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Afghanistan Saffron and Potential for the Economy: An Overview of International Trade and Domestic Well Being

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ABSTRACT

Foreign companies import Afghan saffron, which is considered to be best quality in the world. These companies then apply their labels and market the product under their country names. By adopting methodology required for production and market analysis, a study was conducted to determine the potential for production, export and value share. The study used techniques such as compound annual growth rate (CAGR) and decomposition analysis to determine changes in the area, production and productivity of saffron from 1991-92 to 2021-22. The findings revealed that the growth rates of area, production and productivity of saffron significantly increased by 29.61 per cent, 29.06 per cent and 0.42 per cent annually respectively. Additionally, the returns per hectare of Afghanistan's saffron were compared to other crops such as wheat, rice, corn and barley and the returns of saffron were found to be the highest. The export of Afghanistan's saffron also increased annually, providing farmers with more income opportunities.

Key words: Export, Marketing, Production, Saffron.

JEL Classification: Q1, Q13, Q17, M2, M3.

Saffron is the most precious and costly spice, valued for its delicate flavoring and color. Both stigma and corm of the saffron plant are used in cuisine, perfumes and medicine. The plant produces a visually appealing onion-like corm, approximately three centimeters in diameter and weighing around 8 grams. The slender leaves of the saffron plant are 6-10 cm long and 2-3 mm wide. Saffron blossoms are collected in the initial weeks of October through mid-November. The flowers are light purple in colour with occasional red or white streaks and each has a lifespan of 48 hours. Saffron is a high-value crop and the flowers must be picked before sunrise when they open (Menia *et al.,* 2018).

In 1979, during the Soviet invasion of Afghanistan, many people migrated to Iraq and Iran. Upon returning to Afghanistan, they brought saffron bulbs and planted them. However, the farmers at the time were not well-versed in growing techniques (Ajaz, 2012, Fayz and Sultani, 2016). Fortunately, the Ministry of Agriculture and other non-governmental organizations began distributing the bulbs, which led to the growth of the Afghanistan saffron industry. Afghan saffron is one of the new arrivals in the world market and would be a serious competitor to other big exporters (Hussaini, 2016). Saffron is a versatile spice that has been used for cooking, as a medicine, as a fabric dye and for traditional medicinal purposes. It has been found to have potential health benefits and positive effects on amyotrophic lateral sclerosis disease. Researchers found its potential as a supplement for contemporary medical science (Khazdair *et al.,* 2015, Siddiqui *et al.,* 2018 and Akbari *et al.,* 2020). UNIDO recognizes its medicinal benefits as anti-cancer, cholesterol and triglyceride-reducing. Additionally, the saffron complex aroma has been acknowledged in the field of perfumery. The demand for saffron is increasing globally and economists predict that it will continue to rise drastically.

Afghanistan's saffron is highly recommended among international spice specialists and is consistently rated highly in comparison to saffron from other producers worldwide (Wyeth, 2007). As European nations struggling to find affordable labour options for saffron production, Afghanistan emerges as a promising candidate to address the shortfall resulting from their diminishing saffron output. Cultivating saffron in this country is therefore crucial for commercial purposes (Parto and Mihran, 2010). To ensure Afghan saffron producers receive the best pricing, a two-part plan has been proposed. Currently, Afghan saffron is not well-known from an economic standpoint and is sold without a brand (Anonymous 2007). In 2016, the export value of saffron was $421 million, Afghanistan ranked fifth in saffron exporter of the world and comprising 5 per cent of the total value (Anonymous, 2018). Saffron is one of the most

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important sources of income for women farmers and generates more revenue per square foot than opium poppies (Nabizada 2010; Minoia and Pain, 2016).

Farmers in Afghanistan currently have limited interaction with international buyers, as they rely on middlemen to sell their products. Unfortunately, these merchants often withhold crucial market information from producers, which can negatively impact farmers' profits. However, by establishing inclusive GI protection associations for the saffron value chain, farmers can gain access to vital information about foreign buyers (FAO 2019). To maximize saffron output, the optimal strategy involves providing necessary machinery services, long-term loans and conveniently located saffron promotion service centres. International non-governmental organizations can also offer additional helpful services (Azimi *et al.,* 2020). Therefore, the main objective of this study is to provide a description of Afghan saffron, export data and its value share in international markets.

To achieve the objective, the study was conducted in Afghanistan; utilizing secondary data sources obtained through from reputable published sources, such as ministry of Agriculture, Irrigation and Livestock (MAIL), Ministry of Commerce and Industry (MCI), NGOs and research papers (from 1991 to 2023, as a Ph.D. credit seminar in the Department of Economics and Sociology), to determine resource usage coefficients and availability levels within the country. The study thoroughly analysed trends related to the saffron area, production and productivity, utilizing Compound Annual Growth Rate (CAGR) techniques as estimated by Champaneri and Patel (2022), Rohlupuii *et al.* (2023); Khan and Ansari (2023). Due to limitations in the available data, the study focused on a 31-year period, spanning from 1991-92 to 2021-22, which was further divided into three sub-periods for a more comprehensive analysis: Period-I (1991-92 to 2001-02), period-II (2002-03 to 2011-12) and Period-III (2012-13 to 2021-22). The growth in the saffron area, production and productivity for each sub-period, as well as overall, was computed using the exponential model formula. This model effectively converts large or small numbers into a singular number, thereby enhancing the power of the corresponding capability. The exponent can be positive or negative. Overall, this approach results in a more accurate estimate of underlying trends, as demonstrated below:

$$Y = AB^t$$

$$\text{Log } Y = \log A + t \log B$$

$$\text{Compound annual growth rate} = (\text{Antilog } B - 1) \times 100$$

Where:

Y = Absolute value.

t = Period of time (years).

To determine the growth sources for saffron production in different periods, we followed the growth approach suggested by Joshi *et al.,* 2006 and Das and Mishra 2020. This approach breaks down changes in the production of a single crop into changes in area, yield and its interaction. By decomposing the growth components, we were able to measure the contribution of area and yield towards the overall change in saffron production in Afghanistan. The change in production between two periods and the overall period can be determined by the formula:

Change in production =

Yield effect + Area effect + Interaction effect,

which takes into account changes in both yield and area.

Here is a more detailed breakdown:

$$\text{Area effect} = \text{Area} \times \text{Change in yield}$$

$$\text{Area effect in percentage (\%)} = (At/\Delta Qt) \times 100$$

$$\text{Yield effect} = \text{Yield} \times \text{Change in area}$$

$$Yt\ (\%) = \frac{Yt}{\Delta Qt} \times 100$$

$$\text{Interaction effect} = \text{Change in area} \times \text{Change in yield}$$

$$\text{\% of interaction effect} = \frac{\text{Interaction effect}}{\Delta Qt} \times 100$$

Production

Saffron stands out among agricultural products for its unique characteristics. It requires low water consumption, can be cultivated for five to seven years after harvesting, can grow on infertile land and is easy to transport. Additionally, it is the only agricultural product sold by weight per gram and is also the most expensive. Between 1991 and 2015, Afghanistan's area under saffron encompassed approximately 1,000 hectares, resulting in an output of approximately 3,500 kg. However, in the last two years (2020 and 2021), area under saffron has expanded significantly, surpassing 8,400 hectares and yielding approximately 11,000 kg.

To provide a general idea of expenses and income, a joint report by (Anonymous, 2007), ICARDA and the UK Department for International Development (DFID) estimated the costs and earnings for one hectare of land over five years. According to Table 1.1, the income for one hectare of saffron over five years would be US$ 18464, while input costs would be US$ 8762, as Lunsford and Zenger (2009) estimated in Afghanistan and Benmihoub *et al.,* (2022) in the area of M'Zabvalley-Southern Algeria. Saffron is a crucial export product for Afghanistan, which can serve as a substitute for opium, as mentioned Huramt (2018). Reported that the Afghan government and international efforts are both working together to increase saffron production, raise awareness of its benefits, discourage farmers from growing opium poppies and reduce overall poppy production in the country (World Bank, 2015). Although there is limited information available about this plant, many media outlets, magazines and organizations have researched and promoted saffron. Table 1.2 provides an overview of the situation of saffron from 1991-92 to 2021-22 (Anonymous, 2021).

The results show that area under saffron has increased significantly from 16 hectares to 8410 hectares during the study period witnessing an annual growth of 29.61 per cent. During the same period, saffron production has increased from 60 kg to 10906 kg or 29.06 per cent per annum. Table 3 presents the growth rates of saffron area, output and efficiency in Afghanistan for three sub-periods (1991-92 to 2001-02, 2002-03 and 2011-12, 2021-22) and the overall period (1991-92 to 2021-22). During period I, the area and production of saffron saw a significant

Table 1: Estimation of the cost and income of one hectare of saffron for 5 years.

Inputs/Expenses		Income	
Particulars	(US$)	Items	(US$)
Land preparation	179	Saffron spice	17143
Animal Manure	514	Corms	1179
Corm (planting materials)	4286	Dried leaves (livestock feed)	143
Cultivating bulbous	237		
Bulbus remedy	143		
Weed control	1293		
Soil layer softening	414		
Collecting of flowers	150		
Irrigating	257		
Processing (separation, drying, *etc.)*	1289		
Total	8762	Total	18464
B:C ratio*			2.11

Source: Lunsford 2009, *B:C= Benefit cost ratio.

Table 2: Saffron area, production and productivity in Afghanistan, 1991-92 to 2021-22.

Year	Area (ha)	Product (Kg)	Yield (Kg ha^{-1})
1991-2004	16	60	3.7
2005-06	40	150	3.7
2006-07	83	240	2.9
2007-08	161	400	2.5
2008-09	260	900	3.5
2009-10	306	1500	4.9
2010-11	400	1700	4.3
2011-12	560	1800	3.2
2012-13	650	2700	4.2
2013-14	730	3145	4.3
2014-15	850	3500	4.1
2015-16	1108	4718	4.2
2016-17	2588	6081	2.4
2017-18	5205	10689	2.1
2018-19	6247	12955	2.1
2019-20	7558	19650	2.6
2020-21	7716	19800	2.6
2021-22	8410	10906	1.3
CAGR (%)	29.61	29.06	-0.42

Source: Afghanistan Central Statistical Yearbook and MAIL 2022.

Table 3: Compound annual growth rate (CAGR) of area, production and productivity (Percentage).

Periods	Area (ha)	Production (Kg)	Yield (Kg ha^{-1})
Period-I (1991-92 to 2001-02)	4.15*	3.40*	-0.71*
Period-II (2002-03 to 2011-12)	59.08*	60.68*	1.01*
Period-III (2012-13 to 2021-22)	40.72*	25.64*	-10.7*
Overall (1991-92 to 2011-22)	29.61*	29.06*	-0.42*

*Significant at P≤ 0.05.

increase of 4.15 per cent and 3.4 per cent per annum, respectively, while the productivity of saffron decreased by -0.71 per cent per annum. In comparison, period II showed significantly higher rate of growth in area, production and productivity at 59.08, 60.68 and 1.01 per cent per annum, respectively due to financial assistance provided by the international community for various development projects in Afghanistan. Period III experienced a lesser growth rate in area and production than Period II, at 40.72 and 25.64 per cent per annum, respectively. Throughout the overall period, the area and production of saffron observed an increase at the rate of 29.61 and 29.06 per cent per annum, respectively, while the productivity saw negative growth at a rate of -0.42 per cent per annum.

Table 4 displays the decomposition analysis results for the growth of saffron crop production in Afghanistan from 1991-92 to 2021-22. In period-I, the area and yield effects contributed 106% and -4%, respectively, to the growth of the saffron crop which indicated the dominance of area effect on the increase in production of saffron during that period.

During period II, saffron area had no significant impact effects, while the area effect increased by 104 per cent. In period III, the yield effect decreased by 23 per cent, compared to the area effect which increased by 393 Per cent. Overall, the area effect had a greater impact on production than the yield effect. According to Table 5, the total saffron production significantly increased from 21.5 tons in 2018-19 to 69.74 tons in 2022-23 and the value saffron also increased from US$ 21 million to US$ 22.9 million, according to the current market price. However, the value of Afghan saffron could not increase after the change of government in Afghanistan, but this situation may change soon, and Afghan saffron may regain its position in the world markets, as it was during the previous regime.

Table 6 (statistical yearbook of Afghanistan), shows the average production of various crops per hectare and their economic value. Saffron has the highest percentage at 41.76% with an average production of 3.1 kg per hectare at a value rate of US$ 3647. Rice is the second most produced crop with 3 tons worth US$ 2272, occupying 26.02% of land. Barley, maize and wheat have an average production of 1.96, 1.95 and 1.94 tons per hectare, respectively. Their economic value is US$ 1138, 846, and 830 and they occupy 13.03%, 9.65% and 9.50% of the available land.

Table 4: Decomposition analysis of saffron crop production in Afghanistan, 1991-92 to 2021-22 (Percentage).

Period	Production effects	Percentages (%)
Period-I	Yield effect	-4
(1991-92 to 2001-02)	Area effect	106
	Interaction effect	-2
Period-II	Yield effect	0
(2002-03 to 2011-12)	Area effect	104
	Interaction effect	-4
Period-III	Yield effect	-23
(2012-13 to 2021-22)	Area effect	393
	Interaction effect	-270
Overall	Yield effect	-0.2
(1991-92 to 2021-22)	Area effect	231.7
	Interaction effect	-131.5

Table 5: Production and value of saffron in Afghanistan, 2018-19 to 2022-23.

Year	Quantity (000'Killo gram)	Value (000'US$)
2018-19	21.46	21235
2019-20	30.26	26411
2020-21	40.48	27827
2021-22	61.41	24381
2022-23	69.74	22856

Source: Afghanistan Govt, 2023.

Markets

To enable Afghanistan's saffron to penetrate the global market, several measures need to be implemented. Firstly, it is essential to establish value-added and packaging centres that adhere to international standards and norms. Secondly, a committee comprising experts, merchants, and exporters in the saffron marketing and global relations field should be formed. Thirdly, information dissemination *via* the media on saffron consumption, production and quality should be increased. Lastly, the quality level of saffron should be raised by providing training to producers and merchants, branding and obtaining ISO certification for Afghan saffron cooperation. To support these initiatives, the Afghan government can leverage the expertise of relevant ministries, including the Ministry of Economy, the Ministry of Commerce and Trade, the Afghanistan Chamber of Commerce and Industry (ACCI) and the Ministry of Agriculture, Irrigation, and Livestock (MAIL). Additionally, partnerships with international organizations like FAO, the World Bank and

Table 6: Efficiency obtained from one-hectare land Saffron and other crops (2023).

Plant	Production (Kg/Ha)	Income (US$/Ha)	Percentage (%)
Saffron	3.1	3647	41.76
Wheat	1943	830	9.50
Rice	2979	2272	26.02
Maize	1954	846	9.69
Barley	1962	1138	13.03

Source: Moradi and Turhan 2017, Afghanistan Statistical Yearbook 2020, World Bank 2023.

Table 7: The effective way for achieving international market (2018).

Particulars	No. of respondents	Percentage
Improve quality saffron	11	16.67
Improve quality of processing and packaging	23	34.85
High productivity	14	21.21
All	18	27.27
Total	66	100

Source: Hekmat, 2019.

others can provide valuable financial and technical assistance.

The Ministry of Agriculture Irrigation and Livestock (MAIL) has reported that the value of one kilogram of saffron is $1,150 in domestic markets and $1,600 in international markets. To ensure quality with overseas buyers, exporters often request samples from manufacturers. They store and grade saffron for the foreign market and may retest Afghan saffron to ensure it meets global standards. In recent years, Afghan saffron has gained popularity in the expensive European market due to its unique flavour and high quality. Afghanistan earned $17 million in 2016, $27 million in 2019 and $24.9 million in 2020 from international markets. Afghan saffron has received 3 gold stars for exceptional products with a score between 90 and 100 per cent, making it one of the highest quality saffron in the world markets (Anonymous, 2022).

Despite the high demand for saffron in Afghanistan, the market is much larger in other countries like China, India, UAE, Europe and the USA. Afghan saffron has recently been ranked as the best in terms of quality and is the third-largest global producer of saffron (Katawazy 2013 and Ludovica, 2018). However, its production remains low compared to the demand of the world market. It's worth noting that the unofficial trading of Afghan saffron often reaches Iranian marketplaces and is labelled as Iranian, which means many of its exports are not reported. For three consecutive years, the International Institute of Taste and Quality in Brussels, Belgium has recognized Afghan saffron as one of the best in the world (Jesús, 2018). Afghan saffron has become more popular in European markets recently due to its unique flavour and high quality. If quality control procedures can maintain its reputation, there will be significant opportunities for Afghan saffron exports in the future. Exporters should take advantage of this chance, as Afghan saffron has already been successful in expanding into many markets. Saffron production globally increased by 7% between 2012 and 2016, mainly due to a rise in demand worldwide. Before buying, buyers request exporters to provide samples of their product for testing to ensure the quality of the saffron. After confirming compliance with international quality requirements, they purchase and store the goods for packaging and sale. A 2018 survey in Afghanistan explored how to best achieve the international market for a product, likely saffron. Table 7 summarized

Table 8: Afghanistan saffron export value to top Countries 2013-2020 (US$).

Rank	Country	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
1	India	0	1602456	9064248	14055633	15858812	14679968	17959602	22105700	12919805	14409557
2	Spain	611227	520016	492051	0	0	16958	360358	1420916	1389461	1605704
3	US	240088	106449	198380	237832	410749	66920	473214	672167	784171	804426
4	Germany	73204	62582	29586	53182	84068	50192	108540	276760	231516	321724
5	Switzerland	3631	13138	12869	1084	124900	1200	87972	148627	9677	0
6	Canada	27281	25785	3540	15817	31264	31620	49422	94672	68924	23306
7	UK	0	2429	0	1360	5447	1227	16359	92937	41241	21855
8	Netherland	199	128	1484	15321	3287	4645	3337	19519	103,220	61105
9	Belgium	0	59	0	3136	101	1247	2728	10342	100,483	11053

Source: Anonymous 2023 and Afghanistan govt.

the responses from 66 participants. There were four main suggestions: improving saffron quality itself, improving processing and packaging, focusing on high productivity, and considering all three factors together. Interestingly, the most popular option (23 respondents, 34.85 per cent) was to improve processing and packaging, suggesting that Afghan saffron producers see this as the most crucial factor for success in the international market followed by high productivity (14 respondents, 21.21 per cent), improve the quality of Saffron (11 respondents, 16.67 per cent), and all of the above three options agreed by 18 respondents (27.27 per cent). Afghanistan's saffron exports are popular in many foreign markets, including Saudi Arabia, India, France, Spain, the United Arab Emirates, China, the United States, Sweden, Germany, Italy, the Netherlands, Tajikistan, Canada and Australia (Anonymous, 2020). Table 8 indicated Afghanistan saffron export value to top countries. It provides a detailed look at Afghanistan's saffron exports to its nine major partner countries over a ten-year period, from 2013-14 to 2022-23. Each year has a dedicated column listing the export value in US dollars. The table shows India as the consistent leader in terms of import value throughout the decade. Interestingly, India's imports reached their highest point at US$22,105,700 in 2020-21. Looking beyond India, the table allows you to compare trends across other countries. For instance, Spain was a significant importer in the early years (2013-14 to 2016-17) but its import significantly declined by 2021-22. US consistent importer with a slight upward trend. Germany moderate and somewhat steady import levels. In contrast, Switzerland's imports appear to be more volatile, with years of high import value followed by years of much lower imports. Canada moderate import levels with some fluctuations. The same as other countries have low and inconsistent import levels, with a recent surge in 2021-22. The finding of this report supported by (Anonymous, 2023).

CONCLUSION

The growth rates of Afghanistan's saffron area and production have significantly increased each year. Saffron is a vital source of income for all parties involved, particularly for Afghanistan's poor farmers who cultivate in a landlocked country. The saffron crop requires less irrigation water compared to other crops, needing only one or two irrigations throughout the season. It can be easily cultivated with simple farm tools and requires less labour, making it accessible to those who lack knowledge in farming. Saffron has a brief growth period of about two months and gives high returns annually. It has a low risk of drying out or contracting diseases and up to 80 per cent of the farming can be done by females. Saffron can also be stored for up to two years, making it easy to transport and sell globally. Compared to other crops, saffron has the highest returns and Afghanistan has been exporting more than ever in the last decade. However, after the recent political change in August 2021, Afghanistan's saffron export value has decreased. To maintain its position in the global market and among consumers, Afghanistan needs to focus on developing its quality and quantity. As more countries compete for a share of the lucrative saffron market, Afghanistan must take measures to ensure it remains a top exporter. Under the Geographical Indication tags Afghanistan must has to promote the saffron to different countries especially in European nations. It was observed that production is there but in term of marketing Afghanistan do not have any solid policy. Saffron must be sold in regulated markets. Administration must ensure that only registered middle man should allowed.

Conflict of interest

I hereby certify on behalf of all authors that this research work has not been published before fully or partially (except in the form of an abstract, as part of an unpublished conference presentation or thesis) and it is also not under consideration for publication elsewhere. I further certify that this work will not be submitted to any other publisher for publishing in any form before Agricultural Reviews takes decision of not publishing it. I also declare that all authors duly understand that the copyright of this research work will automatically be transferred to the publisher in case the manuscript is accepted for publication.

REFERENCES

Ajaz, A. Shah, (2012). Knowledge of saffron growers on saffron production technology in Kashmir. Journal of Agricultural Extension and Rural Development. 6: 1-4.

Akbari, E., Alami, K., Hossaini, D., Nazari, M.L., Salehi, M.H., Sajjadi, M., Mousavi, S.Y., (2020). Effect of Afghan Saffron (*Crocus sativus L.*) aqueous extract on withdrawal signs in morphine-dependent Rats. Pharmacology Journal.12: 1727-1731.

Anonymous, (2021). Afghanistan Central Statistical Office, Year Book Report. Kabul, Afghanistan.

Anonymous, (2007). Marketing afghan saffron. International Research and Development. Washington State University, USA. pp. 1-45

Anonymous, (2020). Export of saffron from Afghanistan, available in web:https://www.tridge.com/intelligences/saffron/AF/export

Anonymous, (2007). Saffron: Afghanistan red gold, planting, maintenance, harvesting and processing. Danish Committee for Aid to Afghan Refugees (DACAAR), Kabul, Afghanistan.

Anonymous, (2022). Ministry of agriculture irrigation and livestock (MAIL) Persian report of saffron. Available in web: https://www.mail.gov.af

Anonymous, (2023). Yearly report. Ministry of Trade and Industry, Kabul Afghanistan.

Azimi, M.W., Khan, G.D., Youshida, Y., Kawata, K., (2020). Measuring the impacts of saffron production promotion measures on farmers' Policy acceptance probability: A randomized conjoint field experiment in Herat province, Afghanistan. Sustainability. 12: 4026.

Benmihoub, A., Akli, S., Ameur, F., Oulmane, A., Faysse, N., Mokrani, M. and Belhadi, A., (2022). The emerging saffron value chain in the M'Zab valley-Southern Algeria: an analysis of on going dynamics and strategic development options. NEW MEDIT SPECIAL ISSUE 2022. DOI: 10.30682 nm2205h.

Champaneri, D.D. and Patel, N.K., (2022). Photo selective shade net: An effective tool to reduce the impact of global warming and pesticide residues in vegetable production: A review. Agricultural Reviews. 43: 135-144.

Das, A., Mishra, (2020). Compound annual growth rate (CAGR) of fresh tea leaf (*Camellia sinensis*) production in Assam: A statistical approach. Food and Scientific Reports, ISSN 2582-5437, Central Agricultural University, Pusa, Bihar 848 125, India.

FAO, (2019). Role of Geographical Indications (GIs) in Saffron Production and Marketing in Herat Province, Afghanistan. Available in web:https://www.fao.org/one-country-one-priority-product/asia-pacific/afghanistan/en

Hekmat, A.J., Kumar, S., Hekmat, A.W., (2019). The problems of production and marketing of saffron, and SWOT analysis of export potentials in Ghoryan district, Herat province of Afghanistan. International. Journal Applied Pure Science and Agriculture, 2394, Sam Higginbottom University of Agriculture.

Huramt, (2018). Contribution of saffron production on Afghanistan economy. BSc thesis. Jahan University, Afghanistan.

Hussaini, A., (2016). The potential of Afghan saffron in international markets. MSc thesis. Bochum/Kabul, V: 008.

Jesús, A., (2018). Saffron sector spicing up afghan exports. Afghanistan National export strategy, pp. 1-60. 2018-22. http:// www.intracen.org

Joshi, P.K., Pratap, S., Birthal, Minot, N., (2006). Sources of agricultural growth in India: Role of diversification towards high-value crops. (MTID Discussion paper 98) International Food Policy Research Institute, Washington DC, USA.

Katawazy, A.S., (2013). A comprehensive study of Afghan saffron, research, planning and policy directorate. Afghanistan Investment Support Agency (AISA), Kabul, Afghanistan.

Khan, A. and Ansari, S.A., (2023). Efficiency in cotton production across the states in India. Bhartiya Krishi Anusandhan Patrika. 38: 138-144.

Khazdair, M.R., Boskabady, M.H., Hosseini, M., Rezaee, R. and Tsatsakis, A.M., (2015). The effects of Crocus sativus (saffron) and its constituents on nervous system: A review. Avicenna J Phytomed. 5: 376-391.

Ludovica, G., (2018). Red gold rush: Managing quality for Afghan saffron exports. Pp. 142. International Trade Centre (is the joint agency of the World Trade Organization and the United Nations), Geneva.

Lunsford C, Zenger J, (2009). Saffron red gold, human terrain system research reach back center. TN: RRC-AF2-09-0007.

Menia, M., Iqbal, S., Zahida, R., Taher, S., Khanth, R.H., Saad, A.A., Hussain, A. (2018). Production technology of saffron for enhancing productivity. Journal of Pharmacology and Photochemistry. 7:1033-1039. https://www.phytojournal.com/archives/2018/vol7 issue1/PartN/7-1-20-802.pdf

Minoia, G., Pain, A., (2016). Saffron: The social relations of production. Secure Livelihoods Research Consortium (SLRC), ISBN Code: 978-9936-628-51-9 AREU Publication Code: 1701E.

Moradi, M., Turhan, S., (2017). The Importance of Saffron Plant in Afghanistan's Agriculture. Uludað University, Turkey. Journal of Biology Environmental Science. 11:165-169.

Nabizada, R., (2010). Impacts of saffron projects and the effectiveness of agriculture extension services on transition from poppy to saffron in Pashtun Zarghun district of Afghanistan. MSc Thesis. Van Hall Larenstein University of Applied Sciences, the Netherlands.

Parto, S., Miran, R., (2010). Value chain governance and gender: Saffron Production in Afghanistan. Afghanistan Public Policy Research Organization (APPRO), available in web https://www.appro.org.af

Rohlupuii, Kaur, K., Kataria, P. and Priscilla, L., (2023). Assessment of crop production dynamics in Mizoram. Agricultural Reviews. 4: 573-576

Siddiqui, M.J., Saleh, M.S.M, Basharuddin, S.N.B., Zamri, S.H. B., Najib, M.H.B., Ibrahim M.Z., Noor, M.A., Mazha, H.N., Hassan, MM. N.H. and Khatib, A., (2018). Saffron (*Crocus sativus L.*): As an Antidepressant. Journal of Pharmacy and Bioallied Sciences. 10: 173-180.

Sultani, S.M., Fayz, A. (2016). Knowledge level of saffron growers in Pashtoon Zarghon district, Heart, Afghanistan. Herat University, Conference Paper No: 148.

World Bank, (2015). Saffron: A Major Source of Income and an Alternative to Poppy. Available in web https://www.worldbank.org/en/news/feature/2015/01/20/saffron-major-source-income-alternative-poppy.

World Bank, (2023). Afghanistan economic monitor. pp. 11. Issue 5, 2023.

Wyeth, P. (2007). Marketing Afghan saffron. International Research and Development, Washington State University.