

Saffron -“the red gold spice”: how to improve its profitability

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Saffron (*Crocus sativus* L.), which is also known as "red gold", is one of the most expensive spices. It was traditionally mainly used as a condiment and natural dye in foods and as a medicinal plant in folk medicine. It has several nutritional and therapeutic properties (antioxidant, anti-inflammatory, anxiolytic, and antidepressant). Its cultivation is characterized by an extensive use of labor, since most crop management techniques (e.g., sowing, weeding, flower picking, and stigma separation) are performed manually all over the world [1-4]. Many different environments are suitable for the cultivation of saffron. Saffron can tolerate a wide variety of pedo-climatic conditions; it can survive frosts to temperatures of -10°C and short periods of snow cover, but it performs best in a Mediterranean climate (hot, dry summers and mild winters) [5]. Unfortunately, there is a lack of statistical and economic data on this spice. The market value of saffron was equal to 390 million US\$ in 2017 and it will rise to 555 million US\$ by 2026 [6]. The leading production countries in 2019 were: Iran (430 t, 91%), India (22 t), Greece (7.2 t), and Afghanistan (1.27 t). The main exporting countries in 2022 were Spain, the United Arab Emirates, the Netherlands and France, with values of 51.83, 13.8, 3.26 and 2.98 million US\$, respectively. Italy produces about 1 t, and has an export value of 1.17 million US\$ [6]. Cardone et al. [1] indicated a global production of 418 t y^{-1} in 2018. Iran, which has ca. 90% of the world's production (108,000 ha and 376 t in 2017, mostly in the Khorasan province), is the main producing country, and it is followed by Afghanistan (the Herat Province, 7,557 ha), India (the Jammu and Kashmir regions, 3,674 ha), Greece (mainly around Kozani, 1000 ha), Morocco (mainly around Taliouine, 850 ha), Spain (Castilla-La Mancha, Albacete, Toledo, Cuenca, and Ciudad Real, 150 ha), and Italy (70 ha), where saffron is traditionally produced in Sardinia (about 40 ha in San Gavino, the Cagliari province), Abruzzo (6 ha in Altopiano di Navelli, L'Aquila province), and Sicily (5 ha in the Enna province); small cultivations can be found throughout almost the entire Italian Peninsula [1,7], including the north-western Italian Alps, where its cultivation has recently been introduced to diversify agricultural production. The saffron yield is influenced by soil and climate conditions, agronomic practices, and by the corm size. Its yield –dried stigmas- can vary to a great extent, ranging from 2 to 30 kg ha^{-1} . Indeed, 5.4 kg ha^{-1} was recorded in Iran, 15 kg ha^{-1} in Spain, and 29 kg ha^{-1} in Navelli, Italy in 1999 [8]. Finally, informal sources (producers and utilizers) have indicated that the price of saffron on the Italian market varies from 7-8 €/gr (imported production) to 20-30 €/gr (domestic production). In general, saffron production in European countries has been seriously challenged in the last few decades because of increased manual labor costs, climate change, soil contamination and the spread of diseases [1,8]. Saffron production has decreased by around 98% in Spain (where the saffron cultivation area was about 6,000 ha in 1971), 38% in Greece (1,600 ha in 1982), and 98% in central Italy, Abruzzo (300 ha in 1910). Conversely, production has increased in Iran, although the yield per unit area has fallen significantly (from 5.1 kg ha^{-1} in 1982 to 3.5 kg ha^{-1} in 2017) [1]. The aim of this work, which is currently underway, has been to investigate how the adoption of sustainable cultivation techniques can improve the profitability of saffron at the primary level. Thus, economic and technical data have been collected directly (all the data referred to 1 ha) on farms in a marginal area in the North West of Italy. It was considered the effects on the productivity of: a) sustainable practices, used as inoculants of beneficial microorganisms, such as arbuscular mycorrhizal fungi (AMF); b) optimized agrotechniques. As far as the utilization of AMF is concerned, an increase in replacement corms and in the corm weight, which are important aspects for the production of its flowers, has been observed [9,10]. Such results will allow a comparison to be made with recent economic data¹ which indicate that saffron² was the most profitable spice, in terms of Gross Margin (GM)², in Italy in the 2015-2020 period, a result that reflects the profitability of each farm's production activities [11] and the Operating Margin (OM)³. Moreover, the human labor cost (HLC), that is, 83% of the total Farm labor cost⁴ has had an incidence of approximately 54% on the GM [11]. Our study has excluded the effects of the utilization of the violet tepals of the flower on profitability, as they have long been considered a floral waste of

saffron, although they have health-promoting properties (e.g., antioxidant and antidepressant) and could generate a new source of income from saffron [12-15].

Key words: saffron, profitability, sustainability, low-input crop, MAP

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Notes

¹Farm Accountancy Data Network (FADN). EU Regulation No. 1652/2020.

²Macaluso et al. compared the following species: saffron, rosemary, sage, oregano, lavender and 'other aromatic, officinal and medicinal plants' within the Italian FADN sample (2015-2020).

³Gross Margin (GM): the difference between the Total Gross Output (TGO) and the Variable Cost expenses (Vc). Operating Margin (OM): the difference between the GM and the Farm Labor Costs (FLC).

⁴Farm labor costs (FLC) are the sum of Human labor costs and Machine labor costs.