Value Chain Analysis

Kinnow

Prepared by:

AGRI BUSINESS PROMOTION FACILITY
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Executive Summary: Kinnow

Orange is the most admired citrus fruit in the world. The most important commercial citrus species are mandarin, sweet orange and acid lime. It has great economic importance due to its wide range of uses and benefits. The fruit is rich in Vitamins like A, B, C and phosphorus. Oranges can be consumed fresh or in the form of juice, squash, syrup and jam. In India, it is largely consumed as fresh fruit, besides being used for juice extractions and preparation of concentrated powders which is later used for preparation of drinks. It is also used for extraction of essential oils which finds its way into flavouring hard candy, gelatine, ice cream, chewing gum, and bakery products. It processes many medicinal properties and is used in allaying fever. It is also used to address stomach and intestinal problems. Kinnow/Oranges have a potential of providing an earning of about Rs 1.5 lakh/annum per ha.

Global orange production in the year 2016-17 was about 49.6 million. Brazil’s stands 1st on production of oranges in the world contributing around 27% of the total production followed by China and India. Other major orange producing countries are USA, Mexico, Spain, Egypt, Indonesia and South Africa. European union, Russia, Saudi Arabia are the major importers of oranges from around the world. Orange occupies nearly 50% of total citrus area in India. In the North, it is cultivated in Punjab, Rajasthan, Haryana, Madhya Pradesh, Jammu and Kashmir and Uttar Pradesh. In the South it is confined to Wayanad, Nilgiri, and Shevoy hills, whereas in the North East it is grown in the states of Meghalaya, Mizoram Tripura, Sikkim and Arunachal Pradesh. In Western parts of India Maharashtra and Rajasthan are the most important states as far as orange cultivation is concerned. Jhalawar, Kota, Baran, Chittorgarh, Bhiwara and Sri Ganganagar are the most important districts for orange cultivation in Rajasthan. Punjab is the largest producer of oranges in India with a consistent increase in production from 2011-2012 to 2013-2014. The orange juice business in India is highly dominated by unorganised players with over 75 per cent market share. The organised retail which has only 25 per cent of the business comprises of juice bars, juice cafes and packaged juice players. Most popular recommended commercial varieties of Oranges are Nagpur santra, Kinnow, Khasi Orange and Coorg santra. In Rajasthan, Nagpur santra and Kinnow are most famous among the farmers and traders. Mandarin is chiefly grown in Jhalawar district in Rajasthan.

Some key strengths of Oranges value chain are; Oranges are widely consumed, Rajasthan has a large area under oranges, Presence of Center Excellence in Kota is a great boon for the crop, the crop has a high income potential for the farmer.

1 http://www.fruitipedia.com/sweet_orange%20Citrus%20sinensis.htm
2 http://www.franchiseindia.com/restaurant/How-juicy-is-juice-business-in-India.6277
3 http://www.agricoop.nic.in/sites/default/files/Citrus%20cultivation.pdf
Some key weaknesses of the orange value chain are; Long gestation period for fruit bearing, High cost of input and labour. Highly perishable in nature and has to be sold off immediately. Another major weakness is the sale of fruit orchard 3-4 months before fruit maturity and low share of farmer over consumer rupee and poor availability of quality root stock. Some key opportunities for the orange value chain are; Intervention of RACP and associated agencies in the crop would create new opportunities and establishment of sorting/ grading/ waxing center at FCSC through FPC would open up newer avenues for tie up with larger markets and processors resulting in higher share of farmers in consumer rupee. Some major threats in the orange value chain for Rajasthan are: Change in weather pattern, competition with oranges from Nagpur and kinnu from Abohar, Punjab, Import policies of GoI allowing exotic oranges is a threat to the local orange industry.

The share of farmer in consumer price is very low for oranges like other fruits and vegetables. The perishable nature of the commodity gives lesser options to the farmer for holding back stock and wait till prices rise. The channel is not very long unlike food grains due to its highly perishable nature. The fruit has to reach the consumer within 3-6 days within plucking so that it remains in shape to be consumed. Beyond a weeks time, the fruit start deteriorating and hence the holding time with the stake holders is very less and none of the handlers prefer to store the product. The share of local commission agents is 6%, trader-6%, wholesaler-10% and retailer 50% over total consumer rupee paid. The retailer share is very high in the chain. However, the retailer has to keep adjusting the prices from even Rs 50 per kg till Rs 30 per kg depending upon the demand in the market to maintain his profitability. The fruit is highly perishable and will be a net loss to retailer if not sold in time.

- **Pre intervention Value Chain: Kinnow**
The pre intervention value chain of Kinnow has essentially two chains. The first one is fresh and the 2nd one is processed products of Kinnow/oranges. In the first value chain, farmers sell the crop before the harvesting season on estimation basis to local commission agents who then directly send it to large mandis in other cities in trucks/pickups after doing sorting/grading, waxing and packing in crates or cartoons as per the requirement of the specific market. The produce of acceptable size is sold mostly as fresh and the reject ones below specific size are sold to processors for pulping and juice making. The 2nd channel is farmer selling through Mandi. The mandi traders also undertake sorting/grading/ waxing and packaging before supplying to other mandis and processors. It has been noted that, the commission agents taking directly from the field may end up with more efficient operations as they incur less cost and operate from temporary structures. Whereas, the cost of operation of Mandi traders is higher as they operate from fixed structures.

- **Post intervention value chain: Kinnow**
The post intervention value chain map for kinnow may be may be visualised as one with two production distribution or activity-marketing channels. FPC will replace the role of local commission agents and mandi and will directly aggregate kinnow from member farmers and undertake sorting, grading and waxing. This primary processing will be done through FCSC. The activity of sorting/grading will itself insure 12-15% higher margin for the farmers. The high grade produce will be supplied directly to various mandis like Jaipur, Delhi and other potential ones. The small size kinnow may be tied up with processors like Pepsi/ Rasna/ Baba Ramdev foods for further processing and value addition. The FPC will continue to graduate in an organic manner trading mostly in fresh Kinnow and later on may setup their own pulping unit if they plan so.
**Intervention Plan**

The intervention plan may be considered in terms of three critical stages that are production, post-harvest and processing. Weather conditions play a critical role in the crop production. At the post-harvest stage, the prices tend to decline as harvesting progress and produce starts flowing into the market. At the post-harvest stage information on the storage, grading, waxing parameters, quality needs to be disseminated. The processing related constraints may be viewed in terms of lack of post community level post-harvest infrastructure limiting farmers share in the value chain. Also, at the post-harvest and processing stage there is scope to evolve FPCs to farmers with FCSCs which undertake primary processing and storage activity.
Chapter 1- Introduction

Orange is amongst the top citrus fruits grown in most countries. It’s a round orange colour fruit that grows in a tree, which can reach up to 10 metres of height. The most important commercial citrus species are mandarin, sweet orange and acid lime. Oranges have great economic importance due to its wide range of uses and benefits. The fruit is rich in Vitamins like A, B, C and phosphorus. Oranges can be consumed fresh or in the form of juice, squash, syrup and jam. Oranges are the main source of peel oil, citric acid for cosmetics.

Origin and Importance
Orange is believed to have originated in South-East Asia spreading from the Southeast and Northeast India, Southern China and Vietnam. Various types of Oranges were grown in these regions dating back to around 7000 years ago. In India, it is largely consumed as fresh fruit, besides being used for juice extractions and preparation of concentrated powders which are later used for preparation of drinks. It is also used for extraction of essential oils which finds its way into flavouring hard candy, gelatine, ice cream, chewing gum, and bakery products. It processes many medicinal properties and is used in allaying fever. It is also used to address stomach and intestinal problems.

1.1. Global scenario
Global orange production in the year 2016-17 has been about 49.6 million. Brazil’s production is up a whopping 27 percent to 18.2 million tons based on expected higher yields due to favourable weather resulting in good bloom and fruit set. Oranges for processing are up over one-third to 12.9 million tons; fresh consumption is also up on greater supplies. United States’ production is forecasted to be down by 470,000 tons as citrus greening continues to reduce area in Florida. Production in the European Union is down 190,000 tons on unfavourable dry weather and the Citrus Tristeza virus in parts of Italy. Imports of oranges for processing are relatively flat while fresh consumption is down on lower supplies.

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Global orange juice production for 2016/17 has sharply increased to 2.0 million metric tons (65 degrees brix) as Brazil rebounds from the lowest production in nearly 3 decades. Consumption is forecasted to be down, led by the United States and China. United States’ production is forecast down by 28,000 tons to 355,000 as a result of fewer oranges for processing. Imports have increased from 20,000 tons to 300,000. Brazil’s production is forecast to rise 44 percent to 1.2 million tons on more oranges for processing as orange juice production rebounds. Exports are up 26 percent on greater supplies.

Global production of oranges for 2016/17 is forecast at 28.4 million metric tons, down 1 percent from last year with a much smaller crop in China more than offsetting increases in the European Union and Morocco. Fresh consumption is down on reduced supplies with exports relatively flat. United States’ production is forecast to grow 4 percent to a record 899,000 tons on higher crops in

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California and Florida. Higher consumption will be supported by domestic supplies, not imports. China represents over two-thirds of global production and consumption and one-fourth of global exports of oranges. Production of oranges in the European Union is forecast up 248,000 tons to 3.3 million due to favourable weather in Spain. Consumption and exports are both up on greater supplies. Japan's production has increases by 7 percent to 1.0 million tons due to favourable weather. Turkey’s production has reached at a record 1.1 million tons, up 20,000 from the previous year on higher area. Exports and consumption are both up slightly. Production in Morocco has increased by 260,000 tons to 1.3 million on higher area. Exports are up on both higher supplies and higher demand from Russia.

1.1.1. **Kinnow/Orange Producing countries**

Brazil is the largest Orange growing country followed by China, India, USA, Mexico and Spain. It contributes 4.39 % of total production of Oranges in the world. India stands fourth in the world for production as in year 2014-15.

**Table 1: Major Orange producing countries of the world**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Country</th>
<th>Production (In Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brazil</td>
<td>1,69,28,457</td>
</tr>
<tr>
<td>2</td>
<td>China</td>
<td>79,86,083</td>
</tr>
<tr>
<td>3</td>
<td>India</td>
<td>73,17,610</td>
</tr>
<tr>
<td>4</td>
<td>United States of America</td>
<td>61,39,826</td>
</tr>
<tr>
<td>5</td>
<td>Mexico</td>
<td>45,33,428</td>
</tr>
<tr>
<td>6</td>
<td>Spain</td>
<td>34,94,471</td>
</tr>
<tr>
<td>7</td>
<td>Egypt</td>
<td>31,35,931</td>
</tr>
<tr>
<td>8</td>
<td>Indonesia</td>
<td>19,26,560</td>
</tr>
<tr>
<td>9</td>
<td>South Africa</td>
<td>17,88,694</td>
</tr>
</tbody>
</table>

1.1.2. **Orange Exports globally**

Orange exports by the countries totalled US$4.5 billion in 2015, down by an average -6.3% for all oranges shippers over the five-year period starting in 2011 when oranges shipments were valued at $4.8 billion. Year over year, the value of global oranges exports appreciated 0.3% from 2014 to 2015. Among Continents, European countries accounted for the highest dollar value worth of orange exports during 2015 with shipments amounting to $2 billion or 43.8% of total exported oranges. In second place were African exporters at 26.8% while 13.2% of worldwide shipments originated from North America. Asia supplied 9.8% worth of oranges, followed by Oceania (mainly Australia) at 3.3%. Close behind, Latin America (excluding Mexico) and Caribbean nations came in at 3.2%.

**Table 2: Worldwide Export data of Oranges**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Exporter</th>
<th>2015 Oranges Exports</th>
<th>% World Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spain</td>
<td>US$1.3 billion</td>
<td>28.9%</td>
</tr>
</tbody>
</table>

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1.1.3. Global Orange Imports

The European Union is the major importer of Oranges in the world with an annual import of 960 MT followed by Russia, Saudi Arabia, China, Hong Kong.

Table 3: Worldwide Import data of Oranges

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Country</th>
<th>Imports(IN '000 MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>European Union</td>
<td>960</td>
</tr>
<tr>
<td>2</td>
<td>Russia</td>
<td>480</td>
</tr>
<tr>
<td>3</td>
<td>Saudi Arabia</td>
<td>440</td>
</tr>
<tr>
<td>4</td>
<td>China</td>
<td>300</td>
</tr>
<tr>
<td>5</td>
<td>Hong Kong</td>
<td>295</td>
</tr>
<tr>
<td>6</td>
<td>UAE</td>
<td>225</td>
</tr>
<tr>
<td>7</td>
<td>Canada</td>
<td>210</td>
</tr>
<tr>
<td>8</td>
<td>Iraq</td>
<td>190</td>
</tr>
<tr>
<td>9</td>
<td>USA</td>
<td>155</td>
</tr>
<tr>
<td>10</td>
<td>South Korea</td>
<td>130</td>
</tr>
</tbody>
</table>

1.2. Indian Scenario

Orange occupies nearly 50% of total citrus area in India. In North, it is cultivated in Punjab, Rajasthan, Haryana, Madhya Pradesh, Jammu and Kashmir and Uttar Pradesh. In South it is confined to Wayanad, Nilgiri, and Shevoy hills, whereas in the North East it is grown in the states of Meghalaya, Mizoram Tripura, Sikkim and Arunachal Pradesh. In Assam, Brahmaputra valley and Dibrugarh districts are famous for Orange production. In Western parts of India Maharashtra and Rajasthan are the most important states as far as orange cultivation is concerned. Jhalawar, Kota,
Baran, Chittorgarh, Bhilwara and Sri Ganganagar are the most important districts for orange cultivation in Rajasthan\(^9\).

Punjab is the largest producer of oranges in India with a consistent increase in production from 2011-2012 to 2013-2014.

Table 4: State wise trend of oranges production in India\(^{10}\)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>State</th>
<th>2011-12</th>
<th>2012-13</th>
<th>2013-14</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Production</td>
<td>Productivity</td>
<td>Area</td>
</tr>
<tr>
<td>1</td>
<td>Punjab</td>
<td>42.8</td>
<td>915</td>
<td>21.4</td>
</tr>
<tr>
<td>2</td>
<td>Madhya Pradesh</td>
<td>44.2</td>
<td>647.5</td>
<td>14.6</td>
</tr>
<tr>
<td>3</td>
<td>Maharashtra</td>
<td>133</td>
<td>443</td>
<td>3.3</td>
</tr>
<tr>
<td>4</td>
<td>Rajasthan</td>
<td>9</td>
<td>179</td>
<td>19.9</td>
</tr>
<tr>
<td>5</td>
<td>Assam</td>
<td>15.1</td>
<td>175.7</td>
<td>11.6</td>
</tr>
<tr>
<td>6</td>
<td>Karnataka</td>
<td>3</td>
<td>63.6</td>
<td>21.2</td>
</tr>
<tr>
<td>7</td>
<td>Nagaland</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Manipur</td>
<td>4.7</td>
<td>28.7</td>
<td>6.2</td>
</tr>
<tr>
<td>9</td>
<td>Meghalaya</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>Tripura</td>
<td>4.7</td>
<td>23.6</td>
<td>5.1</td>
</tr>
<tr>
<td>11</td>
<td>Others</td>
<td>72.7</td>
<td>652.4</td>
<td>9</td>
</tr>
</tbody>
</table>

(Source: National Horticulture Database 2015\(^{11}\))

Figure 3: Processed food industry for Orange

\(^{10}\) [http://www.fruitipedia.com/sweet_orange%20Citrus%20sinensis.htm](http://www.fruitipedia.com/sweet_orange%20Citrus%20sinensis.htm)

\(^{11}\) [http://www.fruitipedia.com/sweet_orange%20Citrus%20sinensis.htm](http://www.fruitipedia.com/sweet_orange%20Citrus%20sinensis.htm)

The orange juice business in India is highly dominated by unorganised players with over 75 per cent market share. The organised retail which has only 25 per cent of the business comprises of juice bars, juice cafes and packaged juice players\(^\text{13}\).

### 1.3. State Scenario: Rajasthan\(^\text{14}\)

Though a large percentage of the total area is desert, and even though there is little forest cover, Rajasthan has a rich and varied flora and fauna. The production of sweet orange is largely favoured by dry, semi-arid to subtropical conditions. However, plants grow well under subtropical climate and can even withstand occasional light frosts. However, good results are not sure under cooler climates. Several hours of exposure to a temperature of -3°C causes severe injury to plants. On the other hand, very high temperatures are also detrimental. The average temperature for growth is about 16°C-20°C. Hence, it can tolerate well maximum temperature of 32°C-40°C and minimum of 17°C-27°C as it exists in most of the sweet orange growing belts of the country.

The total fruit production of Rajasthan was 401.9 thousand metric tonnes with an area of 27.6 thousand hectares and productivity of 14.6 MT/ha. Rajasthan contributes 253.4 thousand MT of citrus production with an area of 14.4 thousand hectares and productivity of 17.6 MT/ha. Thus, Rajasthan ranks 6th in area and 3rd in production in the year 2008-09. In Rajasthan highest production of mandarin is contributed by Jhalawar district ranking at first place.

The major varieties of citrus grown in the state are mandarin and Kinnow. Sri Ganganagar and Hanumangarh are known for Kinnow whereas Jhalawar for Nagpur mandarin varieties production. Among the varieties of produce in the state, Kinnow mandarin bears highest place in juice content and fruit quality. In the state, Kinnow is grown mainly in Sri Ganganagar with 8650 hectares area and 25000 metric tonnes of production followed by Hanumangarh district.

**Jhalawar, Kota, Baran, Chittorgarh, Bhilwara, Sriganganagar** are the most important districts for orange cultivation in Rajasthan.

**Varieties**

Many varieties of sweet orange have been introduced into India but only a few are prolific ones having good quality. Currently, exotic varieties like Jaffa, Hamlin and Pineapple are performing well in Punjab, Haryana and Rajasthan. Jaffa is a famous, mid-season sweet orange, while Hamlin is an early-season variety. However, main varieties of sweet orange in India being cultivated on commercial scale are Blood Red, Mosambi and Satgudi. Blood red is the most important variety in Haryana, Punjab and Rajasthan. Jhalawar has been synonymous with “Chhota Nagpur” because of production of best quality mandarin.

### 1.4. District and cluster scenario

The total production in catchment in district is 260592 MT whereas the total production in Rajasthan is 264389. The percentage in Rajasthan is 98.6%. The top producing districts in the catchment zone are Jhalawar, Sri Ganganagar.
Table 5: Production in catchment area

<table>
<thead>
<tr>
<th>Year</th>
<th>Catchment Production (in MT)</th>
<th>Rajasthan State Production (in MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-13</td>
<td>204,719.27</td>
<td>211,723.16</td>
</tr>
<tr>
<td>2013-14</td>
<td>268,465.43</td>
<td>273,581.08</td>
</tr>
<tr>
<td>2014-15</td>
<td>260,510.39</td>
<td>264,389.21</td>
</tr>
</tbody>
</table>

Table 6: Production in catchment area

<table>
<thead>
<tr>
<th>Year</th>
<th>Catchment Production (in MT)</th>
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<tr>
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<tr>
<td>2014-15</td>
<td>260,510.39</td>
<td>264,389.21</td>
</tr>
</tbody>
</table>

The area under Kinno/ Orange crop in Z Distributory is 108 Ha and the estimated production is 3024 MT. Out of this, around 95% is the marketable surplus with an estimated value of Rs 287 lacs. Currently, there is no productive plant in the cluster and the 13.75 Ha planted is new plantation and hence marketable surplus is not derived for Manoharthana Cluster.

1.5. **Approach to Value Chain Analysis**

In order to evaluate the value chain of Kinnow, consultations were held with major stakeholders in the chain including farmers, Consumers, Processors, traders, supporting public and private service providers and institutions etc. in various parts of the state. Major Kinnow producing clusters were considered for survey within Rajasthan.
Within and outside Rajasthan

In order to evaluate the value chain of Kinnow/Orange, consultations have been held by the AB PF consultants with major stakeholders in the chain including farmers, Consumers, Processors, traders etc. in various parts of the state. Major Kinnow/Orange producing clusters were considered for survey within Rajasthan. The stake holder and the location mentioned are as under:

- Farmers in Shri Ganganagar cluster (5)
- Farmers in Jhalawar cluster (5)
- Nature land organic foods pvt ltd (Processor)
- VegFru (A platform for market linkage of fresh fruits)
- Deepak kanda (Trader)
- Coordinator, RACP, Sri Ganganagar,
- Asst. Director, Agriculture Ext., Sri Ganganagar
- DIC, Sri Ganganagar
- DPM, Sri Ganganagar
- Joint Director, Agri. Marketing, Sri Ganganagar
- Center of excellence for Citrus, Kota
Chapter 2- Pre Harvest Management

2.1. Major Commercial Varieties Grown In Rajasthan
Most popular recommended commercial varieties of Oranges are Nagpur santra, Kinnow, Khasi Orange and Coorg santra. In Rajasthan, Nagpur santra and Kinnow are most famous among the farmers and traders. Mandarin is chiefly grown in Jhalawar district in Rajasthan15.

Table 8 Major Varieties of Oranges

<table>
<thead>
<tr>
<th>Name of citrus fruit</th>
<th>States</th>
<th>Orange Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet Orange</td>
<td>Rajasthan, UP, Punjab</td>
<td>Jaffa, Hamlin, Valencia</td>
</tr>
<tr>
<td>Mandarin</td>
<td>Rajasthan, Maharashtra, MP</td>
<td>Mandarin</td>
</tr>
</tbody>
</table>

2.2. New Initiatives and Practices
• Phytophthora control by Organic insecticide- Removal of Phytophthora from the fruit orchards increases the production of Oranges to a great extent. Jeevamrut is regularly sprayed on the trees. This is the fermented extract of cow dung, cow urine and neem leaves, known for its anti-fungal properties and high nitrogen content16. Solid residue is applied to the wounds followed by mulching the weeds. It took not more than a year for the trees to recover. The yield has now grown to 2,000 fruits per tree per season.

• Organic farming- Organic farmers can increase food production by managing local resources without having to rely on external inputs or food distribution systems over which they have little control and/or access. Organic farms grow a variety of crops and livestock in order to optimize competition for nutrients and space between species: this results in less chance of low production or yield failure in all of these simultaneously. Orange is one of the commodities benefited by Organic farming17.

15 http://www.agricoop.nic.in/sites/default/files/Citrus%20cultivation.pdf
16 http://agritech.tnau.ac.in/organic/organic_farming/organic_farming_panchakavya.html
2.3. **Seasonal Availability Pattern**

Seedlings are mostly transplanted in the month of July-August after the commencement of monsoon. Budding should preferably be done in the last week of January or first week of February following the ‘T’ or shield budding method.  

Table 9: Seasonal Availability of Orange

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Picking</td>
<td></td>
<td></td>
<td></td>
<td>Planting/ After care</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.4. **Land Preparation**

Land needs to be thoroughly ploughed and levelled. The land should be ploughed up to medium tilth and levelled. All perennial grasses such as couch grass should then be cleared and burnt or sprayed beforehand using Round-up (glyphosate) or glyphogun. Citrus fruits are highly sensitive to waterlogging and water stagnation during rainy season providing drainage channels of 3-4 feet depth along the slopes around the orchard is important.

2.5. **Planting and Cultivation**

*Nursery preparation and planting*

Freshly extracted seeds should be mixed with ash and dried in shade. Seeds should be sown in nursery bed, immediately after extraction. Otherwise, they may loose their viability. Seeds are sown at a distance of 2-3cm, germination may take place within 3-4 weeks. Since the seeds are polyembryonic, the sexual seedlings which are stunted and poor in growth are rogued out and the rest that are produced from the cells of nacelles are allowed to grow. The seedlings, thus selected are more or less uniform in growth and production. Every care must be exercised to protect the seedlings in the nursery from weeds, insect pests and diseases.

Planting is generally done during monsoon in north-western and western parts of the country, i.e. Punjab, Haryana, Rajasthan and Maharashtra, while in southern India; it is done at the onset of rainy season.

Land should be ploughed in a cross manner to soften the upper surface. The pits of 60 cm x 60 cm x 60 cm size should be dug. A planting distance of 6m from plant-to-plant and 6m from row-to-row is generally followed in square system of planting. However, planting distance as well as planting density depends upon the cultivar, rootstock used and agro climatic conditions.

2.6. **Climatic and Soil Requirement**

The production of sweet orange is largely favoured by dry, semi-arid to subtropical conditions. However, plants grow well under subtropical climate and can even withstand occasional light frosts. However, good results are not sure under cooler climates. Several hours of exposure to a temperature of -3 C causes severe injury to plants.

20 [http://www.agrifarming.in/orange-farming/](http://www.agrifarming.in/orange-farming/)
Oranges grow successfully in all frost free tropical and sub-tropical regions up to 1,500 m. above MSL. An annual rainfall of 100-120 cm and a temperature ranging from 5-70ºC and relative humidity of 85-90 % is suitable for the crop to grow well. Mandarin can be grown in a wide variety of soils but medium or light loamy soils with slightly heavy sub-soil, well-drained with pH of 6.0-8.0 are ideal for cultivation.

2.7. **Nutrients Management**

Orange, like other citrus fruits also requires judicious application of mineral nutrients for proper growth, development and sustained production of high quality fruits. Orange also requires micro – nutrients like zinc, copper, manganese, iron, boron and molybdenum in ample quantities. About one third of the recommended dose of nitrogen should be applied through Organic manures like FYM, Cakes etc. In case of non-bearing trees, nitrogen should be applied in split doses during April, August and November, Phosphorus in August and November and Potassium in November. Nitrogen should be applied in three split doses in case of bearing trees during April, August and November along with 200g of Phosphorus in two split doses in August and November and 100g.

<table>
<thead>
<tr>
<th>Age of the Plant</th>
<th>Year wise fertilizers applied(g/ plant)</th>
<th>N</th>
<th>P</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>150</td>
<td>50</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>300</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>450</td>
<td>150</td>
<td>75</td>
</tr>
<tr>
<td>4 and above</td>
<td></td>
<td>600</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

2.8. **Water Management**

Excess or deficiency of soil moisture creates adverse effects in Orange production. Irrigation requirement of Orange is higher than other fruit trees because of their evergreen nature, active growth and development throughout the year. In winter season, Orange should be watered at an interval of 10 to 15 days while in summer it is at 5 to 7 days. Orange is highly susceptible to water logging; therefore, stagnation of water around tree trunk should be avoided, also water should be free from salt content. The water requirement varies from 900-1100 mm per year depending upon the location.

2.9. **Weed Management**

Weed is a serious problem in an Orange nursery and young plantation. It can be control by hand pulling, hoeing, burning and tillage. However, frequent tillage may destroy the surface structure of soil, thus lowering water holding capacity of soil and permeability of soil. So, better way to eradicate weeds is to use weedicide. Pre-emergence application of Diuron (5 kg/ha) or Terbacil (4.5 kg/ha) or post emergence application of Atrazine (5 to 6 kg/ha) controls weeds significantly.

2.10. **Pest & Disease Management**

Devitalisation of plants due to poor fruit set, fruit drop both at bearing and maturity stage, stem tunnelling, bark removal, girdling etc. On account of the attack of different insect, pest viz. citrus
black fly, citrus psylla, citrus leaf miner, bark eating caterpillar, mealy bugs, citrus aphids, fruit fly, mites etc. results in poor performance by tree in terms of quality fruit production. Spraying with insecticides viz. monocrotophos, phosalone, dimethoate, phosphamidon, quinalphos etc. depending upon the type of pest infestation has been effective in most cases.

Some of the harmful insects and pests for orange plants along with their control measures are as follows:

1. **Melanose**
   Melanose is a fungal infection of young citrus fruit. The disease is generally more severe in older trees over 10 years of age. As the fungus propagates in dead wood, prompt pruning is an effective way of combating this disease. Liquid Copper Fungicide can also be used as a treatment.

2. **Aphids**
   Aphids, when in small numbers, do little damage to a tree, however, under favourable condition the aphid population can grow very rapidly and cause serious damages to a citrus tree during the growing season. The aphids attack the tree by sucking the sap out of the leaves. The symptoms are very visible in the form of multiple puckered marks, yellowing and the twisting of the leaves, which gives the appearance of deformed leaves. As the severity of the aphid infestation increases, leaf drop, twig and branch die back can be seen.

   Aphids can be controlled using newer and safer insecticides, rather than older and more harmful chemicals. For major outbreaks spray the tree with either Bug Buster or Trounce. The spray should be directed at the undersides of the leaves and other areas of visible feeding and insect concentrations. Normally, one or two spray treatments are required to achieve control. For less severe infections or as a preventative treatment, spray the leaves with Insecticidal Soap in the early summer.

3. **Citrus Whitefly**
   The citrus whitefly is a tiny white winged insect that is about 1/12 of an inch in length. It is most commonly found feeding on the underside of the tree’s leaves. When the branches are shaken, the Citrus whitefly will rapidly take flight and can be seen fluttering around the tree. In addition to feeding on the citrus tree, the whiteflies also lay their eggs.

on the underside of the leaves. When the eggs hatch, the juveniles are small oval, almost transparent larva, which attach themselves to the underside of the leaves and begin sucking the sap from the leaves. As a result trees leaves begin to curl and appear to be covered with a sticky, sooty mold substance.

4. Dog Caterpillars

The Orange dog caterpillar is a large caterpillar about 1.5 to 2 inches in length and brown in colour. The caterpillar attacks citrus trees by eating their leaves, partially eaten or chewed leaves from the outer edge is a good indicator that the Orange dog Caterpillar is attacking a tree. To control the Orange dog caterpillar, it should be removed physically by hand.

2.11. Recommended Good Agriculture Practices (GAP)

As per recommendation of Hand Book of Horticulture the good agricultural practices for Oranges are as follows:

- Look for varieties which are pest and disease resistant.
- Frequently apply compost or other organic material (including crop residues) and plant cover crops.
- Apply the required level of fertilizers at the right time.
- Use organic fertilizers and well composted manure.
- Keep fertilizer in a dry, clean and sheltered place.
- Irrigate fields early in the morning, late in the evening or at night.
- Avoid uneven application of water.
- Always use preventive methods such as using disease free seedlings, planting hedges and crops with pest deterring value and removing excrescent branch and overripe crops.
- Adopt physical control measures such as hand picking, tillage, flaming and setting up of fruits flies traps etc.
- If really necessary, use bio – pesticides or synthetic pesticides.
- Only purchase and use registered pesticides.
- Harvest crop at the right stage of maturity.
- Harvest the crop during the coolest part of the day – either early morning or late

2.12. Harvesting

Fruits are harvested when they attain full size, develop attractive colour with optimum sugar and acid blend. Fruits should be harvested preferably with clipper, shears or secateurs. Oranges should not be harvested in wet weather or during rains.

Oranges start bearing from the fourth year, but substantial yield can be expected only from sixth year onwards. It produces 500-800 fruits after about 9-10 years. However, its plants attain the level of full bearing at the age of 10-12 years. The net productive life span of mandarin orchards after deducting the first 5 pre bearing years is only 15-20 years.

26 http://nhb.gov.in/report_files/orange/ORANGE.htm
Main harvesting period of Orange in Rajasthan is December to February. Harvesting of fruits at proper stage not only maximize profits but also help to maintain quality of fruits. In Rajasthan, method of harvesting of Orange after attaining maturity is hand plucking. Unlike climacteric fruits, Orange doesn’t improve in taste after harvesting. Therefore, fruits should be harvested when they attain full size, develop attractive colour with optimum sugar. Methods of harvesting are very important as it affects the shelf life of fruits. Faulty harvesting and rough handling adversely affects the marketable quality of fruits. The common commercial practice of harvesting is to pull the fruits from the branches, which may rupture the skin near the stem end leading to fungal infection and subsequent rotting. This practice should be avoided. Therefore, fruits should neither be plucked nor turn off, but should be cut off with clipper, shears or secatours.

Figure 4: Harvesting of Oranges

2.13. Pre Harvest Constraints of farmers

Major problems faced by Orange growers are unavailability of good quality of root stock, inputs, lack of irrigation water, labour shortages and high labour cost. In protecting the crops from diseases and pests, farmers face different problems like high cost of pesticides, unavailability of pesticide in time, availability of spurious products in market, Even animals and birds should be kept away from crop as even they might come for food and may spoil the fruit.
Chapter 3- Post Harvest Management

3.1. Post-Harvest Losses, Harvesting Care and Post-Harvest Equipment

Post-harvest losses of horticultural produce may occur due to a variety of reasons. Some of the common reasons for post-harvest losses are as under.

- **Mechanical injury**
  Mechanical damage during harvest and loading affect orange post-harvest quality. This loss can be minimized by controlling incidence of physical damage throughout the harvest and loading operations. Impacts can negatively modify quantitative and qualitative fruits aspects.

- **Injuries due to thermal shock**
  Thermal, High Pressure, and Electric Field Processing affects the Plant Cell Membrane Integrity and Relevance to Fruit and Vegetable Quality. High pressure (HP) and pulsed electric field (PEF) processing are commercially applied to produce high quality fruit and vegetable products, both microbial and plant cell membranes are significantly altered following exposure to heat, HP, or PEF.

- **Disease and pest attack**
  In India, every year a huge loss to citrus production occurs due to damage caused by insect pests, diseases and off course physiological disorders. All these factors together cause a great damage to citrus crops; and growers as well as consumers are disadvantaged with it. The diseases are caused by fungi, bacteria, virus, virus like pathogens, etc. They cause severe damage to the mandarin orange cultivation.

- **Microbial attack**
  Fruits and vegetables can be preserved for long periods by canning, drying or the use of chemical preservatives. By these methods the fruits and vegetables are preserved from microbiological spoilage either by initial sterilization and protection from subsequent re-infection or by maintaining conditions which don’t allow the growth of micro-organism. The bulk of fruits and vegetables used for food are handled in the fresh state, through highly perishable they normally remain at ordinary temperatures in good conditions.

- **Physio-biochemical reasons**
  Salinity is amongst the most significant environmental factors responsible for substantial losses in agricultural production worldwide. This is a critical problem especially in citrus since they are one of

the most globally important horticultural crops considered salt sensitive. The effects of salinity (0, 25, 50, or 75 mm of NaCl) investigated on visible symptoms of leaf damage, electrolyte leakage, relative chlorophyll contents (Chl) (spot values), relative water content (RWC), proline and chlorophyll fluorescence yields (Fv/Fm) in nine citrus rootstocks including: Sour orange, Bakraii, Cleopatra mandarin, Rangpur lime, Rough lemon, Macrophylla, Swingle citrumelo, Citrange and Trifoliate orange. The lowest visible symptoms of leaf damage were found in Cleopatra mandarin. The highest and the lowest electrolyte leakage levels were observed in the Trifoliate orange and Sour orange, respectively. By increasing the levels of salt Chl, RWC and Fv/Fm decreased. The lowest rate of reduction in Chl observed in Cleopatra mandarin and Sour orange.

Post-harvest losses start right at the farm gate which continues till the produce reaches the consumer. A large number of intermediaries play an important role in the system between farmer and the retailer like local retailer, transporter, wholesalers and distributors, and at every step significant waste is noticed. According to farmers, pre-contractors, traders, wholesalers, retailers and consumers, average post-harvest losses in Orange from 20 to 33 % in Rajasthan.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Operations</th>
<th>Level</th>
<th>Losses (% to total production)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Harvesting (Bruises, Cuts due to Falling of fruits, Improper handling)</td>
<td>Bruises, Cuts due to Falling of fruits, Improper handling</td>
<td>1.2</td>
</tr>
<tr>
<td>2</td>
<td>Grading</td>
<td>Farmer</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wholesaler</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commission Agent</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exporters</td>
<td>0.5</td>
</tr>
<tr>
<td>3</td>
<td>Packaging(Fruit rapture, decay, infestation, disease, injuries)</td>
<td>Farmer</td>
<td>0.5-1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wholesaler</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commission Agent</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Exporters</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retailer</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Post-Harvest care

Harvesting Method
To prevent physical damage to the fruit, the worker should trim his/her fingernails, wear gloves, and use special harvesting scissors with rounded ends to cut the fruit. To harvest the fruit, it should be held in one hand, and the other hand used to cut the fruit stem together with a few leaves. Then the fruit should be brought close to the chest and the rest of the stem is cut off smoothly, close to the fruit.

Containers Used for Harvesting

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The container used for newly harvested fruit should be solid, with good ventilation. Fruit in flexible containers tend to crush each other, causing bruises. The bottom of wood or bamboo containers should be lined with newspapers, a paper bag or a fertilizer sack. It is important to move containers as little as possible, and not to leave them standing in the sun.

### 3.2. Grade Specification & Grading at Producer level

Grading is a key post-harvest operation which helps in determining the quality, shelf-life and price of the fruit. During grading, the produce is sorted according to the fixed grade standard, taking into consideration various quality factors to make a homogenous lot\(^{29}\).

Post-harvest grading of orange is rarely practiced at the producer’s level. Grading at farm level is far from desired level; however, there is an increasing recognition to the importance of grading. Grading of fruits by farmers is confined only to remove immature, rotten or diseased fruits from the bulk and grade according to colour, shape and size and the surveyed farmers revealed that they undertake sorting of fruits on the basis of physical characteristics like weight, size, colour, shape and degree of damage on fruits. This type of grading is done by hand in small operations.

Jhalawar farmers in Rajasthan are branding their orange produce and fetching better prices, assisted by NABARD and district authorities. The area around Bhawani mandi (Jhalawar) has distinction of being an important place on fruit map of citrus at national as well as international level exporting a good basket of orange to foreign countries. The district has more than 30,000 hectares area under orange orchards with 2,00,000 Mt of orange production in the year 2013-14.

### Grading and Storability

Citrus are graded by size. This can be done by hand or by machine. If the grower is grading citrus manually, it is best not to judge the size only by eye, but to use some kind of measuring device. A simple way to check fruit size is to cut a series of round holes in a thin wooden board or a piece of thick cardboard, according to standard market sizes for that variety. Fruit of different sizes should not be mixed together, or the market price the grower gets may be only that of the smallest fruit.

The optimum size for fruit varies from one variety to another. Generally, large fruit fetch the highest price. However, in the case of mandarins, large fruit (8.5 cm in diameter) and extra-large fruit (9.0 cm in diameter) have a low level of total soluble solids and low acid content. They have a thick peel and little juice, and do not store well. They should be consumed soon after harvest. Medium sized (8.0 cm in diameter) and small-sized (7.5 cm in diameter) fruit have a higher level of total soluble solids and a higher acid content, so that the flavour improves after short-term storage. Small fruit (6.0 - 6.5 cm in diameter) have a thin rind and high total soluble sugars and acid, but are more likely to rot in storage. They should be consumed fresh. Medium sized fruit (7.0 - 7.5 cm in diameter) have a low incidence of fruit rot after storage. Large fruit (more than 7.5 cm in diameter) have a low incidence of fruit rot but a poor flavour after storage, because of their low level of total soluble sugars and their low acid content.

Treatment after Harvest

Only fruit which have not been damaged in harvest are used for storage, although it is difficult to harvest fruit without some minor damage. Sometimes a chemical treatment is applied to the fruit before storage, to reduce the incidence of post-harvest diseases. Stem of the tree first becomes yellow, then brown. Finally, it drops off, leaving a vulnerable place on the fruit which may be infected by fungus diseases. A treatment of 10 to 40 ppm 2, 4-D can prevent the fruit stem from drying up and dropping off.

Other Treatments before Storage

After harvest or chemical treatment, fruit should be kept in the shade for a few days before they are put into a PE plastic bag. The bag should be 0.02 - 0.03 mm thick. Keeping the fruit in the shade in this way is a curing treatment, to reduce the water content of the peel. This reduces cell activity in the peel, which otherwise might soften the fruit. The time needed for water loss or evaporation depends on the temperature, the length of time the fruit is to be stored, and the thickness of the peel. If temperatures are high, citrus fruit need a longer period of curing. They also need a longer period of curing if they are to be stored for a long time, or if they have a thick peel.

On average, it takes from three to seven days to reduce the fruit weight by about 3%. Higher water content than these causes to condense inside the plastic bag, leading to stem rot. Water loss may cure minor wounds on the peel and reduce the incidence of rot during storage. Fruit which are to be stored for a long period are wrapped in plastic, to reduce water loss. Sometimes only one fruit is kept in each bag. This is the case with Oranges; however, with other varieties several layers of fruit can be stored in each bag. If the fruit are to be stored for more than two months, PE film is used, wrapped around stacked crates of fruit to form a pillar.

Storage

Plastic crates or boxes are used for storing fruit. Oranges should be stored with only one or two layers per box. Sweet oranges should be stored with three or four layers per box. Too many layers in one box may cause bruising of the fruit. Boxes should be stacked inside the storage room in a way that it maintains good ventilation. For the first few weeks of storage, ventilation windows should be left open. Throughout the storage period, the windows should be left open at night or in cold weather, in order to cool the fruit. When temperatures are high in the day time, the ventilation windows should be closed. Sunlight should not be able to penetrate inside the storage room. Any rotting fruit that are found should be removed.
Storage rooms should be constructed in places where cold air can flow into the room at night. The storage room should have a high roof, to allow better circulation of air. Ventilation windows should be small but there should be a large number of them, to allow better air circulation. It is recommended to that some ventilation pipes should be buried under ground, to bring in cool air through the floor of the room. The roof and walls should have good heat insulation, to keep temperatures as cool as possible. The storage room should be insect-proof and rat-proof. A good storage room is the key for extending the shelf life while maintaining fruit quality. Before storage, the room should be sanitized by washing the walls and floor with 5% formalin.

Figure 6: Packaging of Orange

3.3. Major Storage Disease and Pest and their Control Measure

Post-harvest diseases and disorders generally develop due to infestations before harvest. Insects damage is usually because of post-harvest disease like fruit fly. Losses from post-harvest diseases in fresh fruits can be both quantitative and qualitative. This disease is mainly caused by fungi and bacteria. Initially only a few pathogens may invade and break down the tissue systems, followed by subsequent attack of weak pathogen. High temperature and humidity accelerate the process of post-harvest decay by microorganism. Major post-harvest disease, characteristics and their control measure is listed below:

Table 12: Major storage disease

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Disease</th>
<th>Characteristics</th>
<th>Control measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sour rot (Geotrichum candidum)</td>
<td>Fruits show water soaked skin, soft texture with oozing liquid and fermented odour</td>
<td>Treatment with combination of callixin (1000 ppm) and Benlate-50 (0.1 %) emulsion before storage by dipping fruit for 2 minutes</td>
</tr>
<tr>
<td></td>
<td>Fruit rot (Phytophthora nicotianae)</td>
<td>Affected fruits soft, covered with whitish fungus growth</td>
<td>Spraying with Bordeaux mixture (2-3 sprays) (1 %) or Difolaton (0.3 %): defoliated leaves and fruits burnt; water logging to be avoided</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Disease</th>
<th>Symptoms</th>
<th>Control Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Powdery mildew (Acrosporium tingitanium)</td>
<td>Premature fruit drop</td>
<td>Fortnightly spray (during flush period) with any of the following fungicides. I) Cosan (0.2%) II) Thiovit (0.2%) III) Sulfex (0.2%) IV) Karathane (0.2%) V) Morestan (0.05%)</td>
</tr>
<tr>
<td>4</td>
<td>Stem end rot (Alternaria citri)</td>
<td>Seen in stored fruits; discolouration of stem and rotten area in the core; part of segment shows black sporulate</td>
<td>Use of imazalil or 2,4-D (or both) on harvested fruit. Use of the growth regulator 2,4-D delays the onset of senescence of the fruit button, thereby delaying or restricting the movement of the pathogen into the fruit.</td>
</tr>
<tr>
<td>5</td>
<td>Brown Rot (Phytophthora citrophthora)</td>
<td>Brown colour spot on infected fruits; infected fruit does not become soft and pulpy</td>
<td>Copper fungicide sprays applied to the soil and the lower part of the tree canopy prior to anticipated wet weather help to prevent brown rot.</td>
</tr>
<tr>
<td>6</td>
<td>Wither top / Anthracnose (Collectotrichum gloesporioides)</td>
<td>Serious on Orange tree-die back of twigs; or shedding of leaves, flowers and fruit drop; brown spot on rind;</td>
<td>Pruning of affected portion and spraying with Bordeaux mixture. Proper irrigation and timely fertilization essential.</td>
</tr>
</tbody>
</table>

(Source: Central Food Technological Research Institute, Mysore)
Chapter 4- Cost of production and Net value accruals to producers

A typical farmer with about 15 acres for Kinnow production, Commercial production starts after five years. In one acre 112 plants are sowed. Cost of each plant is Rs 30. After four years each plant yields 20-30 kg. After five years each plant yields around 80 kg. After ten years each plant yields 150 kg. Fruiting period of the Kinnow plant is thirty years. Cost of Fertilizers & Pesticides is Rs 20,000/- per acre. Drip irrigation cost is Rs 17,000/- per acre. Cost of plantation per acre is 36,000. Cost of weeding per acre is Rs 10,000. Three permanent labour are working full time for orchard who takes care of day to day activity. Each labour costs Rs 300 per day. Standard format for space between Kinnow plants is 16 feet X 18 feet Rows/Column. Plantation time is September, October and February. Cost of Fencing and Water channel for 15 acres orchard is Rs 3,00,000/- . Selling price for Kinnow varies between Rs 8 to 22 per kg. Gross earning per acre is Rs 161280 at an average price of Rs 12/kg. Net earning per acre is Rs 78280 for a production of 134 qtl/acre. This brings cost of production per quintal to Rs 610/qtl and earning per quintal of Rs 1203 per quintal showing a net earning of Rs 593 per quintal.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particular</th>
<th>Amount (in Rs. Per acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Income per acre</td>
<td>161280</td>
</tr>
<tr>
<td>B</td>
<td>Cost of Production (Incl labor, electricity, fertilizer)</td>
<td>83000</td>
</tr>
<tr>
<td>C</td>
<td>Net Profit per acre</td>
<td>78280</td>
</tr>
<tr>
<td>9</td>
<td>Net earning per quintal</td>
<td>593</td>
</tr>
</tbody>
</table>
Chapter 5- Supply Chain of commodity

5.1. **Seasonal Availability and Price Pattern**

5.1.1. **Seasonal Availability**

Oranges are harvested in the months of January and February in Rajasthan. Mandarins and sweet oranges normally take 240-280 days to arrive at maturity. Mature fruits are colour break stage and are picked up in 2-3 intervals of 10-15 days.

Production of Orange in central and western part of India is increasing every year. Crop (monsoon blossom) which matures in February-March has great potential. The fruit is available in the market in the month of April. However, the **Peak period** is considered to be from April to July after which the fruit is available in limited amount in markets. The period from August to March where production is low is considered as **Lean Period**.

**Table 13: Seasonal Availability of orange in Rajasthan**

<table>
<thead>
<tr>
<th>State</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rajasthan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Period</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lean Period</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.1.2. **Price pattern**

The price pattern at Ganganagar Mandi for Kinnow is shown below.

**Table 14: Arrival and Mandi price pattern of Kinnow in Ganganagar mandi**

<table>
<thead>
<tr>
<th>Month</th>
<th>Arrival (MT)</th>
<th>Price/qtl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov-14</td>
<td>1450</td>
<td>660</td>
</tr>
<tr>
<td>Dec-14</td>
<td>1950</td>
<td>840</td>
</tr>
<tr>
<td>Jan-15</td>
<td>19960</td>
<td>1213</td>
</tr>
<tr>
<td>Feb-15</td>
<td>72050</td>
<td>1092</td>
</tr>
<tr>
<td>Mar-15</td>
<td>62700</td>
<td>1006</td>
</tr>
<tr>
<td>Dec-15</td>
<td>2700</td>
<td>842</td>
</tr>
<tr>
<td>Jan-16</td>
<td>7050</td>
<td>872</td>
</tr>
<tr>
<td>Feb-16</td>
<td>3440</td>
<td>1396</td>
</tr>
<tr>
<td>Mar-16</td>
<td>920</td>
<td>1907</td>
</tr>
<tr>
<td>Nov-16</td>
<td>850</td>
<td>1533</td>
</tr>
<tr>
<td>Dec-16</td>
<td>2070</td>
<td>1479</td>
</tr>
</tbody>
</table>
The above table shows that there has been an upward surge in prices of Kinnow since last two years to the corresponding months of previous years. Farmer generally gets an average price of Rs 1133 per quintal as per the data available for last three years. Bhawani mandi in Jhalawar district is also one of the major markets in Rajasthan.
5.2. Existing Marketing Channels

Figure 8: Existing value chain map of Orange/Kinnow
The pre intervention value chain of Kinnow has essentially two chains. The first one is fresh and the 2nd one is processed products of Kinnow/oranges which either reaches domestic channel as shown in channel one or to foreign consumers as shown in channel 2. In the first value chain, farmers sell the crop before the harvesting season on estimation basis to local commission agents who then sell it to traders who have set up sorting, grading, packaging centers in makeshift arrangements near the villages. The traders further supply the consignments to large mandis in other cities in trucks/pickups after doing sorting/grading, waxing and packing in crates or cartoons as per the requirement of the specific market. The produce of acceptable size is sold mostly as fresh and the reject ones below specific size are sold to processors for pulping and juice making. Because of no mandi tax on oranges, most of the procurement is done outside the mandi and very few stock reaches the local FSV mandi. It has been noted that, the commission agents taking directly from the field may end up with more efficient operations as they incur less cost and operate from temporary structures.

The share of farmer in consumer price is very low for oranges like other fruits and vegetables. The perishable nature of the commodity gives lesser options to the farmer for holding back stock and wait till prices rise. The channel is not very long unlike food grains due to its highly perishable nature. The fruit has to reach the consumer within 3-6 days within plucking so that it remains in shape to be consumed. Beyond a week’s time, the fruit start deteriorating and hence the holding time with the stake holders is very less and none of the handlers prefer to store the product. The share of local commission agents is 6%, trader-6%, wholesaler-10% and retailer 50% over total consumer rupee paid. The retailer share is very high in the chain. However, the retailer has to keep adjusting the prices from even Rs 50 per kg till Rs 30 per kg depending upon the demand in the market to maintain his profitability. The fruit is highly perishable and will be a net loss to retailer if not sold in time. Holding time is very small in this trade as the consignment has to reach the farthest market at the earliest. Some instances were seen where the drivers are even paid incentives to enter the trucks in shortest time.

Post harvest losses are to the tune of 20-30% in certain cases and hence retailers work upon very high margin to make up losses.

Various support institutions at cultivation stage includes National Horticulture Mission, Dept of Horticulture-State Government, NGOs, KVKs, enter of excellence in Citrus, ICAR and allied institutions and agri input and machinery suppliers. At the post harvest stage, the marketing board, FSSAI, APEDA play vital roles in maintaining a quality and regulatory framework for the market. Financial institutions support all stake holders upto retailers with different banking and non banking financial products.

5.3. Alternative Systems of Marketing

Marketing information is a key to regulate the competitive marketing processes and to restrict the monopoly or profiteering stakeholders in the market. It is needed by producers in planning production and marketing of their produce, and is equally required by other market participants. Farmers need to be fully familiarized in different areas of agricultural marketing in order to improve their price realization. Marketing information is important at all the stages of marketing right from farm level to ultimate consumption level and simultaneously for all participants in these stages i.e producer, trader (millers), consumer etc. The Government of India has started Agricultural marketing information network scheme through Directorate of Marketing and Inspection to improve the present market information scenario by linking all agricultural produce markets in the States and Union Territories. This has also been established to an extent in Rajasthan.
5.3.1.  **Direct Marketing**

Direct marketing by farmers to the consumers has been experimented in the country through Apni Mandis in Punjab and Haryana. The concept with certain improvements has been popularised in Andhra Pradesh through Rythu Bazars. At present, these markets are being run at the expense of the state exchequer, as a promotional measure, to encourage marketing by small and marginal producers without the help of the middlemen. In these markets, mainly fruits and vegetables are marketed along with other commodities at present. Currently, most of the marketing channel for Oranges is almost like direct marketing where farmers are selling to traders directly.

5.3.2.  **Contract Farming**

Contract marketing is a system of marketing, where selected crop is grown for marketing by farmers under a ‘buy-back’ agreement with an agency (entrepreneur or trader or processor or manufacturer). In the wake of economic liberalization, it has gained momentum as the national and multinational companies enter into contracts for marketing of agricultural produce. They also provide technical guidance, capital and input supply to contracted farmers. Contract marketing ensures continuous supply of quality produce at mutually contracted price to contracting agencies, as well as ensures timely marketing of the produce. Contract marketing is beneficial to both the parties i.e. farmers and the contracting agencies.

5.3.3.  **Private market yard**

Market Yards are a long felt need of the farming community of our country as it goes a long way in ensuring higher remuneration to them through proper weighing, cleaning, grading and better price realisation of their produce. The farmers look forward to a regulated market yard as a dependable infrastructure for furtherance of their economic goal. The advantages of a regulated market yard system are immense and wherever such a system exists, it has been widely appreciated. Today the farmers consider it as a boon to them where they can confidently sell their produce and get an appropriate return for the quantity and quality they produce year after year.

Because of the perishability, most of the Kinnow are being sold directly through small private market yards setup by processors. The farmers bring their Kinnow to the sorting/grading/waxing centre and the sorted graded ones are directly sent from the private processors’ warehouse after waxing.
Chapter 6- Processing Infrastructure availability and utilization

6.1. Processing

Oranges can be used for making several products such as juice, jams, squash, creams and candies. The process flow chart of some of them has been discussed below.

1. Orange/Kinnow Juice

Juice and juice products represent a very important segment of the total processed fruit industry. Juice products are being marketed as refrigerated, shelf-stable, and frozen, in a variety of packages with increased emphasis on functionality, health attributes, new flavours or blends, and in some cases fortified with vitamins and minerals. High-quality juice operations are dependent upon a source of high-quality raw material.

Most fruit juices are excellent sources of vitamin C, several are good sources of carotene and many contain moderate amounts of pyridoxine, inositol, folic acid and biotin. Fruit juice is regarded as source of energy due to their rich carbohydrate content. The organic acids present in the fruit juice plays a significant role in the maintenance of the acid-base balance in the body.

The process starts with sound fruit, freshly harvested from the field or taken from refrigerated or frozen storage. Thorough washing is usually necessary to remove dirt and foreign objects and may be followed by a sanitation step to decrease the load of contaminants. Sorting to remove decayed and moldy fruit is necessary to make sure that the final juice will not have a high microbial load, undesirable flavours, or mycotoxin contamination. For most fruits, preparation steps such as pitting and grinding is required prior to juice extraction. Heating and addition of enzymes might also be included before the mash is transferred to the extraction stage. Juice extraction can be performed by pressing or by enzymatic treatment followed by decanting. The extracted juice will then be treated according to the characteristics of the final product.

For cloudy juices, further clarification might not be necessary or may involve a coarse filtration or a controlled centrifugation to remove large insoluble particles. For clear juices, complete depectinization by addition of enzymes, fine filtration, or high speed centrifugation is required to achieve visual clarity. The next step is usually a heat treatment or equivalent non-thermal process to achieve a safe and stable juice and final packaging if single-strength juice is being produced. For a concentrate, the juice is fed to an evaporator to remove water until the desired concentration level is obtained. Other processes used for water removal include reverse osmosis and freeze concentration,
which are best suited for heat-sensitive juices. The concentrate is then ready for final processing, packaging, and storage.

Figure 9: The generalized flow chart for preparing fruit juice
Harvesting/collection
Oranges are harvested from large groves. Some citrus growers are members of cooperative packing and marketing associations, while others are independent growers. When the mature fruit is ready to pick, a crew of pickers is sent in to pull the fruit off the trees. The collected fruit is sent to packing centres where it is boxed for sale as whole fruit, or sent to plants for juice processing. The oranges are generally shipped via truck to juice extraction facilities, where they are unloaded by a gravity feed onto a conveyor belt that transports the fruit to a storage bin.

Cleaning/Grading
The fruit must be inspected and graded before it can be used. An inspector takes a 39.7 lb (18 kg) sample to analyse in order to make sure the fruit meets maturity requirements for processing. The certified fruit is then transported along a conveyor belt where it is washed with a detergent as it passes over roller brushes. This process removes debris and dirt and reduces the number of microbes. The fruit is rinsed and dried. Graders remove bad fruit as it passes over the rollers and the remaining quality pieces are automatically segregated by size prior to extraction. Proper size is critical for the extraction process.

Extraction
Proper juice extraction is important to optimize the efficiency of the juice production process as well as the quality of the finished drink. The latter is true because oranges have thick peels, which contain bitter resins that must be carefully separated to avoid tainting the sweeter juice. There are two automated extraction methods commonly used by the industry. The first places the fruit between two metal cups with sharpened metal tubes at their base. The upper cup descends and the fingers on each cup mesh to express the juice as the tubes cut holes in the top and bottom of the fruit. The fruit solids are compressed into the bottom tube between the two plugs of peel while the juice is forced out through perforations in the tube wall. At the same time, a water spray washes away the oil from the peel. This oil is reclaimed for later use.

The second type of extraction has the oranges cut in half before the juice is removed. The fruits are sliced as they pass by a stationary knife and the halves are then picked up by rubber suction cups and moved against plastic serrated reamers. The rotating reamers express the juice as the orange halves travel around the conveyor line.

When the mature fruit is ready to pick, a crew of pickers pull the fruit off the trees. Once collected, the fruit is sent to plants for juice processing. Before extraction, the fruit is cleaned and graded. When the mature fruit is ready to pick, a crew of pickers pull the fruit off the trees. Once collected, the fruit is sent to plants for juice processing. Before extraction, the fruit is cleaned and graded. Some of the peel oil may be removed prior to extraction by needles which prick the skin, thereby releasing the oil which is washed away. Modern extraction equipment of this type can slice, ream, and eject a peel in about 3 seconds.

The extracted juice is filtered through a stainless steel screen before it is ready for the next stage. At this point, the juice can be chilled or concentrated if it is intended for a reconstituted beverage.

Concentration
Concentrated juice extract is approximately five times more concentrated than squeezed juice. Diluted with water, it is used to make frozen juice and many beverages. Concentration is useful because it extends the shelf life of the juice and makes storage and shipping more economical. Juice is commonly concentrated with a piece of equipment known as a Thermally Accelerated Short-Time
Evaporator, or TASTE for short. TASTE uses steam to heat the juice under vacuum and force water to be evaporated. Concentrated juice is discharged to a vacuum flash cooler, which reduces the product temperature to about 55.4° F (13° C). A newer concentration process requires minimal heat treatment and is used commercially in Japan. The pulp is separated from the juice by ultra-filtration and pasteurized. The clarified juice containing the volatile flavourings is concentrated at 50° F (10° C) by reverse osmosis and the concentrate and the pulp are recombined to produce the appropriate juice concentration. The flavour of this concentrate has been judged to be superior to what is commercially available in the United States and is close to fresh juice. Juice concentrate is then stored in refrigerated stainless steel bulk tanks until ready to be packaged or reconstituted.

Reconstitution
When the juice processor is ready to prepare a commercial package for retail sale, concentrate is pulled from several storage batches and blended with water to achieve the desired sugar to acid ratio, colour, and flavour. This step must be carefully controlled because during the concentration process much of the juice's flavour may be lost. Proper blending of juice concentrate and other flavour fractions is necessary to ensure the final juice product achieves a high quality flavour.

Pasteurization
Thanks to its low pH (about 4), orange juice has some natural protection from an automated process, the juice is extracted from the orange while the peel is removed in one step. In an automated process, the juice is extracted from the orange while the peel is removed in one step. Bacteria, yeast, and mould growth. However, pasteurization is still required to further retard spoilage. Pasteurization also inactivates certain enzymes which cause the pulp to separate from the juice, resulting in an aesthetically undesirably beverage. This enzyme related clarification is one of the reasons why fresh squeezed juice has a shelf life of only a few hours. Flash pasteurization minimizes flavour changes from heat treatment and is recommended for premium quality products. Several pasteurization methods are commercially used. One common method passes juice through a tube next to a plate heat exchanger, so the juice is heated without direct contact with the heating surface. Another method uses hot, pasteurized juice to preheat incoming unpasteurized juice. The preheated juice is further heated with steam or hot water to the pasteurization temperature. Typically, reaching a temperature of 185-201.2° F (85-94° C) for about 30 seconds is adequate to reduce the microbe count and prepare the juice for filling.

Packaging/filling
To ensure sterility, the pasteurized juice should be filled while still hot where possible, metal or glass bottles and cans can be preheated. Packaging which cannot withstand high temperatures (e.g., aseptic, multilayer plastic juice boxes which don't require refrigeration) must be filled in a sterile environment. Instead of heat, hydrogen peroxide or another approved sterilizing agent may be used prior to filling. In any case, the empty packages are fed down a conveyor belt to liquid filling machinery, which is fed juice from bulk storage tanks. The filling head meters the precise amount of product into the container, and depending on the design of the package, it may immediately invert to sterilize the lid. After filling, the containers are cooled as fast as possible. Orange juice packaged in this manner has a shelf life of 6-8 months at room temperature.

2. Orange Jam
Jam is a product obtained by cooking fruit pulp with sugar and acid to desired consistency. Jam contains 0.5-0.6 per cent acidity and 68 per cent total solids. Apple, pear, tomato, sapota, apricot, loquat, peach, papaya, karonda, carrot, plum, straw berry, raspberry, mango, tomato, grape and...
muskmelon are used for preparation of jams. It can be prepared from one kind of fruit or two or more kind.

- Machines and equipment made of stainless steel can be used for fruits and vegetables processing and preservation
- Steam jacketed kettle for cooking and concentration
- Fruit Pulpers- Brushes and SS sieves of various sizes are provided which are used for complete extraction from fruits.

Figure 10: Process flow chart of Orange Jam

```
Fruit (Fresh)

Fruit (Mature & Ripe)

Washing

Cutting Fruits

Boiling (30 to 40 Min)

Decanting

Pectin test

Addition of Sugar

Boiling till Jellying Point

Lidding

Storage
```
Fresh fruits are washed in water and after removing their skin, they are cut or sliced in small pieces. These pieces are boiled with water. Appropriate quantity of sugar is mixed with the pulp. When the temperature is around 60°C; citric acid, colour, essence etc. are added. This mixture is then stirred for a while, cooled and then packed in bottles.

3. Jelly
Jelly is semi solid products obtained by boiling a clear, strained fruit juice with sugar and acid to a thick consistency, jelly total soluble solids not less than 65% and acidity 0.5-0.7 percent.

- Qualities of Jelly
  - Clear
  - Transparent
  - Sparkling
  - Attractive colour

Washed and peeled fruits are fed to the hopper of a juice extractor and the juice so obtained is filtered. Certain fruits like rosella or guava need to be boiled in water before extracting juice. Sugar is added to juice and then this mixture is boiled to convert it in jelly form and pectin, citric acid, colour etc. are added in the required quantity. Boiling is done till jelly-like formation is obtained. Packing is done on cooling.

Figure 11: Flow chart for processing of jelly

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Fruit (Firm not over ripe)

Washing and cutting into thin slices

Boiling with water
(1 ½ times the weight of fruits for about 20-30 minutes)

Addition of Citric acid during boiling (2 g per kg of fruit)

Straining of extract

Pectin test (For addition of Sugar)

Addition of Sugar and Boiling

Judging of end-point (Sheet/drop/temperature test)

Removal of scum or foam
(one teaspoonful edible oil added for 45 kg sugar)

Filling into bottles followed by waxing and capping

Storage at Ambient Temperature
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6.2. **Stakeholder's Share in Consumer Rupee**

The price spread along with margin at every stage of value chain starting from the farmer till retailer is shown in the table given below.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Value per Quintal (Rs.)</th>
<th>Stakeholders' share in consumer rupee</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retailer to consumer:</strong> Sale by retailer to consumer</td>
<td>About Rs. 5000 per quintal which makes a profit margin of 20%</td>
<td>50</td>
</tr>
<tr>
<td><strong>Wholesaler to retailer from city F&amp;V mandi:</strong> Sale by wholesalers to retailers</td>
<td>Rs. 2500 per quintal with a margin 7-8%</td>
<td>10</td>
</tr>
<tr>
<td><strong>Trader to Wholesaler at large mandi:</strong> After sorting, grading, packing</td>
<td>Rs. 2000 per quintal (Storing, unloading, grinding, packaging Gross value on sale with net profit margin in processing 6%)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Local commission agent to Trader:</strong> Sale to wholesaler cum primary processor after aggregating</td>
<td>Rs.1500 per quintal (Gross value on sale from Mandi incl 2% agent commission, unloading, cleaning, grading, batch formation, waxing, packing, loading)</td>
<td>6</td>
</tr>
<tr>
<td><strong>Farmer to local commission agent:</strong> Production: Cost of production is Rs. 83000 per acre</td>
<td>Rs. 1200 per quintal (Gross value on sale to mandi; gross value accrual to producers after cultivation costs is Rs. 610 per Quintal)</td>
<td>24</td>
</tr>
</tbody>
</table>

The existence of a long chain of middle men including the APMC and related commission agents, producers share in consumers’ rupee is adversely affected. This mirrors the need for promotion of contract farming options eliminating/minimising the role of the APMC. However, the limitations in contract farming policy & statutes merits correction.

6.3. **Price build up & Marketing Efficiency Analysis**

The price spread and values accrued to stakeholders across the chain reflects the profit margins accrued to different stakeholders. Much of the value accruals are accrued to processors and retailers. Producers’ incomes are apparently dependent on yield as well as their dependency on the type of end product. (Juice, Jam, Jelly etc.). Due to limited infrastructure facilities at the dispersal of various stakeholders, and high perishability of the produce, marketing efficiency is adversely affected.

The share of farmer in consumer price is very low for oranges like other fruits and vegetables. The perishable nature of the commodity gives lesser options to the farmer for holding back stock and wait till prices rise. The channel is not very long unlike food grains due to its highly perishable nature. The fruit has to reach the consumer within 3-6 days within plucking so that it remains in shape to be consumed. Beyond a week’s time, the fruit start deteriorating and hence the holding time with the stake holders is very less and none of the handlers prefer to store the product. The share of local commission agents is 6%, trader-6%, wholesaler-10% and retailer 50% over total consumer rupee paid. The retailer share is very high in the chain. However, the retailer has to keep adjusting the prices from even Rs 50 per kg till Rs 30 per kg depending upon the demand in the market to maintain his profitability. The fruit is highly perishable and will be a net loss to retailer if not sold in time.
6.4. **Consumer preference Analysis**

Oranges are mostly eaten fresh in India. The liking for the fruit varies in different parts of the country. The consumers in Delhi like medium to large size ones preferably little greenish in colour whereas the small size ones having greenish texture has good market around Jammu mandi. In eastern India, smaller and medium ones with uniform colour are preferred.

Small sized oranges are preferred by the processors as they cost less and used by the industry for preparing orange extracts like pulp, juice and other products. In case of processed orange segment, brand does matter and companies like Rasna, Delmonte and Pepsico have good share in the market. Few companies are into organised sector marketing in the fresh fruit. The organized sector supplies oranges to modern trade after doing sorting and grading and fetch extra margin of Rs. 5-10 per kg as compared to raw oranges.
Chapter 7- Existing Institutional support and Infrastructure facility

7.1. Support at cultivation stage

Centre of excellence for Orange, Kota32.

Jaipur is aiming to give a boost to cultivation for citrus fruits in the state, the agriculture department launched a centre of excellence for oranges in Kota. The cultivation will be done with technical assistance from Israel. The Kota belt has favourable conditions for the cultivation of oranges. Jhalawar, which also lies on the belt, is known as Nagpur of Rajasthan because of oranges produced in district. Kota will become epicentre for oranges cultivation. The hot-humid conditions in the Kota belt are favourable for oranges cultivation. Giving a fillip to oranges cultivation in the state, the agriculture department inaugurated the Centre for Excellence for citrus fruits in Kota on Wednesday. While inaugurating the Centre for excellence in Kota, Chief Minister Vasundhara Raje said that the oranges produced in the state will be known as Raj Santara. The centre's focus will be on producing the best quality oranges in state. "Besides, three other centres for excellence for custard apple fruit (sitaphal) in Chittorgarh, for vegetables in Bundi and for fruits in Sawai Madhopur will be developed. The centre for excellence in Kota would further help the producers of oranges in Jhalawar.

7.2. Support at post-harvest, primary processing and secondary processing stage

Storage Facilities

Since the shelf life of fruit is limited, adequate storage is very essential for extending the consumption period of fruits as well as for regulating their supply to the markets. Farmers and others functionaries store orange for a period of 2 to 3 weeks in simple storage in wooden boxes, plastic crates and also loose. Citrus fruits processors store it for a period of 3 to 5 weeks in cold storage in boxes. Orange fruits can be stored in evaporative cool chamber at 8-100°C & 90-95% relative humidity for a period of three weeks after post-harvest treatment with Bavistin (1000 ppm.).

- Primary Processing and Post-Harvest Management related projects shall be implemented either as on-farm projects linked with individual projects of area expansion of commercial horticulture or as a common facility for cluster of new projects of commercial horticulture and existing orchards / farms. Projects relating to introduction of new plant/ machinery / equipment to effect automation, introduction of latest processing technology etc. in existing

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PHM infrastructure may also be considered; however, components covered by regular repairs & maintenance and replacement of old plant & machineries on attaining near zero book value is not to be incorporated. PHM components such as pack-house will be eligible for enhanced rate of subsidy only when infrastructure is as per prescribed level of technology, if any.

- Subsidy @ 50% as per prescribed norms will be available for crates and nets (shed and anti-hail only) in integration with commercial horticulture projects of production as one time assistance. Subsidy for crates shall be released only after its actual purchase at appropriate stage, which shall be at stage of fruiting / harvesting. Accordingly, release of subsidy for crates shall be made separately at appropriate stage later.

- As financial assistance for plastic crates / bins is given at producers’ end itself and it is aimed to increase producer’s share in consumer-end price of horticulture produce; assistance for plastic crates / bins shall be considered along with a new, credit-linked project of pack-house / ripening or curing chamber / cold storage unit/ primary processing unit or their suitable combination when Producers’ Company / Registered Growers Association / PSU is the promoter of such projects. The proposal shall be considered on merit in view of business model of the project, stocking & stacking system and actual need. But for this, the crates must be integral part of fixed capital investment under such credit linked projects and should be appraised by the lending Bank accordingly. Committee of NHB shall formulate formula for assessing admissible number of crates / bins in respect of any such project.

- Shade nets and anti-hail nets shall be considered as one time assistance for credit linked project for the benefit of existing commercial horticulture projects of fruit orchards qualifying area norm of above 4 Ha. Assistance in case of CFB Cartons, Aseptic Packaging, Punnets / Poly bags etc. shall be available on merit for launching a new horticulture product during its first year and for introduction of horticulture products in a market as one time assistance.

- Benefit of exclusive components of cold storage scheme shall also be available to the promoters over and above the assistance that will be provided under Commercial Horticulture Scheme to set up integrated projects for production and PHM components. Selection of units for promotion of indigenous manufacturing of items covered by item 3.1 (B) shall be decided on merits by a Committee of NHB.

- Credit component as means of finance of the project should be term loan from banking or non-banking financial institutions and should be at least 15 % more than the admissible rate of subsidy.

- Projects relating to setting up of new production units shall be technically and financially appraised to ensure and enable entrepreneur to incorporate latest available technology to take care of quality of produce, economy in cost of production, energy saving, safety and environmental concerns.

- Projects under this scheme component may be integrated as part of new Production Related projects or in integration with existing Production Related projects set up with or without assistance under NHB schemes and falling under category of Production related Components; certain components may be on-farm and other may be off-farm; in addition, such projects shall be set up by a service provider/ trader / processors with proper backward linkage with production of fresh horticulture produce.

- Normative cost for various components shall be prescribed by NHB from time to time.
7.3. Farmers' level advisory system

- Centre of excellence for citrus, Kota
Aiming to give a boost to cultivation of citrus fruits in the state, the agriculture department inaugurated a centre of excellence for citrus fruits in Kota in Apr 2016. The Indo-Israel centre for excellence has been developed under the National Horticulture Mission. The farmers and horticulturists of the state will learn a lot from the newly set up centre for citrus fruits. "Farmers will get a chance to get trained in citrus fruits production. The centre will offer new saplings of citrus fruits to the farmers and they will be told about how to use the technology for watering the plants," The Kota belt has favourable conditions for the cultivation of citrus fruits. Jhalawar, which also lies on the belt, is known as Nagpur of Rajasthan because of oranges produced in district.

- International Horticulture Innovation and Training Centre (IHITC), Jaipur:
The mandate of IHITC is to offer spectrum of short duration training courses that are practical and innovative in nature so as to upgrade the skills of personnel's in the areas related with hi-value commercial horticulture, value addition or processing for the promotion of agricultural entrepreneurship and for demonstrating advanced horticultural technology for commercial horticulture crops and to promote entrepreneurship in horticulture in relation to retail marketing.

Most of the Orange farmers in Rajasthan both in Ganganagar and Jhalawar are not much aware of the proper harvesting techniques of Mandarin. IHITC is working on the skill up-gradation of farmers which would lead to improvement of Mandarin production in Rajasthan. Approximately 2500 farmers are planned to be trained on mandarin harvesting techniques. IHITC is a practical training centre and has been organizing district, state and National level seminars and workshops in the field of Horticulture. It has already conducted many training camps in Jhalawar district and through this project wishes to expand its reach and include more and more farmers, and helping them to enhance their profits.

- Directorate of horticulture, Govt. of Rajasthan:
The mandate of the department is 1. to increase the area, production and productivity of fruits, vegetable, spices, Medicinal and floriculture crops. 2. Introduction of high yielding, disease free and true to type varieties of fruits, vegetable and spices crops through layout of demonstration and mini kits in the selected areas. 3. Increasing the production of high quality grafted plants of Mango, Guava, Orange, Aonla, Ber etc. in nurseries and supply to the farmers, 4. Training of farmers and extension workers to recent technology based on reach for the area, 5. To popularize the use of drip system the major water saving device, in the field of horticulture particularly in fruit crops, 6. Implement the different programme envisaged under state plan, National Horticulture Mission, National Mission on Farm Water Management, Rashtriya Krishi Vikas Yojana, etc.. 7. To encourage more farmers to take up cultivation of fruits, vegetable, spices, and floriculture so that additional income is generated.

- National Research Centre for Citrus
The National Research Centre for Citrus is an institute for research in citrus fruits and horticulture in India. It is located at Nagpur in the state of Maharashtra which has been famous for Mandarin oranges. The centre provides for research in the field of citrus agriculture; it also offers consultancy towards the field. It is a research institute under the Indian Council of Agricultural Research (ICAR) which is an autonomous body under the Ministry of Agriculture of the Indian Government.

- Punjab Agricultural University (PAU) Ludhiana
The Department of Fruit Science of Punjab Agricultural University is engaged in conducting research, teaching and extension work related to various aspects of fruit crops being grown since
1962. The research activity, apart from main campus at Ludhiana, is also being carried at Abohar, Bathinda, Bahadurgarh (Patiala), Gangian (Hoshiarpur), Gurdaspur Ballowal Saunkri (Nawanshahar), Jallowal and Lesseriwal. The teaching work is mainly centered at Ludhiana while the extension work is being carried out from Ludhiana, FASS and KVKs’ situated in different districts of the state. The crop concept has been introduced for research in 1989. Accordingly, the teams of scientists were constituted to entrust the research work on all the aspects of a particular fruit. This approach has drastically improved the quality and quantum of research on different fruit crops. The department is also running one professional society, namely Horticultural Science Society. This society is publishing a quarterly Horticulture Newsletter, which contains the latest information relating the various aspects of horticulture for the benefit of farmers and extension workers.

- **Krishi Vigyan Kendra, Sriganganagar**
  
  Establish in 2004, at Padampur, District Sriganganagar, under the Swami Keshwanand Rajasthan Agricultural University, Bikaner (SKRAU, Bikaner). there are Major thrust areas-

  - Productivity enhancement of major kharif and Rabi crops of the district through optimum use of inputs for rationalization cost of production
  - Awareness about INM, Water Management, IPM and IDM in crops.
  - Livelihood generation for unemployed youth.
  - Promote organic farming for conservation of natural resources, soil and human health.
  - Dissemination of Hi-tech production technology of horticulture crops including emphasis on micro irrigation and protected cultivation technology.
  - Entrepreneurship of rural women through income generation activities
  - Information communication technology strengthen in agriculture and develop behavior, attitude, leadership and group working environment.

**Agriculture Research Station, Sri Ganganagar**

The Irrigated North-Western Plain Zone (1b) comprises two districts of Rajasthan, Sriganganagar and Hanumangarh, which are located between 28.40 to 30.60 North latitude and 72.30 to 75.30 East longitudes. The zone has geographical area of 20.6 lac hectares out of which about 74 per cent area is under cultivation. The Ferozpur district of Punjab and Hissar district of Haryana form North-Western boundary, Churu and Bikaner districts of Rajasthan form South boundary and International border of Pakistan forms the North and North-Western boundary of the zone. Fifty percent of the cultivated area in the zone is irrigated. The Gang canal, Bhakhra canal and Indira Gandhi Canal are the major sources of irrigation in the zone. The zone has extreme climatic conditions with the scorching summer, cold winter and mild rainy season. Dust storms during summer, frosty winter nights and ground fog are some of the typical features of weather hazards. The mean annual rainfall of the zone is 322 mm

Lead functions:

- Cotton, Chickpea (irrigated)
- Water & soils management
- Crop physiology
- Fruit research (Kinnow, malta, peach, grape) including horticulture
- Biological control of insect-pest and disease
- Integrated nutrient management

Verification functions:

- Mustard, wheat, paddy Cluster bean, groundnut, sugarcane
- Drip irrigation in horticulture
- Testing & modification of farm tools and implements for increasing farm efficiency.
Chapter 8 - Gap & Constraint Analysis

8.1. Constraints as Perceived by Producers and Other Stakeholders

Producer case illustration
Oranges

Following is an illustration of a typical farmer with about 15 acres for Kinnow production. Commercial production starts after five years. In one acre 112 plants are sowed. Cost of each plant is Rs 30. After four years each plant yields 20-30 kg. After five years each plant yields around 80 kg. After ten years each plant yields 150 kg. Fruiting period of the Kinnow plant is thirty years. The farmer has set up Kinnow orchard in 15 Acres. Cost of Fertilizers & Pesticides is Rs 20,000/- per acre. Drip irrigation cost is Rs 17,000/- per acre. Cost of Solar pump is around Rs 1,75,000/. Cost of plantation per acre is 36,000. Cost of weeding per acre is Rs 10,000. Three permanent labour are working full time for orchard who takes care of day to day activity. Each labour costs Rs 300 per day. Standard format for space between Kinnow plants is 16 feet X 18 feet Rows/Column. Plantation time is September, October and February. Cost of Fencing and Water channel for 15 acres orchard is Rs 3,00,000/- per acre. Selling price for Kinnow varies between Rs 8 to 22 per kg. Gross earning per acre is Rs 161280 at an average price of Rs 12/kg. Net earning per acre is Rs 78280 for a production of 134 qtl/acre. This brings cost of production per quintal to Rs 610/qtl and earning per quintal of Rs 1203 per quintal showing a net earning of Rs 593 per quintal.
Processor case illustration

Mr. Arvind Godara is a director in “Natureland Organic Foods Pvt. Ltd” which is Kinnow processing plant situated at Sri Ganganagar, Rajasthan. He is of the opinion that Kinnow has significant potential. Apparently, Rajasthan, Haryana & Punjab produce about 182,000 tonnes, 231,000 tonnes and 988,000 in year 2013-14 respectively. California orange is grown in these three states.

Cost of Production and Value Arrivals:

A sample unit has a capacity of 14,400 MT. Natureland Organic Foods Pvt. Ltd has average turnover of about Rs 28 crores. The unit has installed capacity of about 80 tonnes per day. This implies that sample unit supports about 200 farmers. The particular unit has investment of about Rs 1.5 crores in buildings and Rs 50 lakhs in Plant and Machinery. The unit procures inputs at Rs 15 per kg directly from farmers. Processing cost per kg is Rs 1.70 and packing cost is Rs 2 per kg. Cost per kg of Kinnow is Rs 18.70. There are 25 labours in the unit. The unit is exporting Kinnow to neighbouring countries and also selling it across pan India. The unit is using now a day’s plastic tray for packaging because it protects Kinnow from damaging & also it can be re-use. One plastic tray cost Rs 120. The net margin is 4 to 5 percent on sale price.

Critical Constraints

Producers:
- Production cost is very high.
- Commercial production starts from fifth year.
- Requires lot of pesticides to protect from insects.
- Farmers are largely dependent on village level traders and APMC commission agents for aggregation and sale and have low bargaining power.

Processor:
- Processors are dependent on “Arthiya’s” traders in APMC for supply of inputs.
- Processing margins are barely 4-5 percent.
- Most units are yet to have links with large retailers.
- Lack of state government encouragement for new entrepreneurs

Figure 12: Meeting with Kinnow Processor at Sri Ganganagar
### 8.2. SWOT Analysis of Pre Intervention Value chain

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
</table>
| - Oranges/kinnow are widely consumed around India and abroad  
- Rajasthan has a large area under oranges  
- Nagpur santra and Kinnow variety grown in Rajasthan. Mainly in Jhalawar as oranges and Ganganagar as Kinnow.  
- Strong support institution like "Centre of Excellence for Oranges, Kota" etc.  
- Kinnow/Oranges have a potential of providing an earning upto Rs 1.5 lakh/annum per ha.  
- Apart from good demand of fresh oranges in the market it has good scope of value addition as pulp, juices etc  
- Among the varieties of citrus produce not only in the state but also in the country, Kinnow mandarin bears highest place in juice content and fruit quality. | - Long gestation period for fruit bearing  
- High cost of input and labour.  
- High cost of pesticides, unavailability/spurious pesticides.  
- Constraints vis-à-vis water source for irrigation  
- Perishability: Highly perishable product if fresh sale of fruit orchard 3-4 months before fruit maturity  
- low share of farmer over consumer rupee  
- poor availability of quality root stock. |

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Threat</th>
</tr>
</thead>
</table>
| - Intervention of RACP and associated agencies in the crop would create new opportunities  
- Scope of establishing sorting grading and waxing unit by FPCs through FCSCs will result in higher price realization for farmers  
- Scope of establishing FPCs will open up avenues for direct market linkage of farmers with larger mandis around India  
- Scope of tie ups with large companies like Pepsi, Coke etc | - Any sudden change in weather may impact the production of oranges  
- Shift of consumers between Kinnow/oranges and other fruits as the arrival time matches to harvesting time in most parts of India.  
- This poses price pressure on the produce and farmer realization dips below Rs 10/kg  
- Crop diversification can adversely impact the production of oranges as the producers would tend to grow other crops instead softened.  
- Import policies of GOI may tend to increase orange imports which can impact prices of local oranges/kinnow |
8.3. **Key constraints in Kinnow/ Orange crop:**

The constraints observed under Oranges are divided under different categories, viz. Planting and after care related constraints, Production related constraints, Post-Harvest related constraints, and Processing and market infrastructure related constraints.

8.3.1. **Planting material and after care related constraints:**

Oranges could be planted from seeds but farmers prefer purchase of disease free root stock for planning for a healthy orchard. Most of the existing Orange and Kinnow orchards are above 10-15 years old and their productivity would decline over next five years. Availability of root stock is also an issue. Earlier, the root stock has to be brought from Nagpur and quality was not granted. With the establishment of Center of Excellence in Kota, this issue seems to get addressed to some extent. Currently, the center has a capacity of grafting 50,000 plants annually for 24 varieties of citrus viz. Clementine, Michale Daisy, Kinnow, Nagpur Mandarin, Nagpur Seedless, Jaffa among the most popular ones.

Being a horticulture crop, the plantation has to be taken care of for 5-6 years before the plants can start production full fledged. This waiting period could be a loss to the farmer if not managed properly. Inter cropping of various field crops and vegetables during the growth phase may help the farmer start earning from the orchard.

Harvesting of the crop is a major labour consuming activity and specialized labours from outside the state (mostly from Nagpur area) visit the fields during harvesting season. Their charges are higher than local labour. The local labour should be provided with harvesting skills so that the orchards are able to generate source of income for landless farmers.

8.3.2. **Post-Harvest related constraints:**

In case of Kinnow, few options are available for sorting, grading, waxing and packaging. However, for oranges, in Jhalawar region, very few facilities are available for post harvest management and they are out of access of normal farmers. Being a perishable crop, Oranges can not be stored for long time without controlled temperature and hence farmers have to sell them immediately. Many farmers therefore give the gardens on contract even during flowering stage to get rid of post harvest related errands.

8.3.3. **Processing and market infrastructure related constraints:**

Generally, farmers give the orchard on contract to middle men who take entire watering, fertilization and harvesting operations and farmers role in the value chain is very limited. The contractors have a fair understanding of the crop and negotiate with very less price for the entire orchard. It is these middle men who establish temporary sorting, grading units near the production centers. They generally have a pool of specialized labor who undertake manual sorting, grading with high level of efficiency. The labours mostly come from orange belt of Nagpur. Farmers do not turn up to the APMC as the traders are free to operate outside the APMC and operate on their own terms and conditions. Many times, payment of farmers who just avail the services of the traders for sorting, grading and onward sale, end up in selling the oranges at a rate lower than market rate due to ignorance of pricing parameters.

Processing of oranges involves high volumes, requires various licenses for production and marketing and hence is out of reach of farmers/farmer institutions. Currently there is lack of primary sorting
and grading infrastructure at community level forcing farmers to sell semi-graded produce to traders who later on sell it at a higher margin after doing sorting, grading and cleaning.

**Lack of market intelligence services:** Farmers do not receive information on market prices. Some farmers sell crops through village level traders because due to which they are not realising fair price.

**Lack of primary processing infrastructure:**

i. There is a non-availability of facilities for primary processing: cleaning, grading & sorting at the farm level.

ii. There is no practice and provision of producer level storage.

iii. There is acute lack of awareness among farmers regarding FAQ (Fair Average Quality) standards.

iv. Equipments for judging size, texture and TSS are not available

**Distant markets:** Farmers are not aware on the prices of major mandi like delhi and resort to sell at lower price to local traders.

**Seasonal price variations:** Generally during harvesting period, prices are on lower side and reach highest after 5-6 months of harvesting. However, farmers do not have any option but sell immediately at lower prices as they need cash to meet out their expenses. They could realize higher price if they can hold the stock for 2-3 months.

**Malpractices in markets:** Many malpractices prevail in the markets of for oranges i.e. less weighment, delay in payment, high commission charges, delay in weighing and auction, different kinds of arbitrary deductions etc.

**Infrastructure facilities:** Due to inadequate infrastructural facilities available with the producers, traders, millers and at market level, the marketing efficiency is affected adversely.

**Agribusiness policy related constraints:**

**Contract farming:** Rajasthan has adopted a model APMC Act, 2007. In Rajasthan Contract farming of desired variety and quantity as per buyer’s/processor’s need, has been allowed. Buyer/processors may supply inputs and technical know-how and farmers may produce the crop for sale to buyers at an agreed price. However, this price shall not be lower than minimum support price and title of land shall remain with farmer. Produce will be purchased at buyer/processor’s business/factory place. But processors found less interested in registering under contract farming. Team ABPF discussed contract farming issues with some of the processors and related challenges are given below:

i. **Rule 5** – Each agreement shall be written on stamp paper of the value of Rs.100. This increases cost of procurement and procurement time.

ii. **Rule 9** – Separate registration form shall be filled for each agreement. Large amount of paper work can be reduced by group registrations or procurement directly from FPCs.

iii. **Rule 17**-In case the contract farming buyer fails or refuses to purchase the agreed quantity of the agriculture produce from the contract farming producer, he is to pay the amount of the difference between the agreed price and the actual sale price of the contracted produce in the market committee concerned to the producer. Mutual termination of contract should be allowed.
iv. **Rule 19** – The contract farming buyer need furnish an undertaking equal to 20% of the value of the contracted amount. This amount can be reduced and this will motivate big players to participate in contract farming.

8.4. PIESTEC Framework

Kinnow can be summarily considered within the adapted PIESTEC framework as follows:

8.4.1. Political circumstance

The 'Kinnow' is a high yield mandarin hybrid cultivated extensively in Sri Ganganager and Hanumangagh district in state of Rajasthan. Similarly, Oranges of Jhalawar are also getting importance. It is famous for its attractive colour, high juice content and pleasant taste. Due to these quality traits kinnow is in high demand not only in Indian markets but also in Sri Lanka, Thailand and some middle east countries like Bahrain, Kuwait and Saudi Arabia. The small and marginal farmers can hardly be expected to invest in better farming technologies, nor aggregate adequate volumes of commodities as to develop alternate marketing channels away from typical APMC or multiple-trader led channel in vogue. There is, therefore, need for aggregation of such farmers into FPOs / FPCs. Typically, such FPOs / FPCs may have a combined holding of 1000-1500 acres. Agriculture Produce Marketing Committee (APMC) markets have an important role to play in the supply chain. The APMC market (also called mandis) provides a platform for aggregation and operation for various players operating at the wholesale level like traders, stockists, etc. In Sri Ganganager and in Jhalawar mostly contractors purchase the kinnow/orange orchrd at time of the fruiting and these contractors supply to processors even most of the primary processor act as contractor.

8.4.2. Institutional context

In 2011, H.S.Rattanpal of Punjab Agricultural University, Ludhiana, India developed low seeded 'Kinnow' through mutation breeding and recommended it under the name 'PAU Kinnow-1'. Likewise under the Swami keshavanand Agricultural university in ARS (Agricultural research station both Sri Ganganager and Hanumangarh and KVK also to development of GAP in it helps to increase productivity in kinnow but There are limited development among the institutions. ICT (Information Communication Technology) can be used as an effective instrument in developing and strengthening integration among various institutions related with farming systems. ICT offers several opportunities for the citrus production and marketing management. Here to FPCs play an important role in to extend the value chain and help in increase in farmers share in price spread.

Promotion of direct marketing and contract farming in is suggested for linking farmers to buyers. Development of hinterland ICDs linked with railway network, and sorting, cleaning & grading units in market yards will facilitate the industry.

8.4.3. Economics

Most of the target export markets of Indian and Pakistani 'Kinnow' are those of developing countries. Only 2.6 percent of Kinnow exports target the markets of developed countries, which is due to the emerging demand for seedless Kinnow by the developed countries. About 61 percent of total world exports of oranges and mandarins are of seedless varieties. Farmers have serious financial constraints. Therefore, they are unable to use capital intensive technologies or make timely purchase the inputs. Situation has gotten worse with the high rate of
increase in the price of fertilizer. The other factors like pattern of arrival, demand from processors and export also cause volatile price movement. Unseasonal rainfall also influencing kinnow Price at time of flowering. In entire supply chain contractor play the vital role in price fixation due to that farmers not get the actual benefit of increasing price. Mostly orchards sell out at time of the fruiting.

8.4.4. Social
In India this kinnow was introduced by J. C. Bakhshi in 1954 at the Punjab Agricultural University, Regional Fruit Research Station, Abohar. In Rajasthan, kinnow cultivated in irrigated area i.e. in Sri Ganganager and Hanumangarh. The farmers use minimal off-farm inputs and provide limited intercultural care. The crops need to be approached with a commercial perspective and the farmers need to be trained to adopt irrigation, better inputs and better cultivation practices, Hence, it is suggested that there should be a national level federation of Mandarin industry/traders and farmer's associations with close coordination for a better information flow as a backward linkage and product flow as forward linkage.

8.4.5. Technology
The kinnow mandarin is usually budded on rough lemon (jambhiri, Soh-myndong or jatli khatti) rootstock. The kinnow is also budded on the kharna khatta rootstock. It is a hybrid of two citrus cultivars — "King" (Citrus nobilis) × "Willow Leaf" (Citrus × deliciosa) — first developed by Howard B. Frost, [1] at the University of California Citrus Experiment Station. After evaluation, the 'Kinnow' was released as a new citrus hybrid for commercial cultivation in 1935.

In important intercultural operation are Trimming and the pruning are crucial horticultural practices to ensure health of the citrus trees. More over removal of weeds is also important for the same purpose, as weeds compete with the citrus trees in nutrients. Most of the kinnow growers not in practice such intercultural operations.

In packaging technology after grading sorting and waxing, use of polymeric films is very pronounced in packaging of fruits with a purpose to extend their storage life. Packing of fruits in polymeric films creates modified atmospheric conditions around the produce inside the package allowing lower degree of control of gases and can interplay with physiological processes of commodity resulting in reduced rate of respiration, transpiration and other metabolic processes of fruits thereby allowing lower physiological weight loss, reducing decay incidence and maintaining retention of colour and texture of fruits during extended shelf life. Hence the present investigation was planned to study the effect of packaging films such as shrink and cling packaging films on storage life and quality of kinnow fruits under super-market conditions.

8.4.6. Environment
Due to the hot and cold climate fruits developed more rapidly in weight, circumference and volume. More in peel thickness and N content but well coloured having good flavour and satisfactory solid acid ratio and juice content. In a hot climate, plants can grow up to 35 feet high. 'Kinnow' trees are highly productive; it is not uncommon to find 1000 fruits per tree. The fruit matures in January or February. It peels easily and has a high juice content. In arid regions citrus trees are highly prone to heat injury / sun burn, drying fruit, burning and defoliation of leaves, burning and death of bark & slightly discolouration of fruit skin.
High temperature and high intensity of solar radiation are two environmental factors causing injury to fruit and tree. Wind induces abrasion injury on susceptible fruit (when small) due to rubbing of leaf against fruit causing lesions.

8.4.7. Competition

The Kinnow peel is rich source of d-limonene which finds its utility in perfumery and pharmaceutical/non pharmaceutical industry. Limonene a monocyclic monoterpane is a major constituent in several citrus oils (orange, lemon, mandarin, lime, and grapefruit) & turpentine oil. The KMW (Kinnow Mandarin Waste) makes good quality silage, which can effectively provide the maintenance requirements of small ruminants. Ensiling of same can reduce the potential threat of KMWs as an environment pollutant and also provides kinnow mandarin silage as a non-conventional feed for small ruminants. (Source: https://www.ncbi.nlm.nih.gov/pmc/articles/)

Another reason competitiveness in market is non availability of certified rootstock in the nurseries. A most of the citrus growers reported that they were not satisfied with the current type of varieties of citrus and they were looking for any new variety. The respondents from the nursery owners identified four issues related with quality of plants, which include problem of diseases, improper selection of soil, rootstock, scion, budding method, and budding height. Continuous improvement in the genetics of Kinnow is needed not only to sustain but also to improve its competitiveness in the world market.

8.5. Impact of GST over Kinnow/oranges value chain:

The Goods and Services Tax is one indirect tax for the whole nation. GST is a single tax on the supply of goods and services, right from the manufacturer to the consumer. It will be levied at every stage of the product distribution chain by giving the benefit of Input Tax Credit (ITC) of the tax remitted in the previous stages. Therefore, the final consumer will bear only the GST charged by the last dealer in the supply chain, with set-off benefits at all previous stages. GST will replace all Central level taxes such as excise, service tax, custom duty as well as state level taxes like VAT, CST, entertainment tax among others.

Table 16: Tax Structure

<table>
<thead>
<tr>
<th>Transaction</th>
<th>New Regime</th>
<th>Old Regime</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale within the state</td>
<td>CGST+SGST</td>
<td>VAT + Central Excise/Service tax</td>
<td>Revenue will be shared equally between the Centre and the State</td>
</tr>
<tr>
<td>Sale to another state</td>
<td>IGST</td>
<td>Central Sales Tax + Excise/Service Tax</td>
<td>There will only be one type of tax (central) in case of inter-state sales. The Center will then share the IGST revenue based on the destination of goods.</td>
</tr>
</tbody>
</table>

The impact on the Food Processing Businesses:

- There would be no direct impact on the Kinnow/oranges business at the farm level as fresh fruits and vegetables are exempt from mandi tax in Rajasthan. However, once the crop reaches any processor, any further invoice whether processed or un-processed would attract GST.
• Implementation of the GST is said to increase the prices of agricultural goods. However, the products will be able to reach the consumer faster due to state-level taxes such as Octroi and entry taxes which will significantly reduce the time and hassle of transporting goods across state borders.

• GST will also favour the National Agricultural Market on merging all the different taxation on agricultural goods will improve the marketing and virtual market growth.

• Because GST is a consumption tax, it will be levied only when food products are sold by the manufacturer and not when they are manufactured.

• The Confederation of Indian Industries (CII) has also in its representation called for a zero rate tax on products which have a rate of up to Rs. 10/- and Rs. 20/-. It also demanded that all packaged material used as inputs by the food processing industry should have a zero-percent rate.

Impact on Restaurants and Food Joints:
Service tax liability with the credit of input VAT on goods consumed will get submerged into GST and irrespective of goods and services, the credit of input will be available for adjustment against the output liability. This will further optimize the working capital of these restaurants and consumers can expect the superior quality of goods and services.

Please refer to Annexure 3 for product wise GST rates of Food Products.
Chapter 9- Proposed Intervention and Investments

### 9.1. Intervention areas for value chain strengthening

The intervention plan of Orange may be broadly considered in the context of activities and stakeholders as follows.

<table>
<thead>
<tr>
<th>S N</th>
<th>Stakeholder</th>
<th>Roles and responsibilities</th>
<th>Pre-intervention constraints</th>
<th>Post intervention action</th>
<th>Action By</th>
<th>Timeline</th>
</tr>
</thead>
</table>
| 1   | Farmer      | ● Planting
● After care
● Nutrient management
● Pest management
● Watering
● Plucking | ● Lack of appropriate information on availability of good quality versus scummed planting material
● Farmers do not follow recommended PoP
● Plant to plant gap is not maintained
● High cost of insecticides
● Non availability of nutrient management solutions at right time/ | ● Awareness campaigns for motivating farmers to use recommended PoP on soil testing, land preparation, line sowing, INM, IPM and seed rate
● Crop demonstrations for use of seeds developed by research institutions
● Facilitating formation of FPC
● Pooled purchase of agri inputs through FPC at bulk price and onward sale to member farmers at | RACP in partnership with ATC and local NGO
RACP, ABPF, NGO for FPC formation and further operation.
RACP to tieup with | On going process during the project period. 3 months for FPC formation, share collection and issue of business licenses |
<table>
<thead>
<tr>
<th>S N</th>
<th>Stakeholder</th>
<th>Roles and responsibilities</th>
<th>Pre-intervention constraints</th>
<th>Post intervention action</th>
<th>Action By</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>High cost of transportation as farmer takes in loose quantity</td>
<td>wholesale price keeping minimum operating margins</td>
<td>COE for supporting technology transfer of seed multiplication through FPC members</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tieup of FPC with COE citrus for Planting materials</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Non availability of post harvest tools like plastic crates, cutters</td>
<td>Subsidized distribution of tarpaulin sheets</td>
<td>RACP to provision for the same and facilitate distribution to FPC members with support from local NGO</td>
<td>3 months from formation of FPC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Non availability of training and pruning skills with farmers</td>
<td>Promotion of plantation skills with farmers through COE and horticulture dept.</td>
<td>RACP, SPs with input from ABPF team</td>
<td>6 months from formation of FPC</td>
</tr>
<tr>
<td></td>
<td>Farmers</td>
<td>Ensure availability of community cleaning &amp; Grading facility to farmers through FCSC established and maintained by FPC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Limited adoption of direct procurement and contract farming</td>
<td></td>
<td>Setting up alternate channel to sell directly from PC to processor or large retail shops.</td>
<td>Large Processor/ Buyer and ABPF, RACP, FPC, RSAMB</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Processors</td>
<td>Process the raw produce Value addition</td>
<td>Limited adoption of direct procurement and contract farming</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>S N</th>
<th>Stake holder</th>
<th>Roles and responsibilities</th>
<th>Pre-intervention constraints</th>
<th>Post intervention action</th>
<th>Action By</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>NGOs</td>
<td>• Extension services to farmers</td>
<td>• Packaging of value added product</td>
<td>Awareness seminars for processors</td>
<td>ABPF, RACP, FPC</td>
<td>6 months whichever is earlier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Disseminate RACP Schemes to the farm level</td>
<td>Limited processed product available in the market which limits the marketing potential of the commodity</td>
<td>Policy conference, investors meet</td>
<td>ABPF</td>
<td>As required and as per schedule of RACP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Distribution of seeds and farm kits as per various schemes</td>
<td>Many existing processors and budding entrepreneurs are not aware of schemes of the GoI including CLCSS, cluster Development scheme or “Sampada” for technology upgrading.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4</td>
<td>RACP</td>
<td>• Establish the feasibility of sustainably increasing agricultural productivity and farmer income</td>
<td>• Lack of clarity on the form of FPO-Cooperative or FPC among field staff</td>
<td>Create basic understanding among the RACP PMU staff about concepts of FPC</td>
<td>ABPF</td>
<td>Within the lifetime of the project as ongoing process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Integrate agriculture water management and agricultural technology,</td>
<td>• Selections of capable leaders for the proposed FPO</td>
<td>Clear understanding on fundamental differences between FPC &amp; Cooperative</td>
<td>RACP PMU Line staff</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Establish farmer organizations (FPCs) and market</td>
<td>• Low level of awareness among the PMU staff</td>
<td>Create market linkages by bringing more big players and processors to the cluster</td>
<td>NGO</td>
<td></td>
</tr>
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</tr>
<tr>
<td>S N</td>
<td>Stake holder</td>
<td>Roles and responsibilities</td>
<td>Pre-intervention constraints</td>
<td>Post intervention action</td>
<td>Action By</td>
<td>Timeline</td>
</tr>
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</tr>
<tr>
<td></td>
<td></td>
<td>innovations in selected locations</td>
<td>and farmers regarding the concept of FPC</td>
<td>• Conduct training of the potential farmer leaders about FPC and its functioning</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Poor or no Market linkages of the value chain crops in clusters</td>
<td>• Capacity building training of the NGO staff regarding the extension services to be provided to the farmers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Lack of active NGO staff deployed in the cluster</td>
<td></td>
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</tr>
</tbody>
</table>

The intervention plan may be considered in terms of three critical stages that are production, post-harvest and processing. Weather conditions play a critical role in the crop production. At the post-harvest stage, the prices tend to decline as harvesting progress and produce starts flowing into the market. At the post-harvest stage information on the storage, grading, waxing parameters, quality needs to be disseminated. The processing related constraints may be viewed in terms of lack of post community level post-harvest infrastructure limiting farmers share in the value chain. Also, at the post-harvest and processing stage there is scope to evolve FPCs to farmers with FCSCs which undertake primary processing and storage activity. The intervention table for Kinnow/Oranges is as under:

Under the production component, the FPC can take up host of activities including tieup with COE Lota for making availability of quality root stock, backward integration with agri input companies for making quality inputs available to members at right price. For this, RACP may facilitate linkage of FPC with COE Citrus at Kota. Making availability of good quality root stock would enhance the quality of produce in the region and thus their marketability. In the post harvest stage, RACP may train a pool of local labours/landless farmers on skills related to plucking, sorting, grading of the produce. In the processing stage, FPC may establish FCSC for sorting, grading and waxing of the produce. For this, they can avail the FCSC support grant of RACP upto Rs 22.5 lakh for a project cost of Rs 30 lakh. This will help marketability of the produce to longer distances and larger markets like delhi from where, they can earn 15-20% higher returns.

9.2. **Proposed post intervention Value Chain map of Kinnow**

9.2.1. **Proposed post intervention value chain interventions:**

The post intervention value chain map for Kinnow may be be visualised as one with two production distribution or activity-marketing channels. FPC will replace the role of local commission agents and and will directly aggregate Kinnow from member farmers and undertake sorting, grading and waxing. This primary processing will be done through FCSC. The activity of sorting/grading will itself insure 12-15% higher margin for the farmers. The high grade produce...
will be supplied directly to various mandis like Jaipur, Delhi and other potential ones. The small size Kinnow may be tied up with processors like Pepsi/ Rasna/ Baba Ramdev foods for further processing and value addition. The FPC will continue to graduate in an organic manner trading mostly in fresh Kinnow and later on may setup their own pulping unit if they plan so.

The farmers share may thus increase from existing 24% to 26% over the consumer rupee. Also, the FPC will enjoy a share of 14% in the consumer rupee which will ultimately come back to the farmers. Hence this is an indirect benefit to the farmers. It is also envisaged that post harvest losses would also reduce from 25-30% to 15-20% due to lesser handling time and direct handling by the FPC from the farm gate.

Figure 13: Proposed post intervention value chain map of Kinnow
The role of RACP and ABPF would be to facilitate FPC formation, making availability of FPC and FCSC grant. ABPF will then facilitate business planning of the FPC along with work on market linkages with processors and the FPC for direct supplies.

9.2.2. Interventions through FPC in the Kinnow value chain crop:

**Introduction to FPC Model**
Aggregation is the proposed solution of the constraints farmers are facing at present. It is proposed to form Farmers Producers’ Company by bringing farmers together in the form of voluntary groups of about 15 to 20 active farmers and federating 20 to 25 such groups into a Producer Company. These Producer Companies will be functioning on behalf of member farmers and will strive to undertake a range of activities which will result in added value accruals to farmers and value to farmers produce. To form a producer company, producer groups will be mobilized (in some cases, this initiative may have already been completed by NGO’s).

It is envisaged that an elected committee of members of Producers Groups will form a management committee and oversee the performance of an incentivized manager/CEO. The manager will be trained in technical issues of post-harvest management, marketing and in operating a transparent accounting system. The ABPF will support the operation of the Producer Company, and accelerate the cross learning of best practices.

**FPC Development Approach**
The FPC development approach may be viewed as depicted below:

![FPC Development Approach](image)

Figure 14 FPC Development Approach
Following are the steps to be followed for formation of the FPC:

- **PRI of the MTG**: The MTGs will be made aware on the FPC model through PRI and individual farmers will be motivated to join the FPC as shareholder through respective MTGs.

- **Initial discussions with MTG leaders**: After PRI is done, initial discussion will be done with the MTG leaders for further orientation on FPC concept.

- **Identification of MTG leaders**: MTG leaders who show inclination to the concept will be selected in the executive committee for FPC formation.

- **Resource mobilization and FPC planning**: The executive committee will meet 2-3 times to plan further activities of FPC viz. crops, strategy for business etc.

- **Election of BoD and Share collection**: 10-12 BoD will be identified along with 2-3 expert directors one each from Agri, Horti, AH and WS dept. The BoD will decide on share value and initiate collection of share through MTG leaders.

- **FPC registration**: Following identification of FPC BoD, registration will be done. This may take 1-2 months as DIN no of BoD has to be generated first. Care should be take that all elected BoD should have PAN no so that there is no delay in paper formalities for registrations.

- **FPC business**: Following registration of FPC, ABPF will prepare business plan for the FPC and facilitate market linkage for input and output.

- **Setup of processing/financing**: ABPF will further facilitate establishment of processing unit setup along with feasibility studies and planning business linkage with market players.

**Policy and Management**

A FPC will function within the overall policy and regulatory framework as per the Producer Company Act. The management of a FPC will vest with the elected Board from amongst the members. The provision about constitution of managing committee will be made in the byelaws. The management of FPCs will be by an elected Board of Directors. Therefore, the representatives of farmers will actually oversee and manage the affairs of a FPC.

**The selection criteria for membership of FPC may be viewed as follows:**

1. A member will express his willingness to become a member of MTG.
2. A member will actively participate in all functions and activities of MTG
3. A member will contribute his equity to the FPC
4. A member will bring all or part of his produce to the FPC for sale.
5. A member will purchase all or part of his farm inputs through the FPC.
6. A member will produce and prepare his produce for marketing as per directions of FPC.
7. A member will contribute his share to the Producer Association as upfront payment for the business development plan of a FPC as needed.
8. A member will contribute his share to the Producer Company towards the reserves of FPC as needed.

**Illustrative list of components of a common facility of a Producer Company (Food Grain)**

- Godown for storage, drying platforms
- 2-3 MT per hour grain cleaning, grading, and packing machinery with shed
- Additional need based Agricultural Equipment
- Computer with internet connectivity for market information
- Display Board with Accessories
Value Chain Analysis: Kinnow

- Auction Hall
- Input Suppliers Shops
- Toilets
- Drinking water & Electricity

Note: Though the illustrative infrastructure proposed is shown in the above tables, the actual infrastructure to be developed will be need based and on participative consultation process.

Typically, start-up may be involved in secondary and tertiary processing activities while FPO’s may be involved in post-harvest and primary processing activity. In many cases, start-up may emerge firm within FPO members.

The success should be evaluated on the parameters as under:

I. PCs operating without financial support by the end of 36 months.
II. The PC operates with a reserve fund to cover short term cash flow deficit and with potential for reinvestment in various activities
III. The PC has an effective governing structure.
IV. The PC has a transparent accounting system.
V. The PC can function as a working example for other farmer organizations to observe and learn from.
VI. Contribution towards increasing farmers’/members incomes.

9.3. Conclusion:

Orange has been a major crop of economic significance for farmers of Rajasthan due to its high return potential. The productivity in RACP clusters has to be at par with national level and hence availability of good quality planting materials is a must. RACP may tie up with COE kota for providing high quality planting materials. However, some major constraints in production stage are in-consistent weather pattern, high cost of seeds and farmers not following PoP. The crop suffers around 25-30% post-harvest loss due to handling at various stages in the value chain and its perishable nature. There is currently scope of further reducing the cost of cultivation through reducing the cost of fertilizers and pesticides and proper water management and improved productivity through good agriculture practices. The post-harvest losses also need to be reduced through proper education of farmers and other handlers in the value chain. Currently, the farmers’ share in the consumer rupee is only 24% as there is little value addition activity currently being undertaken in the cluster by farmers. As the value addition activities in Orange value chain enhances, the share of farmers would also reduce as demonstrated in other value chain. FPC of farmers would be an ideal intervention for evolving the role of farmers from being chain actors to chain partners by doing both backward and forward integration of activities related to Orange value chain. At the back end, the FPC would help in reducing cost of cultivation by undertaking bulk purchase of agri input at wholesale price and selling farmers at a price equal to or lower than the retail price. Similarly, in the front end of the value chain, the FPC would undertake direct collection of Oranges from the farmers and thereby reduce both the wastage and cost of visit to mandi for farmers. The FPC can further undertake primary/secondary processing of the fruit and supply directly to large processors and other value chain actors.

For this, a strong base has to be facilitated for the FPC by motivating farmers to contribute in terms of equity and business participation with the FPC. The Board and FPC staff has also to be handholded for a period of 2-3 years to train them on all processes of FPC management and business processes.

All stake holders including RACP, NGO, ABPF, Bankers and other support institutions therefore need to work cohesively towards the common goal of facilitating a strong community organization which can run in a sustainable manner after the project period.
Proposed outcome:

- 2% direct benefit to farmer due to direct procurement through FPC
- 14% benefit through profit accumulated by FPC
- 2-5% price benefit on cost of inputs
- 1% saving on cost of transportation to APMC and associated charges
- Increased competition in input and output market resulting in higher earning potential for farmer
- Increased bargaining power of farmers
- Sustainable operations through community institution and assets through FPC and FCSC
References

13. Acknowledging inputs from RACP officials, related producers, processors, industry associations, NGOs, ATMA, Dept of Horticulture and Dr. Bhatnagar, College of Horticulture, Jhalawar.
Annexure 1: Stakeholder’s consulted over the study

Producers
5 Farmers in Sri Ganganagar Cluster
- Luxman Singh, 4Z Ganganagar, 9550640339
- Anraj Singh, 4Z Ganganagar, 8239000731
- Manjeet Singh, 4Z Ganganagar, 995058123
- Beant Singh, 4Z Ganganagar, 9413934532
- Dilabaag Singh, 4Z Ganganagar, 9414212050
- Harmeet Singh, 4Z Ganganagar, 9414578615
- Ameet Singh, 4Z Ganganagar, 9414578615

5 Farmers in Sri Manoharthana Cluster
- Suresh Maali, Garboliya, 9772402638
- Dhirendera Kumar, Garboliya, 9636525039
- Luxmi Narayan Kumar, Garboliya, 9636525039
- Mangi Lal, Garboliya, 8830732768
- Ram Lal, Garboliya, 9166241694

Processors
- Natureland organic foods pvt ltd, Arvind Godara, SriGanganagar, 9460430830
- Veg Fru Ltd., Azadpur Mandi, Dinesh Sharma, Delhi – 9650900586
- Dinesh Mallik, Azad Agro, Kota – 9587263999
- Coca Cola, Ankush Singha, Gurgaon, 9654360339

Government agencies
- Dr. S.K Sharma (DPM), SriGanganagar, 9414272165
- Shiv Singh Bhatti (Joint Director), Agri. Marketing, SriGanganagar, 9829270446
- Harbans Singh (Asst. Director), Agriculture Ext., SriGanganagar, 9468971228
- Dinesh Kumar (Horticulture Assistant), Manoharthana, 9602107637
- Dr Baldeva, (Horticulturist), KVK, Jhalawar, 9636150949

Others
- Madheshwar Singh (T.L), Seva foundation, SriGanganagar, 9785974751
- Kiriti Kumar – Team Leader, Manoharthana – 8875376111
- Hari Singh, NGO, Jhalawar, 9772640381
### Annexure 2: List of Cold Storage facilities in Rajasthan-NHB

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Name &amp; Address Of Cold Storages</th>
<th>C.S.O. Licence No</th>
<th>Capacity In Mt</th>
<th>Sector</th>
<th>Products Stored</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AJMER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Laxmi Cold Storage Bewar Road</td>
<td>RJST/3215</td>
<td>3000</td>
<td>Private</td>
<td>Potato, Flower Egg, Jaggery, Multipurpose</td>
</tr>
<tr>
<td>2</td>
<td>Rajasthan Coop Dairy Fed Ltd. Opp. HMT Beawar Road</td>
<td>RJST/2694</td>
<td>334</td>
<td>Cooperative</td>
<td>Milk &amp; Milk Products</td>
</tr>
<tr>
<td><strong>ALWAR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Rajasthan Coop Dairy Fed Ltd. Jaipur Road</td>
<td>RJST/2553</td>
<td>314</td>
<td>Cooperative</td>
<td>Milk &amp; Milk Products</td>
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<tr>
<td>2</td>
<td>Vijay Ice &amp; Cold Storage Old Industrial Area</td>
<td>ALR/1081</td>
<td>801</td>
<td>Private</td>
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<tr>
<td>3</td>
<td>Jayanti Cold Storage, Rajgarh Rd., Gram Dadar</td>
<td></td>
<td>3533</td>
<td>Private</td>
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<tr>
<td><strong>BARMER</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mahaveer Cold Storage</td>
<td></td>
<td>2025</td>
<td>Private</td>
<td>Multipurpose</td>
</tr>
<tr>
<td><strong>BHARATPUR</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>1</td>
<td>Akash Cold Storage Pvt. Ltd., Kumehar Road</td>
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<td>2</td>
<td>Bharatpur Cold Storage (P) Ltd. Sewar PO</td>
<td>RJST/3121</td>
<td>2708</td>
<td>Private</td>
<td>Potatoes</td>
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<td>3</td>
<td>D. R. Oil Industries Mathura Road Bharatpur</td>
<td></td>
<td>4000</td>
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<tr>
<td>4</td>
<td>Ganesh Pvt. Ltd. Seware Road</td>
<td>RJST/2826</td>
<td>1781</td>
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<td>Potato</td>
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<tr>
<td>5</td>
<td>Fauzi Cold Storage Krishna Nagar</td>
<td></td>
<td>3000</td>
<td>Private</td>
<td>Potato</td>
</tr>
<tr>
<td>6</td>
<td>Dhanker Cold Storage Near Panchyat Smit Bayana</td>
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<td>1600</td>
<td>Private</td>
<td>Potato</td>
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<tr>
<td>7</td>
<td>Sharvan Cold Storage Delhi Road</td>
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<td>4000</td>
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<td>Potato</td>
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<tr>
<td>8</td>
<td>Tantpur Enterprises Hora Bai</td>
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<td>2640</td>
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<td>Golden Cold Storage</td>
<td></td>
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<td>10</td>
<td>Brijwasi Cold Storage, V&amp;PO Brijwasi Tehsil, Bawer</td>
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<td>L.R.J. Cold Storage</td>
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<td>No.</td>
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<td>12</td>
<td>Pratap Ice &amp; cold Storage</td>
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<td>Potato</td>
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<td>13</td>
<td>Nadabi Cold Storage, Teh. Nadvai Vill., Bilora</td>
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<td>14</td>
<td>Deeg Cold Storage, Rambagh</td>
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<td>Private</td>
<td>Potato</td>
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</tr>
<tr>
<td><strong>BIKANER</strong></td>
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<td></td>
<td></td>
</tr>
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<td>1</td>
<td>Chitra Ice Factory &amp; Cold Storage P.O. Bhinsar</td>
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<td>Bikaner Dairy Unit M/s Raj Coop Dairy Fed. Ltd. Sriganganagar</td>
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<td>Cooperative</td>
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<td>Pareek Cold Storage Kami Ind. Area</td>
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<td>4</td>
<td>Rajasthan Coop Dairy Fed. Ltd. Bikaner Dairy</td>
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<td>Cooperative</td>
<td>Milk &amp; Milk Products</td>
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<td>5</td>
<td>Rajasthan Cold Storage Pvt. Ltd.</td>
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<td>Shri Bikaner C.S. Kami Ind. Area</td>
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<td>Nakha Cold Storage, B-5A, RICCO Ind. Area</td>
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<td>Shankar Sheetalaya Cold Storage Ice Factory, Vill. Govindpur Baroi Post Talera</td>
<td>KTA/867</td>
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</tr>
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<td><strong>JAIPUR</strong></td>
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<td>Annapurna Cold Storage V.K.I.A. Jaipur</td>
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<td>2</td>
<td>Baba Ganesh Aloo Bhanders Malviya Indl. Area</td>
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<td>Potato</td>
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<td>3</td>
<td>Bhagwati Udyog Cold Storage &amp; Ice Factory, Location C-177 r Road No. 9 J.V.I. Industrial Estate</td>
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<td>4</td>
<td>Core Fionance Ltd. E-705-6 Sitapur Indl. Area</td>
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<td>5</td>
<td>Hira Cold Storage &amp; Ice Factory D/192 VKIA</td>
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<td>6</td>
<td>Hotel Clarks Amer Amer Road</td>
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<td>7</td>
<td>Hotel Man Singh Sansar Chandra Road</td>
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<td>Private</td>
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<td>8</td>
<td>Indian Hotels Co. Ltd. The Jai Mahal Palace, Jacob Road</td>
<td>RJST/2989</td>
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<td>Private</td>
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<td>Jan Arthant C.S. Sitapur Ind. Area</td>
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<td>Pvt</td>
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<td>J &amp; N Cold Storage Sitapur Indl. Area</td>
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<td>11</td>
<td>Kotadmola Agro Cold Storage Delhi Road Jaipur</td>
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**DHOLPUR**

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**JHALAWAR**

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Annexure-3: Impact of GST

Product wise GST rates of Food Products

- **GST-28%

1. Molasses
2. Chewing gum/bubble gum and white chocolate
3. Cocoa butter, fat and oil
4. Cocoa powder
5. Cocoa chocolates
6. Malt extract (other than for infant use and mixes and doughs of bakers)
7. Waffles and wafers coated with or containing chocolate
8. Extract, essences and concentrates of coffee
9. Mustard flour and sauces thereof
10. Sugar, lactose and glucose syrups
11. Food flavouring material
12. Churan for pan
13. Custard powder
14. Aerated waters containing added sugar or other sweeting matter

- **GST-18%

1. Condensed milk
2. Malt, whether or not roasted
3. Refined sugar, sugar cubes
4. Sugar confectionery
5. All preparations of cereals, flour, starch or milk for infant use and sold retail
6. Pasta, spaghetti, macaroni, noodles
7. Corn flakes and other cereal flakes
8. Waffles and wafers (other than chocolate coating)
9. Pastries and cakes
10. Extracts, essences and concentrates of tea or mate
11. Soups and broths
12. Ice cream and other edible ice
13. Instant food mixes, soft drink concentrates, sharbat, betel, supari, packaged food
14. Water, including natural or artificial mineral waters and aerated waters not sweetened
15. Ethyl alcohol and other spirits
16. Vinegar and substitutes
17. Curry paste, mayonnaise and salad dressing; mixed condiments and mixed

➢ GST – 12 %
1. All meat in unit containers put up in frozen, salted, dried, smoked state
2. All meat and marine products, prepared or preserved.
3. Butter, ghee, butter oil, cheese
4. All goods under Chapter 20 (preparations of vegetables, fruits, nuts or other parts of plants, including pickle, murabba, chutney, jam, jelly)
5. Ketchup & sauces, Mustard sauces
6. Dry fruits 2
7. Starches
8. Animal fats and oils
9. Fruit and vegetable juices
10. Roasted chicory and coffee substitutes
11. Yeasts and prepared baking powders
12. Namkeens, bhujia, mixture, chabena
13. Bari made of pulses including mungodi
14. Soya milk drinks
15. Fruit pulp or fruit juice based drinks
16. Tender coconut water (in unit container with brand name)
17. Beverages containing milk

➢ GST – 5 %
1. All fish variants (except seeds of fish, prawn & shrimp) processed, cured, frozen state
2. Ultra-high temperature milk
3. Milk and cream including skimmed milk powder but excluding condensed milk
4. Yoghurt and other fermented milk and cream
5. Chena or paneer in unit container and branded
6. Egg yolk, fresh or dried
7. Natural honey in branded unit container
8. Vegetables frozen or preserved (but unsuitable in that state for immediate consumption)
9. Edible fruits and nuts; peel of citrus fruit or melons, in frozen or preserved state
10. Coffee, tea, pepper, vanilla, cloves, cardamoms
11. Seeds of anise, coriander, cumin
12. Ginger (other than fresh ginger), saffron, turmeric, other spices
13. Cereal groats, meal and pellets in branded unit container
14. Cereal grains worked upon (hulled, rolled, flaked)
15. Meal, powder, flakes, granules and pellets of potatoes
16. Meal and powder of the dried leguminous vegetables (pulses, sago, tamarind)
17. Wheat gluten
18. Soya beans
19. Ground nuts
20. Copra
21. Linseed, rape seeds, sunflower seeds, other oilseeds like mustard, poppy,
22. Flour and meals of oilseeds
23. Sugar beet and sugar cane (frozen and dried)
24. Vegetable fats and oils (groundnut, olive, palm, sunflower oil etc)
25. Beet sugar, cane sugar, khandasari sugar
26. Cocoa beans, shells and paste
27. Mixes and doughs for preparation of bread, pastry and other baker’s wares
28. Pizza bread
29. Seviyan
30. Rusks, toasted bread
31. Sweetmeats
32. Flours, meals, and pellets of meat, fish meant for animal consumption
33. Cashew nuts and cashew nut in shell
34. Raisin 3
35. Ice and snow

➢ GST – Nil %

1. Meat (Other than in frozen state and put up in container)
2. Bones and horn cores, bone grist, bone meal etc., hoof meal, horn meal, etc
3. Fish, prawn and shrimp seeds
4. All fish, fresh or chilled (but not processed, cured and frozen)
5. Fresh milk, pasteurized milk but not concentrated, sweetened
6. Eggs (in shell)
7. Curd, lassi, buttermilk
8. Chena or paneer (except in unit container with brand name)
9. Natural honey (no container-no brand)
10. Fresh fruits and vegetables, roots and tubers (except in frozen state or preserved)
11. Dried fruits
12. Leguminous vegetables, shelled or unshelled
13. Dried leguminous vegetables, shelled, whether or not skinned or split (pulses)
14. Coffee beans, unprocessed tea leaves, fresh spices
15. All cereals (no container-no brand)
16. Cereal grains hulled
17. Flour
18. Atta, maida, besan (no container-no brand)
19. Wheat or meslin flour
20. Cereal flour, groats and meals (no container-no brand)
21. Flour of potato, dried leguminous vegetables (no container-no brand)
22. Oilseeds of seed quality
23. Cane jiggery (gur)