

**THE PRESENT CONDITION AND PROSPECTS FOR DEVELOPMENT OF THE
VITICULTURE INDUSTRY IN THE AUTONOMOUS TERRITORIAL UNIT OF GAGAUZIA**

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The Autonomous Territorial Unit of Gagauzia is located in the southern part of the Republic of Moldova and constitutes an independent economic region. The region features a moderately continental climate. In winter, the air temperature is unstable, with frequent thaws and frost-free days negatively affecting crops, often leading to vegetative regrowth. The coldest month of the year is January, with an average temperature of $-2.5...-5.5^{\circ}\text{C}$. When Arctic air penetrates from the north and lingers in anticyclones, the air temperature can drop to -28°C [1].

The territory of the Autonomous Territorial Unit of Gagauzia is located in the Budjak Steppe, which is a part of the Southern Moldovan Hilly Plain. Wide valleys intersect its surface, and numerous ravines dissect the slopes. The relief is characterized by steppes and small elevations, as well as small rivers like Yalpug, Lunga, and Lunguța. Gagauzia, like the entire Republic of Moldova, is situated in the Carpathian seismic zone [3].

In Gagauzia's economy, the agro-industrial sector traditionally dominates, accounting for up to 70% of the region's Gross Domestic Product (GDP). The favourable climate and terrain of the region facilitate this. The total area of agricultural land reaches 150,000 hectares, of which about 100,000 hectares are arable land, and approximately 26,000 hectares are allocated to orchards and vineyards. However, in the context of market relations and the adoption of modern technologies, the share of agriculture in the labour market is decreasing, even though agriculture employs up to 20% of Gagauzia's economically active population.

The Autonomous Territorial Unit of Gagauzia is one of the major grape producers in Moldova, which can be attributed to its natural-climatic conditions, the characteristics of the terrain and soil, and the traditional orientation of the population with skills in viticulture and winemaking [2].

The main goal of Viticulture in the Autonomy is to establish a modern industry for the production of high-quality grapes that are competitive in the markets and have high economic efficiency.

The intensification of the grape-growing industry is a systematic improvement of technology, equipment, and production organization, incorporating high-yielding varieties, clones, scientific achievements, and advanced experience into production [4].

Achieving the set targets became possible through strict adherence to the production technology recommendations by the grape-growing enterprises. The technology began with the establishment of new grape plantations. Grape plantations should only be planted according to projects developed by specialists, considering soil conditions, terrain configuration, favourable climatic conditions for the plantation, and so on. It should be noted that at all stages of grape production, it is necessary to comply with the entire complex of measures related to the regulation of the processes of establishing and maintaining vineyards.

Effective viticulture development is impossible without a deliberate and precise selection of grape varieties and clones. The choice of cultivated grape varieties and clones has a significant impact on the final quality and quantity of grape and wine products. This is not only a matter of vine yield but also taste characteristics, resistance to diseases and climatic conditions, as well as the ability to adapt to changing market demands. Therefore, the choice of grape varieties and clones plays a pivotal role in the success and sustainability of the viticulture industry.

According to our research, there are 54 grape varieties cultivated in the Autonomous Territorial Unit of Gagauzia, with 30 belonging to the technical grape varieties and 24 to the table grape varieties. This diverse assortment of grape varieties represents a significant resource for the winemaking and viticulture industries in the Autonomous Territorial Unit of Gagauzia. The technical grape varieties, with their high sugar and acid content, are widely used in the production of wines, brandies, and other alcoholic beverages. Meanwhile, table grape varieties are of interest to consumers as an important source of fresh berries rich in vitamins and antioxidants. They contribute to strengthening health, improving the immune system, and providing dietary variety.

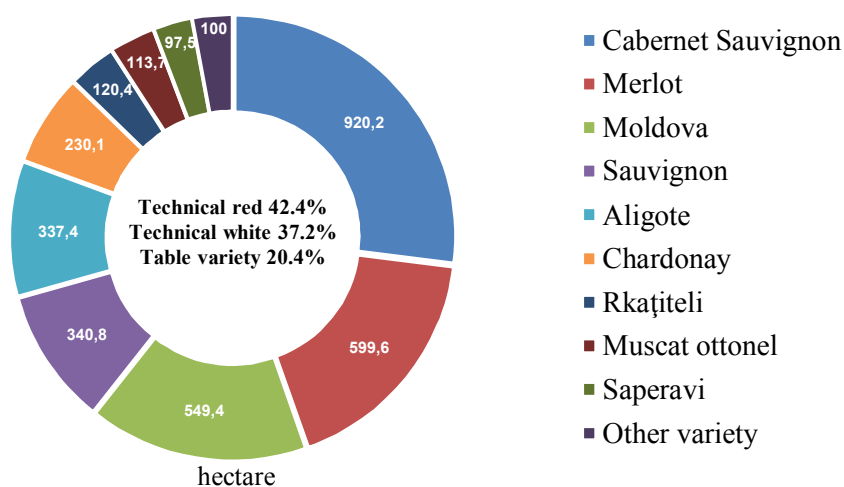


Figure 1. – Grape Varieties in ATU Gagauzia

According to the Grape and Wine Register of the Republic of Moldova, the total area of productive grape plantations in the Autonomous Territorial Unit of Gagauzia amounts to 4,562.8 hectares [6]. The

largest share by area is occupied by plantings of technical grape varieties, which account for 79.6% of the total area (of which technical red 42.4%, technical white 37.2%), while table grape varieties make up 20.4% (Figure 1). The most common red technical grape varieties are Cabernet Sauvignon (920.2 hectares), Merlot (599.6 hectares), and Saperavi (97.5 hectares). Among white technical grape varieties, Sauvignon covers 340.8 hectares, Aligote 337.4 hectares, and Chardonnay 230.1 hectares. As for table grape varieties, Moldova is the predominant variety, occupying 549.4 hectares, followed by Rannii Magaracea with 91.3 hectares, and Alb de Suruceni with 51.9 hectares.

At the same time, in the Autonomous Territorial Unit of Gagauzia, alongside valuable classic varieties, new breeding varieties characterized by increased resistance to low temperatures and diseases are being introduced. These varieties require lower cultivation costs, and their quality meets the requirements for table grape varieties as well as for the production of table wines, juices, and other grape products.

We conducted an analysis of viticulture in the autonomy, which allowed us to assess its level of development, identify existing shortcomings, and determine ways for further improvement. The indicators of grape production for the years 1997-2021, encompassing the last 25 years, were analyzed [5]. It was established that from 1997 to 2021, there was a noticeable trend of increased grape yield.

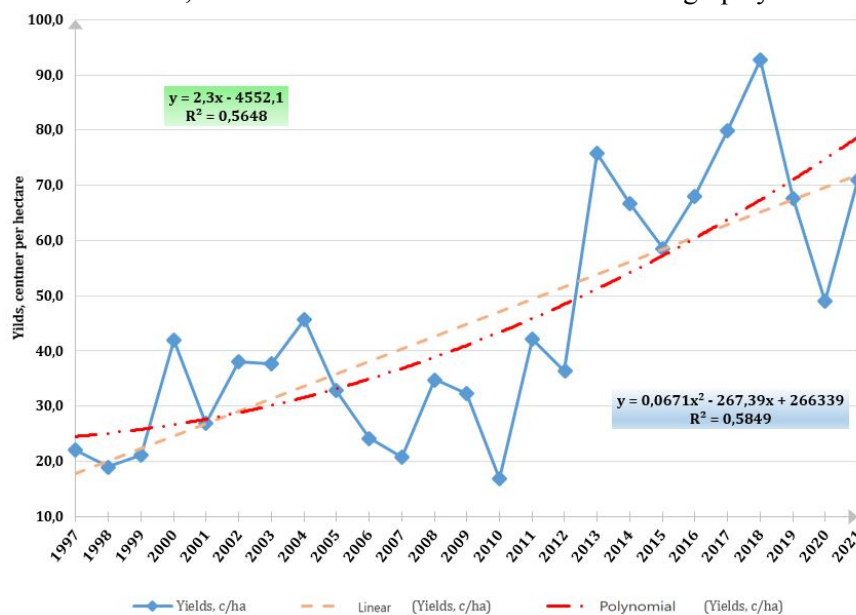


Figure 2. – Dynamics of Grapevine Plantations Yield, ATU Gagauzia, 1997-2021

On average, the annual increase in grapevine productivity amounted to 2.3 centners per hectare ($y = 2.3x + 15.34$). However, there is also a trend of a decrease in the gross grape harvest. Each year, the production harvest decreased at a rate of 259.9 tons ($y = -259.9x + 38154$). This can be attributed to the declining trend in productive areas, which decreased by an average of 539.7 hectares per year ($y = -539.7x + 16048$).

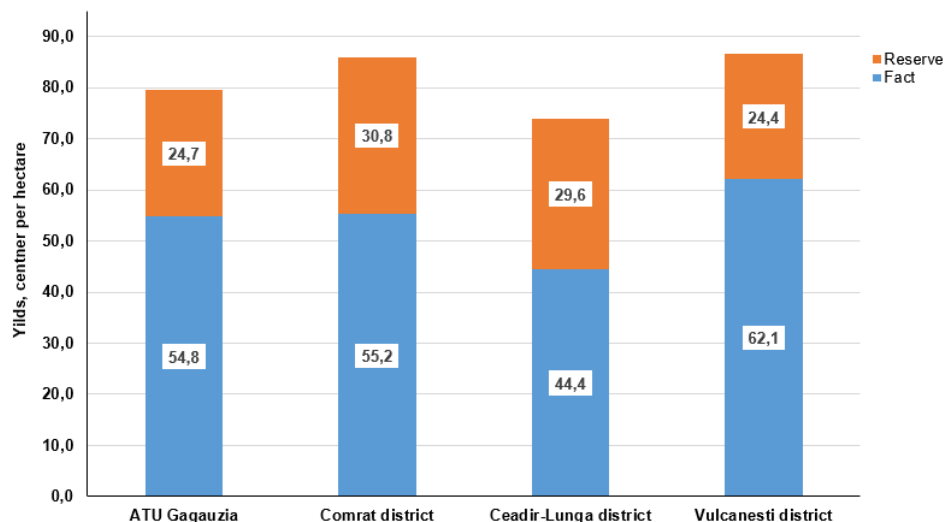


Figure 3. Grape Yield Indicators and Growth Reserves in Farms of the ATU Gagauzia

We have calculated the potential grape yield level for the Autonomous Territorial Unit of Gagauzia, which amounts to 79.5 centners per hectare. The obtained data indicate that the potential grape yield is 45% higher than the actual yield, which can be considered a possible reserve for increasing grapevine productivity. The growth potential in grape yield for the Autonomous Territorial Unit of Gagauzia could reach 24.7 centners per hectare.

On the vineyard plantations in Gagauzia, modern methods of grapevine care are increasingly being implemented. These contemporary techniques encompass automated systems for irrigation, fertilization, growth, and development monitoring of plants, enhancing the efficiency of grapevine management. Additionally, mechanized care such as machine pruning, green shoot thinning, inter-row soil treatment, and harvesting not only reduces the physical burden on labourers but also increases the productivity and precision of these processes. Adopting these modern methods reduces manual labour costs, ultimately lowering the production expenses of grape growing and winemaking. All of this contributes to increased output of produce and has a positive impact on the development of this industry in the region.

Alongside these innovations, new training and trellis systems, vine forms, and shoot growth management techniques are being utilized. These methods enable mechanized plant care, increase illumination, and enhance the efficiency of photosynthetically active radiation. The new systems and growth management methods provide better conditions for photosynthesis processes, which, in turn, contribute to improved grape development and ripening, and accumulation of phenolic and colouring compounds. They also reduce the risk of diseases and enhance crop quality, leading to higher yields of high-quality grapes compared to traditional growth management methods, ultimately lowering production costs.

Conclusions:

1. The climate in the Autonomous Territorial Unit of Gagauzia is warm, with temperatures exceeding 10°C lasting for 179-187 days, an accumulated temperature sum of 3300°C, an average precipitation level of 350-370 mm, and a hydrothermal coefficient (HTC) ranging from 0.7 to 0.8;

2. It has been noted that meteorological conditions have changed in recent years, with an increase in average annual temperatures and a decrease in precipitation. Alongside this, there has been a shift in the distribution of precipitation throughout the year, resulting in moisture deficits during critical periods of growth and development, which hurts the growth, development, and yield of the vines;

3. Over the past 25 years, a declining trend in the fruit-bearing area of vineyards in Gagauzia ATU has been identified. However, there has been an annual increase in the yields of vineyards by 2.3 centner per hectare. The potential yield reserve for vineyards has been calculated at 24.7 centner per hectare;

4. In recent years, new training and trellis systems, vine forms, and methods of shoot management have been implemented at ATU Gagauzia. These innovations facilitate mechanized vine care, improve illumination conditions, and enhance the photosynthetically active radiation-use efficiency. These advances result in higher yields of better-quality grapes compared to traditional systems and reduce production costs.

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