The Critical Issues in the Supply Chain Management of Kashmiri Saffron

By

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Abstract
The saffron in Kashmir, which is considered as king of spices has a great market potential at the national as well as at global level; Moreover, Kashmir has the privilege of being only place where high quality saffron (based on crocin and picocrocin content) is grown. No doubt the Kashmir has the legacy of enjoying the status of producing premium quality saffron, but in reality there are many supply chain problems which has direct impact on its final value of the product. Further, lack of awareness among the consumers has diminished the brand value of saffron. In this paper critical issues have been identified at different levels of Supply Chain of Saffron and if these issues are dealt properly, then it is possible for the marginal farmer to get its right value. So, it is important that all stakeholders should work in sync at all strategic levels which will not only help in reviving the existing saffron industry in Kashmir but will also give its deserving space at global level.

Key words: Kashmiri Saffron, Value added product, SCM, System Model

1.1. Introduction:
Saffron (Crocus sativus Iridaceae) is a cash crop known in India as Kesar, and grown in Kashmir region with its annual production approximately 5,000 kg (5 metric tons) (Dar, 2014) and generates good source of income for the state economy. The flowering starts in autumn (mid-October month) and has three main parts; namely Stigma, petal and anther. The purple flower has three petals and three sepals along with six golden crimson stamens. Approximately 1 kg of flower produces 12 g of dried saffron spice known as golden spice and its cultivation in Kashmir dates back to 750 AD (Plessner et al, 1989). The collected stamens are dried for commercial use and is considered as the most expensive spice in the world. It has a unique sweet smell and is used in various recipes as coloring and flavoring agent; Moreover, the stigmas are put in warm water which becomes golden-yellow solution and is used as high quality fabric dye; moreover is added to Kahwa - the traditional Saffron Tea along with granulated almonds and cashew nuts popular in Kashmir and other Central Asian countries used for ceremonial occasions. Saffron have many medicinal properties but general public including the growers in Kashmir are unaware about its uses. At the Global level, saffron is intensively cultivated in Iran (approximately 90 percent world production), Greece, Spain, Morocco, Azerbaijan, Italy, France, Switzerland, Israel, Pakistan, China, Egypt, Turkey, Japan, Afghanistan, Iraq and recently in Australia (Mortazavietal, 2012). The total production at global level is approximately around 300 tonnes a year (Lunsford & Zanger, 2009) and Kashmir contributes about approximately 2 percent high quality saffron which is mostly utilized for domestic consumption (Nehvi et al., 2005) however, a very small proportion is exported to US, Germany and Dubai also. This is an accepted fact that the quality and quantity are inversely proportion to each other and the same is case with Kashmir where quality saffron is produced but of lesser quantity and reverse is true of Iran where quantity is high based on mass production system and caters approximately 90 percent of world production but quality wise it is inferior based on Crocin and Picrocrocin content as compared to Kashmiri Saffron. Rest is contributed by other countries which speaks volumes about the potential of the saffron expansion both horizontal and vertical expansion in other countries in general and India in particular.
1.2. Composition:

The major odour components include (safranel), taste (picrocrocin) and pigment (crocin) and are restricted to the red stigmatic lobes of the saffron flower (Himeno & Sana, 1987; Neghbi et al., 1989; Plessner et al., 1989). The yellow stamens of the plant are also harvested but is less in aromatic and color properties and is considered as low value saffron due to low Crocin and Picrocrocin content. The quality saffron is the orange-red stigmas of the saffron plant which is exclusively exported to pharmaceutical industries particularly to Germany. The high quality saffron contains Crocin (colour) 190 mg, Picrocrocin (flavour-bitterness) 70 mg and safaranal (aroma) 20-50 mg which remains same in all grades, however, the red stigma contains crocin 220 to 250 mg based on ISO-3632- for saffron (Anonymous, 2009). The purity of Saffron is determined by its bitter taste and iodoform or hay-like fragrance which makes any food item a special one. Energy provided by 100 gm of saffron is 310 kcal. Nutritionaly, the saffron has been reported to contain per 100 gm (Guleria, 2012; USDA national nutrient database, 2012), as mentioned in table 1.1.

Table 1.1: Composition of Saffron.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Composition</th>
<th>Quantity</th>
<th>S. No.</th>
<th>Composition</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carbohydrate</td>
<td>65.37 gm</td>
<td>12</td>
<td>Vitamin C</td>
<td>80.8mg</td>
</tr>
<tr>
<td>2</td>
<td>Fibre</td>
<td>3.90gm</td>
<td>13</td>
<td>Calcium</td>
<td>111mg</td>
</tr>
<tr>
<td>3</td>
<td>Fat</td>
<td>5.85 gm</td>
<td>14</td>
<td>Iron</td>
<td>11.10mg</td>
</tr>
<tr>
<td>4</td>
<td>Saturated Fat</td>
<td>1.86gm</td>
<td>15</td>
<td>Magnesium</td>
<td>264mg</td>
</tr>
<tr>
<td>5</td>
<td>Mono Saturated Fat</td>
<td>0.43gm</td>
<td>16</td>
<td>Phosphorus</td>
<td>252mg</td>
</tr>
<tr>
<td>6</td>
<td>Polyunsaturated Fat</td>
<td>2.06gm</td>
<td>17</td>
<td>Potassium</td>
<td>1724mg</td>
</tr>
<tr>
<td>7</td>
<td>Protein</td>
<td>11.43gm</td>
<td>18</td>
<td>Sodium</td>
<td>148mg</td>
</tr>
<tr>
<td>8</td>
<td>Water</td>
<td>11.90gm</td>
<td>19</td>
<td>Zinc</td>
<td>1.09mg</td>
</tr>
<tr>
<td>9</td>
<td>Vitamin A</td>
<td>530IU</td>
<td>20</td>
<td>Selenium</td>
<td>5.6mg</td>
</tr>
<tr>
<td>10</td>
<td>Vitamin B1</td>
<td>0.115mg (10%)</td>
<td>21</td>
<td>Vitamin B6</td>
<td>1.101mg</td>
</tr>
<tr>
<td>11</td>
<td>Vitamin B2</td>
<td>0.267mg (22%)</td>
<td>22</td>
<td>Ash</td>
<td>5.45mg</td>
</tr>
</tbody>
</table>

Source: USDA national nutrient database.

1.3. Medicinal Uses:

The stigmas of the flower is normally used for its medicinal properties mostly in traditional medicine and has been used for aphrodisiac, antispasmodic, expectorant, stomach problems and for relieving tension. The medicinal properties of saffron is due to presence of number of its compounds having strong antioxidant properties such as crocetin, crocins and other substances (Maryam et al., 2013). In Iran, it is also used to treat insomnia, measles, dysentery, jaundice, cholera, skin problems etc. and moreover, it is used as a medicine for nervous system, heart, kidney and balancing menstruation. In addition, it is used as an anti-bacterial, antiseptic, anti-fungal and anti-flatulent agent. Moreover, saffron is also used as a protective agent against chromosomal aberration, a modulator of lipid oxidation, anti-seizure for reducing blood pressure and also used in treatment of psoriasis (Bhargavak, 2011). Khare, (2004) reported that at low doses, it causes the stimulation of the pregnant uterus and in larger amounts it can cause constriction and spasm. It has been reported that the saffron reduces level of glucose, triglycerides, LDL cholesterol in blood, increases energy expenditure and fat oxidation, as well as lower body weight (Maryam, 2013; Bhargavak, 2011; Khare, 2004).

1.4. Objectives:

i) To study the supply chain of Kashmiri Saffron.

ii) To identify the various missing values in the supply chain of Kashmiri saffron.

iii) To give suggestions for developing value added Kashmiri saffron which will benefit all stakeholders in the Supply Chain.
1.5. Methodology:

In Kashmir province, Pampore town is famous for high grade saffron which is situated at a distance of 15 kilometers (south) from Srinagar city in J&K state (India). This spice is also grown, though in a limited scale, in Kishtwar (Doda) of Jammu region and Budgam of Kashmir region. The Pampore town alone produces an average of 2,128 kilograms of saffron every year. In Jammu & Kashmir state, district Pulwama (J&K) accounts for 78.91 per cent, Budgam 12.27 per cent, Srinagar, 7.32 per cent and Doda district, 1.5 percent (Anonymous, 2012). The supply chain of Kashmiri saffron was studies under the system model which consists of input, processing and output stage along with value chain model (Porter, 2015). The research is exploratory in nature and sample frame of the research study was three major saffron producing districts of Kashmir region which are Pulwama, Srinagar, and Budgam districts. The data was collected under Random cum judgmental sampling method wherein more than 280 interviews were conducted with the different stake holders of the supply chain members in three years’ time period and also in association with UGC sponsored Saffron Project Supervisor, Department of Food Technology, I. University of Science & Technology Awantipora. The data was collected from farmers, agents (middlemen of distribution channel), retailers, agricultural scientists, Government officials and consumers through personal interview method.

2.1. Supply Chain

Supply Chain Management (SCM) of saffron value chain process, is the integration of key business processes from input stage to output stage that delivers value directly or indirectly to serve the needs of consumer (Lambert et al, 1998; Chopra & Meindl, 2010; Gunasekaran & Ngai, 2004), where system wide costs will be minimized (Simchi-Levi et al, 2000) at each level and value is added to the final product at each stage for final delivery to customer (Porter, 1990) so that customer will be not only satisfied but will be also delighted (Kotler & Kaller, 2006). Supply chain, including communication among members can be divided into three flows: flow of goods, funds flow and information flow. Thus, each step from supply chain is linked through the flow of goods, information and funds. These flows are shown in the form of agricultural product supply chain in the picture below (fig. 1). In figure (1) input values/ raw values provided to farmers by suppliers which is processed and then saffron produced will be offered to consumers by product vendor. This shows the flow of goods from the input stage to output, i.e. consumer and on the other hand, the money value is returned to the farmer. The information about the characteristics of goods, needs and tastes of consumers also must be exchanged between members of chain (information flow). SCM is the integration of activities shown in the fig.

Fig. 1: The supply chain of saffron (Crocus Sativus l.).

The key actors are suppliers (including bulb and input traders), farmers, middlemen and village-level traders, wholesalers, processing companies, exporters, and retailers.

2.2. Critical Issues in the Input Stage:

Due to Pampore town’s proximity to the capital city of J&K in the region, it has been impacted by rapid urbanization towards the south of Kashmir on national highway. Many acres of land once
reserved for saffron are being developed into new constructions which resulted in rapid decrease of
saffron land and hence prompted the state government to pass a law banning the sale of saffron land for
any other purpose (J&K Saffron Act-2007). Despite, passing the law to protect the saffron land but still
the small agri-farmers sell their land for one or another purpose due to low returns from the crop.
Moreover, the presence of cement plants around the Pampore area is also the biggest threat to the
saffron production; Many farmers believe that the production of saffron has decreased by almost one to
two kg per hectare due to the presence of cement dust in nearby areas like Khrew, Khanmoh and
Wuyen area (Kashmir) which are very nearer to the saffron fields.

Saffron cultivation is on around 3200 hectares in the Kashmir, with an average productivity of 2
kg to 2.5 kg per hectare, (Anonymous, 2011) and in the year 2017 it was just 1.5 kg (Mudasir, 2017)
which is quite low as per the international standards (6kg to 8 kg). Currently, over 16,000 families
living in 226 villages in Kashmir (9916 families are beneficiaries under saffron mission, Anonymous,
2018) are engaged in saffron farming (Anonymous, 2011) but low land holding remains an issue
(Gandhi, 2012). As per official record, 61 per cent of the farmers are holding below 0.5 hectare, 26 per
cent between 0.5 to 1 hectare and 13 per cent above one hectare (Anonymous, 2010) which means that
the annual yield does not suffice the livelihood needs for a majority of the farmers. Which compels
these farmers to sell their land for some other business opportunities as the profitability is marginal.
It was reported that traditionally (in 1980’s) land preparation was a cumbersome process but production
was relatively more (3 kg to 4 kg per Ha) as farmers used to plough land twenty one times before
sowing of corm. After ploughing, the crop land used to be of just dust which used to retain high
moisture content in the soil based on high capillary properties and used to withstand even the dry spell
of the season. Nowadays with the introduction of new technology, farmers have just adopted four
ploughing maximum per season for the preparation of land which is not sufficient for saffron
production and its cost have escalated over a time period. Now in the current century when average
temperature is already on the higher side, farmers largely rely on rain for irrigation and a deficit often
leads to crop failure. In the next stage, corms are treated with fungicides which is right now provided
by the Agricultural Department free of cost under national saffron mission and then sowed in the field
on a particular day in the month of August under the supervision of J&K Agricultural Department and
if that day happened to be rainy then sowing is total waste as traditional practice was to sow the seeds
in total dry weather in the month of August. Secondly, farmers do not follow any grading of corms on
the basis of size- small and large (Nehvi, 2010; Salwee & Nehvi, 2013) which is one the reason of poor
flowering saffron plant and the recommendations of the department is to sow only big size corm which
gives flowering in the same year but has life cycle of only four years as in the fourth year multiplication
of corm take place automatically. So farmers need to be trained regarding optimizing the plant
population, no doubt research claim that this practice gives good yield in Iran but in Kashmir, farmers
claim that their yield is still stagnant at 2 to 2.5 kg per hectare. Traditional practice as claimed by many
farmers, was sustainable and productive approximately 3 kg to 3.5 kg as they used to sow small sized
corms which used to flower in the next year and average life cycle used to be at least ten years and
then farmers used to grow pulses for next two years in such fields so that soil could become again
nutrient rich and then saffron corms used to be sown again. Even in some cases farmers claim that the
life cycle used to extend even up to twenty years. During survey, farmers claim that experts advise them
to plant only big size corm of random weight, then what will happen to small size corm which is a total
loss and automatically will add up cost to the final product. In addition, crop is badly affected by the
weeds and during crop growth, de-weeding of saffron fields is not generally practiced as a result
saffron crop struggles for nutrients which results in retarded growth ultimately affects productivity.
Nehvi, et al, (2004) reported that there are 21 species of weeds in Kashmir whereas in Iran
184 species of weeds has been found in saffron farms (Rashed-Mohasel, 1990) which has direct impact
on saffron production. It has been reported in South of Pampore town-Tral Area of Kashmir in the late
years of 1990’s, that rodents destroyed the corm of saffron fields and now the scene of scenario is
that hardly anybody is practicing this crop in that area which has decreased the farm land to larger
extent.
2.3. Critical Issues in Processing Stage:

The cultivation of saffron needs temperate climate with adequate rainfall as optimum flowering takes place at a temperature around 17 degrees and the soil should be enriched with organic matter (Golmohammadi, 2014; Giri, et al, 2008; Kafi et al, 2006). Further, the plant during lean seasons needs the climate in summer and dry and cold weather in winter which should be supported by dry, calcareous, aired, flat and open land without trees. The soil must be equilibrated in organic material which will help in minimizing erosion, and water should be drain out so that the bulb is not damaged. Moreover, it was reported that corm rot is an important disease of saffron in Iran affecting the productivity (Jafarpur, 1991) and same rot has been also reported in Kashmir.

The land ploughing starts in ending June and then sowing takes place in the months of August, wherein the bulbs are placed in ridges of about 20 cm depth and the distance between the bulbs should be at least of 10 cm. It is necessary to maintain nutrients in the soil for successful crop production and the organic manure is best to maintain the product value of international standard. It was found during the survey that the farmers mostly lack the awareness about the same and they mostly use the inorganic manure which not only diminishes the product value but also the soil value for the crop production in the long run. Now J&K agricultural department is encouraging the farmers for organic farming by adding compost to enrich the fields with natural nutrients and retain moisture for better productivity but the visibility of high production is bleak. The sowing of bulbs is laborious process as it is done by hand, which increases the labour cost and finally the total cost (Kotler, & Keller, 2015).

The harvesting normally takes place in the last week of October and beginning of November month. The flower of saffron blooms at dawn and is quickly plucked from the plant because it withers quickly and the stigmas lose colour and aroma. Because of this reason, flowers are collected before 10 a.m. in the morning, which is significant labor intensive job as it adds the labor cost to the final product. The delay in picking saffron flowering is again direct loss of value to the final product. It has been found that more than 85,000 flowers are needed to obtain just one kilo of saffron which gives us an idea of the hard work associated with the final product (Golmohammadi, 2014). After plucking the flowers, the stigma must be dried immediately to keep its quality and drying must be done under proper sunlight to achieve the right moisture content in the final product and if it is too moist it may get infected with fungus, and if saffron is too dry it may break easily and turn into powder. Hence, in either case, a farmer is supposed to maintain the balance between the two in order to maintain the final value of the product that too without using any technology. Moreover during processing stage many critical issues are hampering the production of saffron in Kashmir.

i) Lack of Irrigation Facility:

There can be many reasons for diminishing production of saffron but one major reason is due to erratic rainfall and consequent drought like conditions that are now a regular feature in Kashmir. The whole saffron land area (3265 ha of land as per official records and 8000 ha land as unofficial sources) is rain fed and artificial irrigation is being introduced now but at snails race under National Saffron Mission, Government of India initiative. In Kashmir, the production is stagnant at 2.5 kilogram /ha which is very low in comparison to Afghanistan which produces a yield of 6 kilograms/ha, and Iran 8 kg to 10 kg (Qaraeen, 2009). The best scene is that in war ravaged Afghanistan, saffron was introduced under World Bank project in 2004 and are showing tremendous results. Moreover, in Spain, where sprinkle irrigation is practiced has a yield of approximately 8 to 10 kg/ha. (Rashed-Mohasel, 1990). In the comparative scenario, Kashmiri marginal farmer is facing huge financial loss which prompts them to sell their land in the saffron belts and makes better economic sense than to continue with this agricultural practice.

ii) Iranian Saffron Makes Inroads into Kashmir:-

Saffron produced in Iran based on mass production system, is cheaper than compared to Kashmiricounterpart; many unscrupulous Kashmiri traders sell Iranian saffron under the brand name
of Kashmir by mixing the two in the ratio of 1:3 (one portion of Kashmir saffron and three parts of Iranian saffron) thereby diminishes the brand value of Kashmiri saffron in the international market. One kilogram of Iranian saffron is sold at Rs 70,000-75,000 while Kashmir saffron fetches a price of more than Rs 1.50 lakh in Indian market. Which has direct impact on purity value of “Kashmiri saffron” in Indian, and international markets, and has a direct loss to the Kashmiri farmer particularly to the marginal one.

In addition there are weighing inconsistencies which puts the farmers at a real disadvantage while selling saffron in Kashmir. As the Kashmiri traders (middle man) buy saffron from source (farmer) under traditional weighingsystem of tolas (comprising 12.75 grams), whereas later on they sell the same onwards under normal standard terms of 10 grams as one tola. In the end, if a farmer sells one kilogram of saffron to a local trader he loses 2.75 grams per tola (product value) in the process which is a huge loss to industry at grower’s level. So Government is supposed to intervene in this issue which has failed so far in doing so.Moreover, The state government can take initiative for Geographical Indicator (GI) in order to differentiate Kashmiri Saffron from the rest of the world (Natash, 2015).

2.4. Critical Issues in Output Stage:

The moisture content of stigmas is of high level, so it is mandatory to dry them for its good preservation, followed by roasting process, in which the stigmas gets final shape with bright red, rigid and without wrinkles. This roasting process reduces stigmas to 1/5 of the original size, which means for one kg of raw stigmas will give 200 g of saffron ready for consumption. For its perfect preservation, saffron is stored in big wooden trunks lined with metal plate inside protecting it from heat, cold and specially moisture.

It has been reported that 450,000 stigmas are needed to make 1kg of saffron, as each flower has only 3 stigmas, that means 150,000 flowers per Kg of saffron and the whole separation is done by hand i.e. labour cost, which is the big cost factor in the supply chain of saffron and can be minimized if labour is replaced with standardized technology. Moreover, on an average it takes a person approximately one hour to pick 1,000 flowers i.e. 125 hours per Kg. Then it takes a person approximately two hours to remove the stigma of 1,000 flowers i.e. 300 hours per Kg (Qaraeen, 2009; Golmohammadi, 2012; 2014). So this is a major cost value in the supply chain and in addition whole process is technical which further adds its cost.

Normally in Kashmir traditional air drying of saffron is done, which can take minimum one week to complete drying process subject to the sunny weather otherwise it can develop fungus. Air drying is a limiting factor due to poor sun heat waves in November (winter) in Kashmir which also increased the risk of fungal growth in these stigmas, whereas in Iran, Spain and also in Afghanistan, electric drying and dehydration technique is used to dry the saffron which saves their lot of time and adds value to the final product but Kashmir is lagging behind in this technology.

2.5. Critical Issues in Marketing Stage:

Poor marketing structure which is susceptible and vulnerable to the onslaught of middlemen and commission agents is another important issue in saffron decline. More than 67 percent of the saffron growers sell their produce to the middlemen and commission agents, whereas, percentage of farmers selling their produce directly to whole sellers in Delhi, Amritsar, Calcutta, Mumbai etc. is just 20 per cent and through cooperative societies, it is only 10 per cent (Munshi, 2002). The involvement of too many agents in the channel system results in quality deterioration of saffron due to addition of adulterants thus reducing the spot price of saffron. The same difficulty has been also reported in Turkey (ibid). Approximately twenty different channels are used in Iran for saffron delivery to the end user (Ghorbani, 2008), however, in Kashmir only a couple of the channels are used and is not grown on professional lines. Moreover, the channel system in Kashmir is mostly dominated by middlemanship, with the result channel length increases the total cost of the product (Rosenbloom, 2007) and minimizes the profit margin to the agri-producer (Kotler, 2011) hence the cause of migration for most of the farmers in the sector. Moreover, issues related to logistics and supply chain relationships have been
largely ignored (Hultink et al, 1997). The government is trying to establish Saffron Park in the vicinity of Pamporetown with the purpose to eliminate the middleman ship in the channel structure which is right now grabbing maximum profit and is a big loss of value in the final product of saffron.

With no effort being made to get Saffron listed in Indian commodity exchanges, as the domestic industry faces an uncertain future. The government has not yet approached either the Multi Commodity Exchange of India or National Commodities Exchange, which carry commodity exchange trade in India. The future trading through commodities exchange can ensure due returns to farmers and remove their economic deprivation. A farmer can sell a future contract of his produce at a market determined price. The trading protects the farmer from price drops and the buyer from price rises. Producers can sell directly to the exchange, which assures instant and guaranteed payment.

3.1. Suggestion and Policy Implications:

In Kashmir, there are many potential areas where saffron can be grown on both horizontal and vertical expansion lines by adding values at different levels in supply chain and can give a fillip to this industry. Unless, small saffron growers will not get awareness with respect to product, market conditions, demand condition, technological advancements, etc. from input to output stage, it is very difficult for a farmer to fetch premium value for his product and if processing can be experimented on the basis of medicinal properties, new value added product can be conceptualized to increase its product line in the market. Moreover, the need of the hour is that the substantial branding, advertising and distribution supported by right timing and targeting should be is done in both domestic and international market which is mostly missing due to lack of expertise and knowledge among the saffron growers. The grower gets exploited by the middleman in the channel distribution so it is mandatory to promote awareness related to web based marketing. Moreover, strategies should be designed to establish the identity based product on its quality and uniqueness in comparison to its competitors at the international level so that brand reputation and product positioning of Kashmiri saffron will get enhanced. In this regard, the state government should at least initiate the process for getting Geographical Indicator (GI), which will automatically will help in branding of Kashmiri saffron at global level. At the initial stage, domestic consumers should be targeted to identify Kashmiri saffron as best quality saffron in the world and consequently during the process viral marketing should be introduced so as to develop ripple effect in the world market. No doubt, there are efforts for declaring Saffron as a national product so that it is sold under the ‘brand Kashmir’ but on ground results are abysmally poor. In addition, there is need to create a Saffron Board on the pattern of other boards like rubber, tea, coffee board etc which will try to minimize the gaps between different stages of SCM rather than just giving subsidies.

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