



## IDENTIFICATION OF OPPORTUNITIES FOR DIGITALIZATION OF MANAGEMENT PROCESSES IN SUNFLOWER PRODUCTION

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### ABSTRACT

The current complex geopolitical and economic situation leads to increased competitive pressure on producers of agrarian products, especially in crop production. The optimization of management processes can help to improve the profitability of crop production and, accordingly, the competitiveness of the offered products. The application of digital models for this optimization will continue to increase in importance in the future.

The aim of the present study is to evaluate the possibilities of digitization of management processes in sunflower production. In order to achieve the goal, it is necessary to solve the following tasks: to assess the level of competitiveness of the Bulgarian sunflower production; to analyze the factors determining the level of competitiveness; to analyze the levels of digitalization of management processes in sunflower production and offer future pathways for development.

**Key words:** intelligent crop production, competitiveness, agrarian markets

### INTRODUCTION

Digitalization involves the introduction of digital technological innovations into existing (organizational, industrial, societal) systems in such a way that it changes the way these systems work.

The agricultural innovation system is more than just adopting new technologies; it involves the co-development of technologies, societies, economies and institutions.

The five main influential trends in the digitization of management processes in agriculture are:

- diversification of information seeking behavior and knowledge production processes by sector participants;
- the increasing specialization and accumulation of decision-making expertise within complex advice networks;
- the privatization of the counseling system;
- turning agricultural data into commodities;

- identification and digital mapping of supply and service gaps in the system.

This study will focus on analyzing the economic results of sunflower production in Bulgaria and offer solutions for digitalization of the management process, that can improve these results in the future.

### METHODS

The data used in this study is sourced from Bulgaria's Ministry of agriculture and it's Agrostatics database, as well is UN's FAOStat database. The available data was cross-referenced and aggregated when needed.

In order to analyze the competitiveness of Bulgaria's sunflower production we used the methodology provided by Balassa (1) and Volrath (2). This combined methodology allows for the use of trade flows to evaluate competitiveness. Although there are some shortcomings with this analytic framework, such as mishandling of rapid data fluctuations and lack of data verification procedures it is still widely used to measure competitiveness on a countrywide basis.

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## RESULTS

Sunflower is one of the three main agricultural produce in Bulgaria, alongside wheat and maize. The wide variety of agricultural products that the country has produced in the last two decades of the 20<sup>th</sup> century, has slowly eroded. With the accession of Bulgaria to the European union in 2007, under the effects of CAP of EU and its implementation in the country productions was rapidly concentrated and the three forementioned products have expanded to take a huge portion of the sector.

Sunflower production has been a significant part of Bulgarian agriculture (3). Sunflower oil is the main cooking oil used in the country.

Production of sunflower and refining it in to sunflower oil is one of the population requirements of the sector. For large portion of the planned economy history of the country (1945 through 1989) growing and refining of sunflower was a community wide effort with significant cultural significance. Research in to such community efforts and their transformations are still relevant (4).

Sunflower production has been significant during the studied period (**Table 1**). The peak values have been reached in 2017, due the increase in the area harvested. During the following years the area harvested declined and thus the overall production.

**Table 1.** Sunflower production in Bulgaria

	2016	2017	2018	2019	2020	2021
Area harvested (ha)	817511	898844	788660	815560	821920	836470
Yield (kg/ha)	2291,90	2288,50	2464,90	2375,30	2109,10	2393,60
Production (t)	1873677	2056987	1943980	1937210	1733530	2002180

Source: Data sourced from FAOStat

Lowering of harvested area allowed for better organization of production and higher average yield per ha in 2018, 2019 and 2021 compared to the peak year of 2017. Only in 2020 the yield has declined due to the slower reaction to pandemic conditions among producers and work disruptions, characteristic for this period worldwide. In 2021 the average yield has increased and allowed for production to reach 97.5% of the 2017 values with just 93% of the harvested area. This increase in productivity has been related to better management of production assets, through the larger scale implementation of digital tools.

Large portions of Bulgarian sunflower productions is traded on the international

markets - up to 47% (2020). This export orientation of production (**Table 2**) makes it highly dependent on the global market prices and production often follows global price trends. Per example in 2017 the export prices of Bulgarian sunflower declined and in the following year the area allocated to sunflower production rapidly declined, only due to the already mentioned better yield that year, the overall production quantity and thus the export was barely affected. Following 2018 in 2019 global prices increased and the allocated areas increased with it and the ratio of production allocated to export also increased to reach its peak – 47% in 2020.

**Table 2.** Exports of Bulgarian sunflower

	2016	2017	2018	2019	2020	2021
Export Quantity (t)	688018,10	784079,78	779429,65	732031,44	818257,97	758074,64
Export Value (thou. USD)	409650,00	438010,00	454753,00	422480,00	534183,00	704416,00
Avg. export price (USD/kg)	0,60	0,56	0,58	0,58	0,65	0,93

Source: Data sourced from FAOStat

During the studied period import of sunflower has also increased (**Table 3**). This trend is very noticeable after 2018 when the average import

price dropped below the average export price. From that point going forward it was more economically beneficial for Bulgarian sunflower oil producers to import resources, than rely on the more expensive locally

produced sunflower seeds. This developing process reached its peak in 2020 when the imported quantities exceeded the exported ones, although the exported value surpasses the

imported due to the significant difference of the two prices - 0,16 USD per kg. or 160 UD per ton.

**Table 3.** Imports of sunflower in Bulgaria

	2016	2017	2018	2019	2020	2021
Import Quantity (t)	147005,00	178271,94	327134,65	624227,09	1020753,62	585407,72
Import Value (thou. USD)	107116,00	139145,00	186186,00	272364,00	498093,00	388644,00
Avg. import price (USD/kg)	0,73	0,78	0,57	0,44	0,49	0,66

Source: Data sourced from FAOStat

The sunflower oil refinement industry plays a significant role for the development of the sector and its trade flows are presented in **Table 4**. The production of sunflower oil in Bulgaria develops rapidly through the studied period as it

increases by 50% from 2016 to 2020. This growth is even more significant when we analyze the exports of sunflower oil, which have increased by more than 120% from 2016 to 2021.

**Table 4.** Economic realization of sunflower in Bulgaria

	2016	2017	2018	2019	2020	2021
Sunflower oil production	404220,00	461300,00	495900,00	524500,00	602600,00	no available data
Sunflower oil exports	252669,77	325436,18	400348,47	405328,14	524526,98	559455,39
Sunflower oil imports	13599,24	19000,52	19766,88	33405,34	41873,31	25154,24

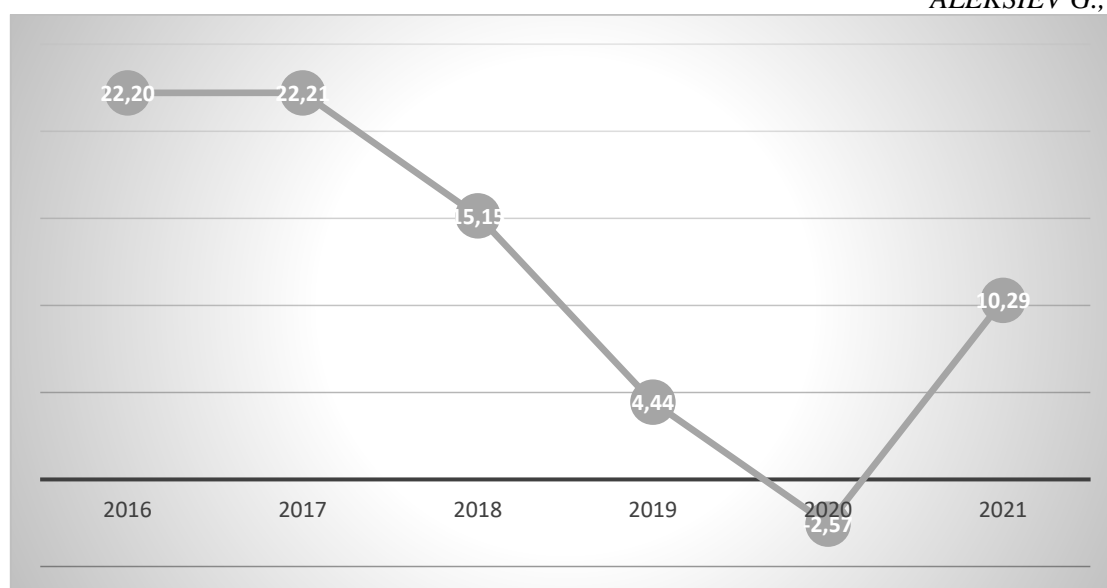
Source: Data sourced from FAOStat

The rapid increase in sunflower oil exports leaves the domestic market vulnerable to imports, as the local consumer needs can not be met with remaining quantities. During the studied period imported quantities have increased from 2016 to 2020 by almost 200%, and then declined in 2021. Although import quantities are very low when compared to the local production and exports, they show the export focus of sunflower oil refiners and the neglect of the local market during some years of the studied period.

The significant trends of imports and exports of sunflower and sunflower oil are also evident in the competitiveness dynamics of Bulgarian sunflower (**Figure 1**). The export focus of local producers and the increasing levels of imports needed to supply local sunflower producers leads to the rapid decline in competitiveness of Bulgarian sunflower. In 2020 when the import quantity was highest Bulgarian sunflower lost its competitiveness as there was more sunflower imported than exported.

By the end of the studied period the competitive position of Bulgarian sunflower improves, mainly due to the decrease of imports in 2021. The import prices have rapidly increased, which made importing sunflower less attractive, and a larger part of the local production was refined in to sunflower oil.

The close tracking of international trade prices and Bulgarian production give us more information on managerial decisions in the sector. An ever growing part of the producers are highly specialized and use an increasing number of data points supplied by new digital technology. Inclusion in knowledge networks, social networks, marketing and sales networks provides larger producers with up to date information, allowing them to make economically efficient decisions. This is also largely supported by the improvement in information infrastructure in Bulgarian rural areas (5).



**Figure 1. Competitiveness of Bulgarian sunflower.**  
Source: Own calculations based on data from FAOStat

The concentration of production is shown in **Table 5**. The data shown is inconclusive, due to the fluctuation in harvested area.

**Table 5. Sunflower farms in Bulgaria**

	Number of farms	Sunflower farming area (ha)	Average size of sunflower farms (ha)
<b>2013</b>	18984	882095	46,5
<b>2016</b>	18973	820032	43,2
<b>2020</b>	18193	821523	45,2

Source: Data sourced from Agrostatistics of the Ministry of Agriculture

As previously stated, the area allocated to sunflower in larger farms varies widely through the period adjusting to the export prices for the finished product – sunflower seeds. At the end of the studied period (2021) the sunflower farming area grew (**Table 1**) and the average size of the farms will be in line with the 2013 levels. This lack of difference in average sizes, considering the slight decline in the number of farms relates to the optimization of economic results in modern Bulgarian farming. Producers increase their productivity, apparent by the increase in average yield, but do not increase the average holding size or the harvested area in order to not flood the market with product, thus leading to lower prices. This form of production optimization in correlation with international market trends clearly shows the data collection, analysis and implementation by Bulgarian farmers. The digitalization of the management processes in sunflower production in Bulgaria

has reached significant levels, allowing local agents to reach optimal economic results from their activities.

## CONCLUSION

The process of digitalization of the management processes in Bulgarian sunflower production is evident in the optimization of resource use, market adjustment and orientation. Bulgarian farmers have introduced a large variety of new digital technologies allowing them to optimize their production, better network with their local counterparts as well as all other relevant parties (IT, local government, suppliers and clients).

The need to further increase average sunflower yields can be supported by further digitization of the management processes, taking into account the most significant elements that affect the sector.

The competitiveness of the goods produced will increasingly be affected by the possibility of integrating more activities to add value to the them within a single farm. This integration will add to the complexity of managing these farms and requires digitization of the processes.

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#### **REFERENCES**

1. Balassa, B. (1986). Comparative advantage in manufactured goods: a reappraisal. the Review of Economics and Statistics, 315-319.
2. Vollrath, T.L. (1987): Revealed Competitive Advantage for Wheat. Economic Research Service Staff Report No. AGES861030 (US

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Department of Agriculture: Washington DC);

3. Hristov, K., Beluhova-Uzunova, R., & Shishkova, M. (2019). Competitive advantages of Bulgarian sunflower industry after the accession into the European Union. Scientific Papers: Management, *Economic Engineering in Agriculture & Rural Development*, 19(2).
4. Tsacheva, S., & Zheleva, V. (2021). Impact of community-led local development on territorial prosperity. In *SHS Web of Conferences* (Vol. 120, p. 01015). EDP Sciences.
5. Zheleva V., E. Mutafov (2022). Digitalization level of rural areas in Bulgaria, Innovative Development of Agricultural Business and Rural Areas. Conference proceedings. pp. 200-206