

TABLE GRAPE PRODUCTION AND ITS IMPACT ON THE ECONOMIC PERFORMANCE OF AGRICULTURE

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Abstract: *The analysis of the economic performance of the agri-food sector in the Republic of Moldova has revealed a series of significant issues, including: the lack of stable trends in the growth of production value; the presence of a large number of inefficient entities; the slow growth in the value of exported agri-food products; a considerable reduction in its share of total exports; and, most importantly, the limited adoption of new technologies. Therefore, the aim of this article is to highlight the impact of new technologies on the production of table grapes and their influence on the economic performance of agriculture. Growing table grapes is crucial for agriculture in the Republic of Moldova, as it is a highly valuable export product that brings added value. At the global level, Moldova stands out for its advanced viticulture, taking advantage of favorable natural conditions, such as a temperate climate and fertile soils, perfect for vines. Growing table varieties is a difficult and important activity at the current stage. Success and results depend on the methods of growing, storing and marketing table grapes.*

Key words: *agriculture, viticulture, productivity, economic efficiency, Pergola system*

INTRODUCTION

The Republic of Moldova is an agrarian state, with agriculture being the main economic sector, particularly grape growing. Soil is a vital natural resource, and agriculture has traditionally been a cornerstone of the country's economy. Modern agriculture significantly impacts soil ecosystems. As a means of food production, soil has become a subject of intensive exploitation. Human activity on soil is far more extensive compared to other components of the biosphere. The northern region of the country specializes in the production and processing of sugar beets, cereals, fruits, and tobacco, benefiting from higher and sufficient temperatures compared to the southern areas. The central region focuses on grape production, with its land receiving ample sunlight and being protected from northeast winds. The southern region is known for growing grapes, particularly red varieties, as well as corn and sunflowers. A distinctive feature of this area is the large expanse of flat land covered with chernozem soil. In the 19th century, Tardan established, from its own resources, a Research Center in Viticulture and Winemaking, the first of its kind in the region [8].

The Republic of Moldova, renowned for its picturesque landscapes and rich viticultural tradition, is a well-known destination in both the wine and table grape production worlds. In our country, viticulture is an integral part of its culture and economy, and vine cultivation systems represent an essential component in the process of producing quality wine. [4].

Economic efficiency is one of the key pillars of economic transformation in a competitive environment. It reflects the ability to utilize available resources in the most effective way to achieve optimal economic outcomes. In an economic environment marked by intense competition and rapid changes, the level of economic efficiency is becoming increasingly important [10]. Some specialists in the field believe that the assessment of economic efficiency should focus on productive areas, because young plantations, which are just starting to bear fruit, do not yet bring profit [5]

The concept of economic efficiency quantifies the degree of optimization of financial, material, and human resources utilized to achieve specific objectives. This

measure is crucial for performance assessment and involves analyzing the ratio between the results achieved and the resources invested [1]. Economic efficiency aids in evaluating and improving performance, contributing to informed decision-making and the responsible, sustainable use of resources. In practice, economic efficiency reflects how resources are used, with its key characteristic being the causal relationship between effort and results..

MATERIALS AND METHODS

In order to ensure a comprehensive approach to the examined issue and to provide an in-depth analysis of the investigated subjects, generally accepted methods were employed during the development of the paper, supplemented by appropriate logical procedures, documentary research, the comparative method, and statistics. The methods of analysis and synthesis were used to decompose complex processes into their components and present them separately within the scope of the investigated topic. Phenomenology was applied to analyze phenomena from the perspective of their internal content, while the historical method was used to explore the conceptual evolution of agriculture and the developmental aspects of viticulture. The inductive method was employed to identify general regularities, and deduction was used to draw specific conclusions under certain conditions. Comparative analysis helped to identify the particularities of agro-industrial sector development. The validity of the chosen methods is supported by the results obtained, which enabled the achievement of the established research objectives. For informational support, numerous scientific and analytical publications relevant to the topic were used, alongside data from the National Bureau of Statistics of the Republic of Moldova, information from the official website of the European Union (Eurostat), and findings from semi-structured thematic interviews, among other sources.

RESEARCH RESULTS

The comparison of the effects with the efforts made in the table grape sector can be evaluated by analyzing the ratio between the products obtained (quality and quantity of grapes) and the resources consumed (investments in planting material, technologies, labor, water, fertilizers, machinery, etc.). Therefore, to improve the economic efficiency of table grape production, it is essential to consider optimizing resource use, adopting technological innovations, and applying best agricultural practices. These practices contribute not only to increasing production but also to reducing costs.

The term efficiency can be interpreted in two ways [2]:

As an initiative to create the most beneficial outcomes for the community. In the field of table grapes, this involves offering high-quality products that meet consumer demands and contribute to their well-being; creating jobs in rural areas to reduce unemployment and increase family incomes; adopting sustainable agricultural practices to preserve the environment; and stabilizing the market by ensuring product availability and mitigating price fluctuations. This approach emphasizes the positive impact of table grape production on the economy, the environment, and the community, rather than simply maximizing the individual profit of the grower.as an initiative to create the most beneficial results for the community.

The increase of an intervention in relation to the resources consumed. For table grapes, this means evaluating the grape harvest in relation to the resources used, such as labor, technologies, etc. If a cultivation method requires more resources but results in a significantly larger quantity of higher-quality grapes, it could be considered more profitable. Therefore, efficiency reflects not only the quantity obtained but also how resources are utilized to achieve these results.Thus, the specific factors of the table grape

branch require the use of adapted calculation methods, which reflect these particularities and provide a correct estimate of economic efficiency.

In order to determine the economic efficiency of table grape production, it is important to analyze the influence of expenses related to the establishment and maintenance of plantations, i.e., investments, while considering the time factor [10] :

$$E_{sm} = \frac{\sum CF_t}{(1+r)^t} - I$$

where:

Esm – efficiency coefficient of table grape production;

CFt – cash flow for period t, lei;

r – discount rate (usually annual interest or project profitability), %;

t – calculation period (growing season), years;

I – value of initial investments, lei.

In Moldova, the annual table grape harvest reached 99.3 thousand tons in 2022, placing the country in a strong position compared to EU nations, specifically in 4th place, behind Spain. This highlights Moldova's potential to be a key player in the European table grape trade market.

In terms of evolution, table grape production increased from 86.7 thousand tons in 2016 to a peak of 125.9 thousand tons in 2018, and in 2023, it reached 107.7 thousand tons, indicating an overall growth trend, though with fluctuations. These transformations were largely influenced by changes in consumer preferences and climatic conditions. Although grape production was significantly impacted in 2020, the general trend shows a recovery in the subsequent years (Table 1).

Table 1.

Grape production in the Republic of Moldova, thousand tons

Grape varieties	2016	2017	2018	2019	2020	2021	2022	2023
technical	529.0	566.4	604.3	546.8	377.6	400.5	431.9	463.4
table grapes	86.7	108.7	125.9	111.9	84.4	90.2	99.3	107.7
Total	615.7	675.1	730.2	658.7	462.0	490.7	531.2	571.1

Source: developed by the authors

It is noted that the share of production of technical grape varieties significantly exceeds that of table grapes. This is due to several factors, but primarily because technical varieties offer a higher added value compared to table grapes, which are often used for direct consumption. At the same time, the share of table grape production in total grape production has steadily increased, from 14.08% (86.7 thousand tons) in 2016 to 18.86% (107.7 thousand tons) in 2023, an increase of 4.78 percentage points. However, in 2019, a slight decrease was recorded, dropping to 16.99% (111.9 thousand tons), indicating a temporary stagnation. After that year, the trend has been upward, without significant declines. The approximate 33.94% increase in table grape production from 2016 to 2023 reflects a positive development in the sector.

The conditions for efficient economic activity include the generation of goods that meet social needs and the achievement of a surplus without disrupting the ecological balance. Indicators such as yield per hectare, cost per kilogram, and profitability provide a clear picture of the performance of the table grape sector and help optimize production

strategies [11]. To obtain high-quality table grapes, a complex approach is essential, given that the quality of table grapes depends on the variety, ecological conditions, cultivation techniques and storage methods [6].

To gain a clearer picture of economic efficiency, a series of economic indicators were analyzed, including the area per crop, the total harvest, the average yield per hectare, etc. (Figure 2).

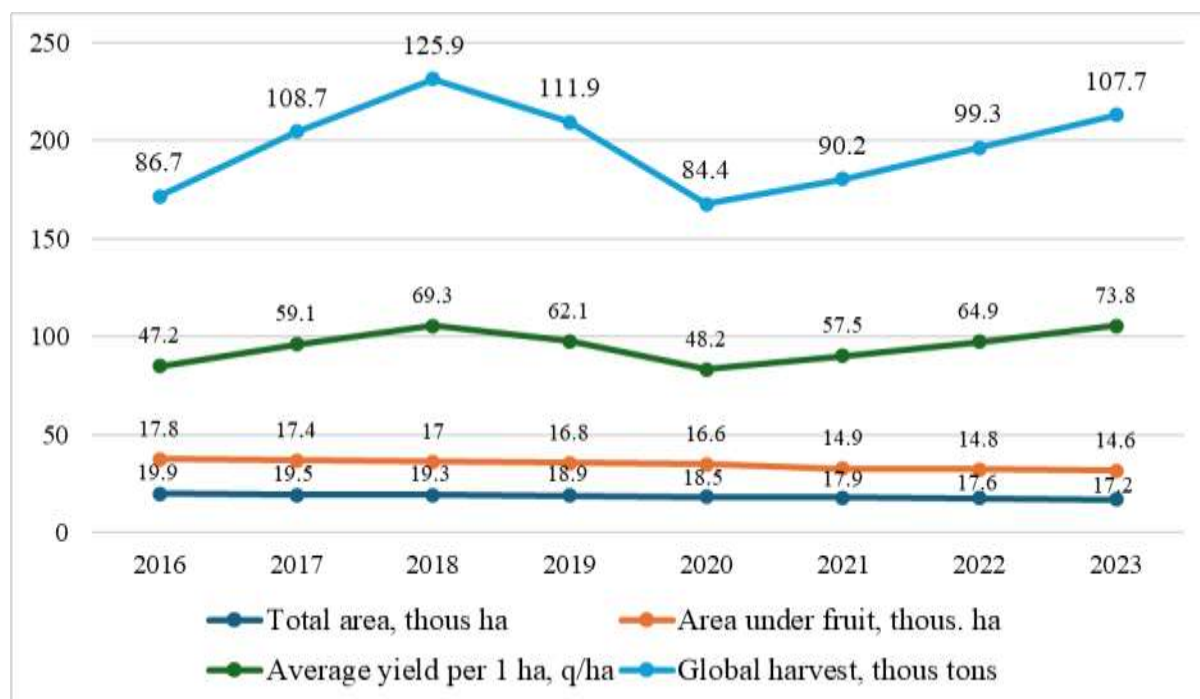


Figure 2. Analysis of productivity indicators in the table grape sector of the Republic of Moldova

Source: developed by the authors

The analysis of table grape productivity indicators in the Republic of Moldova reveals a steady decrease in the total area cultivated with table grapes from 2016 to 2023, from 19.9 thousand ha to 17.2 thousand ha. Additionally, the area per crop decreased from 17.8 thousand ha to 14.6 thousand ha.

However, the average yield per hectare increased significantly, from 47.2 q/ha in 2016 to 73.8 q/ha in 2023, indicating improvements in agricultural technologies and variety selection. As a result, the global grape harvest fluctuated but reached 107.7 thousand tons in 2023, compared to 86.7 thousand tons in 2016. Thus, although the cultivated area decreased, the efficiency and productivity of table grapes increased, reflecting significant progress in adapting the sector to environmental and market conditions.

The estimation of the economic efficiency of table grape production begins with determining the areas per crop, while simultaneously establishing the number of vines per crop per hectare, the average grape yield per hectare and per vine, and the total grape production.

Regarding the area per crop of table grapes, it is worth noting that it varies significantly depending on the variety and the technologies used (such as the Pergola plantation cultivation system or the standard Vertical Espalier system). An important aspect of vineyard plantations is the establishment costs, which include essential elements for their proper structuring.

Among the most significant costs are those related to the irrigation system, which ensures a constant water supply; the costs of the support system that allows vertical vine growth and ensures proper ventilation and sun exposure; and the costs of anti-rain film and anti-hail nets, which protect the harvest from extreme weather events, such as hail and heavy rain, thereby preventing grape damage and the risk of infections.

These initial costs are fundamental for creating a plantation establishment budget and must be accurately assessed to ensure the long-term economic viability of the table grape plantation

CONCLUSIONS

Table grape production in the Republic of Moldova has significant growth potential. The country benefits from favorable climatic conditions for grape cultivation, a long-standing tradition in viticulture, and a variety of table grape types appreciated both locally and internationally. However, despite the wide range of available table grape varieties, most plantations are dominated by the Moldova variety.

Thus, in the Pergola system, more vigorous plants are obtained, with a greater weight of branches and leaves. In the Pergola system, plants intercept solar energy better than in the Espalier system, favoring photosynthesis [7].

The results of some research have shown that table grape varieties grown in the Pergola system have a more moderate and controllable vine vigor, a more consistent growth of shoots, a better quality and taste of the fruit compared to the espalier system [12].

Training people involved in agriculture is one of the primary objectives of developing the agricultural sector in the Republic of Moldova, having a direct impact on increasing competitiveness and ensuring its sustainability [14,15,16].

Recent trends in table grape production show an expansion, both in terms of cultivated area and overall production. The increase in area is supported by government incentives for establishing vineyards with competitive varieties aimed at foreign markets.

At the same time, the global harvest of table grapes has risen in recent years, reflecting strong economic efficiency in the production process. In 2014, the European Union adopted a resolution on plant breeding [9], promoting the use of breeding technologies, including innovative NBT (New Breeding Techniques), which allow precise genetic modifications to create varieties resistant to climate change [13].

Economic efficiency is a crucial factor in table grape production. By implementing efficient production strategies, leveraging market opportunities, and collaborating with various partners, it can significantly contribute to boosting economic efficiency, increasing the profitability of grape producers, and promoting sustainable development in the table grape sector.

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