

Analyzing Production Trends of Saffron Cultivation in Kishtwar District: A Geographical Perspective and Future Outlook

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Abstract

This paper examines the production trends of saffron cultivation in Kishtwar district in the UT of Jammu and Kashmir, India. Using historical data and current statistics, we analyze the factors that have contributed to the growth and decline of saffron production in the region. This study focuses on the period from year 2010-2021. We begin by examining the historical context of saffron cultivation in Kishtwar tracing its roots back to the Mughal Empire. We then analyze the factors that have influenced saffron production in the region, including changes in climate, government policies and socio-economic conditions. This study reveals that saffron production in Kishtwar has fluctuated over time, with periods of growth and decline. However, despite these fluctuations, saffron remains an important crop in the region, and efforts are being made to promote its cultivation. In the final section of the paper, we offer a future outlook for saffron cultivation in Kishtwar, taking into account the current state of the production and potential opportunities for growth. We argue that with the right policies and investments, saffron production in Kishtwar has the potential to grow and contribute to the economic development of the region.

Key words: Saffron, Trend line, Productivity, Corm rot

Saffron (*Crocus sativus* L.) is known as Kesar in Hindi and Kong in Kashmiri and Kishtwari. It is a plant belonging to the Iridaceae family. Iran, Spain, India and Greece are the leading producers of saffron in the world. Saffron flowers in the autumn shortly after planting, and the process of its growth involves sowing and maturing of corms at the start of each summer [1]. In Greece saffron growing areas receive more than 500mm of annual rainfall, while in Spain it grows in dry temperate conditions with 400mm of annual rainfall [2]. Saffron is grown successfully under irrigated conditions in Jammu and Kashmir. Saffron is native to Mediterranean environment, characterized by cold winters, autumn-winter rainfall. Flowers are usually picked early in the morning after the dew has evaporated but before the flowers wither [3]. The flower is cut at the base of the stem with a slight twisting movement and care is taken not to damage the leaves. The quality of saffron depends on its crocin concentration, odor and taste [4]. The best quality saffron has safranal content. Rainfall before 10-15 days of flowering results in excellent flowering.

Due to its limited production and wide variety of uses, saffron is one of the most expensive products in local, national and international markets. Traditionally saffron is used in both Unani and Ayurvedic system of medicine [5]. Jammu and Kashmir is known for quality saffron and represent one of the major saffron producing areas in the country [6]. Although the exact time in which saffron was introduced to Kashmir is unknown, evidence from Rajtarangani, indicates its presence in Kashmir even before king Lalitaditya in 750 AD. Another historical account traced the origin of saffron back 3000 years,

from Mediterranean and Asian countries [7]. Chinese historical documents reveal that saffron was brought to India by Persian rulers in 500 BC, and they planted it in Kashmir [8].

The cultivation of saffron in Jammu and Kashmir is limited to certain districts, with majority of the production comes from districts of Pulwama, Srinagar, Budgam and Kishtwar. In Jammu division Kishtwar is the only district where saffron is cultivated. The type of saffron grown here is Gucha Saffron. The quality of saffron produced here is superior than the saffron of Pampore of Pulwama district [9]. For the year 2021-22 the area under cultivation is 202 hectare and production is 484.5kg which is 100 kg more than the previous year.

MATERIALS AND METHODS

Study area

Kishtwar district is located in the UT of Jammu and Kashmir and known for its saffron cultivation. The region is situated between 33.22° N latitude and 75.77° E longitude, with an altitude of approximately 5400 feet above sea level. The climate in Kishtwar is temperate, with cool summers and cold winters. The soil in the district is rich in nutrients and ideal for saffron cultivation [10]. The saffron cultivation in Kishtwar district is mainly carried out in small plots of lands by farmers who rely on the crop as a source of income. The saffron cultivation in Kishtwar starts in early August and ends in November. The harvested saffron is sold in local markets and to traders from other regions. In terms of drainage, Kishtwar is located in the Chenab River basin and has a well-defined

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drainage system [11]. The Chenab River and its tributaries flow through the region, and there are several small streams and

springs that drain into these water bodies that act as recharge zones for groundwater and provide habitat for local wildlife.

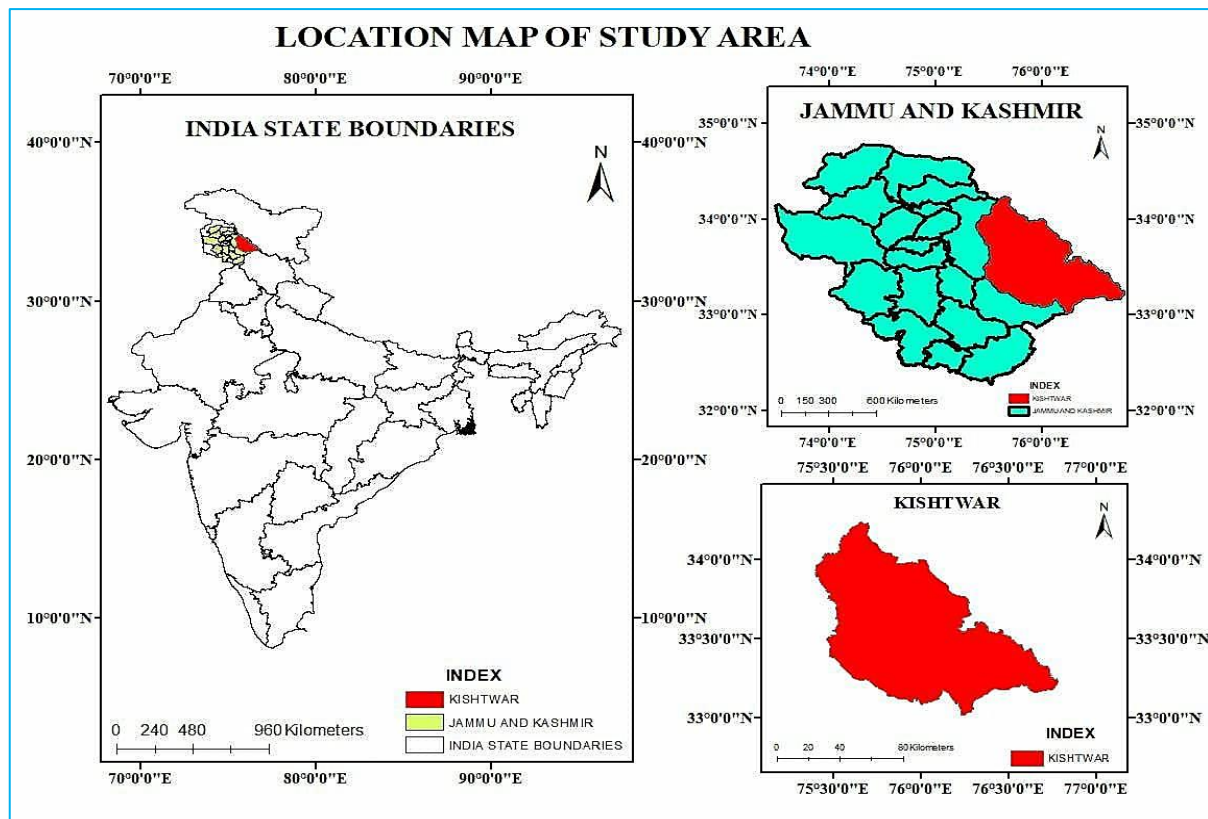


Fig 1 Geographical location of the study area

Database

The research is based mainly on secondary data.

Secondary data

The required secondary data for research is collected from reports of governmental and non-governmental agencies Agriculture office report Kishtwar, Saffron development office Kishtwar, Directorate of Agriculture Jammu and Kashmir. The other published records relevant for the study are also consulted.

Tools

Arc GIS 10.5 is used for preparation of maps

To estimate trend, the equation: $Y = a + bX$ has been used with method of least square.

Statistical Package for social sciences for data tabulation and analysis.

RESULTS AND DISCUSSION

The trend line in the graph shows that there is increase in the area under saffron cultivation in Kishtwar district over the year. For the year 2009-10 the total area under saffron cultivation was 120 hectare which was increased to 130 hectares in the year 2011-12. In the year 2012-13 the area under cultivation was further increased to 150 hectares. The area under saffron cultivation was further increased to 202 hectares in the year 2015-16 and the current area under saffron cultivation for the year 2021-22 is also 202 hectares. From the year 2015-16 to year 2021-22 there is no increase in area under saffron cultivation. The trend line show that there is constant increase in area under saffron cultivation due to the efforts made by Agriculture Department in acquainting the saffron growers

of the district through awareness programme to adopt the latest technical recommendations and good cultivation practices for saffron cultivation. Moreover, the efforts made by saffron development officer in implementing National Saffron Mission has helped in bringing more area under saffron cultivation in the district. However, the data also indicates a plateau in cultivation area from 2015-16 to 2021-22, suggesting the need for continued innovation and strategic interventions to sustain and further enhance saffron cultivation in the district. It is imperative for stakeholders to collaborate and devise new strategies to overcome any existing barriers and unlock the full potential of saffron cultivation in Kishtwar district.

The production of saffron in Kishtwar district have shown a wide range of fluctuation. In the year 2009-10 the production was 264 kg. The production increased to 450 kg in the year 2012-13 and reached its zenith in the year 2013-14 where the total production was 600kgs. From the year 2014 onwards, the production starts declining. For the year 2017-18 the production was 35kg only. The reason for such decline in production was prolonged drought. In the year 2018-19 the production further declined to 33 kg which was lowest and the reason for lowest production was continuous dry spell suffered during active flowering season. For the year 2019-20 the production was also low and it was 38 kg only and the reason for this low production was advance snowfall followed by decrease in temperature throughout the flowering period. From the year 2020 onwards, the production starts increasing and for the year 2020-21 it was 384 kg and for the year 2021-22 the production was further increased to 484.5 kg. A positive trend emerged from 2020 onwards, with production showing signs of recovery and increasing steadily. These fluctuations underscore the vulnerability of saffron cultivation to climatic variability and highlight the importance of implementing adaptive strategies to mitigate risks and sustainably enhance production

in Kishtwar district. Continued efforts in research, technology adoption, and climate resilience measures will be crucial for

ensuring the long-term viability and prosperity of the saffron industry in the region.

Table 1 Saffron production in Kishtwar

S. No	Year	Area (Hectare)	Production (Kg)	Yield (Kg/ha)
1	2009-10	120	264	2.2
2	2010-11	120	270	2.25
3	2011-12	130	325	2.5
4	2012-13	150	450	3
5	2013-14	150	600	4
6	2014-15	150	300	2
7	2015-16	202	400	1.9801
8	2016-17	202	150	0.7425
9	2017-18	202	35	0.173
10	2018-19	202	33	0.163
11	2019-20	202	38	0.188
12	2020-21	202	384	1.9
13	2021-22	202	484.5	2.398

Source: Saffron Development Office, Kishtwar

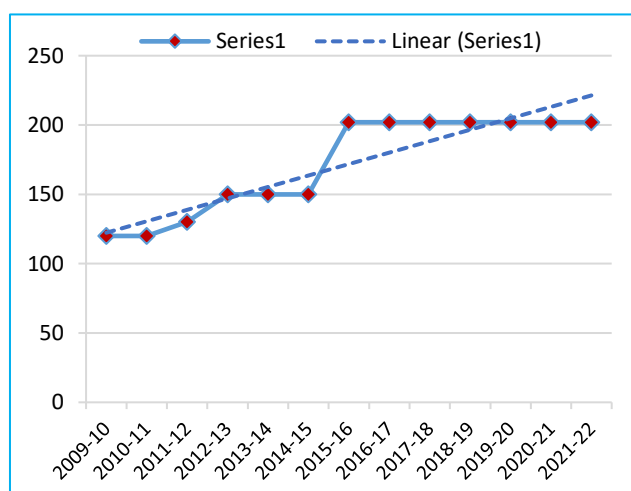


Fig 2 Trend line of area (hectare)

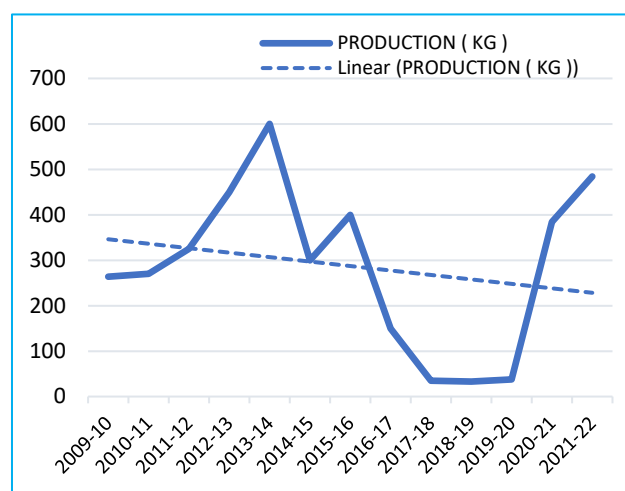


Fig 3 Trend line of production (Kg)

The productivity trend of saffron has increased over the years. In the year 2009-10 the yield was 2.2 kg/ha. The productivity was highest in the year 2013-14 in which the yield was 4kg/ha. The yield has been declined drastically in the years from 2016-20. The productivity was lowest in the year 2018-19 in which the yield was 0.163. The productivity for the year 2020-21 is 1.9 kg/ha and it is 2.398 kg/ha for the year 2021-22.

Constraints to saffron production

Corm quality

The quality of corms has a direct impact on the yield and quality of saffron crop. In Kishtwar saffron farmers often use low quality corms which have a low viability and are susceptible to diseases. This results in poor plant growth and low saffron yield. The use of low-quality corms also increases the risk of pest and disease infestations leading to crop losses [12]. To overcome this constraint saffron farmers in Kishtwar need to source high quality corms from reliable sources that are adapted to the local climate of Kishtwar. Farmers can also adopt proper corm management practices, such as proper storage and treatment to maintain the viability and quality of corms. Farmers can adopt proper planting techniques such as using the correct planting depth and spacing to optimize the growth of saffron plants. By addressing the constraint of low-quality corms saffron farmers in Kishtwar can improve the profitability and sustainability of their saffron cultivation.

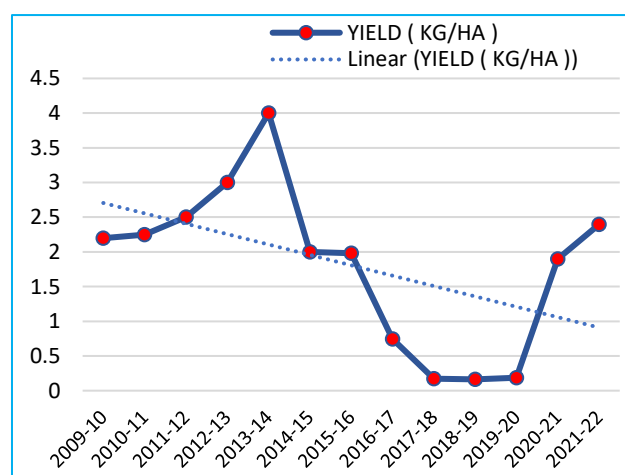


Fig 4 Productivity trend of saffron

Pests and diseases

Pest and diseases can significantly reduce the quality and yield of saffron crop. Some of the common pests and diseases affecting saffron crops in Kishtwar include:

Corm rot: Corm rot is a fungal disease that affects saffron corms, leading to their decay and reduced viability. This disease is caused by the fungus *Sclerotinia-sclerotiorum* and it can spread quickly and cause significant crop losses [13].

Corm mites: Corm mites are tiny arachnids that infest saffron corms leading to reduced plant growth and saffron yield. They feed on the corm tissues leading to discoloration and decay.

White grubs: White grubs are soil dwelling larvae of certain beetles that feed on saffron corms and roots. They can cause significant damage to saffron crops leading to reduced yields and plant mortality.

Leaf spot: Leaf spot is a fungal disease that affects the saffron leaves leading to the formation of small circular spots on the leaves. It can cause leaf yellowing and reduced photosynthesis leading to reduced plant growth and saffron yield.

Weeds management

Some common weeds that affect saffron crop include:

Field bindweed: This weed has deep and extensive root systems that can compete with saffron plants for water and nutrients.

Barnyard grass: This weed can grow quickly and shade saffron plants reducing their access to light.

Lamb's quarters: This weed can reduce the growth of saffron plants by competing for water and nutrients [14].

To address the weed constraints in saffron cultivation in Kishtwar farmers can adopt proper weed management practices such as hand weeding, mechanical weeding and use of herbicides.

Labor availability

Saffron cultivation requires manual labor which is becoming scarce in Kishtwar due to migration and urbanization [15]. This limits the availability of skilled labor for saffron cultivation.

Water availability

Saffron requires irrigation during the growing season, which is limited by the availability of water in Kishtwar. The district has limited water resources which makes it difficult to provide adequate irrigation to saffron crops.

Climate

Saffron cultivation requires a cool and dry climate with temperatures ranging between 15-25 °C during the growing season [16].

Soil quality

Saffron requires well drained soil with good fertility and a pH range of 6-8. However, the soil in Kishtwar is mostly rocky and infertile except few areas which limits the growth of saffron. Additionally, the soil lacks adequate organic matter which is essential for retaining moisture and nutrients required for the growth of saffron crop.

Marketing

Marketing can be significant constraint for saffron growers in Kishtwar as the market for saffron is highly competitive and the quality of the saffron can vary greatly. Saffron growers in Kishtwar may face challenges in accessing markets due to their remote location. Additionally, there may be a lack of awareness about the quality of saffron produced in

Kishtwar which can make it difficult to attract buyers [17]. To overcome these constraints saffron growers must invest in marketing their saffron effectively. This may involve creating awareness about the quality of saffron produced in the area, packaging the saffron effectively and transporting it to markets in a timely and cost-effective manner.

Suggestions to promote saffron cultivation in Kishtwar

There are several suggestions to promote saffron production in Kishtwar:

1. Providing better irrigation facilities

Saffron cultivation requires a significant amount of water and therefore providing better irrigation facilities to the farmers in Kishtwar can help to increase the yield of saffron.

2. Improving soil fertility

The quality of the soil plays an important role in the growth of saffron. Providing farmers with fertilizers and other soil nutrients can help to improve soil fertility and thereby increasing the production of saffron.

3. Access to finance

One of the major challenges faced by saffron farmers in Kishtwar is access to finance. The government can collaborate with financial institutions to provide loans at low interest rates to saffron farmers. This will help farmers invest in modern farming techniques and equipment's which will in turn increase saffron production.

4. Promoting scientific research

Research on saffron cultivation such as breeding of better saffron varieties can help to improve the quality and yield of saffron in Kishtwar.

5. Providing training and education

The government can provide training and extension services to saffron farmers on modern farming techniques and best practices in saffron cultivation. This will help farmers to improve their farming practices and increase their saffron yield.

6. Promoting market linkages

Providing farmers with market linkages such as connecting them to exporters can help to ensure that the saffron produced in Kishtwar is sold at fair prices, thus increasing the income of farmers.

CONCLUSION

Saffron holds a pivotal role in fostering sustained growth within the regions where it is cultivated, thereby earning its status as the most expensive crop. Despite Kishtwar's longstanding history of saffron cultivation, the current scenario reveals that only specific pockets of the town engage in its production, leaving other districts with favourable geographical conditions unutilized. This disparity underscores a conspicuous lack of interest among the local population in cultivating saffron in the study area. While saffron boasts considerable economic potential and profitability, its expansion and sustainability face impediments that demand attention. Overcoming these challenges is imperative for ensuring the prosperity of the saffron industry, underscoring the frequent essentiality of government support. Some of the hindrances to saffron growth are: insufficient land usage, the absence of irrigation systems, challenges in product branding, a deficit in programming and policy-making knowledge, and a lack of trade and marketing

facilities. By overcoming these hindrances, the productions of saffron in Kishtwar can be promoted which can help to improve the livelihood of farmers and boost the economy of the region. The promotion of saffron cultivation in Kishtwar has the potential to significantly improve the livelihoods of farmers and

bolster the economy of the region. Through collaborative efforts between government authorities, local communities, and relevant stakeholders, the saffron industry can thrive, contributing to sustainable economic development and prosperity in the region.

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