

An Economic analysis of Production and Marketing of Saffron in Jammu and Kashmir

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Abstract: Saffron a perennial herb, well-known for its aroma and used for flavoring, is a culinary delight. It is an important commodity and is of great significance in the agricultural economics of Jammu and Kashmir. Saffron is popularly known as Red Gold. The commercial part of saffron is Stigma. Saffron is used in industries like food, pharmaceutical, cosmetic and perfumery as well as in the textile dyes. In India most of the saffron production is limited to the state of Jammu and Kashmir. Besides, having tremendous medicinal values, saffron has traditionally been associated with the famous Kashmir cuisine and undoubtedly represents the rich cultural heritage of Kashmir. This legendary crop is under threat of extinction and warrants collective attention of researchers, farmers and policy makers. Economically creation of the strong market demand is the biggest opportunity for its revival and needs a consortium of traders and producers to be established at the international level for market assurance and price stability. Scientific approach needs more work on genetic improvement and post-harvest technologies.

Key Words: Crocus Harvest Jammu and Kashmir Metric ton Saffron Stigma.

Introduction: Saffron is the most expensive spice among the spices. Saffron is a non perishable high value low volume commercial crop of Jammu & Kashmir State. Saffron is made from the dried stigmas of the Saffron flower (*Crocus Sativus* Linn).

It is indigenous to Greece and Asia Minor. In the Greek Roman era, Saffron was scattered on the floors of theatres and public halls as a perfume. With the passage of time Medicinal and aromatic plants have been increasing in importance to society continuously for the past 100 years. Saffron grows in climatically diverse regions, varying in altitude, temperature and humidity conditions. However, it prefers a cool and sunny situation in well drained soils in the areas falling between 1500-2250 m.a. m.s.l. Saffron is a high price spice due to much direct labour required for its cultivation, harvesting and handling. One Stigma of Saffron weights about 2 mg each flower has three stigmas 150,000 flowers must be carefully picked one by one in order to produce 1 kg spice. Its high value makes saffron the object of frequent adulteration and fraud.

Saffron is currently being cultivated more or less intensely in Iran, India, Greece, Morocco, Spain, Italy, Turkey, France, Switzerland, Pakistan, China, Japan and recently in Australia while the words Saffron production is estimated 205 tons per year, Iran is said to produce 80 percent of this total i.e. 160 tons. The State of Jammu & Kashmir in India produces 8 to 10 tons of Saffron.

In India Saffron is mainly cultivated in Jammu & Kashmir where it is sown in August mid September and flower picking were done during October and November. Saffron, after harvesting, is dried for three to five days and stored in air containers to retain its colour and aroma at moisture content of about 6-8

percent. The coloring agent is crocin which ranges between 13-14.5 percent in Saffron from Kashmir. Current trend in food colorants has increasingly centered on naturally occurring pigments for which Saffron has no parallel. The increase in demand in national and international market makes Saffron a remunerative agricultural activity because of its high value. Value addition of Saffron through extract is one of the future strategies to gain international market. However, there has been a reduction in the productivity and production of Saffron during the last 10 years. This is being attributed to severe drought particularly during the month of September, which drastically reduces Saffron yield. However depletion of nutrient status of soil, which are being used without any further enrichment and non replacement of seed corms are some of the major causes of low production. Saffron, a spice derived from the dried stigmas of the saffron crocus (*crocus sativus*) has remained among the world's most costly substances throughout history. Some believe that origin of saffron is located on a vast area of earth like, Greece, Turkey, Iran and central Asia. According to other historical evidences saffron was brought to India by the Persian rulers around 500 B.C.

1.1: Objectives:

- ❖ To document indigenous knowledge.
- ❖ To identify and analyze the problems faced by the saffron production and suggest the solutions.
- ❖ To evaluate the existing practices and problems therein from techno- economic point of view to suggest alternatives.
- ❖ Enhance the returns to predominantly small and marginal farmers by introducing improved production and post-harvest technology.
- ❖ To increase the marketable surplus through increased productivity.

1.2: Methodology

For evaluating the objectives of the study, primary data were collected through personal interview method with the help of a well –structured and pre - tested schedule for the year 2016. The primary data with respect to household composition, educational profile, land ownership, cropping pattern, costs of

inputs, returns and the problems involved in cultivation of Saffron was collected from selected saffron growers from Jammu and Kashmir. A field survey was undertaken to work out the socio-economics of saffron, factors affecting its productivity and the constraints in the production of this crop in the state of Jammu and Kashmir. The secondary data which has been used in this paper has been taken from reliable sources. For the most comprehensive study both types of data have been infused.

2. Saffron Production-World Scenario:

What is lighter than a feather but packs a hefty wallop when we come to sell is associated as an important component of our rich cultural heritage. Saffron is a taxonomic representative of the family of irridaceae and genus *crocus* of which about do species are know so for. It is believed to have originated from Greece, Asia Minor and Persia spreading east words to Kashmir and China. Its cultivation in the world extends through 0 to 90⁰ East longitude (Spain to Kashmir) and 30 to 45⁰ North latitude (Persia to England). Today saffron is cultivated from East Mediterranean (Spain) to India (Kashmir).

Saffron plant groups in climatically diverse regions, varying in attitude, range of temperature and humidity conditions. However the plant prefers a cool and sunny situation in the areas following between 1500-2250 m.a.m. s.l. low winter temperature and short photo period during March-April exert considerable influence on the production of floral primordial mid September light precipitation are beneficial to initiate plant growth activity and promote flowering whereas, heavy rains during bloom adversely affect saffron quality. Major saffron producing countries in the world are Azerbaijan, Greece, Iran, India, Italy, Morocco and Spain while Algeria, France, Germany and Turkey are very small producers. Among the major countries, Iran had the largest area of 43,408 hectares in 2002-2003, accounting for 88.52 percent of the total areas in the world under this crop. The area is now reported to have gone up to 54,000 hectares in 2006-2007, bulk of which is concentrated in Khorasan. India follows next with an average of 2825 hectare (gone up to

3,075 hectare in 2004-05) and Azerbaijan and Spain with 675 and 600 hectares respectively.

Iran, Spain and India are the largest producers, accounting together for more than 95% of the world's production which is approximately 200 tons per year. The distribution of saffron cultivation in the world reveal that Iran occupies the largest areas of 43,408 hectare accounting for (88.52) percent followed by India 2825 hectares (5.76) percent Greece (2.03) percent, Azerbaijan (1.37), Spain (1.22) percent, Morocco (1.02) percent and Italy (0.06) percent.

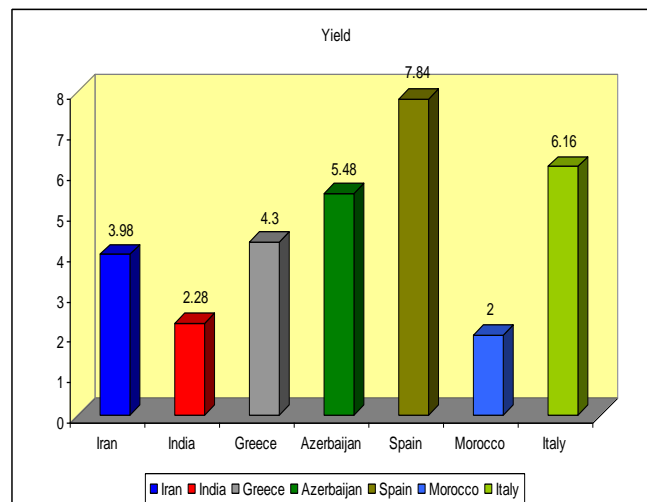
2.1: Area, production and productivity of saffron in major & saffron producing countries of the world:

S.N .	Country	Area (Hectare)	Production (MT)	Yield (kg/hect .)
1.	Iran	43,408 (88.52)	174.00 (89.31)	3.98
2.	India	2,825 (5.76)	6.46 (3.30)	2.28
3.	Greece	1,000 (2.03)	4.30 (2.20)	4.30
4.	Azerbaijan	675 (1.37)	3.70 (2.60)	5.48
5.	Spain	600 (1.22)	5.70 (1.90)	7.84
6.	Morocco	500 (1.02)	1.00 (0.50)	2.00
7.	Italy	29.4 (0.06)	0.24 (0.12)	6.16
	Total	49,037.4	195.40	

Source: Horticulture Department Jammu & Kashmir.

*Note: Figures in parenthesis denote percentage of the total value.

Graph No. 1 Area, production and productivity of saffron in major & saffron producing countries of the world:



Iran contributed the highest tonnage to the total world production in 2002-03 with an annual production of 174 MT (which went up to 205 MT in 2005-06 and continues to increase year after year). While India comes a poor second with a total production of only 6.5 MT followed by Spain with 5.0 MT. Morocco and Italy together contribute 4 percent to the world's production. However, productivity is highest in Spain among the major saffron producing countries of the world with an average yield of 7.48 kg per hectare. Italy occupies second largest position in the productivity of saffron per hectare. While in quality Indian saffron is considered the world's best saffron. In India, saffron is primarily grown in the state of Jammu & Kashmir attempts have been made to cultivate it in Kumaon, Joshimath, Barrar etc areas of Uttaranchal and in Kinnaur district of Himachal Pradesh but has yet to attain the status of a commercial crop there. Comparison of quality of saffron from different countries can be understood with the help of following table.

2.2: Comparison of quality of saffron from Different Saffron Producing Countries

The comparative data confirms the statement that the high intrinsic quality of Kashmir saffron with higher coloring (crocin) and flavoring (saffronal) compounds as compared to that produced by Spain

and Iran. The quality differences are, however, not linked to any genetic superiority of saffron clones being used by the farmers in the state. These are primarily due to the agro-climatic influences on growth and flowering of the crop in the state.

S.No.	Country	Crocin (%)	Safranal (mg/g)
1.	India	13-14	6-9
2.	Spain	11-12	5-6
3.	Iran	10-11	2-3

Source: Sheri-Kashmir University of Agricultural Science and Technology Shalimar.

2.3: Saffron Flower and Its cultivation in Jammu and Kashmir.

Saffron the legendary crop of Jammu & Kashmir belongs to the family of irrdaceae and genus crocus. Saffron is the most expensive spice of the world, what a Saffron flower is? As far Saffron flower is concerned, it has six lilactinted petals, six stigmas and one style of white colour. The three stigmas of red colour with a long style and three stigmas of bulrush colour with short white colored styles come out of the flower, while as the colour of the whole flower in greenish which means that the Saffron flower consists of four colours viz: red, bulrush, purple and white. The three stigmas of red colour along with the style of white colour are called lutchha and only the red stigmas without style are called Mangra (Shahi Saffron). The seeds of Saffron are called corms or bulbs. The corms of Saffron are not sown every year but once for years. Saffron is a slow growing perennial plant regenerating from the vegetative multiplication of its underground corms. Numerous scars like buds covered with scaly leaves are present on the surface of mother corm, which varies in number depending on the corm size. The buds produce aerial shots that subsequently produce daughter corms at the base.

Initially, for the duration of two years it yields the minimum crop in a little quality. After two years of plantation it yields its crop with a great

quantity and with passage of time its corms gets increased. Before processing of these seeds in the soil it is being observed whether the soil is moisture or not. If not then beds are being irrigated and watered frequently in order to prepare moistured soil. Saffron is a perennial herb with low growing needle like leaves appearing after flowering. The long tube funnel shaped flower, about four centimeter long springs directly from the soil. The flower comprises of six petals and six stamens. Its style is tipped with three orange-red stigmas, each more than 2.5 cm extending from the side of perianth. The herb flowers from mid October to end of November and 2-3 pickings are performed. A corm produces up to five flowers.

2.4: Nature of soil and climate required for saffron farming:

The Saffron flowers visible in the last week of October. After the appearance of these flowers, it is found that picking of flowers on alternate days during wee hours of morning provides an opportunity to pick flowers easily and keeps all the quality parameters. The highest crocin percentage in stigmas has been recorded from such picked flowers. From the harvested flowers processing is done by isolating stigmas and style and placed for air drying one kilogram of Saffron (Stigma and Style) needs 2-3 days sun drying. Normally between 1,60,000 to 1,65,000 flowers of Saffron are required to produce one kilogram of good quality dried Saffron.

Saffron flower and plant grows in climatically diverse regions, varying in altitude, range of temperature and humidity condition. However, the plant prefers a cool and sunny situation in the areas falling between 1500-2250 m.a.m.s.l. Low winter temperature and short photoperiod during March-April exert considerable influence on the production of floral primo dia. Mid September light precipitations are beneficial to initiate plant growth activity and promote flowering, heavy rains during bloom adversely affect Saffron quality. Adequate soil moisture during early vegetative growth (November-December) and maximum photosynthetic activity (March-April) is essential for corm growth and development and subsequent productivity. A well

distributed 300-400 mm precipitation during crop growth is enough to have a successful crop.

2.5: Benefits and uses of saffron:

Saffron finds on variety of uses in India and abroad. In India it is used a herb in Ayurvedic medicines which heal a variety of disease ranging from Arthrities to importance and infertility. It is known to have aphrodisiac properties and a widely used in Asia and the Middle East as such Chinese and Tibetans medicine also finds many uses of this exotic herb. It is an essential commodity in high quality milk/cream base confectionaries and Mughli dishes in India where in it imparts a rich colour and distinctive flavour. As a purchase Saffron was strewn in Greek halls, theatres and in bathrooms. The Hinds over all consider the Tilak of Saffron stigmas on their foreheads usually on ceremonies and auspicious occasions a sign of good omen.

2.6: Trends in Area, Production and Productivity of Saffron in Jammu and Kashmir :

Jammu and Kashmir agriculture has an international identity. The world's best saffron is grown in the valley and its major intensity is in district Pulwama and Budgam. Nearly 90% of the total area in the state under the crop is cultivated in Kashmir province only. Its cultivation in Jammu division is limited to district Kishtwar only. Saffron is a rain fed crop and the main output of the crop is a dark yellow substance obtained from the flowers called the saffron. Saffron is a kharif crop. Saffron the identity of Jammu and Kashmir and the pride of valley is rapidly vanishing although its cultivation had spread beyond the terraces of Pampore in South Kashmir, where it has been grown since ancient times. Adulteration by Some growers and pathetic approach of Government are the factors that are mainly responsible for decline in its production. Adulteration by growers has led not only to the fall in rates in the markets, but has also last Saffron the reputation that it used to enjoy thought out the world. The figures revealed by the agriculture department are disgusting. The recorded Saffron cultivation and production in Jammu & Kashmir dating back to year 1980-89 used to be about 300-400 quantals per year while the cultivation has been now reduced to

130 quantals per year. Saffron cultivation has declined by 25% from 4161 hectares in 1998 to 3110 hectares in 2008 for want of adequate irrigation facilities and increasing diversion of agricultural land to urbanization and industrialization. It is necessary that replacement of the existing corms, through introduction of new variety of grim plasm and significant enlargement of the area under saffron cultivation on the highest priority basis. The decline in the area and production of saffron over the years in indicated in the following table.

Trends in Area, Production and Productivity of Saffron in Jammu and Kashmir:

Year	Area (Ha.)	Production (MTs)	Yield Rate (KG/ha.)
1997	5707	15.85	2.8
1998	4161	12.88	3.13
1999	2880	7.65	2.27
2000	2742	3.59	1.88
2001	3075	0.3	1.57
2002	2989	6.5	2.96
2003	2928	5.15	1.66
2004	2436	6.86	3.75
2005	3110	7.04	1.63
2006	3130	6.5	2.25
2007	3010	8.2	2.15
2008	3000	7.7	2.5
2009	3280	9.46	2.34
2010	3785	9.55	2.5
2011	3790	8.85	2.52
2012	3674	10	2.72
2013	3674	11.5	3.13
2014	3674	15	4.08
2015	3674	9.6	2.61

Source: Jammu and Kashmir Agriculture Department.

2.7: Reason for growing saffron:

Any agricultural crop is being produced by the farmer for certain reasons and consideration. Saffron is a commercial crop and most expensive spice among the spices in the world. Kashmir has a suitable land and climate for the cultivation of saffron crop and bears the power of monopoly state in this crop. However paddy, wheat and other staple crops

are also being produced in the state. According to the farmers saffron is non perishable goods and can be produced easily on Karewa lands relatively to other crops which require maximum water and irrigation facilities. While the saffron crop requires least water during its different stages of growth.

Reasons for growing saffron in Jammu and Kashmir (Table No. 2)

Reason for growing saffron	No. of farmers	Percentage
A good gain	83	41.5
Guarantee of an assured market.	15	7.5
Valuable and beneficial than other crops	78	39
Suitable lands for saffron crop	24	12
Total	200	100

Source: On the bases of primary Survey.

The analysis of table reveals that farmers of Jammu and Kashmir are growing saffron in their farms deliberately and taking into consideration the gains from this crop which is relatively high when compare with other agro farm crops of Jammu and Kashmir. 41 percent of farmers out of 100 percent are growing saffron because of high profits from this crop of cultivation. While 39 percent of farmers are growing saffron, because according to them it is highly profitable and beneficial than other crops in Jammu and Kashmir. While 12 percent of the people out of 100 percent are of the view that our fields are best suited for the cultivation of saffron and we are growing saffron over them.

2.8: Marketing of saffron:

Every good which has a good market yields maximum profits to its cultivators or manufactures. Likewise saffron production requires an organized and well established market for higher profits. As it is

the world's most expensive spice. Without good marketing facilities farmers have to face a lot of problems like exploitation by middle men and low prices of their produce. Marketing of saffron in the state and the country as a whole is highly unorganized. Due to this growers are showing disinterest towards the cultivation of this legendary crop. Prices of saffron are fluctuating from region to region and from market to market during September and October when every year saffron flowers were picking from the fields the prices a varies as compared to the months of February and March etc. However the growers have different strategies and way of thinking for receiving high prices of their produce. In recent years the prices of saffron are increasing at an increasing rate.

2.9: Adulteration Test:

Saffron being expensive material liable to frequent adulterants for economic gains. Adulteration and substitutes of saffron include floral parts, other than stigmas of saffron, e.g. stamens and corolla, other common adulterants include ray florets of marigold, safflower, mixed with dyes, fine plastic chips of saffron color etc.

Following are a few methods to check adulteration in saffron.

- Saffron with sugar imparts yellow color to water but not to xylene.
- Saffron stigma on reaction with strong sulphuric acid turns blue, color gradually changing to deep violet or purple and finally to purplish red.
- Nitrogen contents of saffron are remarkably constant at 2.22-2.43% and kjeldahl's estimation is good to check its purity.
- Saffron dyes white piece of cloth to yellow shade and not as red as the spurious stuff will do.
- Saffron solution gives reddish precipitation with barium salt solution.
- Saffron stigmas sink in water while the spurious stuff does not.
- Saffron when pressed between blotting filter paper no translucent oily spot should appear.
- Saffron in yellowish or blackish color is an old stuff.

2.10: Major Findings and results of the Study:

(1) The yield per hectare in Jammu and Kashmir has been growing at a rate 1.63 kg per hectare. While in other saffron producing countries of the world it is relatively more.

(2) More than 90% of Saffron farmers in all the districts grow Saffron as a main crop. There is no culture of an inter cropping system in the state. However almonds can be grown as approved and recommended by the scientists of SKUAST.

(3) Lagged area and lagged saffron price are the important variables influencing current area under Saffron in Jammu and Kashmir State.

(4) The general trend of crop shifting in Jammu and Kashmir, i.e., from saffron production to other crops, the emergence of substitute crop and lower yield per hectare are the main reasons for decelerated growth rate of Saffron production in Jammu and Kashmir.

(5) The marketing system for Saffron production in Jammu and Kashmir consists of Saffron growers, merchants and other intermediaries.

(6) Increasing domestic demand, very slow progress of export, slow progress of product and market diversification and comparatively high price of Indian Saffron are the main problems of Indian Saffron export.

(7) Although Jammu and Kashmir places India among top three saffron producers in International market; the cash crop is bereft of any official policy; proper irrigation facility and commodity risk protection.

2.11: Recommendations

Based on the findings of the study, the following recommendations are made for the development of production, marketing and export of Saffron.

(1) Since there is only limited scope for increasing area under Saffron in Jammu and Kashmir as a mono crop, the existing potentialities of cultivating Saffron as an intercrop in Almonds, may also be exploited to the maximum possible extent. In Saffron cultivation,

emphasis should, therefore, be placed on both productivity increase and area expansion.

(2) To protect cultivators from incurring loss the Government should announce a support price for Saffron.

(3) Side by side with crop research, marketing research may be taken up so that enough data are available to the policy makers to fix prices and formulate development policies.

(4) Technological up gradation of processing is very much essential to improve the quality of dry Saffron. Saffron is a food item and considerable importance is attached by importing countries to hygiene art of the produce. Traditional method of processing will result in loss of flavour and quality. Scientific drying facilities should be made available by the Spice Board especially in major producing districts like Pulwama; Budgam for producing clean and good quality product retaining the original flavor. This would encourage buyer's confidence, help the farmers to get better price for the commodity and would result in increased export.

- **Conclusion**

Saffron (*crocus sativus*) is playing a significant role in the economy of Jammu and Kashmir. The spatio-temporal variations in area and production reveals its nature of being patchy in distribution and limited mainly in Karewas particularly in south-eastern part of the valley. About 70 per cent of the saffron area and corresponding 70 per cent of total production lies in Pulwama only. Saffron provides about 16 per cent of the total agricultural income. The basic growth retarding factors of the crop are its weak research base, unscientific in all respects, discouraging marketing mechanism and non-interference attitude of the government, lack of irrigation, unavailability of pesticides etc. These factors playing a fundamental role in strengthening the already present prejudicial views, superstitious notions, legends, myths and the traditional ways of cultivation. Its marketing structure which is totally under the control of private enterprise is quite discouraging. It has been observed that intermediaries, on an average basis take about 41 per

cent of total income from saffron as their commission leaving only 59 per cent to the actual growers. The role of saffron cultivation in socio-economic development becomes more pronounced at the micro level. The acreage under saffron and socio-economic development of households is having a watertight relationship. Majority of farmers are marginal and small farmers in Jammu and Kashmir. Economic setup of growers also playing an important role in its limited extension because the crop is of peculiar nature and almost whole the input expenditure is required at once i.e. at the time of sowing the seeds. So the majority of farmers, especially low income groups and small farmers are helpless to fulfil their desires of saffron cultivation. India has been the major exporter of Saffron in the world. During the last three decades, world trade in Saffron recorded impressive growth. There is considerable scope for boosting export of Saffron by the producing countries including India. But during the last decade, the country has lost prime position as compared to the past. Our competing countries like Iran could made use of the opportunity.

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