Market Concentration and Value Chain Analysis of Kinnow in Rajasthan, India

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ABSTRACT

The study analysed kinnow market concentration; kinnow value chain constraints; and explored other ways of upgrading the kinnow value chain in the Rajasthan State of India. Primary data was obtained through the administration of structured questionnaire to producers, experts of kinnow production and marketing, processors, exporters, pre-harvest contractors, as well as a market official of kinnow. Kinnow value chain mapping revealed farmers as beneficiaries from direct purchases by processors and exporters. Also, value adding activities undertaken by wholesalers show that, aside washing which is of less significant, packaging, waxing, grading & sorting are important. However, all the value adding activities are not done by farmers. Moreover, perishability of kinnow is the first major rank constraint identified by farmers and wholesalers. Gini coefficient calculated to complement Lorenz Curve was 18 percent; implying kinnow markets are not concentrated in the state. Furthermore, kinnow value chain governance in the state is weak with no judiciary arm. In the context of policy implications, firstly, the Government of Rajasthan and India should invest in cold storage warehousing, road infrastructure, processing factories and other infrastructure in order to enable farmers to either store their produce for better prices or sell to different actors who can offer better prices. Secondly, the government should endeavour to give transportation subsidies to farmers whose farms are far from major markets to encourage them to sell their produce to other actors other than pre-harvest contractors. Furthermore, government, in conjunction with various agricultural offices should train farmers on grading of kinnow and standards needed by kinnow exporters and other actors who offer higher prices than pre-harvest contractors. Finally, research should be conducted to determine the potential of processing kinnow into other products that have longer shelf life so as to limit the direct sales of produce to pre-harvest contractors.

Keywords: Kinnow, Rajasthan, Gini coefficient, Lorenz curve, market concentration, Kendall’sCoefficient of Concordance, value chain governance.
1. INTRODUCTION

Major fruit crops produced in India include banana, mango, citrus and papaya, with 33.4 percent, 20.7 percent, 12.5 percent and 6.3 percent contributions respectively. The total citrus production in India is estimated to be about 11.64 million metric tonnes for 2014-15 production year. Rajasthan State in India produced 717,000 metric tonnes of fruit in 2012-2013 production year. It is the fifth (5th) citrus-producing state in the country with production of 456,000 metric tonnes on an area of approximately 25,000 hectares which shows contribution of 4.5% to the national citrus production (National Horticulture Board, 2013).

The major varieties of citrus grown in the state are mandarin and kinnnow. Sri Ganganagar and Hanumangarh are known for kinnnow whereas Jhalawar and Nagpur are known for mandarin variety production. Sri Ganganagar is the highest producer of kinnnow in Rajasthan with Hanumangarh district as second highest in the State. The total land size for kinnnow production in Sri Ganganagar was 8650 hectares with total production level of 25000 metric tonnes (Anonymous, 2008). Realising the importance and prospects of kinnnow production, the Government of Rajasthan and India have been continuously outlining different approaches and strategies to increase production of the crop in the state. Notable among these are developing and disseminating required technologies for enhanced productivity of quality fruits through activities such as development of infrastructure and initiating research projects in citrus (Bannor and Madhu, 2015).

However, if the immense growth in kinnnow production sought by the government through various initiatives is to be realized, marketing aspects such as market concentration, constraints faced by farmers and improve ways of upgrading various actors especially producers in the kinnnow value chains should be adequately explored. (Aujla et al., 2007). This is because marketing of kinnnow in Rajasthan is bedevilled with challenges in the value chain. For example, inaccurate price information, lack of market intelligence and price fluctuations (Singh, 1996). There are also problems of malpractices in buying and selling, affecting the distributive justice and efficiency of the kinnnow marketing system (Verma and Singh, 2005). These problems also leads to inefficient product movements (Goodwin and Schroeder, 1991), high retailer share of consumer price rupees, weak processing infrastructure (Maviet et al., 2012), 20-40, per cent losses at different stages of grading, packing, storage, transportation and marketing of kinnnow (Ali, 2005), among other marketing problems resulting in kinnnow marketing inefficiencies (Yisa, 2009) in the state of Rajasthan.

As a result, a number of researches have been conducted from production to marketing of kinnnow in Rajasthan. These studies focussed mainly on evaluation of various aspects of production and marketing of kinnnow in the Sri Ganganagar district of Rajasthan state (Sharan and Singh, 2002; Kaur and Singh, 2010; Bhat et al., 2011; Maviet et al., 2012); evaluation of the post-harvest losses at different stages of marketing and their impact on farmer’s net price, marketing costs, margins and efficiency (Murthy et al., 2007); estimation of marketing margins, price spread and efficiency (Gangwaret et al., 2007). Additionally, researches have been conducted on knowledge and constraints in recommended kinnnow production technology among kinnnow growers as well as adoption
of recommended kinnnow production technology (Choudhary and Banarva, 2011; Choudhary and Bangarwa, 2013). Notwithstanding these researches, there seems to be a research gap in the field of kinnnow market concentration analysis, kinnnow value chain governance and exploring other ways of upgrading kinnnow value chain actors in the state, hence this study.

2. METHODOLOGY

2.1 Sources of data
Primary data was obtained through the administration of structured questionnaire to producers of kinnnow.

2.2 Selection of districts
In Rajasthan, the SriGanganagar district is the lead producer of kinnnow, followed by Hanumangarh district (Anonymous, 2008). Sri Ganganagar produced 60,000 metric tonnes of kinnnow in 2013. As a result, Sri Ganganagar and Hanumangarh were purposively selected based on the area under production of kinnnow in the state.

2.3 Selection of farmers
In the first stage of sampling, purposive sampling was used for selecting potential districts based on high level of production of kinnnow i.e. Sri Ganganagar and Hanumangarh. The second stage involved purposive sampling of two high kinnnow-producing tehsils from Sri Ganganagar and one tehsil from Hanumangarh, in consultation with district agricultural officers. Again, in consultation with these district agricultural officers, the third stage involved purposively selecting high kinnnow-producing villages; three (3) villages from each tehsil of SriGanganagar and four (4) villages from the one tehsil of Hanumangarh. Ten (10) farmers were selected randomly from each village, from a list of kinnnow growers provided by Sarpanch/Gram Sevaks/influencial farmers, thus making sixty (60) farmers from SriGanganagar and forty (40) from Hanumangarh with cumulative number of 100 respondents or farmers.

Table 1: Summary of sampling size and sampling technique for value chain actors

<table>
<thead>
<tr>
<th>Population</th>
<th>Sample size</th>
<th>Sampling Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesalers/pre-harvest contractors</td>
<td>8</td>
<td>Simple Random Sampling</td>
</tr>
<tr>
<td>Processors</td>
<td>2</td>
<td>Purposive sampling</td>
</tr>
<tr>
<td>Experts</td>
<td>3</td>
<td>Judgemental Sampling</td>
</tr>
<tr>
<td>Exporters</td>
<td>2</td>
<td>Judgemental Sampling</td>
</tr>
<tr>
<td>Mandi officials</td>
<td>1</td>
<td>Judgemental Sampling</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td></td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data
2.4 Method of data analysis
Percentages and frequencies were used in analysing the data. In addition, the researchers adopted Lorenz curve and Gini coefficient to calculate market concentration among kinnow wholesalers. This approach was used by Kelechi et al., (2013) and Garba et al., (2015) in Nigeria to calculate market concentration of okra and shea butter, respectively. In this study, the element chosen to be measured in the context of the conventional understanding of inequality is the quantity of kinnow handled by wholesalers. Inequality represents only the value judgment of the absence of a homogeneous distribution of resources.

2.5 Lorenz curve
The shape of the Lorenz Curve is a good visual indicator of how much inequality exists in quantity of kinnow handled by wholesalers. The X-axis of a Lorenz curve records the cumulative proportion of population ranked by income, land and quantity of kinnow handled. Its range is (0, 1). The Y-axis records the cumulative proportion of quantity handled for a given proportion of population, i.e., the quantity of kinnow handled (wealth) share is calculated by taking the cumulated (quantity of kinnow handled by wholesalers) of a given share of the population, divided by the (total quantity of kinnow handled by wholesalers) Y, as follows:

\[ L(k) = \frac{\sum_{i=1}^{k} y_i}{Y} \]

Where

\( k = 1, \ldots, n \) is the position of each individual in the quantity of kinnow handled distribution;
\( i = 1, \ldots, k \) is the position of each individual in the quantity of kinnow handled distribution
\( p \) is the total number of individuals in the distribution
\( y_i \) is the wealth of the \( i^{th} \) individual in the distribution
\( \sum_{i=1}^{k} y_i \) is the cumulated wealth up to the \( k^{th} \) individual
\( \sum_{i=1}^{k} y_i \) ranges between 0, for \( k=0 \), and \( Y \), for \( k = n \), therefore the equation \( L(k) = \frac{\sum_{i=1}^{k} y_i}{Y} \) ranges between 0 and 1.

A 45° line represents absolute equality and the Lorenz curve represents the current distribution of the income; as the Lorenz curve reaches farther away from the 45° line, the more inequality dominates the distribution. The Lorenz curve acts as the natural instrument for graphically depicting the Gini coefficient (Bannor and Madhu, 2015).

2.6 The Gini-coefficient
Attributed to Gini (1912), it is by far the most, widely used measure of inequality; the reason for this, is attributed to the fact that it is straightforward, easy to understand and not at all complicated to calculate (Melkamu and Bannor, 2015). Its value ranges from 0 to 1 (although it is commonly multiplied by 100 in empirical studies), with 0 being the
value of perfect equality and 1, of maximum inequality (i.e. one individual holds all the quantity of kinnow and the rest hold no quantity).

Figure 1: Lorenz curve showing section A and B used in Gini coefficient

\[
\text{Gini} = \frac{\text{Concentration}}{\text{Maximum Concentration area}(A + B)} \\
Gini = \frac{A}{(A + B)}
\]

Since, \(A + B\) equals 0.5(Area of equality triangle), the Gini - coefficient will be:

\[
\text{Gini} = \frac{A}{0.5} \quad \text{or} \quad \text{Gini} = 1 - 2B
\]

2.7 Kendall’s coefficient of concordance

Kendall’s coefficient of concordance, used to test the agreement among ranked constraints, was adopted to analyse the constraints in kinnow marketing. It established the extent of disagreements and agreements among responses. Kendall’s coefficient of concordance (W) is the measure of the degree of agreement among \(m\) set of \(n\) ranks. \(W\) is an index that measures the ratio of the observed variance of the sum of ranks to the maximum possible variance of sum of ranks. If the rankings are in perfect agreement, the variability among sums will be a maximum (Martey et al., 2014). Computing the total
rank score for each constraint and objective, the constraint and objective with the least score is ranked as the most pressing whilst the one with the highest score is ranked as the least pressing. The total rank score computed is then used to calculate for the coefficient of concordance (W), to measure the degree of agreement in the rankings.

The formula for the coefficient of concordance W is then given by:

\[
W = \frac{\left(\sum T^2 - \left(\frac{\sum T}{n}\right)^2\right)}{\frac{m^2(n^2 - 1)}{12}}
\]

The formula is further simplified as follows:

\[
W = \frac{12\left[\sum T^2 - \left(\frac{\sum T}{n}\right)^2\right]}{nm^2(n^2 - 1)}
\]

Where; T = sum of ranks for each factor being ranked.

m = number of rankings (value chain actors) and n = number of factors being ranked.

The hypothesis used for testing the agreement among constraints according to respondents was:

\[H_0: \text{There is no agreement among the constraints faced by actors at the same level.}\]

\[H_1: \text{There is agreement among the constraints faced by actors at the same level.}\]

The Coefficient of concordance W is tested for significance using the F distribution. According to Legendre (2005), W of 0 ≤ W ≤ 1 indicates increasing strength of agreement; the closer to 1, the higher the level of agreement or concordance and W of zero signifies disagreement.

3. RESULTS AND DISCUSSION

3.1 Type of marketing outlets used by kinnow growers interviewed

The type of outlets used by kinnow growers in the state includes mainly pre-harvest contractors or wholesalers, selling directly to mandi (market), retailers and consumers. According to exporters and processors, they buy directly from farmers but the researchers did not interview any farmer who sells directly to exporters or processors. The type of marketing outlet used by kinnow producers is presented in table 3 below.

<table>
<thead>
<tr>
<th>Table 3: Choice of marketing outlet used by kinnow producers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-harvest contractor/ Wholesalers</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>90</td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data, 2015

3.2 Value chain mapping of kinnow

Figure 2 shows kinnow value chain mapping in the state based on the people interviewed. The value chain mapping shows that, unlike previous value chain mapping of the state that did not include processors and exporters as part of the chain, these actors are now part of the chain.
About ninety (90) percent of the farmers interviewed either leased out their orchards to pre-harvest contractors or harvest the produce and sell to pre-harvest contractors. One of the main reasons why farmers sell their produce to pre-harvest contractors is because of price fluctuations. It means farmers who are risk averse use pre-harvest contractors as insurance against price fluctuations. Formation of Producer Based Organizations or cooperatives in pomegranate, apple and mango and grapes could give farmers high bargaining power and also possible upgrading on the kinnov value chain. Again, since the kinnov marketing system is highly unorganised, such groups can promote organised marketing of kinnov.

In addition, earlier kinnov value chain mapping researches done by Sharan and Singh (2002); Kaur and Singh (2010); Jhajhria et al. (2010) and Marv et al.,(2012) did not have exporters as actors on the kinnov value chain, however, this research witnesses exporters as actors who buy kinnov directly from farmers. This indicates the kinnov value chain is developing with farmers having more options on whom to sell their produce. Few of the farmers represented by 10 percent sell their produce to wholesalers, retailers, consumers directly, or through commission agents in the mandi.

3.3 Value adding activities by farmers
Using an interval scale from 1 to 5 based on level of importance, where 5=very important, 4=important, 3=neutral, 2=less important, 1=very unimportant, farmers were asked to indicate the value adding activities they perform before selling their produce.
The value adding activities included washing, packaging, waxing, and sorting and grading.

Table 4 shows the summary of all the value adding activities done by farmers before sales of kinnow using an interval scale from 1 to 5 based on level of importance, where 5=very important, 4=important, 3=neutral, 2=less important, 1=very unimportant.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Washing</th>
<th>Packaging</th>
<th>Waxing</th>
<th>Grading and Sorting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.10</td>
<td>1.26</td>
<td>1.09</td>
<td>1.30</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.58</td>
<td>0.84</td>
<td>0.43</td>
<td>0.91</td>
</tr>
<tr>
<td>Range</td>
<td>4.00</td>
<td>4.00</td>
<td>3.00</td>
<td>3.00</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>5.00</td>
<td>5.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data, 2015

The results indicate that all the value adding activities, as in washing, packaging, waxing, and grading and sorting, are not done by farmers. This is because all the activities are either less important at best or very unimportant, according to them. This phenomenon can be attributed to the type of channel farmers used, thus leasing farms directly to pre-harvest contractors.

3.4 Kinnow market concentration based on wholesalers/ pre-harvest contractors

Market concentration shows the ability of a firm to alter the market price of a good or a service. It is the ability to raise prices without losing customers to competitors. In perfectly competitive markets, market participants, who in our case are wholesalers (pre-harvest contractors), have no market power. High market concentration indicates a firm or group of wholesalers with market power has the ability to individually affect either the total quantity or the prevailing price in the market, or both. Market power can be measured by different measurements which include concentration ratio, Lorenz curve and Gini coefficient.

In order to understand the kinnow market structure based on the quantity of kinnow handled by eight (8) major wholesalers interviewed, the researchers adopted Lorenz curve and Gini coefficient analysis for the market concentration. The results of the Lorenz curve are presented in figure 3.
In this study, the shape of the Lorenz curve which is mathematically explained by Gini coefficient, is used in the identification of the market structure and power which determines the degree of competition that exists in the kinnow markets. It is generally used to indicate the level of competition within the market as well as the absence of an oligopolistic market structure. Furthermore, the Lorenz curve and Gini coefficient are used as a guide for indicating the most likely type of market structure and levels of competition within a given market segment.

The Lorenz curve in figure 3 clearly shows that, there is no concentration of market power among specific wholesalers or pre-harvest contractors interviewed. The inequality line is very close to the equality line of zero (0). Behaviour of this nature of the market promotes market integration and efficiency as wholesaler(s) cannot dictate the price of kinnow.
Table 5: Market concentration using Gini coefficient based on quantity of kinnow handled by wholesalers

<table>
<thead>
<tr>
<th>S. No</th>
<th>Quantity</th>
<th>% of Population</th>
<th>% of Quantity</th>
<th>Cum. %</th>
<th>Cum. Quantity/100%</th>
<th>CMqk1+CMqk2/2*0.125</th>
<th>Gini coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2000</td>
<td>12.50</td>
<td>7.38</td>
<td>7.38</td>
<td>0.07</td>
<td>0.00</td>
<td>0.5-0.41/0.5</td>
</tr>
<tr>
<td>2</td>
<td>2400</td>
<td>25.00</td>
<td>8.86</td>
<td>16.24</td>
<td>0.16</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3000</td>
<td>37.50</td>
<td>11.07</td>
<td>27.31</td>
<td>0.27</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3000</td>
<td>50.00</td>
<td>11.07</td>
<td>38.38</td>
<td>0.38</td>
<td>0.04</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3500</td>
<td>62.50</td>
<td>12.92</td>
<td>51.29</td>
<td>0.51</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4000</td>
<td>75.00</td>
<td>14.76</td>
<td>66.05</td>
<td>0.66</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>4200</td>
<td>87.50</td>
<td>15.50</td>
<td>81.55</td>
<td>0.82</td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>5000</td>
<td>100.00</td>
<td>18.45</td>
<td>100.00</td>
<td>1.00</td>
<td>0.11</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>27100</strong></td>
<td><strong>100</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>0.41</strong></td>
<td><strong>0.18</strong></td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data, 2015, NB; CMqk means cumulative quantity/100% from first respondent to 8<sup>th</sup> respondent

The distribution of the wholesalers by sales in quintals is presented. Table 5 shows how Gini coefficient was derived. It shows Gini coefficient as 0.18 or 18 percent implying that the concentration of market sales among kinnow wholesalers who are mostly pre-harvest contractors is low. This was due to a large number of wholesalers competing with each other. This is an indication that there was no kinnow wholesaler exercising control over the market price. This is a typical feature of a purely competitive market structure indicating a sign of efficiency in the market. In other words, there is also a reflection of low level of income inequality from sales among the wholesalers.
3.5 Value adding activities by wholesalers/ pre-harvest contractors
Using an interval scale from to 1 to 5 based on level of importance, where 5=very important, 4=important, 3=neutral, 2=less important, 1=very unimportant, wholesalers were asked to indicate the value adding activities they perform before selling their produce. The value adding activities included washing, packaging, waxing, and sorting and grading. The results are presented below.

3.6 Summary statistics of value adding activities as per wholesalers
Table 6 shows, except washing which had a value of 2.38, all the rest according to the wholesalers are important, hence they are regularly undertaken before sales. Washing had a mean value of 2.38 indicating generally, wholesalers do not see washing as priority before sales. Grading and sorting recorded a highest value of 4.88 indicating wholesalers put much emphasis on grading and sorting as value adding activities.

<table>
<thead>
<tr>
<th>Statistics</th>
<th>Washing</th>
<th>Packaging</th>
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<th>Grading and Sorting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>2.38</td>
<td>3.75</td>
<td>4.63</td>
<td>4.88</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.06</td>
<td>0.46</td>
<td>0.52</td>
<td>0.34</td>
</tr>
<tr>
<td>Range</td>
<td>3.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Minimum</td>
<td>1.00</td>
<td>3.00</td>
<td>4.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>4.00</td>
<td>4.00</td>
<td>5.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data, 2015

Losses during transit of kinnow is estimated to be about 5.70 per cent whereas rotten fruits due to diseases account for 57 per cent of post-harvest losses in kinnow marketing. These losses can be avoided by waxing kinnow (Gangwar et al., 2007). Thus, waxing as a kinnow value chain activity increases the shelf life of the crop. From table 6, the second best value adding activities among kinnow wholesalers is washing. This is represented by a figure of 4.63 indicating waxing is a very important activity. From the wholesalers, to keep the fruits fresh and also prevent transit losses during the transporting of kinnow to big cities like Delhi, Mumbai, Jaipur or any city where demand is high, waxing is done. Packaging which is also another value chain activity was seen to be important for the wholesalers compared to kinnow producers.

3.7 Processors on kinnow value chain
Each of the processors interviewed purchase about 50 lakh tones of kinnow during the peak season of kinnow. These processors who are located in the RIICO zone of Ganganagar mostly have the supplies from Ganganagar and Hanumangarh. The processors interviewed, indicated that there are no government regulations on buying and selling of kinnow, even though, Government provides subsidies for those who intend to establish kinnow processing plants. Primary processing such as grading and sorting, washing, packaging and waxing are undertaken by the processors with no major processor in the state that does secondary processing such as processing of kinnow into juice. These processors sometimes receive kinnow from other wholesalers who want their produce to be waxed, pending suitable market prices for their produce to be sold.
However, few retailers undertake secondary processing of kinnow to meet the demands of their customers.

3.8 Exporters in the kinnow value chain
Exporting, according to the exporters, has been very steady in terms of volume exported. Usually, there are guidelines on quality standards demanded by the export market. In order to take care of this, Agricultural and Processed Food Products Export Development Authority (APEDA) has developed a manual which talks about the standards to meet for kinnow exporting especially into the EU market. Kinnow exported from India are mostly in the raw form. Reasons are that, kinnow in the fresh, raw form has better market prices to the processed kinnow produce. Additionally, due to high seasonality of kinnow, processing of kinnow is expensive. Mostly, exporters buy kinnow from farmers directly. In Rajasthan, the main suppliers are from Ganganagar and Karanpur. Asked whether farmers are aware of quality standards for export, they reported negative. However, selective fields and selective picking can approximately give 25 percent of the desired standards for export. Also, exporters do not buy under contract from farmers but undertake spot buying based on quality and quantity available in the orchards of farmers. High seasonality of kinnow production and rigorous dominance of kinnow from Pakistan in international markets are the major challenges faced by exporters of kinnow from India.

3.9 Kinnow value chain potential
Generally, kinnow has high yield potential compared to sweet mandarin, late Valencia and other orange varieties. There exists value chain upgrading potential for farmers to sell most of their produce directly to processors and exporters. This can be done if farmers have the requisite skills and understand the grades and standards demanded by these actors in the value chain. Such kind of integration in the kinnow value chain can encourage most of the farmers to upgrade in terms of quality and standards. Product upgrading is also facilitated by government with the current, new seedless kinnow variety introduced. In terms of processing and upgrading, there is more room for improvement as the state still lags behind. Functional upgrading is done by some exporters which provides great opportunity for farmers. These might include on-farm waxing by farmers and meeting the standards by APEDA for kinnow exports.

Moving ahead, kinnow fruits have thick peel hence the peel can be processed for products such as cosmetics and medicinal products because of the high fibre contained in it. The peel of citrus have been in high demand by most European cosmetic companies hence ushering in a new value chain potential and network for farmers and other value chain actors. Kinnow can be processed into value added products such as juice (juice recovery for 1kg of fruit is about 450-500ml on average indicating about 50 percent recovery), sweets (kinnow baffy) and powdered form which can be used in offices as cold, soft drinks anytime, especially, during the hot summer that proceeds kinnow peak period. Other diverse products from kinnow through the development of small and medium scale industries have the potential to increase incomes of kinnow producers and escalate agricultural growth in the state and the country at large. Also, this would lead to greater price stability and increase shelf life of kinnow.

Furthermore, the easiness to peel kinnow and the lesser price it offers in the market can be of competitive advantage against competitive crops such as Nagpur mandarin. Rajasthan Government could promote Rajasthan kinnow as a brand since the state is known to produce the
best quality of kinnow in India. This will be a better and strong marketing strategy for promoting the marketing of kinnow within and without of the state.

Mechanical harvesters, when developed, also have the potential to ease the harvesting problems encountered by kinnow producers which literally is one of the main reasons motivating them not to upgrade to the higher level of the kinnow value chain. Kinnow harvesting requires a number of man hours which are not readily available in the villages, hence a mechanical harvester developed will not only solve the problem of labour during harvesting, but also the fruit will not drop when harvesting-hence preventing damages and will also reduce the time for the harvesting of kinnow. Kinnow production potential exists in areas of the state where there are canals such as Jasailmer and Jodhpur areas. This is because kinnow is about a 99 percent irrigated crop, thus having huge a potential in other areas of the state.

3.10 Kinnow value chain governance system

Value chain governance identifies who and what coordinates transactions in the chain. Elements of governance include: who decides what is produced (buyer vs. producer chains), how the rules of trade are determined, the nature of relationships between the participants, coordination mechanisms (contracts, market sales, etc), the extent of chain “power” based on the relative size of a particular actor, share of chain profits, or control over a key technology, the institutions and conventions behind such mechanisms. However, coordination does not require that a single firm engages in these roles. Indeed, there may well be a multiplicity of nodal points of governance and coordination functions. Furthermore, these nodal points may change over time as the prominence accorded to different firms/actors shifts within a value chain. Governance provides context to the chain: chains are entities with actors, each with their own constraints and value systems that influence chain operation and performance. Governance points out where some of the institutional bottlenecks and constraints are within the chain. Governance influences strategies for upgrading, and why (or why not) there is uptake. Governance provides insights on power relationships, and possible winners and losers from value chain participation. There is an important distinction between the three functions of government (the “separation of powers”) - the legislature (making the laws), the executive (implementing the laws) and the judiciary (monitoring the conformance to laws). Table 7 shows value chain governance of kinnow in Rajasthan.

<table>
<thead>
<tr>
<th>Type of Governance</th>
<th>Exercise by internal parties to the Chain</th>
<th>Exercise by external parties to chain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legislature</td>
<td>APEDA, Rajasthan Horticultural Board</td>
<td>Ministry of Environment, Forest and Climate Change, Ministry of Labour</td>
</tr>
<tr>
<td>Executive</td>
<td>Exporters, pre-harvest contractors, wholesalers and processors</td>
<td>Ministry of Agriculture</td>
</tr>
<tr>
<td>Judiciary</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Author's own computation based on field data, 2015*

From Table 7, it indicates the value chain governance of kinnow in Rajasthan. APEDA and Rajasthan Horticultural Board are two bodies that make laws and set standards in relation to quality of kinnow in the state. The external parties are Ministry of Environment, Forest and Climate Change and Ministry of Labour who are concerned with environmental standards and
child labour rules and laws that need to be upheld by kinnow growers and all other main value
actors along the kinnow value chain. The executive arm of the kinnow value chain governance is
made up of exporters, pre-harvest contractors, wholesalers and processors. Ideally, under the
executive arm of governance, Producer- Based Organisations or cooperatives should have been
the best act instead since they have their members’ interest as supreme. However, there exists no
association of farmers in that regard. These value chain actors assist farmers in meeting the
standards consumers both within and outside the country need. Extension officers under the
Ministry of Agriculture also assist farmers in meeting standards of consumers but their assistance
is of less impact. This is because, they advise mostly on production than marketing of the
produce. Even with the advice on production, their coverage level is far below recommendations
since their number is inadequate.

There is no judiciary arm in the kinnow value chain governance. In other words, there are
no associations or people who monitor the performance of kinnow producers in meeting
standards demanded by consumers. This represents how weak the kinnow value chain
governance is in the state. Generally, the kinnow value chain governance system is very weak in
the light of the three arms of governance. Without a strong governance system both within and
without the chain, maintaining marketing efficiency of kinnow value chain will be very difficult
in coming years.

Table 8: Kendall’s coefficient of concordance ranking of marketing constraints by kinnow
producers

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Mean Rank</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perishability of kinnow</td>
<td>3.83</td>
<td>1st</td>
</tr>
<tr>
<td>Far off location of markets</td>
<td>4.57</td>
<td>2nd</td>
</tr>
<tr>
<td>Inadequate market intelligence</td>
<td>4.84</td>
<td>3rd</td>
</tr>
<tr>
<td>Poor roads</td>
<td>5.35</td>
<td>4th</td>
</tr>
<tr>
<td>Price fluctuations</td>
<td>5.40</td>
<td>5th</td>
</tr>
<tr>
<td>Middlemen dictating of prices</td>
<td>5.54</td>
<td>6th</td>
</tr>
<tr>
<td>Bulkiness of kinnow</td>
<td>5.83</td>
<td>7th</td>
</tr>
<tr>
<td>Inadequate storage facilities</td>
<td>6.52</td>
<td>8th</td>
</tr>
<tr>
<td>Inadequate processing facilities</td>
<td>6.24</td>
<td>9th</td>
</tr>
<tr>
<td>Inadequate knowledge of quality standards</td>
<td>6.90</td>
<td>10th</td>
</tr>
</tbody>
</table>

Test Statistics

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall’s W</td>
<td>0.095</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>85.400</td>
</tr>
<tr>
<td>Df</td>
<td>9.000</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Source: Author’s own computation based on field data, 2015

The results show that perishability of kinnow is the first rank constraints among the constraints
identified. The second constraint is far off location of markets according to farmers whereas the
third constraint is inadequate market intelligence. Market intelligence is a problem not only to
farmers but most of the actors that trade. The least of the constraints faced by farmers is
inadequate knowledge of quality standards. This is because most farmers give out their farms
directly to pre-harvest contractors hence are not interested in quality and standards in
marketing. The Kendall’s W which indicates the extent of agreement among farmers with respect to the rank constraints is 9.5 percent.

3.11 Rank constraints by wholesalers

The results from table 9 below show the rank constraints according to the wholesalers interviewed. The results show, perishability of kinnow is a major problem faced by kinnow wholesalers, hence ranked first among all the constraints. This is because kinnow is highly perishable such that within seven (7) days after harvesting, the kinnow starts deteriorating; even after waxing it could take only about a month before it starts deteriorating.

Table 9: Kendall’s coefficient of concordance ranking of marketing constraints by wholesalers

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Mean Rank</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perishability of kinnow</td>
<td>1.13</td>
<td>1\textsuperscript{st}</td>
</tr>
<tr>
<td>Far off location of markets</td>
<td>3.50</td>
<td>2\textsuperscript{nd}</td>
</tr>
<tr>
<td>Cost of transportation</td>
<td>3.50</td>
<td>2\textsuperscript{nd}</td>
</tr>
<tr>
<td>Inadequate market intelligence</td>
<td>3.88</td>
<td>3\textsuperscript{rd}</td>
</tr>
<tr>
<td>Price fluctuations</td>
<td>4.50</td>
<td>4\textsuperscript{th}</td>
</tr>
<tr>
<td>Seasonality of kinnow</td>
<td>4.50</td>
<td>4\textsuperscript{th}</td>
</tr>
<tr>
<td>Inadequate processing facilities</td>
<td>7.38</td>
<td>5\textsuperscript{th}</td>
</tr>
<tr>
<td>Inadequate post-harvest infrastructure</td>
<td>7.63</td>
<td>6\textsuperscript{th}</td>
</tr>
</tbody>
</table>

**Test Statistics**

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall’s W</td>
<td>0.76</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>42.42</td>
</tr>
<tr>
<td>Df</td>
<td>7.00</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>0.00</td>
</tr>
</tbody>
</table>

*Source: Author’s own computation based on field data, 2015*

Cost of transportation is the second major constraint. This is because, most wholesalers are also pre-harvest contractors hence had to move products from kinnow orchards. Again, most of the wholesalers do not sell their produce in the production areas but in cities of the state and cities in other states like Delhi, Bangalore, etc., which have high demand of Rajasthan kinnow, hence the high cost of transportation incurred. Inadequate market intelligence is also a major constraint faced by wholesalers, especially, market intelligence on kinnow from other states. The Kendall’s ‘W’ of 0.76 indicates that there is 76 percent (76%) agreement between the respondents in the ranking of the constraints.

3.12 Rank constraints by exporters

The results from table 10 below shows the rank constraints according to the processors interviewed. The results show, meeting export quality standards of different countries is the major problem. This is because different countries have different quality standards for kinnow fruits. Commenting on this, one exporting company retorted, the quality standards that are exhibited by our farmers who are suppliers is highly not encouraging, hence it becomes a major problem. In other words, farmers are not aware of the quality standards demanded by these countries. They added, even with careful selection of fields and selective picking, one can get approximately, only 25 percent (25%) of fruits that meets desired standards by these countries.
Table 10: Ranking of marketing constraints by exporters

<table>
<thead>
<tr>
<th>Constraints</th>
<th>Mean Rank</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting export quality standards of different countries</td>
<td>1.50</td>
<td>1&lt;sup&gt;st&lt;/sup&gt;</td>
</tr>
<tr>
<td>Seasonality of kinnow</td>
<td>2.50</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Location of farms</td>
<td>3.00</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inadequate post-harvest infrastructure</td>
<td>3.00</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
</tr>
<tr>
<td>Price fluctuations</td>
<td>5.00</td>
<td>4&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Cost of transportation</td>
<td>6.00</td>
<td>5&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inadequate government support</td>
<td>7.00</td>
<td>6&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inadequate processing facilities</td>
<td>8.00</td>
<td>7&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inadequate market intelligence</td>
<td>9.00</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>Perishability of kinnow</td>
<td>10.00</td>
<td>9&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**Test Statistics**

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kendall’s W</td>
<td>0.958</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>17.238</td>
</tr>
<tr>
<td>Df</td>
<td>9</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>0.045</td>
</tr>
</tbody>
</table>

**Source:** Author’s own computation based on field data, 2015

In addition, seasonality of kinnow was ranked second among all the constraints. Inadequate post-harvest infrastructure was ranked third constraint. Seasonality of kinnow and price fluctuations in the international markets are also major constraints to the exporters. The degree of agreement between exporters is 95.8 percent.

4. Conclusion and Recommendations

The results have shown that, the kinnow value chain is dominated by pre-harvest contractors. About ninety (90) percent of the farmers interviewed either sell out their orchards to pre-harvest contractors or harvest the produce and sell to pre-harvest contractors. Exporters and processors buy from farmers indicating a new value chain potential for farmers. The kinnow markets are less concentrated hence efficient. Generally, farmers do not undertake value addition before selling kinnow whereas wholesalers undertake value addition such as grading & sorting, and waxing. Furthermore, the results show that perishability of kinnow is the first ranked constraint among the constraints identified by farmers and wholesalers. Far off location of markets is a major problem faced by kinnow farmers whereas that of exporters is, meeting export quality standards of different countries.

In the context of policy implications, firstly, the Government of Rajasthan and India should invest in cold storage warehousing, road infrastructure, processing factories and other infrastructure in order to enable farmers to either store their produce for better prices or sell to different actors who can offer better prices. Secondly, the government should endeavour to give transportation subsidies to farmers whose farms are far away from major markets to encourage them to sell their produce to other actors other than pre-harvest contractors. Furthermore, government should also, in conjunction with various agricultural offices, train farmers in grades
and standards needed by exporters and other actors who offer higher prices than pre-harvest contractors. Finally, research should be conducted to determine the potential of processing kinnow into other products which have longer shelf life so as to limit the direct sales of produce to pre-harvest contractors.

REFERENCES


Anonymous, (2014). National Research Centre for Kinnow, Govt. of India, Nagpur.


