An Overview of the Production Practices and Trade Mechanism of Saffron in Kashmir Valley (India): Issues and Challenges

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Abstract

Saffron is an important cash crop of Kashmir valley and the state offers India a credit of being one of the major saffron producing countries of the world, but since last few years the productivity and exports of this crop has virtually shown a declining trend. This research paper looks at available literature with respect to current practices followed in production and trade of saffron in Kashmir valley and highlights the flaws in these practices and stresses on the need for using modernized ways for increased production and productivity. It also highlights ample scope for maximizing the export of this crop provided the sincere efforts are made through organized way of marketing this product.

Keywords: Saffron, Cash crop, Kashmir, Productivity, Exports, Decline, Organized marketing.

Introduction

Saffron (Crocus sativus Kashmirianus), traditionally known as golden spice is the legendary crop of Kashmir valley of India and covers nearly 4% of the total cultivated region of the valley and delivers approximately 16% of aggregate agricultural income (Anonymous, 2008). Over the past several years, Kashmir has the virtual monopoly of saffron cultivation in the country as a valuable industrial/medicinal product and contributes a lot to its agricultural economy. It is the best quality saffron in the world owing to its rich colour and flavour and has been conventionally associated with the well-known Kashmiri Cuisine and has for times been in good demand (Banarjee, 2009; Chand, 2005).The time at which saffron was introduced to Kashmir-India is not precisely known, although evidences from 'Rajtarangini' written by historian 'Kalhana', indicates its presence in Kashmir even earlier thanthe government of Lalitadatiya during 750 AD. The golden spice known as 'Kum Kum', and 'Kaserin Sanskrit and 'Kung' in Kashmiri language is cultivated especially in arid and semi-arid areas in districts likePulwama(74.64%) comprising Pampore, Balhuma, Wayun, Munpur, Mueej, Konibal, Dus, Zundhur, Letpur, Sombar, Baras, Ladu and Khrew; Badgam (16.13%) comprising Chadura, Nagam, Lasjan, Ompora and Kralpura; Srinagar (6.68%) comprising Zewan, Zawreh and Ganderbal; Doda (2.50%) comprising Poochal, Namil, Cherrad, Huller, Blasia, Gatha, Bandakoota and Sangrambatta, and some areas of Anantnag district comprising Zeripur, Srechan, Kaimouh, Samthan and Buch (Amjad, et al., 2010). Even though successful attempts were made to introduce saffron in temperate areas of other districts like

Kishtwar of Jammu region, production has been achieved only on a limited scale. However significant success has been reported from some areas of Doda and Udhampur districts (Munshi, et al., 2002).

Table-1 District Wise Area, Production And Productivity of Saffron in J&K

District	Area (in percent)	Production (MT)
Pulwama	2346 (74.64)	4.41 (7.12)
Budgam	507 (16.13)	1.27 (22..88)
Srinagar	210 (06.68)	0.38 (05.54)
Doda	80 (02.50)	0.20 (02.91)

Source: (Directorate of Agriculture, Jammu and Kashmir Division)

In Kashmir, saffron is grown in uplands (termed in the local dialect as 'Karewas'), which are lacustrine deposits located at an altitude of 1585 to 1677 m above mean sea level (amsl), under temperate climatic conditions (Kanth, et al., 2008). The soils are heavily textured with silty clay loam as the predominant texture in upper horizons and silty clay in lower horizons. The soils are well drained and calcareous in nature with average organic carbon and calcium carbonate contents of 0.35% and 4.61% respectively. The soil is slightly alkaline with pH ranging from 6.3 to 8.3 and with electrical conductivity between 0.09 and 0.30 dsm-1 (Nazir, et al., 1996; Ganai, et al., 2000; Ganai, 2002). Higher yields coincide with higher pH values (Shinde, et al., 1984).

In Kashmir valley the total area under saffron crop production is around 3063 hector with an annual production of nearly 11.2 (MT) and productivity level of (2.71 kgs/hect.).

Table-2 Ye ar wise Production and Productivity of Saffron in J&K

Year	Production (MT)	Productivity (Kgs/hect.)
2010-11	9.85	2.52
2011-12	9.97	2.56
2012-13	10.03	2.60
2013-14	10.47	2.62
2014-15	10.83	2.65
2015-16	11.20	2.71

Sources: (Financial Commissioner R evenue, Jammu & Kashmir; Directorate of Agriculture, Jammu and Kashmir Division; Spices Board India)

With the current production and the annual productivity level, saffron is the one of the largest agro-oriented business activity in the region and ranks Kashmir-India second in terms of production and eighth in terms of productivity (Kgs/hect.) of saffron.

Table-3 Global Saffron Scenario (Year 2015)

Country	Area (hect.)	Production (MT)	Productivity (Kgs/hect.)
Iran	47000	238	5.06
India (J&K)	3785	11.20	2.71
Greece	1000	4.30	4.30
Azerbaijan	675	3.70	5.48
Spain	600	5.70	7.84
Afghanistan	600	3.00	5.00
Marocco	500	1.00	2.00
Turkey	100	0.40	4.00
Italy	29.4	0.24	6.16

Source: (Government sites of Agriculture departments of the countries discussed in table)

This is evident from the data that with high share in global area of production, the saffron exported from Kashmir-India to non-producing countries of the world is much lower than other saffron producing countries with less share in global area of production as a result of the adoption of substandard methods for its production and unorganized marketing techniques used for its export.

Table-4 Global Saffron Export Scenario (Year 2015)

Country	Export (% of Production)
Iran	80%
India (J&K)	3.9%
Greece	5%
Spain	32%

Azerbaijan	10%
Afghanistan	
Marocco	
Turkey	
Italy	4%

Source: (Government sites of Agriculture departments of the countries discussed in table)

Hence the methods of production and export techniques are considered a key to the success of Kashmiri saffron trade. Therefore it is very important to adopt a universal attitude in a mission mode to cover all the aspect related to its production and export problems. This will have a big impact on farmer's income and will result in establishment of Kashmiri saffron as a brand.

The literature available on production practices of saffron and its trade mechanism related to export is limited and researchers have partially investigated the problem. This research paper sheds light on the possible literature available related to production methods and export perspective of saffron and highlights the flaws of the adoption of substandard methods of saffron production and ineffectiveness of the existing marketing channels linked to its trade from Kashmir-India. Further it gives an understanding of the issues and challenges faced by people directly linked to this Industry from the point of produce till its availability to its end users. Hence the main objective of current study is to critically evaluate the avenues already explored by previous researchers on production practices and trade mechanism of saffron for better understanding of the effectiveness of the adoption of efficient and adequate methods for its sustainable production and appropriate marketing channels for its export. The research work is based on the data obtained from secondary sources like journals and periodicals, magazines, official records of state and central government, records of department of horticulture J&K state, revenue records of Jammu & Kashmir government etc.

Production Practices of Saffronin Kashmir valley

Saffron is commercially regarded as most expensive valued spice worldwide as being used in food industry as colorant, in textile industry as a dye or perfume and in pharmaceutical industry owing to its medicinal properties (Omidbigi, et al., 2003; Fernandez, 2007). In Kashmir, it is the main economy regulating factor as the state has the monopoly for production of quality saffron worldwide and is thus placed 2nd in the world after Iran. However Kashmir-India ranks much below that of Khorasan (Iran) in its production and productivity owing to its production system being followed in Kashmir.

In Kashmir-India, farmers use longer planting method of cultivation, under which saffron plants are left in soil for more than15 years leading to saffron corm decomposition (46%). The unsorted corms are further planted without sorting on the basis of weight and size resulting in to low saffron productivity (2.50 kg/ha) and fetching low economic returns. Panday, et al., (1979); Sadeghi, (1983) through their studies in Kashmir-India revealed a positive relationship between size of the corm and number of flowers per corm and weight of corm and the bulk of flowers per corm. The findings were further validated by the studies of Behnia, (1999) and Munshi, et al., (2002), who found that corms of smaller sizes do not flower in first year, while as corms of longer sizes (longer than 2.5 cm) flower more easily. Further the study of Nehvi, et al., (2008) revealed that corm weighing 1-2 grams do not flower in first year, while as corms weighing more than 10 grams flower earlier with better yield. In Kashmir-India farmers prefer substandard corms weighing 8 grams in weight and 2cm in size for sowing resulting in low flower yield and thus shrinking per acre productivity of saffron (Nehvi, 2004). In addition to this, the number of corms sown per unit area in Kashmir-India is much lower than Khorasan (Iran) resulting in to less plant population and accordingly low productivity (Hassan and Shah, 2002). For Example in Kashmir-India, 40-50 corms are sown per unit area compared to 150-250 corms being sown in Khorasan (Iran). Furthermore the frequency of corms hill being sown with respect to depth is also a determent factor for its productivity. Study of Amjad, et al., (2010) revealed that in Kashmir (India) a single corm hill is being sown at a depth of 10-15 centimeters compared to 10-15 corms hill being sown at a depth of 15-20 centimeters in depth in Khorasan (Iran). This could be an important reason for low yield of the Saffron crop in Kashmir valley-India.

Saffron production and productivity has also been linked to age (planting cycle) of the saffron field. Koul and Farooq, (1984); Negbi, (1999) and Nehvi,. et al., (2008) revealed through their individual studies that more productivity (14Kg/hect.) of saffron is achieved in less aged (4 yr. old) saffron fields, while less productivity (13Kg/hect.) of saffron is achieved in more aged (6yr. old) saffron fields. In Kashmir-India, average age (planting cycle) of saffron fields is more than 15 years, hence responsible for poor productivity (2.71Kgs/hect.). A large number of studies on planting cycle of saffron in Kashmir-India have also revealed significant results for productivity of saffron per hectare of field. Studies of Mir, (2002); Munshi, (2002);

Nehvi, (2004); Nehvi, et al., (2008); discovered a negative relationship between planting cycle in Kashmir-India and the productivity. These scientific studies established that longer planting cycle increases the biotic stress and thus abandons saffron productivity. The main biotic stress faced by saffron as a result of longer planting cycle is corm rot fungal infection caused by Fusarium monliformevar intermedium, Fusarium oxysporum and F. gladioli. This infection causes irregular patches below the corm scales and in few cases, the entire corm turns either into black powdery mass or into white fungal mass thus deteriorating the quality and hampering the yield (Sama, et al., 2000; Nehvi, et al., 2008). Besides the loss triggered by corm rot, parasitic nematodes pose a serious threat by infesting saffron growing soil of J&K and causing damage to corms by sucking the sap, causing necrosis in the roots and synergizing corm rot. An extensive research conducted in this regard by Zaki and Mantoo, (2008) found the percentage of infestation at Pampore area of Kashmir valley as 16.6% by Helicotylenchus Vulgaris, 14.6% by Xiphinema, 13.05% by Tylenchus, 10.7% by Tylenchorynchus, 8.8% by Pratylenchusthrornei, 5.8% by Aphelenchusavenae and 3.2% by Hemicriconemoides. Thus nematodes infestation has also become a major cause of concern owing to substantial production loss. Additionally the rodent and field rat infiltration has also evolved as a key challenge in saffron production in Kashmir-India as a result of deterioration in quality and reducing output. Rodents tend to stay in saffron fields due to availability of food material during fall months, when all other agricultural fields are crop-free and devoid of any grain to be used as food material by rodents. Studies of Wani, (2004); Ahmad and Sagar, (2006) and Manzar, et al., (2008) reveled that rodents damage to saffron corms ranges from10-50% o during the critical vegetative phase (November to May). The damaged corms are stolen as a food material and stored in neighboring fields for their use during summer months when saffron attains dormancy leading to pre-harvest corms loss. Rodent population is increasing day by day due to non-adoption of any systematic control measures by the farmers thus resulting in low saffron productivity and corm yield.Despite this, no efficient control method measures are currently being applied by farmers in Kashmir-India for corm protection and mass scale saffron production, which stipulates the need for adoption of better scientific control methods of saffron production and up gradation of saffron fields, horizontal expansion in nontraditional areas and thus a better yield of saffron.

The saffron fields

Saffron in Kashmir-India begins its vegetative growth from October to November and lasts till April. As a result of this saffron field go on unoccupied due to latency phase from April to September, thus providing space for weeds to multiply vigorously and grow more freely in unoccupied fields (Pir, et al., (2008). Tulipastellata belonging to Liliaceae family is commonly found weed in saffron fields of Kashmir-India, which multiplies strongly without any hindrance caused by saffron plants as being shorter in size and with little lateral spread (Pir, et al., 2008). This weed closely resembles saffron, as a result frequently goes ignored till it grows into large mats and occupies huge areas in the fields where the crop is growing (Alam 2007). Despite the presence of weed in saffron fields, no weeding is practiced by saffron growers except for harvesting certain weeds as feed by farm women in May and cattle feeding by some in August thus leading to low saffron productivity.

Saffron farming in Kashmir-India is under threat of extinction as a result of planting inadequate material which has posed a big challenge for saffron revival (Alam, 2007). The production system currently adopted predominantly targets at production of saffron flowers as commercial product without any immediate support for commercial corm production under regular public nurseries, as have been established for other crops (Anonymous, 2010). As a result, time bound availability of corms is not possible and if available, they are beyond the purchasing ability of common saffron growers owing to their high cost, therefore being a major factor in suppressing saffron cultivation. Hence adoption of feasible system for commercial corm production will ensure mass scale corm production and higher economic gains/unit area of saffron.

Irrigation facilities to saffron fields at proper timing have been a big concern for increasing saffron production and productivity. Saffron fields in Kashmir-India are rain fed and this industry is showing a steady decline, particularly during the last few years due to the lack of adequate irrigation facilities (Anonymous 2010). Although the requirement of water is low for saffron, its availability at proper time is essential for increasing its production and productivity (Munshi, et al., 2002; Anonymous, 2010). Study conducted by Srivastava, (1963) reported a significant contribution in the performance of the saffron crop production in the areas receiving adequate precipitation of 100-150 mm in the month of September/October, meeting the requirement of corms for a better flower yield. Rain fall of 100-150 mm is regarded vital and needed during pre-flowering stage (prior to generative phase) of saffron. However saffron production in Kashmir-India has been adversely affected during last few years due to erratic weather resulting in to scanty rains and irregular distribution. Though central and state government launched schemes in the form of Economic Revival of J&K Saffron Sector in 2010-11 and National Saffron Mission (NMS) in 2010 with the aim to support and facilitate better irrigation facilities through tube well/ sprinklers to increase the yield of the saffron and increase the returns to the farmers,all such

measures being made by government agencies would not bear the desired results unless facilities for guaranteed irrigation are created at pre-sprouting and pre-flowering stages. Also recommended by the studies of Nehvi, (2004) and Nehvi and Makhdoomi, (2007) that at least 10 irrigations at an interval of 7 days at the sprouting stage from 25th August to 15 September followed by 3 irrigations at the flowering stage from 8th November to 30th November on weekly basis should be adopted. Therefore effort should be made by the government to incentivize farmers for better and time bound irrigation in saffron fields to improve saffron yield.

Soil fertility which varies across the farm is an important variable that affects the saffron productivity. In Kashmir-India constant saffron production year after year without the supply of nutrients in the required quantities has reduced the fertility of saffron fields (Nehvi, 2004). The soil has turned nutrient deficient and as a result, size of the vigor of corms produced each year is reduced, affecting the flowering potential of saffron plants. Therefore the use of organic manures in proper quantities helps to replenish the soil with all essential nutrients for healthier growth of saffron shoots (Verma, et al., 2008). Study of Nehvi, (2004) revealed that the application of farm yard manure (17.5 tons/hect.) in combination with inorganic fertilizer N: P2O5: K2O (30:20:15 kg/hect.) to a quantity of saffron corms weighing more than 10 grams, planted at a density of 0.5 million corms per hectare caused saffron yield of 1.66kg/hect. Similar study by Kirmani, (2010) revealed even a better yield (3.5-3.6 kg/hect.) by increasing the quantity of farm yard manure from (17.5 tons/hect.) to (60 tons/hect.). Verma, et al., (2008) also reported the variation in saffron yield by changing the concentrations of farm yard manure. This study tested three different doses of farm yard manure (15, 20 and 25 tons/hect.) in a saffron field in Pampore tehsil of Pulwama District, with three different corm sizes (10grms, 10-15 grms and greater than 15 grms) at three different densities (0.5, 0.65, 0.80 million corms/hect.). Application of the 25 tons/hect of farm yard manure in saffron fields using heavier corms of 15 grams at a density of 0.5 million/hectare boosted the production of higher quality planting material with maximum proportion of flower producing corms. The treatment also revealed a significant impact on stigma length (3.8cm), number of leaves per mother corm (45) and on the length of leaves (19.0cm). Thus, it becomes clear that a tailor made approach needs to be adopted year after year for a better soil nutrient management as it is an important variable to boost the production and yield of saffron in Kashmir-India.

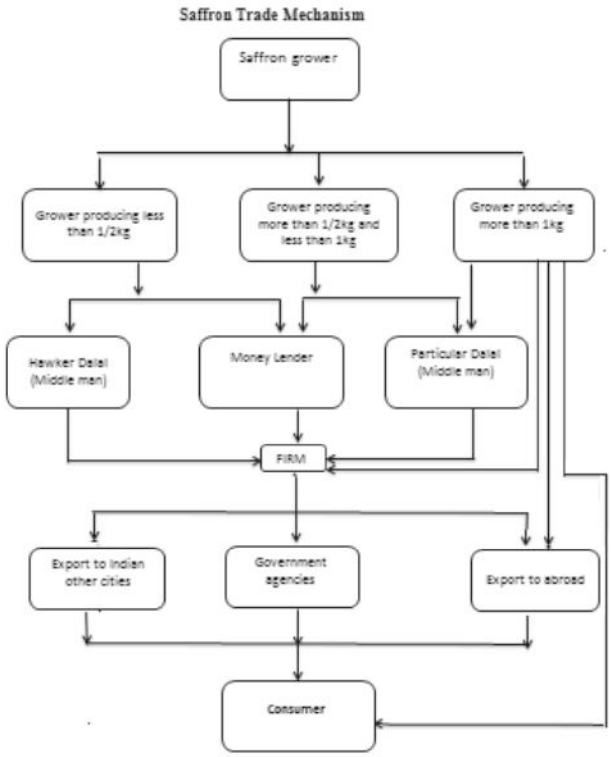
Post-harvest management of saffron is very important from production point of view. In Kashmir-India, poor post-harvest management during the production of saffron has posed many difficulties to the quality of saffron. Studies of Sama, et al., (2000) and Anwar, (2007) reported traditional post-harvest handling practices of saffron including picking of flowers, separation of stigmas and sun/shade drying practices being adopted in Kashmir-India has resulted in decrease of the quality of saffron crop. Nehvi, et al., (2005) stated that post-harvest handling of saffron predominantly the picking process is very critical to the quality of saffron. In Kashmir-India picking of saffron flowers is not done on daily basis, but once every four days usually before 9 a.m. Studies of Munshi, et, al., (2002) and Mir, (2002) highlighted the need for picking the flowers on daily basis owing to their shorter life period and delicacy for better quality and increased yield. Further, these studies necessitated the need for carrying the picked flowers in clean baskets without overload as that may prevent exposure of the saffron to pathogens and allow free air circulation and thus improve the quality. The separation of stigmas from stamens is also a vital stage in post-harvest management of saffron. In Kashmir-India separation of stigmas from the flowers is not done within the stipulated timings, which results in drop of crocin content and thus deterioration in quality of the saffron. Munshi, et, al., (2002) and Nehvi, et al., (2004) reported that separation of stigmas if done within 6-8hrs after picking, 95% of the saffron is recovered, if completed within 24hrs after picking, 50% is recovered and if the separation of stigmas is done after 24hrs of picking, whole saffron flower becomes a cake mass with no chances of recovery. Thus these studies highlighted the need for separation of stigmas from the flowers within the specified timings for a quality yield. The post-harvest drying process is perilous to the quality of saffron as measured by change in the quantities of secondary metabolites like; Picrocrocin, Crocin and Safranal (Sampathu, et al., 1984). In Kashmir-India, traditional drying practices have posed a bid threat to quality production of saffron as a result of degradation of colour, odour and bitterness imparted by pigments like rocin, saffranal and picrocrocin. Studies of Sama et al., (2000) and Kamili and Nehvi, (2005) revealed that adoption of quick drying process reduces the drying time to 3-4 hrs and maintains quality. Quick drying either by low cost solar heated dryers or by hot air dryers avert bio-degradation and oxidative destruction of the odouring material, crocin into crocetin which is a main issue with Kashmir saffron as farmers generally adopt drying under shade which takes 27-53 hrs to dry the product to a moisture level of 10% above than the recommended level of 8% through quick drying process, and thus leads to quality deprivation (Sama et al., 2000; Kamili and Nehvi, 2005). At the end a better post-harvest handling technology on primary processing using a visionary approach needs to be standardized for obtaining quality saffron. Also an integrated system of post-harvest handling under controlled conditions called a Pack House approach needs to be adopted, which will lead to high quality saffron with brand promotion.

Post-harvest treatment of saffron is labour intensive and lack of skilled labourers has arisen as a major challenge in production of saffron in Kashmir-India. Post-harvest treatment of saffron from picking of flowers, separation of stigmas and sun/shade drying is usually done by different family members (both young and older members) with varied levels of skills in handling procedures leading to degeneration in quality ((Dhar, 1992; Wani, 2004; Ahmad and Sagar, 2006; Kalha, et al., 2007). Therefore training programs need to be undertaken at government level for skill development related to saffron cultivation for superior quality.

Trade Mechanism of Saffron in Kashmir valley-India

Trade mechanism includes all the procedures involved in the movement of final yield from the farm (Saffron grower) to the end consumer (Zaki, et al., 2002). In Kashmir-India the trade mechanism of saffron is highly unorganized, as it is largely concentrated in the hands of few brokers (called Dalals/Commission Agents) with a lengthy chain of intermediaries, (viz.; local traders, agents, cooperative societies, government agencies, companies etc.) linking the growers to the consumers as depicted under.

Figure 1: Saffron Trade Mechanism



Source: (Personal Creation based on secondary data)

The saffron growers in Kashmir-India are financially unstable, lack store facilities and don't have knowledge about the demand and supply conditions at the terminal markets, hence do not sell their produce directly to the end consumers and are driven to sell it through middle men and incur huge losses. Moreover there are few growers who borrow money from the middlemen (money lenders) and sell their produce to clear their debts but face exploitation as they are not in a position to dictate terms in the fixation of price of their produce and incur loses. Thus ensuring that saffron growers get best share of the market price for their produce will be critical to any strategy to be evolved for improving saffron trade from Kashmir-India without exploitation as a part of commodity price (marketing margin) that grower doesn't receive due to inefficient saffron marketing channels. Therefore an understanding of margin is important in determining producer's share of final price as key indices of evaluating the efficiency of different marketing channels used for export of saffron from Kashmir-India (Jema, 2008).

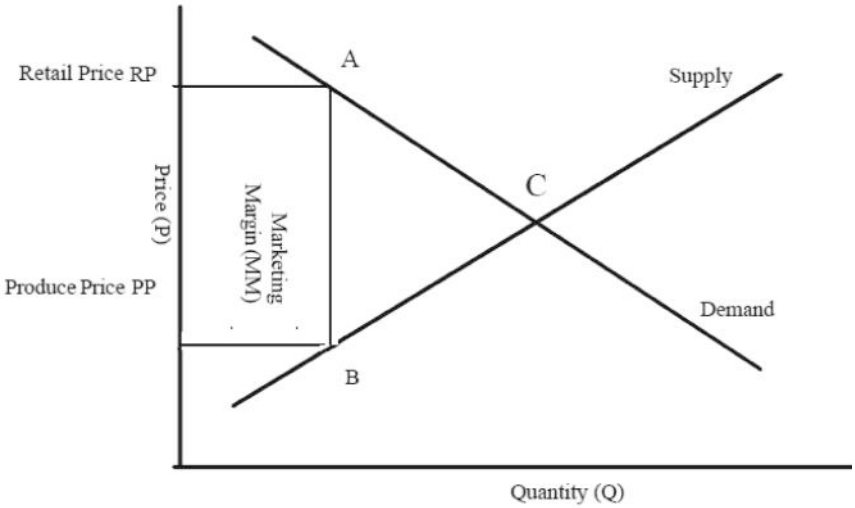
Marketing margin is sum total of all the costs in marketing channel from harvest to pre consumption (Wollen and Turner, 1970). Acording to Cramers and Jensen, (1982); Tamek and Robinson, (1990), marketing margin (MM) is difference between the price received by producers and paid by consumers. Thus in actual terms, it is the difference between retailor price (RP) and producer price (PP).

MM= RP-PP

Similarly Rangasamy and Dhaka, (2008) argued that the producer's share is a key measure for determining effectiveness of marketing channel and is a division between retailor price (RP) and producer price (PP).

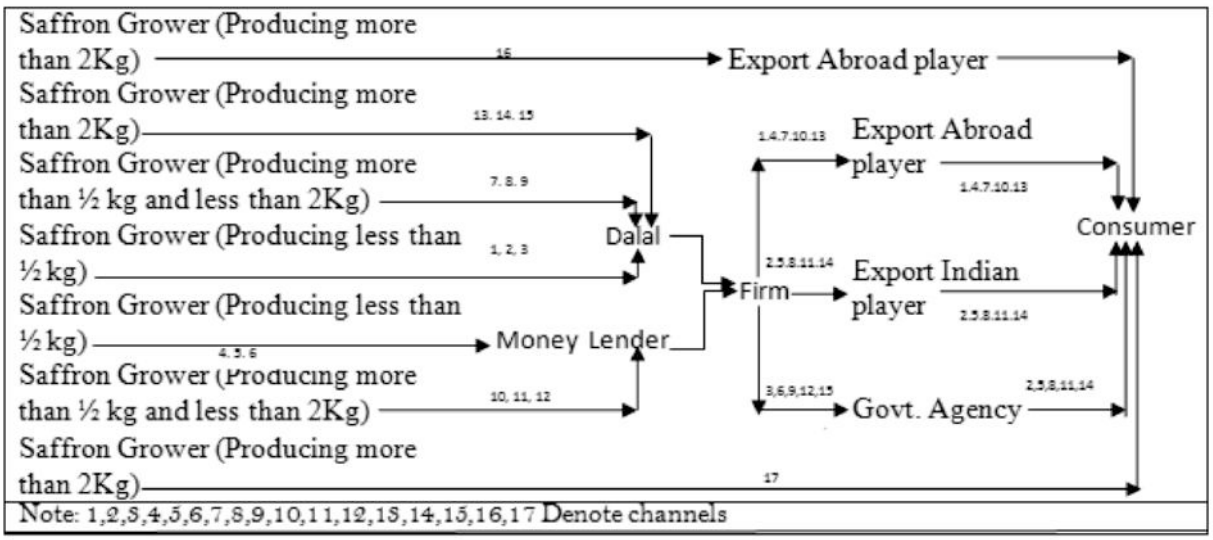
PS= PP/RP*100

Figure-2 Marketing Margin and Producers Share



Based on the direction of flow and volume of saffron transacted, trade mechanism of saffron in Kashmir valley distinguishes seventeen marketing channels. These channels start from the grower and end at consumer passing through a number of marketing actors along each chain as follows:

Fig-3 Marketing Channels of Saffron in J&K



A comprehensive investigation of these channels reveals complexity in various channels and simplicity in few channels. Studies of Ramakumar, (2001); Teka, (2009); Xaba and Masuku, (2012) reveals inefficiency in lengthy and diversity of channels adopted for saffron marketing. The data gathered from various stake holders of saffron trade mechanism and from central government sites viz; Ministry of agriculture J&K, Government of India; Spices Board India Ministry of Agriculture etc. reveals higher rank of efficiency in channel-17 owing to marketing margin and produce share of consumer price equal to 0 and 100%, followed by channel-16 with marketing margin and produce share of consumer price equal to 8% and 92% respectively. The most inefficient channels of saffron marketing are channel-6 and channel-4 owing to higher marketing margins and lower produce share of consumer prices. The other channels-5,1,3,2,10,12,11,7,9,8,13,15,14 are placed in increasing rank of efficiency.

Table-5 Rank Efficiency of Different Channels

Channels	Marketing Margin %	Producers Share %	Rank of Efficiency
1	40.0	60.0	14
2	38.0	62.0	12
3	40.0	60.0	13
4	46.0	54.0	17
5	43.0	57.0	15
6	45.1	54.9	16
7	31.0	69.0	8
8	27.0	73.0	6
9	29.0	71.0	7
10	36.0	64.0	11
11	32.0	68.0	9
12	34.0	66.0	10
13	22.0	78.0	5
14	13.0	87.0	3
15	19.0	81.0	4
16	8.0	92.0	2
17	0.0	100.0	1

Sources: (Financial Commissioner Revenue, Jammu & Kashmir; Directorate of Agriculture Jammu and Kashmir Division; Ministry of agriculture, Government of India; Spices Board India)

It is very clear that number of the marketing channels and the distance between beginning (producer) and end channel member (consumer) plays an important role in the effectiveness of the channel adopted for marketing process of saffron in Kashmir-India. Since the production picture of saffron in Kashmir-India is highly dominated by smaller and medium saffron growers with poor economic conditions, the growers are provoked to sell their produce through a diverse set of intermediaries to end consumers, resulting in diversity and stretchability in the marketing channel, thus causing inefficiency in marketing process of this product. Therefore it is suggested that this sector is cost-effective and has a bright potential to the economic development of the state, provided concrete steps are taken at grass roots level to strengthen the trade mechanism by adoption of less complex and direct marketing channels.

Conclusion

Saffron is an important cash crop of Kashmir-India and the state represents one of the main saffron producing areas of world. The state has the ability to become global leader in the saffron industry, but has suffered on many fronts and is virtually under the threat of extinction due to adoption of improper production practices and inappropriate marketing techniques for its export over the past few years (discussed in Husaini, et al., 2010). The key factors responsible are; traditional agronomic practices like longer planting cycle (>15 years), high incidence of disease and pests, poor soil health, improper irrigation facilities, poor weed management, traditional post-harvest practices like picking of aged saffron flowers, delayed stigma separation and sun drying. All these factors have shaken the confidence of saffron growers and made them hopeless about future prospects of saffron cultivation (Alam, 2007). Further the adoption of unorganized marketing channels with brokers (Dalals/Commission Agents) acting as middle men or intermediaries and lending the money to poor saffron growers in advance and thus controlling a major portion of market arrivals has resulted in to widespread exploitation of the growers in terms of lower price or returns to their produce has ruined overall saffron market of Kashmir (India). Hence there is an immediate need to address these issues at the earliest through political leadership by providing cheap credit facilities to the saffron growers and eliminating roles of middlemen and intermediaries to avoid abandoning of saffron cultivation by saffron growers in Kashmir (Kalha, et al., 2007).

Today Khorasan (Iran) and other saffron producing countries with less share in global area of production has set an example for Kashmir (India) to follow by abolition of traditional production and marketing system replacing them with more modernized interventions and has made it possible for Iran and other saffron producing countries to produce quality saffron and export more compared to Kashmir (India), where growers are still dependent on conventional methods of production and unorganized marketing system. Therefore abolition of conventional agronomic practices by adoption of more updated methods of saffron cultivation, application of better weeding and pests control methods, better irrigation facilities to saffron fields at proper timings and adoption of modernized scientific methods based on breeding and biotechnology can help to address the problems of quality production of saffron crop in Kashmir-India at reduced cost. Further the technological intervention can help to address the issues related to post-harvest losses and will ensure better quality. Moreover the implementation of organized way of marketing with direct grower to consumer contact will boost the confidence of saffron growers about the future prospects

of saffron cultivation and will thus enhance their profitability and accordingly the sustainability in its export. Hence, further research is needed in this direction. Also with rapid increase of saffron price in international market, growers may show more interest in investing in scientific tools and unique technology based on breeding and biotechnology for better yield, but due to marginal nature of this crop, investments by manufacturers on such scientific tools are unlikely to be repaid as quickly as they would expect. In fact, this is a general limitation with the saffron crop in Kashmir (India).

References

Ahmad, M., Sagar, V. (2007). Integrated Management of Corm/Tuber-rot of Saffron and Kalazeera. Horticulture Mini Mission-1. Indian Council for Agricultural Research (ICAR), India, pp 22.

Agarwal, S.G., Nehvi, F.A., Verma, M.K., Dar, S.A., Mir, Z.A., Nabi, N. G. (2004). Technological Innovations for Saffron Production. In: Proceedings of National Symposium on Enhancing Sustainable Agricultural Productivity in Hill and Mountain Agro Ecosystem. Dehradun, Uttranchal, India, pp 58-67.

Alam, A. (2007). Status and Prospects of Mechanization in Saffron Cultivation in Kashmir. Acta Horticulturae, vol. 739, pp 383 -388.

Amjad, M.H., Azra, N.K., Wani, M.H., Jaime, A.T.,Bhat, G.N. (2010). Sustainable Saffron (Crocus sativusKashmirianus) Production: Technological and Policy Interventions for Kashmir. Journal of Functional Plant Science and Biotechnology, vol. 4(2), pp 116-127.

Amjad, M.H., Badrul , h., Muzaffar, Y., Ghani, J.A., Teixeira, D.A., , MNayar, A. (2010). Saffron (Crocus sativusKashmirianus) Cultivation in Kashmir: Practices and Problems. Journal of Functional Plant Science and Biotechnology, vol. 4(2), pp 107-114.

Anonymous, (2008). Directorate of Agriculture, Planning and Development Department, Government of Jammu and Kashmir, India, pp 54.

Anonymous, (2010). Economic Survey of 2009-10. Directorate of Economics & Statistics, Planning and Development Department, Government of Jammu & Kashmir, India, pp 504.

Banarjee, G.D. (2009). Poised for a Golden Revolution. Journal of Times Agricultural, vol, 01, pp 102-113.

Behnia, M.R., Estilai, A.F., Ehdaie, B.D., (1999). Application of Fertilizers for Increased Saffron yield. Journal of agronomical Sciences, vol. 182, pp 9-15

Chand, R. (2005). Exploring Possibilities of Achieving Four Present Growth Rates in Indian Agricultural Production.

Cramer, G.L., and Jensen, W. (1982). Agricultural Economics and Agribusiness, (2nd Edition). McGraw Hill Book Company, USA.

Dharm, A.K. (1992). Bio-ecology and Control of Corm-rot of saffron (Crocus Sativus L.). MSc Thesis, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, India, pp 109.

Fernandez, J.A. (2007). Genetic resources of saffron and allies (Crocus spp.). Acta Horticulturae, vol. 739, pp 167-185

Ganai, M.D. (2002). Nutrient Status of Saffron Soils and their Management. In: Proceedings of Seminar-cum-Workshop on saffron (Crocus Sativus), June 14, 2001, SKAUST-K, India, pp 51-54.

Ganai, M.D., Wani, M.A., Zargar, G.H. (2000). Characterization of Saffron Growing Soils of Kashmir. Journal of Applied Biological Research, vol. 2, pp 27-30.

Hassan, B., Shah, M.H. (2002). Increased Sustainability and Yield of Saffron in Kashmir. In: Proceedings of Seminar cum Workshop on saffron, June-2014, 2001,Skaust-k, India, pp 55-58.

Husaini,, A.M., Hassan, B., Ghani, M.Y., Teixeira, D.S.,, Kirmani N.A. (2010). Saffron (Crocus SativusKashmirianus) Cultivation in Kashmir: Practices and problems. In: Husaini, A.M., (Ed) Saffron. Journal of Functional Plant Science cand Biotechnology, vol. 4(2), pp 108-115.

Jema, H. (2008). Economic efficiency and marketing performance of vegetable production in the eastern and central parts of Ethiopia. PhD Dissertation.

Kalha, C.S., Gupta, V., Gupta, D. (2007). First Report of Sclerotial Rot of Saffron Caused by Sclerotium Rolfsii in India.Journal of Plant Disease, vol. 91, pp 1203-1206.

Kamili, A.S.,,Nehvi, F.A. (2005). Low Cost Solar Drier in Saffron-A report. Sher-e- Kashmir University of Agricultural Sciences and Technology of Kashmir, India, pp 9.

Kanth, R.H., Khanday, B.A., Tabassum, S. (2008). Crop WeatherRelationshipFor Saffron Production. In: Nehvi, F.A., Wani, A.A., (Eds). Saffron Production In Jammu and Kashmir , Directorate of Extension Education, SKAUST-K, India, pp 170-188.

Koul, K.K., Farooq, S. (1984). Growth and Differentiation in Shoot Apical Meristem of Saffron Plant. Journal of the Indian Botinical Society, vol. 63, pp 153-159.

Manzar, A., Nehvi, F.A., Dar, S.A., Pir, F.A. (2008).Rodent in Saffron and their Management. In: Nehvi, F.A., Wani, S.A., (Eds). Journal of Saffron Production in Jammu and Kashmir, Directorate of Extension Education, SKAUST-K, India, pp 223-231.

Mir, M.A. (2002).Post-harvest Handling and Processing of Saffron. In: Proceedings of Seminar-cum-Work shop on Saffron (Crocus sativus), June 14, 2001, SKUAST-K, India, pp 75-82.

Munshi, A.M. (2002). Marketing and trade mechanism of saffron i n Jammu and Kashmir. In: Proceedings of Seminar-cum-Workshop on Saffron (Crocus sativus), June 14, 2001, SKUAST-K, India, pp 81-91.

Nazir, N.A., Khitrov, N.B., chizhikova, N.P. (1996). Statistical Evaluation of Soil Properties which Influence Saffron Growth in Kashmir. Journal of European Soil Science, vol. 28, pp 120-128.

Negbi, M. (1999), Saffron Cultivation: Past, Present and Future Prospects. In: Negbi, M. (Ed.) Saffron (CrocuxSativus L.). Harward Academic Publishers, Australia, pp 1-8.

Nehvi ,F.A. (2004). Success stories of saffron research under temperate conditions of Kashmir. National Agricultural Technology Project (NATP) report, SKUAST-K, India, pp 28.

Nehvi, F.A.,,Wani, S.A., Dar, S.A.,, Makhdoomi, M.I., Allie, B.A., Mir, Z.A. (2007). Biological Interventions for Enhancing Saffron Productivity in Kashmir. Acta Horticulturae, vol. 739, pp 25-31.

Nehvi, F.A., Koul, G.L., Alam, A., Wani, S.A., Makhdoomi, M.I. (2008).Saffron production in Jammu and Kashmir State - A Survey. Journal of Research, vol. 10, pp 167-182.

Omidgeigi, R., Razaii, A., Sadeghi, B., Zearatnia, M. (2003).The Effect of Corm Weight in the Yield of Saffron in Nishaboor Climate. In: Proceedings of Third National Iranian Congress of Saffron, Mashnad, Iran, pp 34-37.

Panday, D., Panday, V.S., Srivastava, R.P. (1979). A note on Effect of the Size of Corms on the Sprouting and Flowering of saffron. Journal of Progressive Horticulture, vol. 8, pp 89-92.

Ramakumar, R. (2001). Costs and margins in coconut marketing: Some evidence from Kerala. Indian Journal of Agric Economics, vol. 56, pp 668-680.

Rangasamy, N., Dhaka, J.P. (2008). Marketing Efficiency of Dairy Products for Co-operative and Private Dairy Plants in Tamil Nadu. A Comparative Analysis. Journal of Agricultural Economics Research Review, vol. 52(21), pp 235-242.

Sadeghi, B. (1993). Effect of Corm weight on Saffron Flowering.I.R.O.S.T, Mashnad Center, Iran.

Sama, J.K., Raina, B.L., Bhatia, A.K. (2000). Design and Development of Saffron (Crocus sativus L.)Processing Equipment. Journal of Food Science and Technology, vol. 37, pp 357-362

Sampathu, S.R., Shirashankar.S., Lewis, Y.S. (1984).Saffron (Crocus Sativus L.)– Cultivation, Processing, Chemistry and Standardization. Journal of Critical Reviews in Food Science and Nutrition, vol. 20, pp 123-157.

Srivastava, R.P. (1963). Cultivation of Saffron in India. Journal of Fertilizer News, vol. 8, pp 9-16.

Shinde, D.A., Talib, A.r., Gorantiwar, S.M. (1984). Composition and Classification of Same Typical Soils of saffron Growing Areas of Jammu and Kashmir.Journal of Indian Society and Soil Sciences, vol. 32, pp 473-477.

Teka, A.G. (2009). Analysis of Fruit and Vegetable Market Chains in Alamata, Southern Zone of Tigray; The Case of Onion, Tomato and Papaya. M.Sc. Thesis, Haramaya University.

Tomek, W.G., Robinson, K.L. (1990). Agricultural Product Prices. Third ed., Cornell University Press, New York, pp.107-108.

Verma, M.K., Ahmad, A., Verma, R.K. (1998). Influence of FYM, Corn Weigght and Planning Density on Vegetative Propgation of Saffron. In: Nehvi, F.A., Wani, S.A., (Eds) Saffron Production in Jammu and Kashmir, Directorate of Extension Education, SKAUST-K, India, pp 163-169.

Wani, A. (2004). Studies on Corm-rot of Saffron (Crocus Sativus L.).PhD thesis.Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, India, pp 108.

Xaba, B.G., and Masuku, M. B. (2012). An Analysis of the Vegetables Supply Chain in Swaziland. Journal of Sustainable Agriculture Research, vol 2, pp1-10.

Zaki, F.A., Mantoo, M.H. (2008). Integrated Pest Management In Saffron. In: Nehvi, F.A., Wani, S.A. (Eds) Saffron Production in Jammu and Kashmir, Directorate of Extension Education, SKAUST-K, India, pp 209-222.