacity has received a myriad of support including direct capital subsidies up to the extent of 75% of capital cost from the government, this will in turn help understand the efficacy of policy support.

As mentioned earlier, the commercial development of CA capacity in India started with the operation of a 2,000MT store in Kashmir in 2004. The growth in capacity from 2000MT to almost 120,000MT over the last 10 years has not been secular and two clear waves of development are discernible.

The first wave, which was the trigger for setting up of the earliest capacity, was the rising incidence of imports which were finding an expanding market despite being priced at significant premiums. Thus about 30,000MT of the current capacity of close of 80,000MT in the growing states of J&K and HP was commissioned between 2004 and 2008. This was the wave of investments by the “early adopters” – larger companies that had greater appetite for risk – particularly Adani Agrifresh and FIL - between whom almost the entire 30,000 MT was distributed⁸⁵.

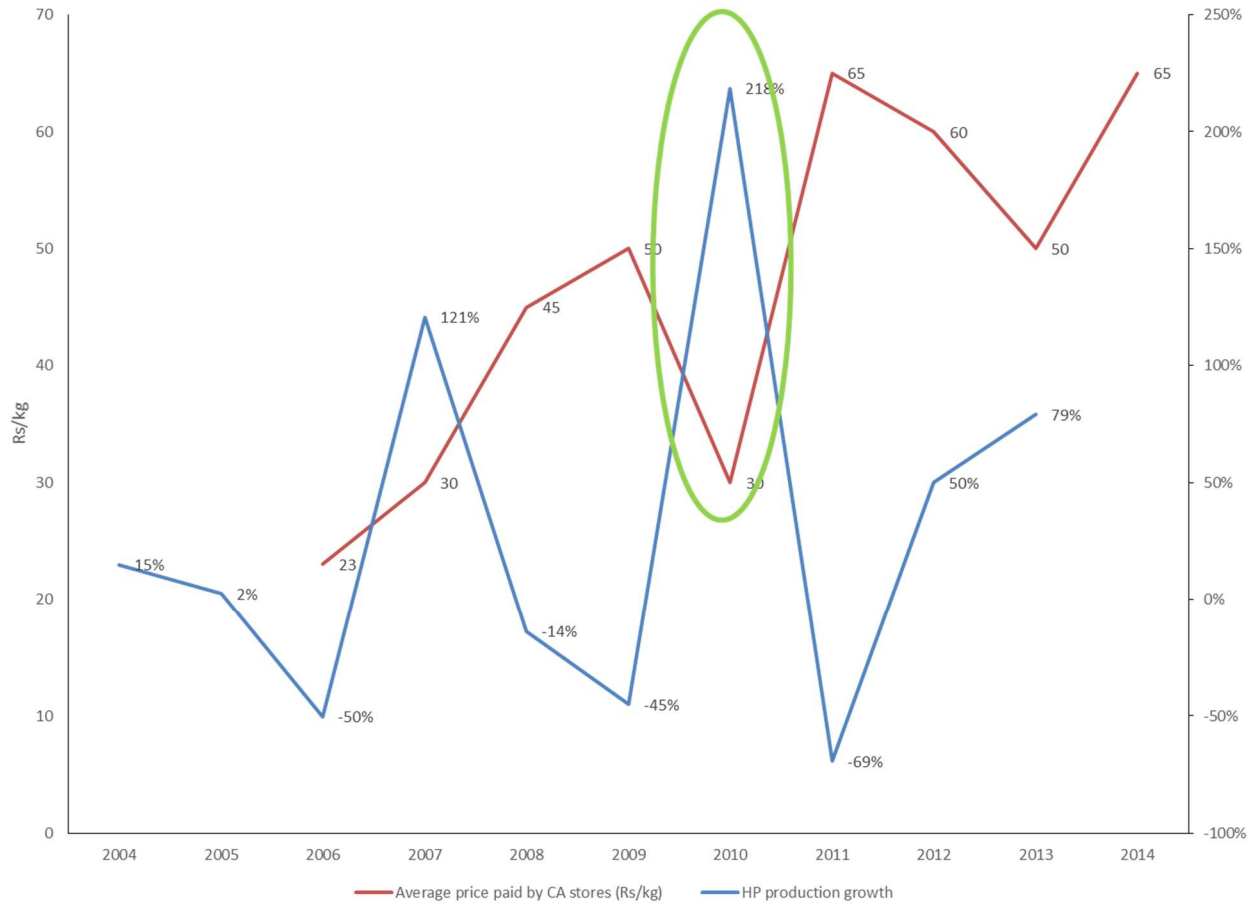
The next wave came about only once the profitability of the business model was established by the early adopters, particularly triggered by the bumper production of 2010 (see Figure 29: Approximate maximum price paid by CA stores in HP year on year vis-à-vis growth in production and Figure 30: Financial performance of two key CA store players in HP) which enabled these companies to earn a good spread between their buying price in season and sale price in offseason.

Several other players jumped into the market on seeing this profitability, giving rise to the next wave of investments between 2011 and the present. Feedback from market participants indicates that in addition to the 120,000MT capacity presently in place, significant further capacity additions are in the pipeline⁸⁶. This wave witnessed players with varied backgrounds entering the fray - while some of these were existing players in the apple trade (like Suri Agrofresh who had been in the apple trade as agents and traders for almost 40 years), several others had no background in the business and appear to have been purely attracted by the high return seen by CA store owners from the 2010 harvest. A few investments were made in partnership between players with industry experience and new entrants looking to tap into the sector’s potential.

Figure 29: Approximate maximum price paid by CA stores in HP year on year vis-à-vis growth in production

⁸⁵ The largest chunk of investment away from the growing areas – 12000MT by Fresh and Healthy Enterprises (FHEL) – was also established by a large cash rich public sector logistics company, Concor.

⁸⁶ Between April 2010 and July 2015, NHB had received LOI applications for CA storage projects with a total project cost of INR 124cr (of which subsidy towards projects worth INR 73cr had been released) in HP. In the same period, LOI applications for CA storage projects with a total project cost of INR 980cr (of which subsidy towards projects worth INR 34cr had been released) in J&K (Source: NHB). With the revision in norms for release of subsidy, which most market participants believe limits the financial support practically available to investors, some of this capacity may get shelved / delayed.



Source: Interviews with CA store owner-operators and farmers in HP and NHB

Figure 30: Financial performance of two key CA store players in HP



Source: Annual Reports of respective companies⁸⁷

An evaluation of the impact of development of CA storages must therefore specifically analyse the price movements before and after the year of 2004-05 and 2010-11. The following sections elaborate on this analysis carried out with a view to understand the following

- Whether the setting up of CA stores has raised real producer prices across all channels: This is done by collecting and analysing real wholesale apple prices between the months of July and November since 2002 before and after the development of CA store capacity
- Whether real prices of fresh apples have risen after the establishment of these stores: This is done by collecting and analysing real retail apple prices between the months of August and December since 2002 before and after the development of CA store capacity
- Whether real prices of domestic apples available in offseason have risen after the establishment of these stores: This is done by collecting and analysing real apple prices between the months of January and June since 2002 before and after the development of CA store capacity

⁸⁷ Since both companies also trade in imported apples (Adani and, even more so, than Devbhumi) and in fresh apples during season, the margins in the chart are not exclusively for the CA storage business. However, the share of revenues from CA storage, at least for Adani, is very high compared to imports (Source: Interview with management). Since gross margins in imports and fresh apple trade are lesser, the actual margins from CA storage exclusively are likely to be higher than in the chart.

- Finally, an attempt has been made to develop the economic model of an independent CA store based on available information on capital investment, expenses and revenues

Limitations of approach used

It is important to bear in mind that the prices analysed have been obtained from mandis and therefore do not include the price of apples that were actually bought by CA stores⁸⁸ since these apples never go through a mandi. The analysis is intended to assess the “rub-off” impact on the overall average price of apples across channels on account of the availability of choices and consequent expected bargaining power of farmers that farmers have after CA stores have been established. Nevertheless, the results are expected to be approximate since the share of apple that can actually avail the CA storage option is limited, as explained earlier in the paper⁸⁹.

While price data has been adjusted for inflation using the Wholesale Price Index data available from the Ministry of Commerce and Industry⁹⁰, no adjustment has been made for fluctuations in supply (production) which have a very strong bearing on producer prices. However, since data has been analysed over a period of over 10 years, we expect to be able to discern a trend over the years despite year to year fluctuations.

Another factor that impacts producer prices, especially prices paid by CA stores, is the expected price of imports in the period that CA apples will be sold. Given that orders for imported apples are placed on exporters from the US around the same time as when the peak domestic procurement is on (August), the import prices have a bearing on the price offered by CA stores to producers.

Producer prices have shown an upward trend

As can be seen from Figure 31, while real prices received by apple farmers in HP in the last 14 years have fluctuated widely, primarily on account of production variances, the trend is clearly upward with a noticeable step increase rise after 2006 (coinciding with the first phase of CA capacity development)

A similar trend is witnessed in the case of J&K, though relatively subdued when compared with HP (see Figure 32). The lower impact in the case of J&K could be on account of the fact that a greater share of apples from HP are considered CA-worthy as compared to those in J&K.

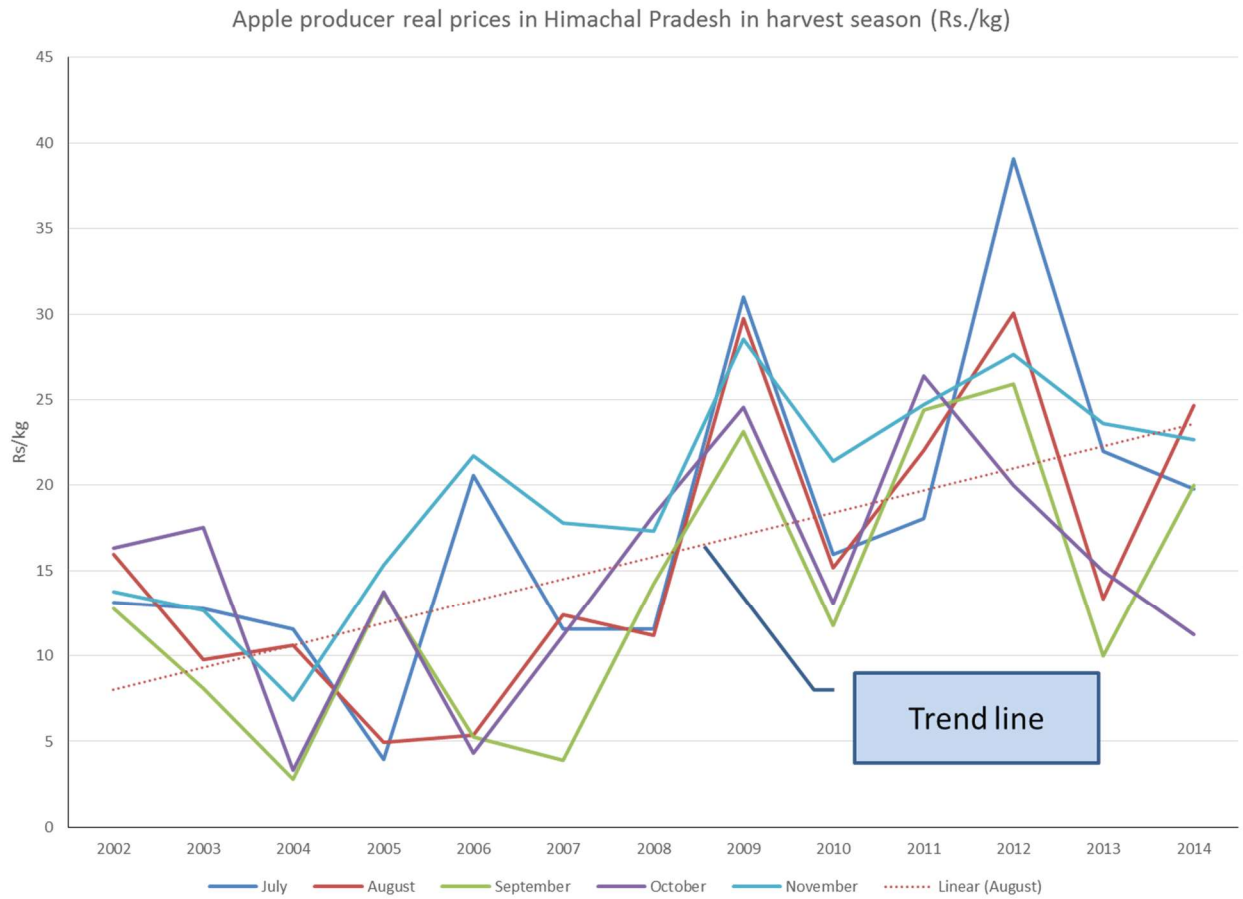
Importantly, in both cases, both the lowest price realized in a high production year and the highest price realized in a low production year have risen directionally indicating that the situation of glut that led to very low prices in high production years has alleviated to an extent.

Figure 31: Apple producer real prices in Himachal Pradesh in harvest season

⁸⁸ Estimates of actual prices paid were obtained from interviews and are mentioned in Figure 29: Approximate maximum price paid by CA stores in HP year on year vis-à-vis growth in production. However, month on month data on prices over 10 years is only available from the mandis

⁸⁹ Only about 50% of apples in HP are considered worthy of being stored in CA stores; CA storage capacity is available only for less than 6% of the total production in India

⁹⁰ Referred data can be found at <http://www.eaindustry.nic.in/>



Source: Prepared from data from NHB

Figure 32: Apple producer real prices in Jammu and Kashmir in harvest season

Apple producer real prices in Jammu and Kashmir in harvest season (Rs./kg)



Source: Prepared from data from NHB

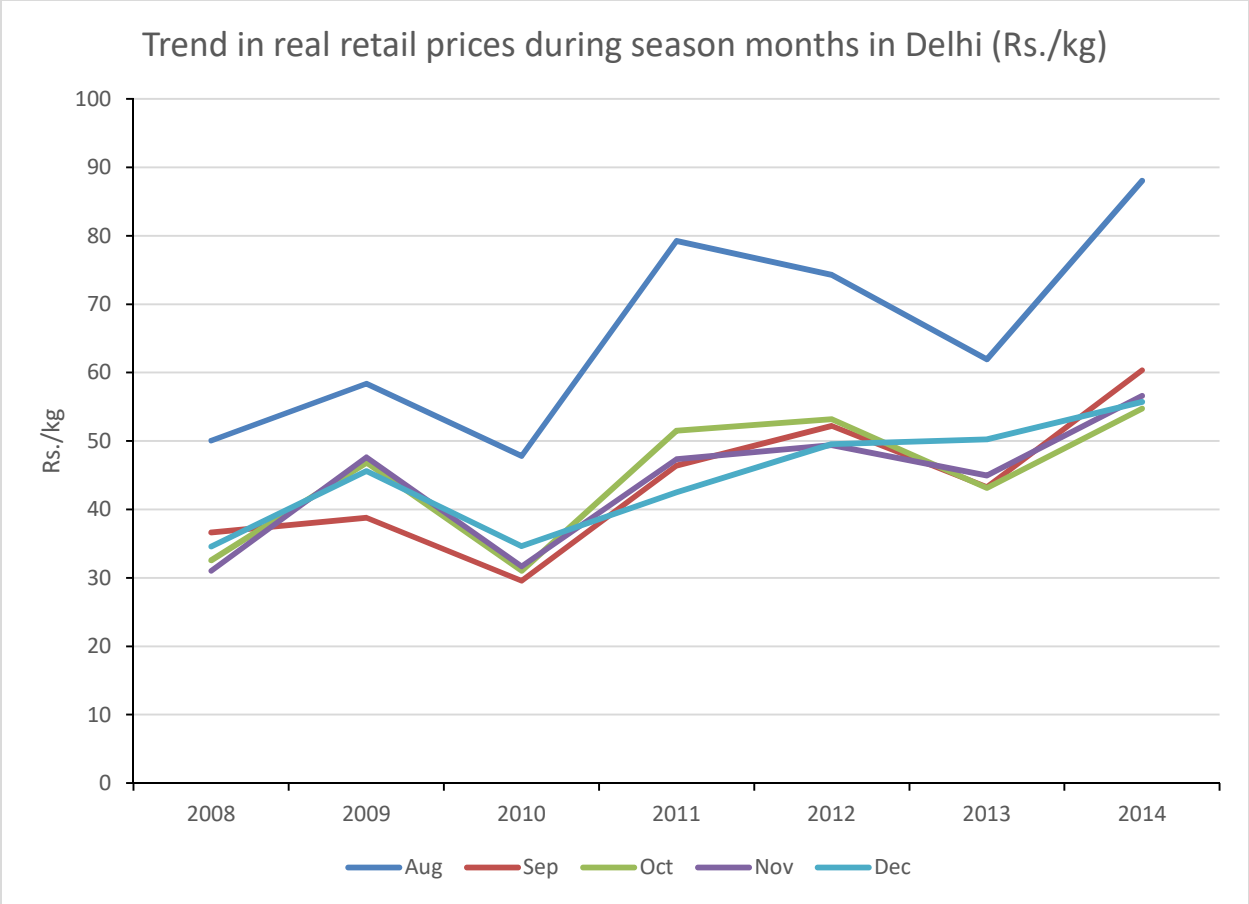
While availability in offseason has risen, prices have also risen across seasons

Consumption volumes have smoothed out relatively over the years on account of the availability of imported and domestic apples stored in CA stores⁹¹.

However, as can be seen from Figure 33, Figure 34, Figure 35 and Figure 36, real consumer (retail) prices have also shown a rising trend both in season and off season over the years.

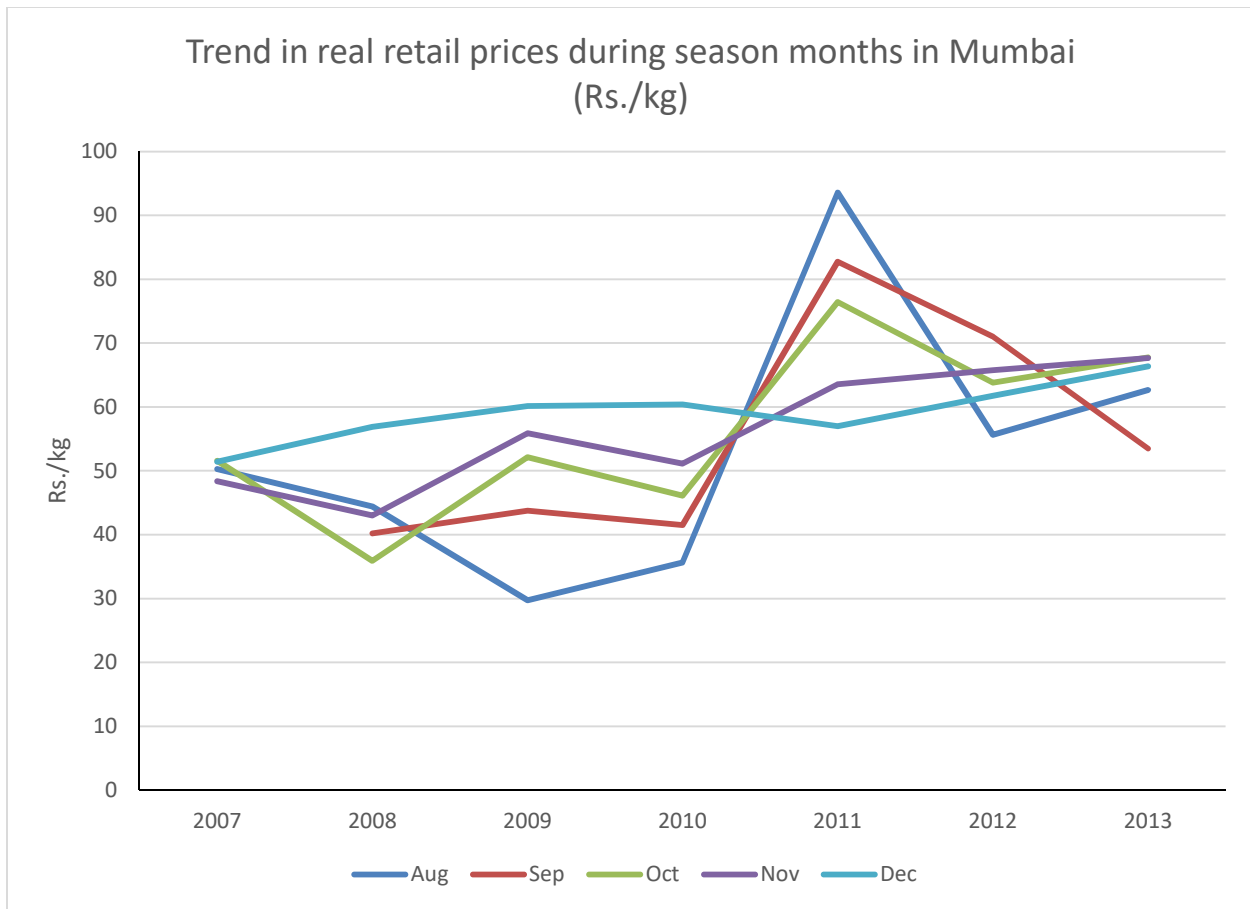
Figure 33: Trend in real retail prices during season months in Delhi

⁹¹ While production between 2001 and 2014 has increased at a CAGR of 5.6%, arrivals of apple in the Delhi mandi have witnessed a CAGR of 15% in the same period. Source: DMI, DoA, GoI



Source: Prepared from data from NHB

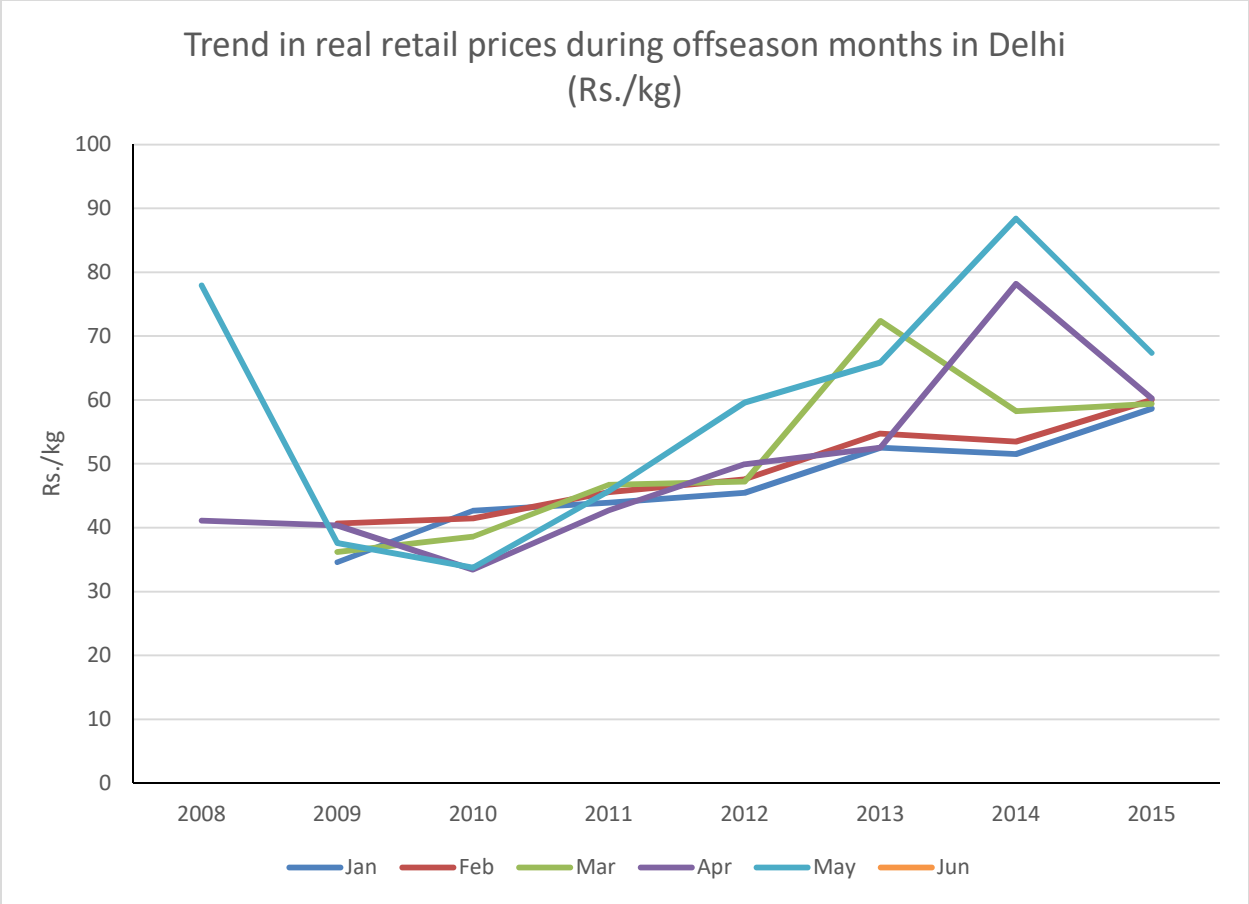
Figure 34: Trend in real retail prices during season months in Mumbai



Source: Prepared from data from NHB

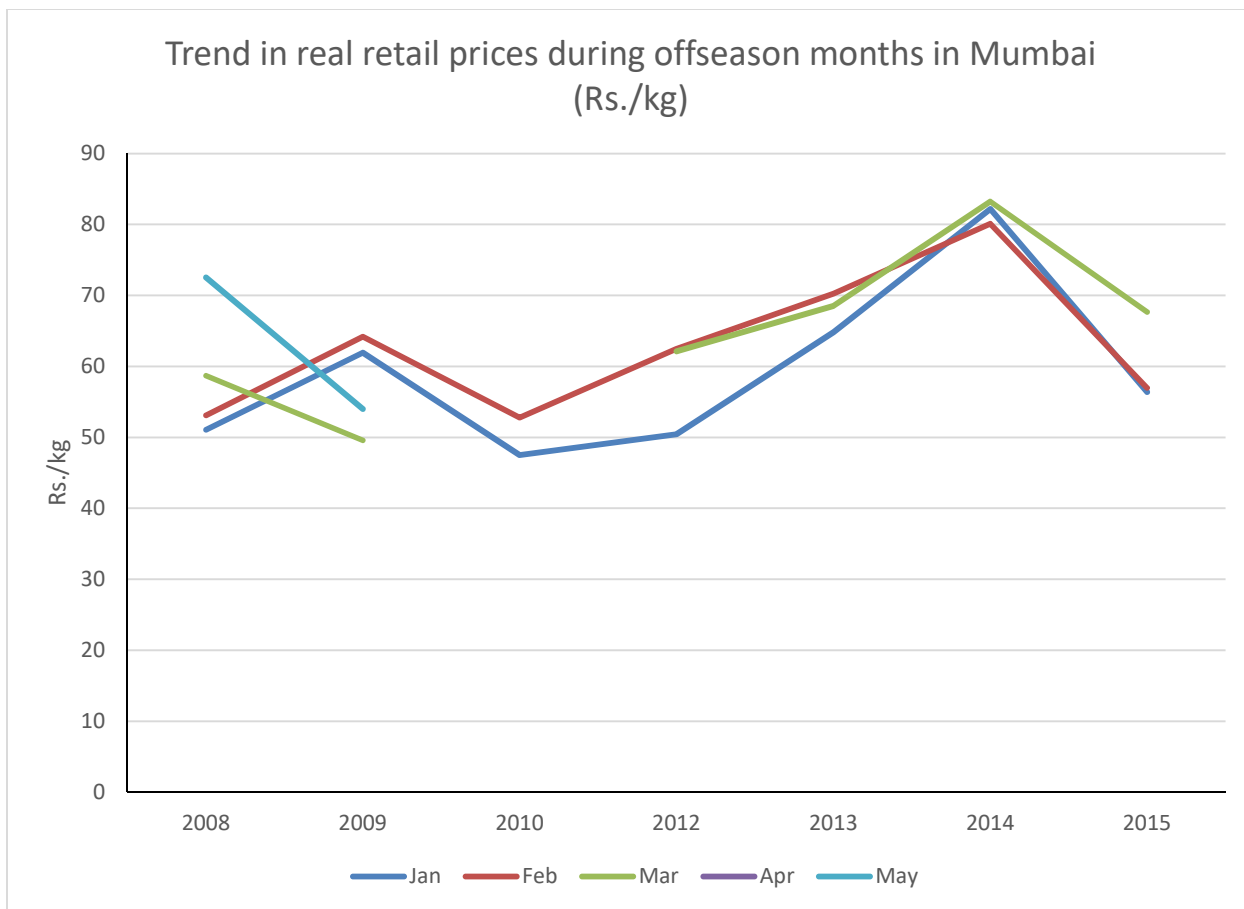
Further analysis would be necessary to determine what has led to the increase in real consumer prices. While one would expect greater realizations obtained by farmers to be a result of increased competition amongst intermediaries and therefore greater supply chain efficiency, it is possible that the higher prices paid to farmers have been simply transmitted through the same chain to the consumers. This would mean that the pace of demand growth is fast outstripping supply growth – while the only long term solution for the same would be to dramatically improve yields, incremental improvements in supply chain efficiency and reducing waste can go a long way in plugging the gap in the interim.

Figure 35: Trend in real retail prices during offseason months in Delhi



Source: Prepared from data from NHB

Figure 36: Trend in real retail prices during offseason months in Mumbai



Source: Prepared from data from NHB

Higher real consumer prices in season could also be the result of relatively lesser availability during season on account of the procurement of CA stores, though given the very low share of CA stores, this would not be a material factor.

Financial viability of CA stores

That the proliferation of CA stores has had a positive developmental impact is largely clear from the foregoing analysis in this and earlier chapters. Nevertheless, current capacity of CA storage remains woefully short of what is required for scaled impact⁹².

Given that a key catalyst for the rapid development of these stores is said to be (and stated as such by some of the smaller CA store investors) the provision of heavy direct capital subsidies to private entrepreneurs, significantly greater quantum of government spend on subsidies will be needed to meet the capacity requirements, were such subsidies to continue.

⁹² According to a study referred to in various government reports and carried out by the National Spot Exchange Limited in 2010, normally 50% of the capacity is recommended for storable surplus for select fruits and vegetables. For apples, this would amount to around 1mn MT of CA capacity! Even if one were to assume that only 50% of current apple production in India is suitable for CA storage and that no improvements in the quality of production to increase this figure will take place over the years, this would mean that a capacity of 0.5mn ton is needed (as against capacity of ~120,000MT in 2014)

In this backdrop, it is important to assess the actual relevance and impact of direct capital subsidy support on CA store investments – this will not only help to evaluate the effectiveness of subsidies provided but should also enable identification of alternative, more sustainable and impactful, means to support these investments.

With this objective, we developed an independent model to simulate the financials of a CA store and assess the effectiveness and relevance of subsidies on the same. We used information gathered from public sources, interviews with stakeholders and the financial statements, where available, of the existing players to simulate the Financial Project Internal Rate of Return (FPIRR), cash payback period for the project and Financial Equity Internal Rate of Return (FEIRR) for the private investor for an investment in a 5000MT CA store. The simulation was carried out separately for a store that offers space for rental at prevailing market rental rates and for one that is owned and operated by a trader⁹³ to store their own produce.

Since FEIRR and cash payback period are the primary measures used by private investors for heavy capital investment decisions, this analysis was also expected to bring out the key parameters that will influence greater private investment in the sector. Key assumptions⁹⁴ taken, results obtained and takeaways from the results are provided below.

Table 12: Key assumptions lays out the assumptions for three different scenarios created for the analysis viz base case, worst case and best case. The base case incorporates the most likely values derived from the sources mentioned while the worst case (taking less favourable assumption) and best case (taking more favourable assumptions) bring out the sensitivity of results to these assumptions.

Table 12: Key assumptions

	Worst Case	Base case	Best Case	Source
Total capital investment (INR/MT)	73,500	70,000 ⁹⁵	66,500	Base case assumption based on interviews with a large CA equipment supplier, CA store owners, analysis on data available from the National Horticulture Board, National Mission for Integrated Development of Horticulture, NCCD and financial statements of existing CA store investors. To account for margins of error, worst case assumes a 5% higher and best case assumes a 5% lower number. Margins of error could arise from cost impact of different levels of technology and features deployed, source of procurement, scale of investment and time of procurement (earlier investors may have had higher landed costs of the primarily imported equipment on account of low volumes of imports at that time) etc.
Season buy price (INR/kg)	47.25	45	42.75	Base case assumption based on interviews with CA store managers, farmers, traders, agents, other intermediaries, analysis on data available from the National Horticulture Board, National Mission for Integrated Development of Horticulture. Since the procurement price varies materially every year based primarily on the production levels, a broad average of the same between 2009 and 2014 has been taken in the base case. Procurement price also varies widely between the grades of apple procured (please refer Table 1: Broad grading and average prices paid

⁹³ For the purposes of this model, the trader is assumed to be exclusively buying during season and selling during offseason with no trade being carried out by the trader in fresh apple produce during season

⁹⁴ Detailed assumptions are laid out in Annexure 3

⁹⁵ Includes all capital costs (refrigeration equipment, insulation, insulation, other related CA equipment like air compressors etc., material handling equipment, crates and bins needed for collection and storage of apples, grading machine, construction, land and basic landscaping). Detailed breakup provided in Annexure 3.

	Worst Case	Base case	Best Case	Source
				(INR/kg) to farmers in 2014/2013 season for apples purchased by CA stores) - the base case accounts for the weighted average overall cost per kg. To account for margins of error, worst case assumes a 5% higher and best case assumes a 5% lower number. Margins of error could arise from factors described above
Offseason ex-store sale price (INR/kg)	66.5	70	73.5	Base case assumption based on interviews with CA store managers, farmers, traders, agents, other intermediaries, analysis on data available from the National Horticulture Board, National Mission for Integrated Development of Horticulture and financial statements of existing CA store investors. Offseason sale price typically does not vary as widely as procurement price since demand is relatively more stable than production and import prices (which influence off season sale prices are also relatively less volatile compared to production levels). Average ex-store price between 2009 and 2014 has been taken in the base case. To account for (lower) margins of error, worst case assumes a 5% higher and best case assumes a 5% lower number. Margins of error could arise from factors described above
Operating expenditure (INR/MT)	4200	4000	3800	Base case assumption based on interviews with CA store managers, large CA equipment supplier and analysis on data available from financial statements of existing CA store investors. To account for margins of error, worst case assumes a 5% higher and best case assumes a 5% lower number. Margins of error could arise from factors described above
Rental realization (INR/MT)	1900	2000	2100	Base case assumption based on interviews with CA store owners, farmers and intermediaries and observations made at CA stores offering rental space. (Rs. 2/kg/month for minimum 5 months of storage) To account for margins of error, best case for rental model assumes a 5% higher and best case rental model assumes a 5% lower number. Margins of error could arise from factors described above. This variable does not impact trading FEIRR since the investment is undertaken by the trader and hence there is no rental payment (capital costs and interest are however incorporated in the trader FEIRR calculation)
Selling, general and administrative expenses (% of revenues)	8.4%	8.0%	7.6%	Base case assumption based on interviews with CA store owners and analysis on data available from the financial statements of existing CA store investors. To account for margins of error, worst case assumes a 5% higher and best case assumes a 5% lower number. Margins of error could arise from factors described above

Table 13: Key results: Base Case

No subsidy		25% subsidy ⁹⁶		50% subsidy ⁹⁷	
Trader owned store	FEIRR	19%	FEIRR	24%	FEIRR
	FPIRR	19%	FPIRR	21%	FPIRR
	Cash payback period (years)	9	Cash payback period (years)	8	Cash payback period (years)
Rental store	FEIRR	6%	FEIRR	10%	FEIRR
	FPIRR	12%	FPIRR	15%	FPIRR
	Cash payback period (years)	>10	Cash payback period (years)	10	Cash payback period (years)

⁹⁶ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 14% of actual capital costs

⁹⁷ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 27% of actual capital costs

Note: The model accounts for subsidy as applied to the **allowable** capital costs, as against total actual capital costs. Subsidy as a share of total **actual** capital costs is lesser.

Key observations

From Table 13: Key results: Base Case, it clear that the trading business yields healthy IRRs of 19% even without any subsidy support, rising to 30% with 50% capital subsidy support. Given that subsidy to existing CA store investors have ranged between 40-75% of permissible capital costs, this is indicative of the health of the business in terms of long term returns. It is noteworthy in this context that even after a change in subsidy policy in early 2014, effectively reducing the total quantum of direct subsidy support for cold storages under the Mission for Integrated Development of Horticulture (MIDH), the pipeline of investments remains long with some estimates putting the additional capacity under construction at 25-30,000MT as of mid-2015.

However, the cash payback period for the trading model is high, at 7 years, even with a 50% subsidy indicating the high gestation period of this investment. A closer look at the year on year cash flow simulation reveals that the business demands a high cash intake especially in the initial years not only for servicing debt and relatively greater operating costs at low scale but also for the heavy working capital investment needed for buying and holding inventories. While the upside from attractive offseason realizations more than offsets these costs in the long term, the month-on-month and, in the initial years, year-on-year cash outflow can be very demanding especially for small and medium entrepreneurs. This situation is exacerbated by the often delayed release of the due subsidy forcing the entrepreneur to put in cash from their own means until the subsidy is actually released from the government.

As far as the rental business is concerned, at currently prevailing rental realizations, the model not only has a high payback period, it is barely viable in overall terms at up to 25% subsidy, yielding poor to average IRRs. At 50% subsidy, the IRRs are reasonable but payback period remains high at 9 years.

Table 14: Key results: Best and Worst Cases

No subsidy		Best Case	Worst Case	25% subsidy		Best Case ⁹⁸	Worst Case ⁹⁸	50% subsidy		Best Case ¹⁰⁰	Worst Case ¹⁰¹
Trading	FEIRR	39%	-5%	FEIRR	48%	-2%	FEIRR	61%	2%		
	FPIRR	29%	6%	FPIRR	32%	7%	FPIRR	35%	9%		
	Cash payback period (years)	6	>10	Cash payback period (years)	6	>10	Cash payback period (years)	5	>10		
Rental	FEIRR	10%	1%	FEIRR	15%	5%	FEIRR	21%	9%		
	FPIRR	15%	10%	FPIRR	18%	12%	FPIRR	22%	15%		
	Cash payback period (years)	10	>10	Cash payback period (years)	9	>10	Cash payback period (years)	8	10		

⁹⁸ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 14% of actual capital costs

⁹⁹ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 29% of actual capital costs

¹⁰⁰ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 13% of actual capital costs

¹⁰¹ Subsidy applied to the “allowable” capital cost, as per government norms, of INR 38,000/MT. Translates to 26% of actual capital costs

Note: The model accounts for subsidy as applied to the **allowable** capital costs, as against total actual capital costs. Subsidy as a share of total **actual** capital costs is lesser.

Table 14: Key results: Best and Worst Cases brings out the variation in key results with the best case and worst case assumptions described in Table 12: Key assumptions. The wide variation in results between the two cases on either side of the base case is striking, particularly in the case of the trading business model. The key reason for this is the very high sensitivity of the results of the trading business to buying prices in season and selling prices in offseason. The bulk of variation in the IRRs is accounted for by the change in these prices as against the other parameters¹⁰².

Overall, for the most part, it appears that the trading model is largely sustainable even without any (or low quantum of) subsidy; however, given the heavy sensitivity of FEIRR to the buying and selling prices, and the wide fluctuations in the same year on year, the risk of these investments remains quite high. Further, the heavy cash infusion requirement in the initial years and a long payback period makes it relatively more challenging for small and medium enterprises to make these investments given their own resources for infusing equity are limited and their creditworthiness for bank debt is also limited.

However, at prevailing rental realizations, the rental model has generally poor FEIRRs across the board in addition to long payback periods.

It follows, therefore, that while the capital subsidy has served to ease initial cash flow requirements of this high gestation business model (though erratic release of the subsidy in several cases has led to a cash flow strain for some of the players), the trading model is fundamentally financially viable with healthy returns to equity investors in the base case. The rental model, which has much greater potential for direct benefit for farmers, is however, woefully unviable at current realizations without 50% or more capital subsidy support.

Key takeaways

From the above observations, it is clear that for the trading model, the heavy upfront cash requirement and the high level of risk arising from the wide fluctuations in season buying prices need to be limited to enable the model to grow and continue to generate the benefits it does. While direct capital subsidies have helped to trigger investments by easing the first factor and enabling investors to take greater risks (the second factor), better ways to address these issues need to be explored. For example, financing structures that align with the unique cash flow requirements (akin to large infrastructure projects) of these projects can address the first issue. Such structures provide for greater flexibility in debt repayment by various means including greater moratorium in the initial years and / or back loading debt repayment obligations for the investor.

As far as the second factor is concerned - addressing the risk of buying price variations – as the consistency of quality and quantity of production improves through interventions at the cultivation level (improving yields, renewing orchards, introducing new root stocks, reducing the currently heavy dependence on weather anomalies etc), this issue will become less prominent. Until then capital subsidies would only enable private investors to ease upfront cash requirements and take

¹⁰² As an illustration, if the base case values for buying and selling prices are used with other assumptions being for the worst case, even worst case FEIRR with no subsidy shoots up to 26%; however, even in the best case, if the buying and selling prices of the worst case are used, the FEIRR drops to 2%.

on high risks without necessarily serving the intended developmental purpose for projects that are otherwise financially healthy.

Knowing the much greater potential for development impact from rental stores and their unviability in the absence of subsidy, it makes sense to continue to support rental stores so that direct benefit is available to farmers. Nevertheless, even in the case of rental stores, non-subsidy approaches to enhancing returns should be evaluated (like encouraging more value added services at CA storages¹⁰³, putting in place a Warehouse Receipts System, making warehouses the hubs for testing, certification, procurement etc; these approaches are covered in the recommendations in the next chapter)

It is noteworthy that the rental business' equity IRR¹⁰⁴ is lower than its project IRR implying that the provision of lower cost debt can make the model more sustainable.

In summary, while provision of subsidies has triggered investments and made investors recognize the profit potential in this segment, for investments in this segment to reach the level desired¹⁰⁵, provision of direct capital subsidies is perhaps not the most suitable use of public funds, especially when the lion's share of benefits does not directly go towards the development objective of the welfare of small farmers and disintermediation in the supply chain. Alternative mechanisms for support, as outlined in the next chapter should be considered.

¹⁰³ An increase in rental realizations from INR 2000/MT/year to INR 2500/MT/year pushes up the rental business model's FEIRR to 16% in the base case.

¹⁰⁴ While what constitutes a "healthy equity IRR" can vary by the investor, in general, for the purpose of this model, an equity IRR of 18% is considered to be healthy in India

¹⁰⁵ According to a study referred to in various government reports and carried out by the National Spot Exchange Limited in 2010, normally 50% of the capacity is recommended for storable surplus for select fruits and vegetables. For apples, this would amount to around 1mn MT of CA capacity!

Chapter 7: Conclusions and Recommendations¹⁰⁶

Conclusions

Apple trade has evolved significantly in the last decade

India has been one of the top few apple producers in the world for several decades. Though until the early 2000s consumption mirrored production with negligible volumes of both imports and exports, the apple trade and marketing scenario in the country has witnessed rapid changes in the last decade. The late 2000s witnessed an influx of imports which have risen rapidly since then (see box titled “Are apple imports here to ` stay?”).

Are apple imports here to stay?

Imports witnessed a quantum jump of over 1000% (albeit from a small base) in the year 2006-07 which was an year in which production fell by 10% after consistent year on year growth over the previous 4 years. Even when production grew 23% in the subsequent year, imports also grew 9%. Again when production slid by 10% in 2009-10, imports jumped 170%, this time from a relatively larger though still small base compared to production. When production fell 24% and 13% respectively in 2011-12 and 2012-13, imports grew 80% and 13% respectively. While, the bumper production year of 2013-14 which saw a 30% increase in production resulted in a 22% reduction in net imports, in the subsequent year even with almost the same production, imports rose 27%. (Source: APEDA)

Clearly while rapid growth in imports seems to have been triggered by a sudden production shortfall in late 2000s, imported apples now seem to have established a niche for themselves witnessed in the reducing correlation between imports and local production volumes. Nevertheless, de-growth in imports in a bumper production year in early 2010s indicates that if domestic supply is available, large quantities of imports are avoidable.

When large quantities of imported apples started being sold at prices at a significant premiums to the limited quantity of domestic apples available in offseason months, domestic traders within and outside the traditional apple value chain woke up to the realization that better value could be drawn from domestic apples by making them available to the domestic consumer in offseason months.

At the same time, there was a rising concern in the government with respect to the perceived very high levels of waste in horticulture produce supply chains. This perception led to an intensification of the drive to provide policy incentives to boost investment in cold storages which were believed to the single most important reason for the high levels of waste.

The combination of these dynamics led to the rapid development of high-end controlled atmosphere storage capacity across the country and particularly close to the growing areas (partly because of the greater subsidy available for setting up capacity in the hilly areas and partly because of concerns around loss of quality from farm to storage, were the storage to be located away from the farms). This development which started with the first such store being commissioned by a prominent apple juice processor – FIL Ltd. – in 2004 in India’s largest apple producing state of

¹⁰⁶ While references to the context in Jammu and Kashmir are made wherever relevant, the information in this section is largely limited to Himachal Pradesh since the study area was limited to this state in general and to Shimla district in particular

Jammu & Kashmir, gained pace with the commissioning of 18,000MT of capacity at one go by one of the largest trading companies in the country – the Adani group – just before the harvest season of 2006 in the second largest apple growing state of India – Himachal Pradesh which is better known for producing apples of the quality comparable to imported apples.

The pace of development has sustained since then with a cumulative development of around 120,000 MT of CA storage as of early 2015 and several proposals for the creation of significantly more such capacity being in the pipeline.

While this development of CA storages is but a drop in the ocean compared to India's total production of over 2.5mn MT as of 2014, wider ranging changes took place with the agriculture marketing reform undertaken by several states in mid-2000s in parallel with the development of new markets closer to the farms.

As against the prevalent archaic system of sales through agents in distant markets, farmers began to have an option to make sales close to their farms and overall transparency in transactions improved. A few of the more progressive intermediaries also evolved their business models to take advantage of these changes by spreading operations across the chain and investing in storage infrastructure. Examples include Suri Agrofresh, Devbhumi, Harshna among others.

At the core of this transformation has been the exponentially rising consumption demand from Indian consumers backed by rising discretionary income buoyed by the much talked about demographic dividend.

Regulatory context and policy action has not evolved commensurately

The development of Controlled Atmosphere (CA) stores close to farms has helped farmers by opening up an additional channel for sale and by reducing their marketing costs. However, since most CA capacity is owned by traders, farmers have had limited options for realizing the full benefit of premium offseason prices. Though a large number of farmers would perhaps not be willing or capable of taking on the exposure to the risk of price fluctuation which is a real possibility with rising imports, even those farmers who are willing and capable to do so currently have very limited options to do the same.

Additionally, while some mid-sized farmers with orchards above 6000ft in elevation have been able to benefit from selling to CA stores, small farmers are largely left out on account of their inability to meet the strict quality norms of CA stores and / or not having sufficient volumes to justify segregating and selling the A-grade produce to CA stores and finding other buyers for the left over B and C-grade produce. Not only are small farmers unable to sell to CA stores, they are unable to leverage the little space available on rent on account of their need for immediate payment of cash for meeting their daily needs. Irrespective, the miniscule availability of CA storage capacity, at only about 4% of total production, despite their rapid growth severely limits the scale of impact as of now.

CA storages are around three times as capital intensive as normal cold storages and often, with the use of best-in-class technology, could cost even more. Financial viability of these stores is thus heavily dependent upon the level of capacity utilization achieved with produce that can pay for

operating costs and debt servicing. However, since the useful operation of these stores is only for the months that apples are stored (August to April with peak utilization in October-November) as against a full year of utilization¹⁰⁷ sustaining a profitable business model is highly dependent upon the markup between purchase price of apples in season and sale prices of apples in offseason in the case of trader-owned stores and upon the rental rates realized in the case of third party stores.

The availability of subsidies up to the extent of 75% of the permissible investment thus played a key role in the pace of development of CA storages by making it relatively easier for players even with no existing stake or experience in the apple value chain to invest in the development of CA storages. The bulk of storage capacity in the state of HP – at least over 50% - is owned and operated by companies that had no involvement in the apple value chain until they set up these CA stores. Interestingly, players that had traditionally operated in the apple value chain only came up with their capacities much later after the business model was established and proven by the early entrants.

However, while the subsidy helped in giving an “initial push” to private investors to make investments primarily by easing their debt and interest burden, the continued profitability of these stores comes about only from their sheer ability to maximize the spread between purchase price of apples in season and sale price in offseason (without letting utilization drop) in the face of rising competition from imports, challenges in sourcing of CA-worthy apples, challenges in managing the supply chain from stores up to markets and month to month variations of a demand that varies materially by regions (in terms of quantum and variety and grade) within India.

As highlighted in the previous chapter, profitability of these companies has fluctuated widely from year to year depending upon these factors. Further investments and sustained viability of the business model of CA storage, which is essential to broaden and deepen their positive impact, will therefore require more fundamental changes in the supply chain as against the continued doling out of direct capital subsidies which in effect serve to only ease the requirement of startup capital, a function that is perhaps better performed by infrastructure or venture capital funds.

These fundamental changes, which include greater predictability or lesser volatility in the availability and quality of domestic supplies and greater reliability of the supply chain in delivering produce to the consumer with minimal deterioration, require a holistic policy making approach elements of which are highlighted in the recommendations below.

A sense of urgency in bringing about these changes is necessary. Traders who invested in CA storages to supply domestic apples in offseason have already diversified into imports and it is understood that the pace of growth in their import volumes surpasses that in domestic apples. From the traders’ perspective this is necessary in order to be relevant to their buyers who demand both domestic and imported apples and increasingly the latter even at prices at a significant premium to domestic apples when domestic apples are simply not available and in order to “hedge” their exposure to the risk of low markups in domestic apples when the availability of imports is high¹⁰⁸.

¹⁰⁷ Though other horticulture crops like pears, garlic, plums and lime which have complementary seasonality have been evaluated for storage at CA stores, the prevalence is limited

¹⁰⁸ Given the lead time for imports from the US, orders are placed for imports around the same time that traders owning CA stores are buying the fresh apple crop helping them make an informed call on the price they can pay to growers to cover their costs and margins

It is ironic that the same entities that were setup with strong policy support with the intent of developing the domestic market have to resort to imports to support their profitability, in effect severely limiting the developmental impact of policy support.

Urgency in implementing changes is crucial also to ensure that the gap in competitiveness of the domestic apple supply chain is plugged before pressure mounts to reduce the 50% import duty, which is already at the bound rate as per India's commitments to the WTO.^{109,110}

Given that the share of apple production suitable for extension of life in CA storage is estimated to be limited to under 50%, no amount of expansion of CA capacity can anyway scale to the level that is necessary to achieve impact at the scale desired unless both the quality and quantity of production rises disproportionately, which in turn is practically possible only by raising yields and curtailing quality deterioration of produce during and immediately after harvest and after their release from the store up to the consumer. This is necessary not only to feed offseason demand and replace imports but more importantly to feed the rising demand even during season since the proportion of supplies available in season will reduce with increase in CA storage capacity.

In essence, going forward government support should be realigned to focus on

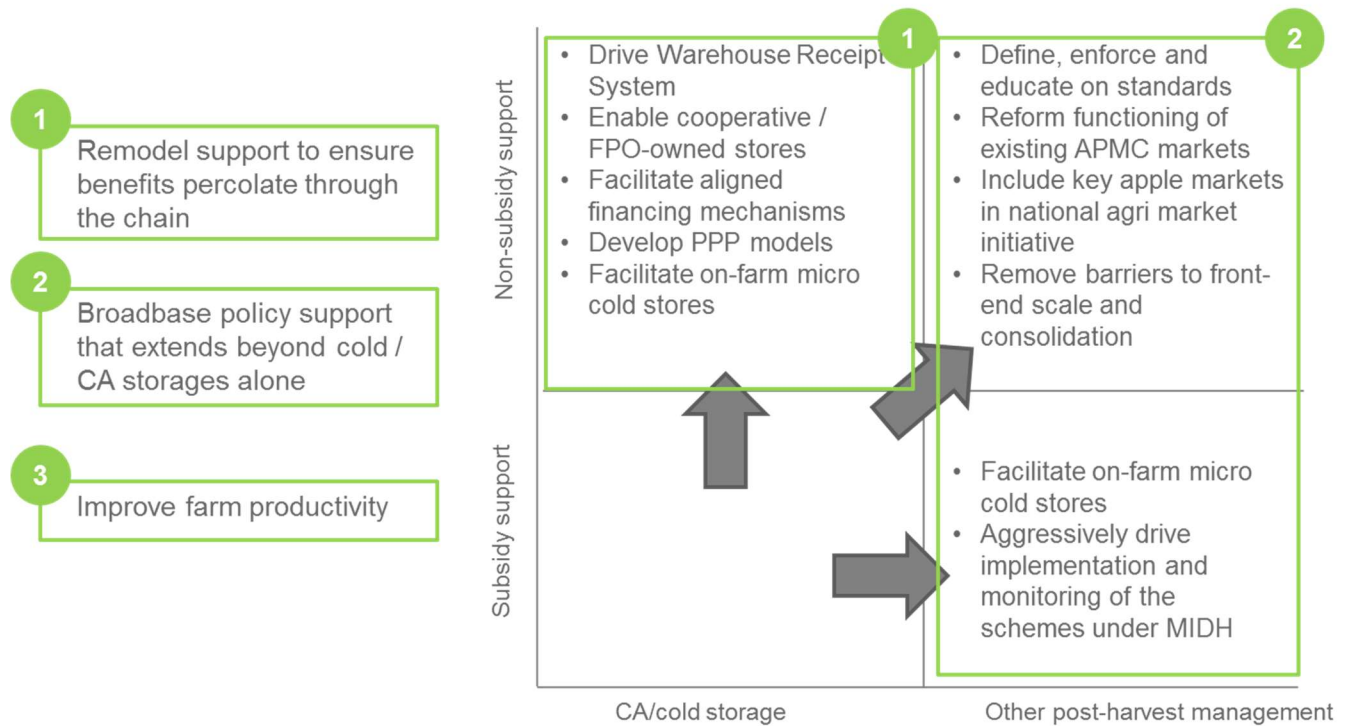
- Enhancing accessibility of storage capacity by farmers
- Broadbasing support for post-harvest management beyond the creation of storage infrastructure
- Improving farm productivity (yield)

Figure 37: Key recommendations

¹⁰⁹ Economic Times, February, 2015

¹¹⁰ The Dollar Business (India-based magazine for Indian importers and exporters)

Moving beyond subsidy support for cold storage



Recommendations

As mentioned earlier, policy support in the domain of post-harvest management has been heavily loaded towards facilitating the development of cold storage infrastructure, in particular by means of providing capital subsidies support to investors. The findings from the research and analysis carried out for this report point towards a need for government support to

1. move beyond only cold storages (which are but a link in the chain) to support for overall post-harvest management and
2. realign such as to move beyond only capital subsidies to more directly impactful mechanisms in the evolved context
3. accelerate initiatives for yield improvement and consistency

Remodel support, moving beyond capital subsidies, to ensure benefits percolate

Given that cold storage, especially in the case of apples, is the most capital intensive link in the chain, policy support for capital investment in building out this link was naturally a priority.

However, as outlined earlier, while capital subsidies have accelerated the pace of development of CA store for apples by easing the requirement of startup capital, the drivers of sustainability and growth of such capacity lie in the greater predictability or lesser volatility in the availability and quality of domestic supplies and greater reliability of the supply chain in delivering produce to the consumer with minimal deterioration. Until these fundamental changes come about, growth in CA

storage capacity will continue to depend upon policy support which may be impractical for the overall scale of investment required¹¹¹.

Further, as seen in the case of CA stores for apples particularly in HP, a significant majority of the CA capacity has been setup by traders giving farmers limited options to obtain a greater share of the upside from sale in offseason. While farmers have benefitted from lower marketing costs and transparency in transactions, the benefit has been limited both in terms of the volumes of apples that can go through this channel and quantum of benefit that passes through to the farmer and other supply chain participants.

Drive Warehouse Receipt System in perishables

Targeting policy support towards creation of capacity that is available for rent for farmers and traders alike as against being run and managed exclusively by traders is one way to change this. However, this will need to go hand in hand with the implementation of a Warehouse Receipt System which can enable farmers to maintain liquidity for their daily expenses as against having to make sales in season at lower prices or taking high cost loans from agents and traders to meet these expenses.

The Warehouse Receipt System developed and regulated by the Warehousing Development & Regulation Authority (WDRA) has brought about positive change in the case of cash crops and to an extent even in staples. Growers of these crops have gained from improved prices in offseason while meeting their immediate cash needs by raising bank loans against stock stored as collateral in accredited warehouses. Agriculture produce warehouses, which have traditionally been basic godowns given their low rental realizations vis-à-vis investment, have begun to transform into respectable warehouses with modern facilities for inspection, testing, electronic weighing and scientific storage etc as their realizations have risen through value added services they have been able to develop and deliver as warehouses accredited either by WDRA or the futures exchanges – for example collateral management fees from banks, inspection and fumigation etc charges from large buyers / traders, procurement services, testing services etc. Further, indirect benefit has accrued to the system through the emergence of non-banking finance companies that fund organized aggregators and farmers against stock placed in WDRA accredited warehouses.

The greater perishability of horticulture produce and the resultant risk in giving out loans collateralized by these stocks in addition to the absence of availability of capacity for such produce in the form of third party warehouses has kept banks away from the perishables space. However, targeted policy support that is preferential to third party stores, establishment and enforcement of grading, handling and packaging standards along with an active role by the WDRA in creating awareness, supporting and accrediting such stores can play a pivotal role in changing this.

Important learnings can also be drawn from the successful implementation of e-trading in north Karnataka, for the existence of which a Warehouse Receipt System is a desirable pre-requisite, to replicate the same for horticulture produce. Apple, being the most hardy fruit amongst almost all horticulture produce besides being one of the most developed in terms of prevalence of storages,

¹¹¹ According to a study referred to in various government reports and carried out by the National Spot Exchange Limited in 2010, normally 50% of the capacity is recommended for storable surplus for select fruits and vegetables. For apples, this would amount to around 1mn MT of CA capacity!

would be an appropriate choice for piloting this. In this regard, it may make sense to evaluate including some of the key apple markets in the National Agricultural Market (NAM) initiative that has been launched in June 2015¹¹². The technology and direct monetary support envisaged under this initiative for e-enablement of selected mandis will enable better price discovery and improved price realization for farmers while enabling direct access for buyers (like modern retailers, pan-India distributors/traders) to these mandis. Complemented with a Warehouse Receipt System, it will enable greater viability of CA stores that provide space on rent as against for their own trading¹¹³.

Enable FPO / cooperative owned stores

Even with the above mentioned initiatives, viability of third party stores will only get established if realizations are remunerative and pay for the high capital investment involved and capacity utilization of these stores is high. While such third party stores are prevalent near the consumption centers and in J&K, these have not developed sufficiently in HP. While in the case of such stores near consumption centers, utilization and viability may come from the availability of several other products that also get stored at these locations, this is not the case for near-farm stores which depend largely on one crop. Provision of more targeted support for such stores is therefore worthy of consideration.

Another way to facilitate such capacity would be to place the ownership of such capacity in the hands of an organized farmers' cooperative or Farmer Producer Organization (FPO). While better incentives for these entities exist even in the current policies, a more active facilitation of the development of cooperatives in parallel with the implementation of the above mentioned Warehouse Receipt System can create more traction. Important lessons for the same could also be drawn from the workings of an "apple project" in operation since 2007 setup by a consortium of partner organisations namely, Fresh Food Technology (FFT), Agriculture and Organic Farming Group (AOFG) and Shri Jagdamba Samiti (SJS) that operates in the state of Uttarakhand. The project deploys a unique blend of grants and investments to enable farmer companies to participate in profits from premium prices of apples in offseason while being able to invest in expensive capital equipment for a CA store.¹¹⁴

Just as the initiatives of APEDA, National Cooperative Development Corporation (NCDC), NHB along with the Government of Maharashtra combined with higher value realization potential from the export market have been able to drive the development of cooperatives in the case of grapes (Roy et al, 2009), a similar context of high offseason realizations can be leveraged by these governmental agencies to bring farmers together into cooperatives with the focused intent to benefit from higher value realizations from offseason sales.

Facilitate aligned financing mechanisms

¹¹² Small Farmers Agribusiness Consortium (SFAC) and Press Release dated 2nd July 2015 from the Cabinet Committee on Economic Affairs (CCEA), GoI; For more details and current status on the NAM initiative, please refer the background paper on Retail

¹¹³ Though spot e-trading in apples has been attempted before when Safal National Exchange – a joint venture between Mother Dairy Food Processing Limited (MDFP), Multi-commodity exchange (MCX) and Financial Technologies India Ltd. (FTIL) – was setup in late 2007, it fizzled out, in part on account of the less developed regulatory environment prevailing besides other market maturity issues like lack of standardization and limited interest of market participants. A more recent initiative (www.ffresh.neml.in) which attempts a similar e-spot market for perishables was launched in late 2015. This initiative leverages the technology from NCDEX, which has been implemented and proven in 51 mandis and 354 sub-mandis in Karnataka. Please refer background paper on Retail by same author.

¹¹⁴ OneWorld South Asia, 2013; Detailed case study on the website <http://southasia.oneworld.net>

As seen in the previous chapter, the business of owning and operating CA stores has a high gestation period and can be subject to high cash flow uncertainty on account of various factors ranging from variability in the quality and quantity of harvest every year, global demand-supply balance and therefore imports into India to erratic/delayed release of government financial support.

Given that despite these factors, shareholder returns (FIERR) of CA store investments ranges from reasonable to high, financial support that is more aligned to the cash flow pattern of this business can serve the purpose of supporting investments in a more regulated manner that is less likely to be subject to the leaks that the current system of subsidies is alleged to be subject to besides limiting the overall financial commitment from government. Such financial support is possible through the setup or facilitation of customized funds akin to infrastructure funds that invest for the long term and align their infusion and expectation of returns to the investment's cash flow.

It is also worthwhile for the government to explore the establishment of a dedicated pool of funds akin to the Clean Energy Fund for renewable energy projects for the development of post-harvest infrastructure to provide long term financing that aligns with the high gestation period and cash flow volatility inherent in such projects.

Develop a public-private partnership (PPP) model for CA storage *(to refine in discussion with Mani)*

The heavy capital expenditure for CA stores primarily comes from the sophisticated equipment required for maintaining the inert environment for stored apples that does not let them mature in addition to the specialized grading, sorting, packing machines that are necessary for maximizing value realization from produce besides land, landscaping and building construction.

To ensure that investments stay aligned with the development objective while at the same time ensuring that private sector investors realize desired returns, one option is for the government to partner with a private entrepreneur/s by bringing in its investment in the key above mentioned capital intensive items in the form of its contribution to the partnership and leaving the operations of rental, trading and marketing to the private partner/s. The government's participation could come in the form of equity or a revenue / profit share and by virtue of its contribution the government could enforce key development oriented conditions (for example, mandating a certain percentage of the store to be given out on rent exclusively and/or to be reserved for the "profit share" model described earlier). Since viability of rental CA stores is tightly linked to the utilization levels achieved, the government could drive guaranteed offtake arrangements / partnerships with cooperatives or FPOs. Like in the case of any PPP, this would ensure sharing of risks and returns that are more aligned to each partner's capabilities and needs respectively.

Facilitate on or near-farm solutions for better preservation of produce

In the lifecycle of a fruit from the moment it is harvested upto the consumer's plate, the time of harvesting and the period immediately following the same is mostly the most crucial period within which actions to preserve its quality have greatest impact. Often harvesting practices are such that damage to the fruit is caused which may either become visible upfront or once the aging process has moved further leading to value loss at the farmer, wholesaler or retailer level. Education on best harvesting practices either through the government or by large institutional buyers can limit

these losses. Adani Agrifresh, the single largest buyer of apples in HP, provides farmers with advice on cultivation and harvesting leveraging retired agriculture scientists. Larger scale programs for the dissemination of on farm best practices for produce quality preservation is an imperative for the government.

Similarly, solutions for preserving freshness of produce immediately after harvest through affordable pre-cooling and on farm storage infrastructure should be explored and supported. Not only will this ensure minimal time lag between harvest and storage – the time during which maximum deterioration takes place – if such storage infrastructure can be made affordable, it will also enable percolation of government support to the small and medium farmers who can individually (or in small groups) deploy on-farm “mini” cold storages.

During the course of research for this paper, the author came across such low capacity, portable, cold storage units sufficient to store an individual or group of farmers’ produce. For example, a company named Ecozen Solutions that has developed solar powered “micro” cold storages has successfully piloted the same in a few locations. Solar power not only minimizes operating costs but also eliminates the dependency on the often erratic and unreliable grid power in remote areas which is a key stumbling block for conventional cold storages in these areas. Some others with similar products include ColdStar, Promethean and Coolify¹¹⁵.

Research for the development of and policy support for such micro cold storages so as to bring them within the means of individual or small groups of farmers can help compound the reach and benefit of better offseason prices to farmers. Ownership of such small scale cold storage systems - which operate on sustainable power source - at the farmer or FPO/cooperative level will help farmers to de-risk and give them negotiating leverage as compared to being forced to sell due to fear of deterioration in glut periods or having to store in a large cold storage and being at the mercy of cold storage owner’s operational and administrative requirements with respect to withdrawal of produce from the store in addition to the hassle of transportation to and from the such large cold storages located away from individual farms. Having these storage and pre-cooling facilities at source will also enable better produce quality to last for longer durations thus allowing the producers to pursue farther markets and boosting exports while also reducing the majority loss of value which happens on farm.

Support could come in the form of direct subsidy or soft / concessional financing to the individual farmers or farmer cooperatives / FPOs that buy or rent these micro cold storages that are deployed on individual or group of farms. Again, like in the case of large scale cold storages, support, especially if it is in the form of direct subsidy, should be time bound given out with the intent of giving an “initial push” to these entrepreneurs to reach a scale and maturity beyond which they become commercially viable without support.

Some of the initiatives of the Small Farmers Agribusiness Consortium (SFAC) towards the development of Farmer Producer Organizations and the provision of venture capital assistance can align well and facilitate the implementation of the above recommendations.

¹¹⁵ Economic Times, November 2014

Boosting competitiveness by broadbasing support for post-harvest management

With cold storage capacity having ramped up (though by no means to the ultimate level required), concomitant attention is necessary towards the other links that make up the supply chain in order to ensure that the product value preserved by installation of cold stores does not get lost as soon as the product exits the store and that its good enough for it to enter the cold store in the first place. For example, with the number of reefer trucks per thousand MT of cold storage capacity in India at 0.3 vis-à-vis 28 for a developed country like France, clearly the use of reefer transport which is often essential for maintaining quality is limited in India¹¹⁶.

While there is no doubt that there is still a large gap between the cold storage capacity needed and that which is available as demonstrated by various studies¹¹⁷, estimates of the quantum of such capacity required must account for its impact on consumer prices in the offseason months for the respective produce. If the sheer demand for a particular horticulture product is beyond the total production, as it is likely to be in the case of apples, then over-investment in cold storage capacity will only lead to consumer price rise (or imports) during season months effectively shifting the burden from farmers to consumers. Applying this principle to the case of apples, it would perhaps be useful to incentivize CA stores only up to the point that they can replace imports without raising consumer prices in season to a point that goes beyond the reach of the masses¹¹⁸.

Introduction of the Mission of Integrated Development of Horticulture (MIDH) in early 2014 was a commendable initiative and for the first time took a holistic view of the horticulture supply chain with policy support defined for integrated post-harvest management as against only cold storage infrastructure development.

The focus on building the pre and post cold store links in the form of packhouses, pre-cooling units, refrigerated transportation¹¹⁹, ripening units in addition to the impetus for development of marketing / trading infrastructure in the form of terminal/wholesale/retail markets and the push for value addition from food processing, was long overdue. Diligent implementation and monitoring of the initiatives identified under the mission will go a long way in improving the state of post-harvest management.

However, while the mission envisages direct support for capital investment for several other elements of the post-harvest chain including packhouses, reefer vans, pre-cooling units, terminal/wholesale/retail markets, food processing units, the true measure of their success will not be the amount of capacity created in each of these supply chain elements but the increased share of volumes that pass through this infrastructure without inordinately raising consumer prices while ensuring fair returns to supply chain actors. Simply put, the focus of incentives and the

¹¹⁶ National Center for Cold Chain Development (NCCD)

¹¹⁷ The most often quoted and referred study is one that was carried out in 2010 by the National Spot Exchange Limited which estimated this gap at close to 40mn MT

¹¹⁸ Given that current import volumes are in the range of 200,000 MT, CA capacity much beyond this amount may be counterproductive

¹¹⁹ Reefer transportation is a particularly underdeveloped segment and has fallen far behind cold store development in the absence of concomitant incentives for investment in the same. In the case of apple, the severity of shortage is reflected in the prohibitive cost of reefer transportation, especially in the peak summer months, so much so that it is a key reason for CA stores to exhaust their supplies before peak summers (May-June) rather than to have to deploy reefer vehicles for servicing consumption centers, leaving the market fully exposed to imports. Source: Interviews with CA stores in HP

measurement of their impact would need to be on the increase in efficiency of the supply chain as against the pure creation of infrastructure.

Removing barriers that limit scale in organized retailing and food processing

As discussed in the background paper on modern retailing, the rampant fragmentation that is characteristic of horticulture supply chains is a key reason for the lack of adoption of good post-harvest management practices. Small scale and unorganized service providers in the chain, especially those that add very little value have neither the willingness nor the ability to invest in making changes in these practices that yield returns only in the longer term.

Consolidation at the front-end of the chain in the form of modern retailing and large scale food processing can drive integration backwards to the farm creating direct farm linkages that are inherently less wasteful and more efficient. This phenomenon has played out in other developing countries as explained in the background paper on modern retailing.

In the case of apples, the low levels of organized processing at one end with high levels of production of processing grade apples and rising imports of apple juice concentrate at the other end, the opportunity to establish apple processing plants at industrial scale deserves to be evaluated.

Thus, facilitation of modern retail and large scale processing will drive consolidation and integration along the chain and / or establish direct farm linkages and strengthening farm based cold / CA stores, development of alternate market channels and reforming existing marketing setup (wholesale and terminal markets) will make traditional retail and small scale processing more competitive by driving supply chain efficiencies.

Setting in motion the cycle of backend integration by priming the frontend (modern retail and food processing) to reach large scale can over time reduce the government's burden of investing in agriculture marketing infrastructure in turn creating a more efficient chain to simultaneously serve traditional retail and small scale food processing.

Reforming the functioning of existing APMC markets

Even though several states have implemented marketing reforms, development of parallel marketing infrastructure has been limited. This is understandable given the long gestation periods and inherent entry barriers in setting up markets such as

- Development of an ecosystem with sufficient scale to continuously attract buyers and sellers
- Heavy capital investment in land, building etc. versus the depreciated and historical investment by APMC mandis
- Complexities arising from lack of clarity in and disparity in implementation of reform across states.

Also, these investments will scale only after some of the initial teething problems are resolved and the environment matures for such investment – the issues created by makeshift private mandis in

HP and the continued levy of market fees even on transactions carried out outside the APMC mandis are cases in point.

Until new markets develop, the traditional APMC markets will continue to rule the roost as far volumes of transactions are concerned, simply because replicating the ecosystems developed at these mandis that have developed over decades by a new entrant with fresh investment at current market rates as against the historic depreciated investment in these markets, will take time.

It is imperative, therefore, to reform the functioning of these markets to make it more transparent not only in terms of transactions carried out at the mandi but also in terms of breaking the well-documented political interest in them that condones cartelization of traders and limits effective utilization of fees collected for market development.

Defining and driving adoption of standards and protocols

The “soft” incentives for inducing (or enforcing) changes in practices that cause loss of quality and competitiveness also require concomitant attention to ensure that quality preserved by making expensive investments is not frittered away in the chain before or after the produce goes through the infrastructure created with these investments.

As highlighted in the preceding chapters, a large proportion of the gap in quality between domestic and imported apples arises from value erosion in the chain during the processes of packing, handling, transportation and the limited level of grading.

Appropriate grading as near the farm as possible can ensure not only greater value realization by the farmer but also the appropriate attention to each grade of produce to preserve its value through the chain. Clearly defined standards and protocols for grading that are consistently enforced and on which supply chain stakeholders are trained can go a long way in preserving the value of produce thus maximizing the return on investments made and enhancing competitiveness vis-à-vis imports. Similarly, clearly defined and enforced standards for packaging, handling and transportation need facilitation.

Establishment of the National Center for Cold Chain Development (NCCD) has led to positive changes with respect to the development of standards and protocols for the technology related to the cold chain which in turn has guided the nature of policy support by linking the quantum of support to the level of adoption of technology standards. These initiatives need to be replicated and broadbased beyond the cold chain to the other elements of post-harvest management mentioned above.

Definition and enforcement procedures for these standards however would need to be clear, simple and unambiguous and should be developed with close consultations with private sector industry stakeholders to ensure that the steady flow of investments continues¹²⁰.

¹²⁰ In the course of the apple field study, it was learnt that while promoters who had invested in CA stores in the past were in favor of the revised subsidy norms that have linked quantum of subsidy to technology standards adopted by the subsidy recipient, some prospective investors and a CA store equipment supplier interviewed expressed reservations against these tightened subsidy requirements alleging that they were impractical and raised the cost and time of compliance.

Even more importantly, enforcement can only be achieved by ensuring that detailed information on defined standards are disseminated in easy to understand formats widely, supplemented with proactive education of stakeholders in the chain on the same. As mentioned earlier with respect to cultivation and harvesting best practices, government proactiveness in large scale education programs for stakeholders are an imperative equally for ensuring stakeholders understand and can comply with standards.

Boosting competitiveness by improving farm productivity

None of the above recommendations will go far in achieving the objectives of development impact and improved post-harvest management if farm productivity levels remain low.

The gap between apple yields from Indian orchards vis-à-vis other growing areas in the world is very high (see “Figure 9: Yields (MT/ha) in key producing countries”) and unless this gap is plugged through a host of initiatives spanning the introduction of higher yielding varieties and clonal rootstocks, improved cultivation and harvesting practices including the appropriate use of fertilizers and pesticides, rejuvenating senile orchards, provision of hail nets etc, the long term impact of all other initiatives will be limited.

Prioritizing horticulture crops for policy support

The ability to extend the life of apples by up to 12 months in CA and up to 4 months in a basic cold storage, short duration of the apple harvesting season complemented with high demand even at premium prices in offseason combined with strong government support are the key reasons why even heavily capital intensive storage infrastructure for apples has witnessed robust growth.

Assessing other key fruit and vegetable categories on these parameters (see Figure 1: Suitability of various horticulture crops for investment in preservation) viz. extendibility of shelf life under controlled conditions, value realization potential from sale in offseason or making the produce available at significant distances from cultivation areas, length of season (shorter season would mean greater potential for fruitful investments) and total volumes of consumption (the higher the total volumes more likely would investments be worthwhile) directionally indicates the relative impact that similar policy support in the other categories may have.

As is evident from “Figure 1: Suitability of various horticulture crops for investment in preservation”, the fruits that should potentially respond well to policy support in a manner similar to apples include pomegranate followed by mango and citrus (particularly oranges and mosambi). Given its sheer volumes, banana would come next in the priority for similar facilitative measures though enabling greater price realizations would make commercial viability more likely. As discussed in the background paper on modern retail, modern retailers have been able to justify investments in ripening chambers to extend the life and retain the quality of banana by catering to consumers willing to pay a premium for better looking bananas as against the typically bruised and damaged bananas available in the unorganized markets.

Similarly, the vegetables that should potentially respond well to policy initiatives include Onion (in particular, initiatives to enhance shelf life will go a long way), cabbage, sweet potato, cucumber, aonla and tapioca. Initial success has been seen in the case of mango pulp and gherkins (cucumber) already.

Implementation of the recommendations outlined in this chapter while accounting for the specific nuances of the produce, particularly value realizations achievable¹²¹ and extendibility of life under controlled conditions, can go a long way in reducing the problem of waste, improving the state of post-harvest management and delivering development impact.

¹²¹ Value realizations achievable in turn depend upon the presence of strong demand in offseason months (eg. Apples) and / or at locations distant from production areas / export markets (eg. Grapes) and / or the demand for its processed form (eg. Potato)

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Annexure 1: List of meetings

1	Mr. Basant Nayak, Head - Business Development, Adani Agrifresh Ltd
2	Mr. Marichi Galava, Store head, Adani Farmpick store, Azadpur mandi
3	Mr. Abhimanyu, Promoter, JCO Ltd. (Commission Agency dealing heavily in Apples)
4	Mr. Rajeev Sood, Promoter, DSF Ltd. (Commission Agency dealing heavily in Apples)
5	Mr. Pruthi, Fresh Sourcing Head, Bharti Retail
6	Mr. Asim, Store Head, Meerut Cash and Carry Store, Wal-Mart India
7	Mr. Hamid, Fresh procurement head, Hypercity Retail India Ltd
8	Mr. Ballary, AVP & Head of Staples, Aditya Birla Retail Ltd.
9	Mr. Swain, Godrej Nature's Basket
10	Mr. Mohanta, Fresh Produce Sourcing Head, Mother Dairy Retail
11	Mr. More, Fresh Produce Sourcing, Aditya Birla Retail
12	Mr. Somani, Aditya Birla Retail
13	Mr. Radhakrishnan, Founder and CEO, Grocermax
14	Mr. Srivastava, Fresh Sourcing, Spencers Retail
15	Mr. Khan, Promoter of Trading Co., Bangalore
16	Mr. Goswami, Policy Specialist, FAO
17	Mr. Aggarwal, CEO, Devbhumi Cold Chain Pvt. Ltd.
18	Mr. Kohli, Harshna Fruits Ltd.
19	Mr. Sharma, Store Manager, Devbhumi Cold Chain Pvt. Ltd, Shimla
20	Mr. Kamboj, Store Manager, Adani Agrifresh Ltd., Shimla
21	Mr. Vinayak, Apple Farmer, Shimla
22	Mr. Chauhan, President, Commission Agents Association of Shimla
23	Mr. Amit Sharma, Store Manager, Himagrifresh, Shimla
24	Mr. Rathor, Farmer, Village Kohlada, Tehsil Jubbal, Shimla
25	Mr. Singh, Farmer, Chandni Village, Distt. Shimla
26	Mr. Suman, Farmer, Village Matiana, Tehsil Theog, Distt. Shimla
27	Mr. Chauhan, Farmer, Village Kiari, Tehsil Kotkhai
28	Mr. Gian Chauhan, Farmer, Village Sherwal, PO Mahasu, Tehsil Kotkhai, Distt Shimla
29	Mr. Alok, Wholesaler, Okhla Mandi, Delhi
30	Mr. Suri, Partner and Director, Suri Agrofresh and Himfresh, Gumma village; Kotkhai
31	Mr. Jishtu, Farmer, Village Shathla, PO Virgarh, Distt Shimla;
32	Mr. Rathor, Farmer, Village Kohlada, Distt. Shimla
33	Mr. Chauhan, Farmer, Sundernagar, Ratnari, Tehsil Kotkhai, Distt Shimla
34	Mr. Marathe, Fresh Sourcing, Future Retail
35	Mr. Nayak, Fresh Sourcing, Future Retail
36	Mr. Lal Chand Dogra, Promoter, Narkanda Private Mandi, Shimla
37	Mr. Suri, Partner and Director, Dogra Traders, Shimla
38	Mr. Das, Wholesaler, Azadpur mandi, Delhi
39	Mr. Kumar, Navjot fruit traders, B180, Azadpur mandi, Delhi

40	Mr. Praveen, Wholesaler, Vashi mandi, Mumbai
41	Mr. Sanjay, Royal Fruits, Vashi Mandi, Mumbai
42	Mr. Jagdish, Preharvest contractor, Village Chumaru, Jubbal, Shimla
43	Mr. Chauhan, Preharvest contractor, Village Chandni, PO Deha, Tehsil Theog, Shimla
44	Mr. Kumar, Wholesaler, New Sabzi Mandi, Azadpur, New Delhi; 9911019163
45	Ms. Chauhan, Farmer, Tehsil Jubbal, Distt. Shimla
46	Mr. Pradeep Bhalaik, Farmer, Bhareri Estate, PO Kotgarh, Distt. Shimla
47	Mr. Harichand Roach, Farmer, Village Saroga, PO Thanedar, Distt Shimla
48	Mr. Sushil Bhalaik, Farmer, Naurang Orchards, PO Kotgarh, Distt Shimla
49	Mr. M C Bhaik, Farmer, Village Bhareri, PO Kotgarh, Distt Shimla
50	Mr. Bhupinder S. Chauhan, Farmer, Village Maraog, Tehsil Chaupal, Distt Shimla
51	Mr. Rajinder Singh, Farmer, Chandni Village, Distt Shimla
52	Mr. Surinder Chauhan, Farmer, Karyali Village, Distt Shimla
53	Mr. Hari Prakash, Farmer, Chandni Village, Distt Shimla
54	Mr. Ramesh Sharma, Farmer Matiana Village, Distt Shimla
55	Mr. Shagun Varma, Farmer, Kotgarh Bahli Village, Distt Shimla
56	Mr. Harish Vasandani, Wholesaler, F-95, APMC Vashi mandi, Mumbai
57	Director, RGA Fresh, Vashi mandi, Mumbai
58	Mr. Ashmat Ali, Small retailer, Faridabad
59	Mr. Raj Kumar Singh, Aditya Birla More Retail, Delhi
60	Mr. Surinder Chauhan, Preharvest contractor, Village Chandni, PO Deha, Tehsil Theog
61	Mr. Anil Kumar, Wholesaler, New Azadpur Sabzi Mandi, New Delhi

Annexure 2: Questionnaires

Questionnaire for CA stores

Post-harvest management and Agribusiness in India

Questionnaire for CA Store owners in Apple Value Chain: Value Chain Number

November 2014

1. Name and address of company:
2. Name of interviewee:
3. Designation of interviewee:
4. Please tell us about your **Controlled Atmosphere (CA) capacity (MT) for apples** by location

CA location	Capacity (MT)

5. Do you rent-in additional CA capacity? If yes, please let us know how much capacity you've rented over the years?

CA location	Capacity rented in (MT)

6. Please tell us the quantities (MT) of Himachal apples that you procured in the 14 season (July – December 2014).
7. Do you procure **at the farm gate** based on some kind of grading system?
Yes _____, No _____

8. If yes, please give us the breakdown of quantities procured by the different grades between July and November 2014

Grade	Quantity (MT)	Modal price Rs/MT	Minimum price Rs/MT	Maximum price Rs/MT
Please specify _____				
Please specify _____				
Please specify _____				
Please specify _____				
Total				

9. For your **2013 procurement**, Please give the breakdown of quantities procured by the different grades between July and November 2013?

Grade	Quantity (MT)	Modal price Rs/MT	Minimum price Rs/MT	Maximum price Rs/MT
Please specify _____				
Please specify _____				
Please specify _____				
Please specify _____				
Total				

10. Please describe the coordination arrangement with farmers and the procurement process?

- a. Do you have contracts with farmers?
- b. If yes, what aspects of the transaction are specified in the contract?
- c. If no, what coordination arrangements do you have to ensure you are able to procure the quantities you need?
- d. Are inputs / extension or other facilities provided to the farmers?

- e. If yes, how are these costs recovered from farmers?
- f. Do you procure at the farms/orchards?
- g. On average, how many days after harvesting do you procure the apples?
- h. Do the farmers themselves grade produce before you procure?
- i. Do you procure all the grades available with each farmer or do you just buy only CA-storable apples?
- j. How much time does it take for the apples to arrive at the CA store after harvest?
- k. Is there any pre-cooling infrastructure available / planned before apples are received at the CA store?
- l. Once the apples arrive at the CA store, please explain the selection, grading and acceptance process
- m. How and when (after receipt of apples) does the farmer receive payment?
- n. Is there any understanding before harvest about the price?
- o. How and when is the price to be paid to farmers decided and how is it communicated to the farmers?
- p. How much of apples are wasted from farm to your CA store?

q. How much wastage occurs during storage in your CA facility?

r. Any estimate of the spread of your procurement by land holding of the farmers from whom procurement is made?

Land holding	% of total procurement
Small < 1 acre	
Medium 1-5 Acres	
Large > 5 acres	

11. For the produce procured between July and November 2013, what quantities (MT) did you sell to each buyer category and at what price?

Grade	Direct to wholesalers		Direct to retailers		Through commission agents	
	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)
Please specify _____						
Please specify _____						
Please specify _____						
Total						

12. What costs did you incur in the chain after purchase from farmer? Please indicate if any of these costs vary by grade.

Costs	Location ¹²²		INR/MT
Pre-cooling at the farm		Did you pay this?	
		If so, how much?	

¹²² HP/Delhi/Mumbai; farm/mandi/distribution center/cold/CA store etc.

Grading at farm, if undertaken		Did you pay this?	
		If so, how much?	
Packaging at farm, if undertaken		Did you pay this?	
		If so, how much?	
Loading at farm		Did you pay this?	
		If so, how much?	
Commission paid to agent (in case commission agent is used for purchase)		Did you pay this?	
		If so, how much?	
Primary transportation		Did you pay this?	
		If so, how much?	
Unloading at CA store		Did you pay this?	
		If so, how much?	
Grading at CA store, if undertaken		Did you pay this?	
		If so, how much?	
Packaging at CA store, if undertaken		Did you pay this?	
		If so, how much?	
Retrieval and loading at CA store		Did you pay this?	
		If so, how much?	
Repackaging / regrading at CA store after retrieval, if undertaken		Did you pay this?	
		If so, how much?	
Commission paid to agent (in case commission agent is used for sale)		Did you pay this?	
		If so, how much?	
Secondary transportation		Did you pay this?	
		If so, how much?	
Unloading at buyer's location		Did you pay this?	
		If so, how much?	
Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	
Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	

Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	

13. Please give a broad idea of the capital investment and operating costs of the CA store.

Capacity (in MT)		
Location		
	INR	INR/MT of capacity
Capital investment		
Land		
Building & Civil works		
Plant & Machinery (refrigeration equipment etc)		
Others		
Operating costs (last available financial year)	INR	INR/MT of procurement
Procurement		
Manpower		
Utilities		
Overheads, please specify		

14. Between July 2013 and November 2014 please tell us about your overall purchasing operations and sales to different buyers distinguishing between domestic and imported apples?

MON TH	PURCHASING OPERATIONS				SELLING OPERATIONS						
	DOMESTIC APPLES		IMPORTED APPLES		DOMESTIC APPLES		IMPORTED APPLES		Proportion (%) of sales to different channels		
	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Other whole salers	Retailers	Commission agents
July 2013											
August 2013											
September 2013											

November 2013											
December 2013											
January 2014											
February 2014											
March 2014											
April 2014											
May 2014											
June 2014											
July 2014											
August 2014											
September 2014											
October 2014											
November 2014											

15. Do you rent-out some of your CA capacity or use it entirely for captive purposes? If you also rent out, please let us know how much capacity you've rented over the years?

CA_location	Capacity rented out (MT)	Average rental cost ¹²³ (Rs per MT per month)

¹²³ In case this is different by grades, try to get the split if easily available otherwise get the average across grades

16. What changes have come about in your business after the APMC Act was amended in HP?
17. What changes have come about in your business after the recent de-listing of fruits and vegetables from APMC in HP?
18. Why are apple farmers in HP not organized into cooperatives / producer organizations?
19. Looking at the entire apple value chain, what investments are needed at the primary production level, storage and distribution, and retailing?
20. Do you think CA stores near farms are benefitting farmers? Why / why not?
21. Can you please provide us with the contact details (or help us connect with) 5 farmers (2 medium, 2 small, and 1 large) that you procure from?
22. Can you please provide us with the contact details (or help us connect with) wholesalers/retailers/commission agents that buy from you?
23. Can you please provide us with the contact details (or help us connect with) cold store owners (non-CA) in the growing areas?

Questionnaire for farmers

Post-harvest management and Agribusiness in India

Questionnaire for apple farmers: Value Chain Number _____

November 2014

1. Name and address of farmer:
2. What is the size of your total landholding?:
3. What was your total land under apples in 2013 the 2013-14 season (July to November 2014 Harvest)?:
4. Please also tell us your cost of production and sales for the 2013-14 cropping season (July to November 2014 harvest)?:

Ap ple vari ety	La nd are a (ac re)	Cost of farm production (Rs.)				Mo nth of harv est	Produc tion		Sales		Pric e for the larg est sale	Sales by grades (pls specify)			Amou nt of wastag e	
		La bor	Agro- Chem icals	Fertili zers	Ot her cos ts		Qt y	U nit	Q ty	U nit		Rs.	Q ty	Q ty	Q ty	Q ty

5. For the harvest from July to November 2014 season for the dominant variety, what quantities (MT) did you sell to each buyer category and at what price?

Grade	CA Store		Cold Store		Pre-harvest contractors		Wholesalers		Commission agents	
	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)
Please specify_____										
Please specify_____										
Please specify_____										
Total										

6. Please describe the coordination arrangement with buyers?

	CA store	Cold Store	Pre-harvest contractor
a. Do you have contracts with buyers?			
b. If yes, what aspects of the transaction are specified in the contract?			
c. If no, what coordination arrangements do you have to ensure you realize best price for your produce?			
d. Are inputs / extension or other facilities provided to you?			
e. If yes, how are these costs recovered by buyers?			
f. Is any procurement done at your farm directly?			
g. Do you grade the produce before you sell?			
h. How many days do you store apples before you sell them?			
i. Do buyers buy all the grades available with you or do they just buy specific grades? If so, which grades?			
j. How much time does it take for the apples to reach the buyer's location after harvest?			
k. Is there any pre-cooling infrastructure available / planned at your farm?			
l. Please explain the selection, grading and acceptance process of the buyer			

m. How and when (after receipt of apples) do you receive payment?			
n. Is there any understanding before harvest about the price?			
o. How and when is the price to be paid to you decided and how is it communicated to the you?			
p. How much of apples are wasted from farm to buyer's location?			
q. How much wastage occurs while the apple is on your farm?			

7. What costs did you incur in making your sale? Please indicate if any of these costs vary by grade.

Costs	Location ¹²⁴		INR/MT
Pre-cooling at the farm		Did you pay this?	
		If so, how much?	
Grading at farm, if undertaken		Did you pay this?	
		If so, how much?	
Packaging at farm, if undertaken		Did you pay this?	
		If so, how much?	
Loading at farm		Did you pay this?	
		If so, how much?	
Commission paid to agent (in case commission agent is used for sale)		Did you pay this?	
		If so, how much?	
Primary transportation		Did you pay this?	
		If so, how much?	
Unloading at buyer's location		Did you pay this?	
		If so, how much?	
Any other costs, please specify (APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	
Any other costs, please specify (APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	

¹²⁴ HP/Delhi/Mumbai; farm/mandi/distribution center/cold/CA store etc.

		If so, how much?	
Any other costs, please specify (APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	

8. Do you have access to credit for apple production? Yes _____, No _____

9. If yes, who provides credit to you and at what terms?

10. Have seen any changes in recent years in the way apples are marketed (regulatory, investments, production technology)?

11. If yes, what changes have you seen?

Regulatory _____

Investments _____

Production technology _____

12. How have those changes affected you apple production activities?

Regulatory _____

Investments _____

Production technology _____

13. Do different marketing channels/individual buyers use the same grading system?

14. Do buyers reward quality/grades sufficiently?

15. If no, why do you think buyers do not reward quality sufficiently?

16. Do you think CA stores near farms are benefitting farmers? Why / why not?

17. Can you please provide us with the contact details (or help us connect with) some other farmers that sell to the same buyer categories as you and some that sell to other buyer categories (CA stores, cold stores, pre-harvest contractors) than those that you sell to?

18. Can you please provide us with the contact details (or help us connect with) cold store owners (non-CA) and pre-harvest contractors operating in the growing areas?

Questionnaire for wholesalers

Post-harvest management and Agribusiness in India

Questionnaire for apple wholesalers: Value Chain Number _____

November 2014

24. Name and address of company:

25. Name of interviewee:

26. Designation of interviewee:

27. Please tell us about your purchasing operations between July 2013 and November 2014. If possible, please also provide the split of your procurement and price of procurement by grade

Bought from (July 2013 to November 2014)	Grade	Quantity (MT)	Modal price Rs/MT	Minimum price Rs/MT	Maximum price Rs/MT
Farmer (<i>purchasing operations from July 2014 to November 2014</i>)	Please specify _____				
	Please specify _____				
	Please specify _____				
Pre-harvest contractor (<i>purchasing operations from July 2014 to November 2014</i>)	Please specify _____				
	Please specify _____				
	Please specify _____				
Another wholesaler (<i>purchasing operations from July 2014 to November 2014</i>)	Please specify _____				
	Please specify _____				
	Please specify _____				
Commission agent	Please specify _____				

<i>(purchasing operations from July 2014 to November 2014)</i>	Please specify _____				
	Please specify _____				
CA Store <i>(purchasing operation from December 2013 to June 2014)</i>	Please specify _____				
	Please specify _____				
	Please specify _____				
Cold Store <i>(purchasing operation from December 2013 to June 2014)</i>	Please specify _____				
	Please specify _____				
	Please specify _____				
	Total				

28. In case you procure substantial quantities directly from farmers, please describe the coordination arrangement with farmers and the procurement process?

- a. Do you have contracts with farmers?
- b. If yes, what aspects of the transaction are specified in the contract?
- c. If no, what coordination arrangements do you have to ensure you are able to procure the quantities you need?
- d. Are inputs / extension or other facilities provided to the farmers?
- e. If yes, how are these costs budgeted / charged to the farmer?
- f. Do you procure at the farms/orchards?
- g. Do the farmers grade the produce before you procure?

- h. If no, how many days do farmers store apples before you procure them?
- i. Do you procure all the grades available with each farmer or do you just buy specific grades? If so, which grades?
- j. How much time does it take for the apples to arrive at your location after harvest?
- k. Is there any pre-cooling infrastructure available / planned before apples are received at the CA store?
- l. Once the apples arrive at your location, please explain the selection, grading and acceptance process
- m. How and when (after receipt of apples) does the farmer receive payment?
- n. Is there any understanding before harvest about the price?
- o. How and when is the price to be paid to farmers decided and how is it communicated to the farmers?
- p. How much of apples are wasted from farm to your location?
- q. How much wastage occurs while the apple is in your possession?
- r. Any estimate of the spread of your procurement by land holding of the farmers from whom procurement is made?

Land holding	% of total procurement
Small < 1 acre	
Medium 1-5 Acres	
Large > 5 acres	

29. Between July 2013 and November 2014 please tell us about your overall purchasing operations and sales to different buyers distinguishing between domestic and imported apples?

MON TH	PURCHASING OPERATIONS				SELLING OPERATIONS						
	DOMESTI C APPLES		IMPORTE D APPLES		DOMESTI C APPLES		IMPORTE D APPLES		Proportion (%) of sales to different channels		
	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Other whole salers	Reta ilers	Comm ission agents
July 2013											
Augu st 2013											
Septe mber 2013											
Nove mber 2013											
Dece mber 2013											
Janua ry 2014											
Febru ary 2014											
Marc h 2014											
April 2014											
May 2014											
June 2014											
July 2014											
Augu st 2014											

September 2014											
October 2014											
November 2014											

30. Of the above sales channels to which ones do you sell by grades?

31. Are the selling grades exactly the same as buying grades? Yes _____, No _____

32. If no, please explain the differences between your buying grades and selling grades for both domestic and imported apples?

33. What costs did you incur in the most dominant chain after purchasing.

Costs	Location ¹²⁵	Domestic	Imported
		INR/MT	INR/MT
Grading at seller location, if undertaken			
Packaging at seller location, if undertaken			
Loading at seller location			
Commission paid to agent (in case commission agent is used for purchase)			
Primary transportation			
Unloading at your location			
Grading at your location, if undertaken			
Packaging at your location, if undertaken			

¹²⁵ HP/Delhi/Mumbai; farm/mandi/distribution center/cold/CA store etc.

Retrieval and loading at your location			
Repackaging / regrading at your location after retrieval, if undertaken			
Commission paid to agent (in case commission agent is used for sale)			
Secondary transportation			
Unloading at buyer's location			
Any other costs, please specify (APMC fees, taxes etc)			
Any other costs, please specify (APMC fees, taxes etc)			
Any other costs, please specify (APMC fees, taxes etc)			

34. What is the total wastage (in % volumes) that you incur while the apples are in your possession? In case the waste is different by grade, please specify

	Domestic	Imported
Grade	Waste %	Waste %
Please specify_____		
Please specify_____		
Please specify_____		
Overall		

35. If possible, please let us know your revenues and profitability?

	2012-13	2013-14
Revenue (INR lacs)		
Operating profit (INR lacs)		
Net profile (INR lacs)		

36. Do you offer financing to farmers?

37. Do you offer financing to other actors you buy from (other wholesalers, pre-harvest contractors etc)?

38. If yes, what are the terms of this financing?
39. If no, then what are the prevalent ways and means for the farmer to access credit? What terms does the farmer get this credit at?
40. What changes have come about in your business after the APMC act was amended?
41. What changes have come about in your business after the recent de-listing of fruits and vegetables from APMC?
42. Why are apple farmers in HP not organized into cooperatives / producer organizations?
43. Looking at the entire apple value chain, what investments are needed at the primary production level, storage and distribution, and retailing?
44. Do you think CA stores near farms are benefitting farmers? Why / why not?
45. Can you please provide us with the contact details (or help us connect with) wholesalers/retailers/commission agents that buy from you?
46. Can you please provide us with the contact details (or help us connect with) some farmers from whom you purchase and some farmers that sell to CA Stores, non-CA cold stores and pre-harvest contractors?

47. Can you please provide us with the contact details (or help us connect with) cold store owners (non-CA) and pre-harvest contractors operating in in the growing areas?

Questionnaire for commission agents

Post-harvest management and Agribusiness in India

Questionnaire for apple commission agents: Value Chain Number 2 ONLY

November 2014

1. Name and address of company:
2. Name of interviewee:
3. Designation of interviewee:
4. Please tell us the quantities (MT) of Himachal apples that you handled in the crop harvested between July 2014 and November 2014?. _____ MT
5. From how many farmers did you obtain the apples between July and November 2014?
_____ farmers
6. If possible, please also provide the split of your volumes by seller category by grade

Bought from	Grade	Purchasing		Selling							
		Qty procured (MT)	Final Price paid to farmer (Rs/MT)	Sold to retailer					Sold to wholesaler		
				Qty (MT)	Cost incurred by you for (Rs/MT)				Price recd (Rs/MT)	Qty (MT)	Cost (Rs/MT)
				Gradg	Packng	Tpor t	Ot her s			Gradg	
Farmer	Please specify _____										
	Please specify _____										
	Please specify _____										

7. For the volumes that you transact in on behalf farmers, please describe the coordination arrangement with farmers and the procurement process?
 - a. Do you have contracts with farmers?
 - b. If yes, what aspects of the transaction are specified in the contract?

- c. If no, what coordination arrangements do you have to ensure you are able to procure and sell the transacted quantities?
- d. Are inputs / extension or other facilities provided to the farmers?
- e. If yes, how are these costs recovered from farmers?
- f. Do you procure at the farms/orchards?
- g. On average, how many days after harvesting do you procure the apples?
- h. Do the farmers themselves grade produce before you procure?
- i. Do you procure all the grades available with each farmer or do you just buy specific grades? If so, which grades? Please explain the selection, grading and acceptance process
- j. How much time does it take for the apples to reach buyer's facility after harvest?
- k. How and when (after receipt of apples) does the farmer receive payment?
- l. Is there any understanding before harvest about the price?
- m. How and when is the price to be paid to farmers decided and how is it communicated to the farmers?

n. How much of apples are wasted from farm to buyer location?

o. How much wastage occurs between farm and buyer location?

p. Any estimate of the spread of your procurement by land holding of the farmers from whom procurement is made?

Land holding	% of total procurement
Small < 1 acre	
Medium 1-5 Acres	
Large > 5 acres	

8. What is the total wastage (in % volumes) that you incur while the apples are in your possession? In case the waste is different by grade, please specify

Grade	Waste %
Please specify _____	
Please specify _____	
Please specify _____	
Overall	

9. If possible, please let us know your revenues and profitability?

	2012-13	2013-14
Revenue (INR lacs)		
Operating profit (INR lacs)		
Net profile (INR lacs)		

10. What is the commission percentage that you take? What has been the trend in this over the last few years?

11. Do you offer financing to farmers?

12. If yes, what are the terms of this financing?

13. If no, then what are the prevalent ways and means for the farmer to access credit? What terms does the farmer get this credit at?

14. What changes have come about in your business after the APMC act was amended?

15. What changes have come about in your business after the recent de-listing of fruits and vegetables from APMC?

16. Why are apple farmers in HP not organized into cooperatives / producer organizations?

17. Looking at the entire apple value chain, what investments are needed at the primary production level, storage and distribution, and retailing?

18. Do you think CA stores near farms are benefitting farmers? Why / why not?

19. Can you please provide us with the contact details (or help us connect with) some farmers on whose behalf you make sales and some farmers that sell to CA Stores, non-CA cold stores and pre-harvest contractors?

20. Can you please provide us with the contact details (or help us connect with) cold store owners (non-CA) and pre-harvest contractors operating in in the growing areas?

Questionnaire for cold storages

Post-harvest management and Agribusiness in India

Questionnaire for Cold Store owners in Apple Value Chain: Value Chain Number

November 2014

1. Name and address of company:
2. Name of interviewee:
3. Designation of interviewee:
4. Please tell us about your **Cold Store (CS) capacity (MT) for apples** by location

CS location	Capacity (MT)

5. Do you rent-in additional CS or CA capacity? If yes, please let us know how much capacity you've rented over the years?

CS location	Capacity rented in (MT)
CA location	Capacity rented in (MT)

6. Please tell us the quantities (MT) of Himachal apples that you procured in the 14 season (July – December 2014).
7. Do you procure **at the farm gate** based on some kind of grading system?
Yes _____, No _____
8. If yes, please give us the breakdown of quantities procured by the different grades between July and November 2014

Grade	Quantity (MT)	Modal price Rs/MT	Minimum price Rs/MT	Maximum price Rs/MT
Please specify _____				
Please specify _____				
Please specify _____				
Please specify _____				
Total				

9. For your **2013 procurement**, Please give the breakdown of quantities procured by the different grades between July and November 2013?

Grade	Quantity (MT)	Modal price Rs/MT	Minimum price Rs/MT	Maximum price Rs/MT
Please specify _____				
Please specify _____				
Please specify _____				
Please specify _____				
Total				

10. Please describe the coordination arrangement with farmers and the procurement process?
- Do you have contracts with farmers?
 - If yes, what aspects of the transaction are specified in the contract?
 - If no, what coordination arrangements do you have to ensure you are able to procure the quantities you need?
 - Are inputs / extension or other facilities provided to the farmers?
 - If yes, how are these costs recovered from farmers?

- f. Do you procure at the farms/orchards?
- g. On average, how many days after harvesting do you procure the apples?
- h. Do the farmers themselves grade produce before you procure?
- i. Do you procure all the grades available with each farmer or do you just buy only CS-storable apples?
- j. How much time does it take for the apples to arrive at the CS after harvest?
- k. Is there any pre-cooling infrastructure available / planned before apples are received at the CS store?
- l. Once the apples arrive at the CS, please explain the selection, grading and acceptance process
- m. How and when (after receipt of apples) does the farmer receive payment?
- n. Is there any understanding before harvest about the price?
- o. How and when is the price to be paid to farmers decided and how is it communicated to the farmers?
- p. How much of apples are wasted from farm to your CS?
- q. How much wastage occurs during storage in your CS facility?

- r. Any estimate of the spread of your procurement by land holding of the farmers from whom procurement is made?

Land holding	% of total procurement
Small < 1 acre	
Medium 1-5 Acres	
Large > 5 acres	

11. For the produce procured between July and November 2013, what quantities (MT) did you sell to each buyer category and at what price?

Grade	Direct to wholesalers		Direct to retailers		Through commission agents	
	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)	Quantity (MT)	Price (Rs/MT)
Please specify _____						
Please specify _____						
Please specify _____						
Total						

12. What costs did you incur in the chain after purchase from farmer? Please indicate if any of these costs vary by grade.

Costs	Location ¹²⁶		INR/MT
Pre-cooling at the farm		Did you pay this?	
		If so, how much?	
Grading at farm, if undertaken		Did you pay this?	
		If so, how much?	
Packaging at farm, if undertaken		Did you pay this?	
		If so, how much?	
Loading at farm		Did you pay this?	

¹²⁶ HP/Delhi/Mumbai; farm/mandi/distribution center/cold/CA store etc.

		If so, how much?	
Commission paid to agent (in case commission agent is used for purchase)		Did you pay this?	
		If so, how much?	
Primary transportation		Did you pay this?	
		If so, how much?	
Unloading at CS		Did you pay this?	
		If so, how much?	
Grading at CS, if undertaken		Did you pay this?	
		If so, how much?	
Packaging at CS, if undertaken		Did you pay this?	
		If so, how much?	
Retrieval and loading at CS		Did you pay this?	
		If so, how much?	
Repackaging / regrading at CS after retrieval, if undertaken		Did you pay this?	
		If so, how much?	
Commission paid to agent (in case commission agent is used for sale)		Did you pay this?	
		If so, how much?	
Secondary transportation		Did you pay this?	
		If so, how much?	
Unloading at buyer's location		Did you pay this?	
		If so, how much?	
Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	
Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	
Any other costs, please specify (commission, APMC fees, taxes etc)		Did you pay this?	
		If so, how much?	

13. Please give a broad idea of the capital investment and operating costs of the CS.

Capacity (in MT)	
Location	

	INR	INR/MT of capacity
Capital investment		
Land		
Building & Civil works		
Plant & Machinery (refrigeration equipment etc)		
Others		
Operating costs (last available financial year)	INR	INR/MT of procurement
Procurement		
Manpower		
Utilities		
Overheads, please specify		

14. Between July 2013 and November 2014 please tell us about your overall purchasing operations and sales to different buyers distinguishing between domestic and imported apples?

MON TH	PURCHASING OPERATIONS				SELLING OPERATIONS						
	DOMESTI C APPLES		IMPORTE D APPLES		DOMESTI C APPLES		IMPORTE D APPLES		Proportion (%) of sales to different channels		
	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Qua ntity (MT)	Pric e (Rs/ MT)	Other whole salers	Reta ilers	Comm ission agents
July 2013											
Augu st 2013											
Septe mber 2013											
Nove mber 2013											
Dece mber 2013											
Janua ry 2014											

February 2014											
March 2014											
April 2014											
May 2014											
June 2014											
July 2014											
August 2014											
September 2014											
October 2014											
November 2014											

15. Do you rent-out some of your CS capacity or use it entirely for captive purposes? If you also rent out, please let us know how much capacity you've rented over the years?

CA_location	Capacity rented out (MT)	Average rental cost ¹²⁷ (Rs per MT per month)

16. What changes have come about in your business after the APMC Act was amended in HP?

17. What changes have come about in your business after the recent de-listing of fruits and vegetables from APMC in HP?

¹²⁷ In case this is different by grades, try to get the split if easily available otherwise get the average across grades

18. Why are apple farmers in HP not organized into cooperatives / producer organizations?

19. Looking at the entire apple value chain, what investments are needed at the primary production level, storage and distribution, and retailing?

20. Do you think CA stores near farms are benefitting farmers? Why / why not?

21. Can you please provide us with the contact details (or help us connect with) of farmers that you procure from?

22. Can you please provide us with the contact details (or help us connect with) wholesalers/retailers/commission agents that buy from you?

23. Can you please provide us with the contact details (or help us connect with) cold store owners (non-CA) in the growing areas?

Annexure 3: Model for CA storage – detailed assumptions and limitations

Base case assumptions

Assumptions		
Capacity	5000	MT
Capex - P&M (CA eqpmt, MHE, insulation, grading m/c)	61,000	INR per MT
Capex - building and related	9,000	INR per MT
Land required	6	Sq.ft. per MT
FSI	55%	
Land Requirement	54545	Sq.ft.
Land Requirement	1.3	acres
Land cost	0.1	INR cr per acre
Debt/Equity	3	Ratio
Subsidy	0%	in %
Debt cost	13%	in %
Realization of cold store	2000	INR/MT/month
Average storage period	5	months
Inflation	5%	in %
Power, labor cost, SGA and overheads	4000	INR/MT/annum

Apple price - Farmer realization	45.00	INR/kg
Apple price - off season Mandi buy price	70.00	INR/kg
Wastage	4%	in %
SGA of trading	8%	in %

Capex - P&M breakup		
<i>Ref eqpmt</i>	<i>6000</i>	<i>INR/MT</i>
<i>Insulation</i>	<i>11000</i>	<i>INR/MT</i>
<i>Other CA eqpmt</i>	<i>8000</i>	<i>INR/MT</i>
<i>MHE</i>	<i>4000</i>	<i>INR/MT</i>
<i>Crates and bins</i>	<i>14000</i>	<i>INR/MT</i>
<i>Grading machine</i>	<i>18000</i>	<i>INR/MT</i>
<i>Building construction</i>	<i>9000</i>	<i>INR/MT</i>

Subsidy to be applied to total cost capped at 38000 INR/MT

Cost of Equity	18%
Cost of Debt	13%
Weighted average cost of capital	11%

Accounts receivable days for trading model: 30 days

Accounts payable days for rental model: 5 days

Accounts receivable days for rental model: 75 days

Accounts payable days for rental model: 30 days

Key limitations / disclaimers with respect to the model

- Buying prices change widely between years and sales price could also vary, though less so. Therefore actual markup in any particular year across apple grades may range from as low as 20-25/kg to 40-45/kg. Typically the years with bumper production lead to low purchase prices and years with poor production lead to higher buying prices – thus while harvest years 2007, 2010 and 2013 being high production years were favourable for apple traders owning CA stores, harvest years 2009, 2012 and 2014, with relatively lesser production, were less favourable.
- Subsidy availed by players has ranged from 40-75% of allowable capital costs; at the upper end, the effective subsidy as a percentage of total actual capital costs goes up to around 50% for at least a few. In the simulation, in order to be conservative, the share of subsidy in overall capital costs does not go beyond 29%. As of April 2014, the subsidy has been reduced to 35-50% of allowable capital costs. The allowable capital costs have also been clearly defined revised downwards.
- The model assumes a 100% utilization of the store for trading from the first year of operations. However, in some cases, players have started with rented capacity and then, over the first few years, reduced share of rental while increasing the share of trading simultaneously.
- Model assumes trading only being done on apple bought in season and sold in off season with no trade in fresh apples in season. However, most CA store investors are also traders in not only fresh apple during seasons but also in imported apples
- The model assumes release of subsidy by the government as per schedule. However, often the actual release of payment of subsidy amount is delayed causing cash flow strain for the entrepreneur. Some stakeholders interviewed in the course of this study indicated that recent changes in the subsidy release mechanism, wherein the central subsidy is routed through the state government is leading to even greater delays than in the past.