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Sorghum - A safe agricultural crop in Europe

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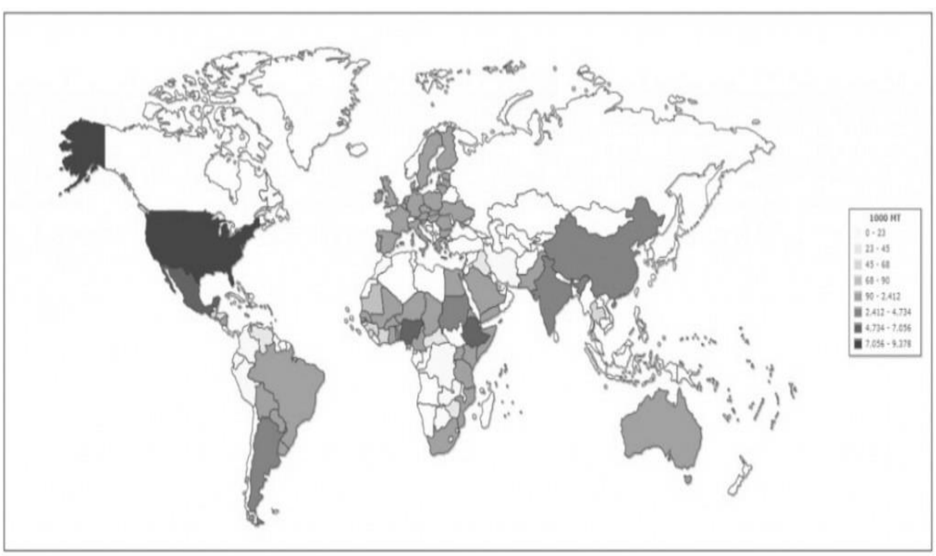
Abstract
Sorghum has a high biological and agricultural potential, which is why it is grown by many farmers, especially in Europe. Sorghum is the fifth most cultivated cereal in the world, after wheat, rice, corn and barley. It is a cereal with a chemical composition similar to cereals grown in our country, especially corn. This crop must be reconsidered as a cereal with great potential to be used for human consumption, not only for animal feed. Sorghum is adapted to a wide range of environmental conditions and can produce significant yields under conditions that are unfavourable for most other cereals. This adaptability can help farmers in Romania respond to changing climate conditions. Sorghum can become a substitute for maize.

Keywords: sorghum, cereal, changing climate, human consumption

Introduction

Sorghum is found next to the world's cultivated cereals, occupying fifth place after wheat, rice, corn and barley. Sorghum is the main staple crop for more than 500 million people in more than 30 countries (Abreha et al., 2021), especially in sub-Saharan Africa (Prasad et al., 2021). The largest area cultivated with sorghum, over 90%, is found in Africa and Asia(fig.1).

Fig. 1. Global sorghum production. Source: FAOSTAT



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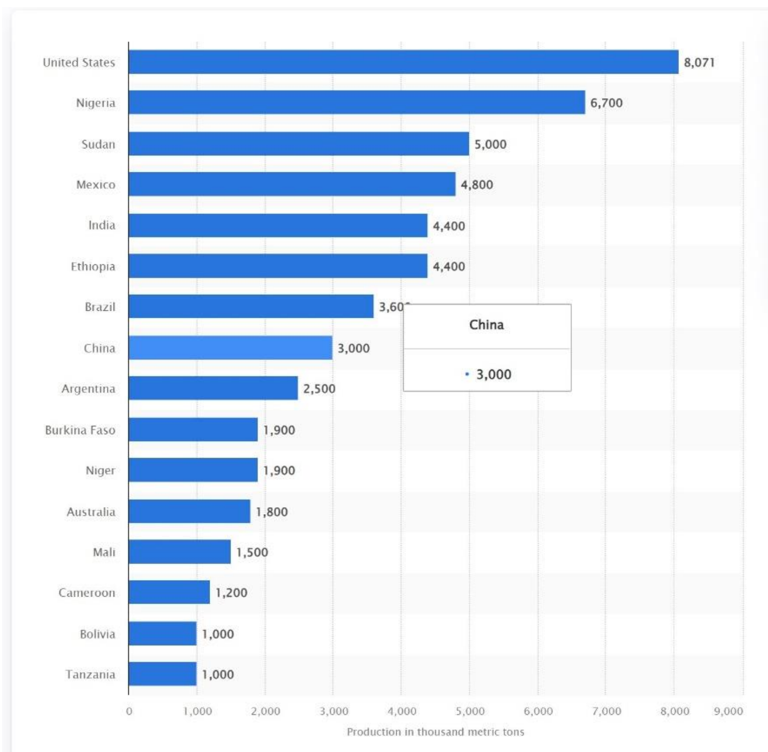
In terms of production, the U.S. currently leads with an annual production of about 9 million tons, followed by Nigeria (6.9 million tons), Ethiopia (5.0 million tons) and Mexico (5.0 million tons), India (4.5 million tons) and China with 3.6 million tons(fig.2). The multiannual average production (2001-2020) of sorghum is almost 58.7 million tons per year. The total production of the top 10 sorghum-producing countries accounts for about 78.6% (46.1 million tonnes) of total global sorghum production. This crop is widely cultivated in more than 100 countries around the world (Upadhyaya et al., 2019; Hao et al., 2021).

Fig. 2. Production in thousand metric tons. Sorghum production worldwide in 2023/2024, by leading country. Source: www.statista.com.



Materials and method

The current research aims to provide an assessment of the current state of sorghum cultivation worldwide, in the E.U. but also in Romania. This assessment can help to identify the opportunities of this agricultural crop, its sustainability in the context of climate change, especially in recent years, as a safe agricultural crop, in Europe. The research includes an

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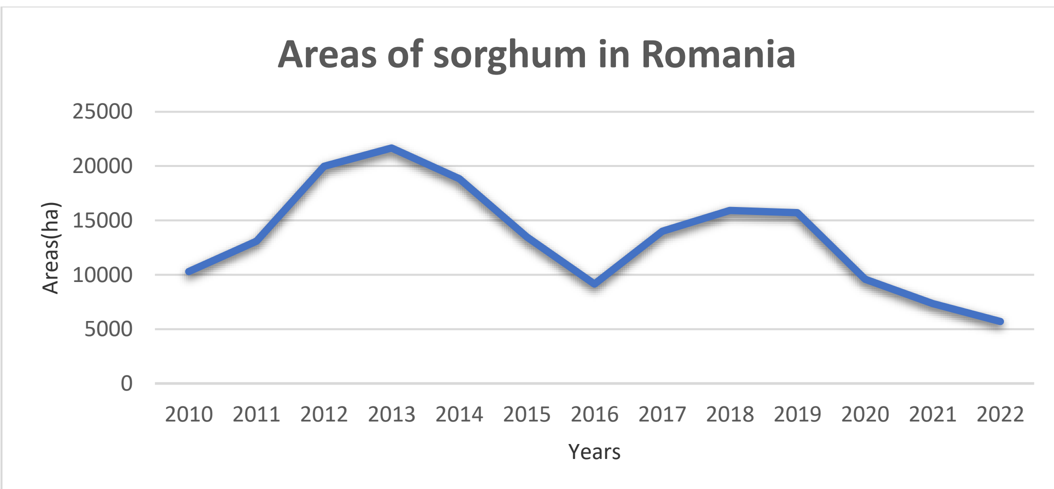
analysis of data on sorghum cultivation, but also an objective assessment, supported by the literature.

Analysis and Results

In 2020, the area cultivated with grain sorghum in Europe reached 375,000 ha, and in 2022, the area decreased to 183,000 ha cultivated with sorghum. Of the total EU production, 41% is made in France, 34% in Italy, 8% in Hungary and 7% in Romania.

In Romania, the area cultivated by sorghum between 1961 and 2022 registered a significant increase, especially in 2013.

Fig. 3 Romanian sorghum production (Own conception). Data source: INS-Tempo online



In 2022, 5702 ha were harvested with sorghum, with productions of over 4 tons in Romania (fig.4)

Fig. 4. Sorghum yields in Romania. Source: Food and Agriculture ONU (2023)

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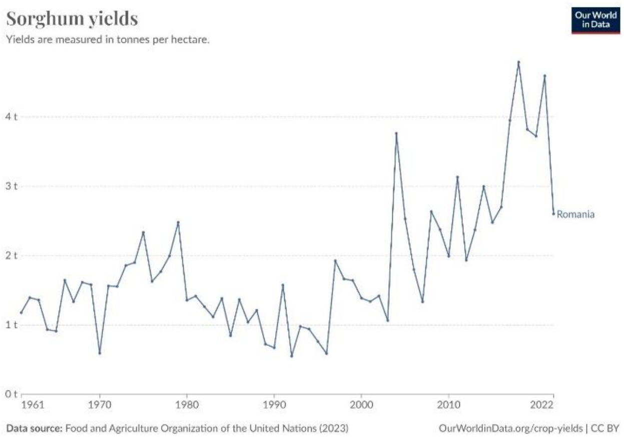

The sorghum crop has a high ecological plasticity, especially in adverse climatic conditions, good production performance, especially when suitable fertilizers are used, and good cultivation technology, so it is a safe crop to fight hunger during climate change.

Sorghum (Sorghum bicolor (L.) Monech) is a plant with a dense root system, extracts water and nutrients from the soil more efficiently than other plants, drought tolerant like a camel, resists diseases and pests, does not require many phytosanitary treatments, has an antiparasitic role in rotations, a good precursor plant, and new hybrids have a high production potential.

Sorghum loves heat, requiring an average temperature of at least 25°C. It has a maximum yield at daytime temperatures of 30°C, a temperature at which other agricultural crops are stressed.

The downside is that nighttime temperatures below 13°C for more than a few days can have a real impact on potential plant yield, which limits planting location and dates.

Sorghum has a chemical composition similar to that of corn and wheat but a higher protein content than corn and an energy value similar to that of wheat.

Compared to other cereal crops such as maize, rice, and wheat, sorghum yield is relatively low (Müller et al., 2020; Hao et al., 2021; Ndlovu et al., 2021). The average global yield of sorghum (~2.5 t/ha) is just at the lower level of the optimum yield, which ranges between 2.5 and 5 t/ha.

Sorghum contains a varied range of phytochemicals that act as antioxidants in the body, such as tannins, phenolic acids, anthocyanins, phytosterols and policosanols. In fact, the shell of the sorghum grain has a higher number of antioxidants than blueberries, strawberries and plums. Antioxidants contribute to slowing down the aging process, and foods rich in antioxidants are associated with a reduced risk of heart disease, diabetes, cancer, type 2 diabetes and some neurological diseases (Ananda et al., 2020; Hossain et al., 2022; Khoddami et al., 2023)

So, sorghum can be used not only in animal feed but also in human consumption due to its qualities, gluten-free, because today's consumer is eager for healthy products.

Conclusions

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Sorghum benefits from EU funds for promotion in Europe, under the coordination of the Sorghum ID Interprofessional Association.

Sorghum cultivation in Europe and Romania, the European sorghum development strategy, research, but also selection by creating varieties with high productive yield, are the premises of the sustainability of sorghum cultivation, along with its stress resistance, its adaptation to a range of soils difficult for agriculture (sandy and saline) and short vegetation season compared to other crops.

Despite sorghum's relative resistance to stress, this crop can be affected by biotic and abiotic factors. Abiotic factors, heat stress and moisture deficit may be challenges for sorghum cultivation in the future in the context of climate change.

Among the biotic factors, there is a large gap between developed and developing countries. advanced technologies, financial resources and agricultural practices suggest that major efforts need to be made by developing countries in terms of technology adoption, policy reform and policy enforcement to achieve higher crop yields.

Sorghum has a great potential for development in Europe and Romania because farmers are looking for productive, profitable and sustainable crops, thus being a solution to the problem of global warming. Sorghum also has many ecological, nutritional and agricultural benefits, it is an economic crop.

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