

## RAIN COVER FOR TABLE GRAPES AND ITS BENEFITS

**BOTEZATU Andrei,**

PhD student,

Technical University from Moldova

[andrre2011@yahoo.com](mailto:andrre2011@yahoo.com).

<https://orcid.org/my-orcid?orcid=0009-0006-2189-6418>

### SUMMARY

Agriculture represents a vital component of the global economy, and table grape production is one of the most significant agricultural activities worldwide. However, farmers often face weather-related challenges, such as continuous rainfall that can jeopardize the harvest and the quality of grapes. In this context, rain cover for table grapes has become an essential agricultural practice to protect from diseases the vineyards and the yield.

**Key words:** pergola, investments, plantations, producers, table grapes.

## ACOPERIRE ANTIPLOAIIE PENTRU STRUGURI DE MASA ȘI BENEFICIILE SALE

**BOTEZATU Andrei,**

doctorand,

Universitatea Tehnică din Moldova

[andrre2011@yahoo.com](mailto:andrre2011@yahoo.com)

<https://orcid.org/my-orcid?orcid=0009-0006-2189-6418>

### REZUMAT

Agricultura reprezintă o componentă vitală a economiei globale, iar producția de struguri de masă este una dintre cele mai importante activități agricole la nivel mondial. Cu toate acestea, fermierii se confruntă adesea cu provocări legate de vreme, cum ar fi precipitațiile continue care pot pune în pericol recolta și calitatea strugurilor. În acest context, acoperirea de ploaie pentru strugurii de masă a devenit o practică agricolă esențială pentru protejarea de boli a viilor și a randamentului.

**Cuvinte-cheie:** pergola, investiții, plantații, producători, struguri de masă

**Introduction.** Rain cover for table grapes is an agricultural practice used to shield vineyards and their yield from the adverse effects of excessive rainfall. This technology involves the installation of special covering materials over the vineyard to prevent grape damage and harm to the entire plant during periods of rains. It's important to note that rain cover requires an initial investment and proper management to be effective. However, for high-quality table grape crops, this practice can be beneficial in preventing losses and ensuring the quality of the harvest.

Agriculture represents one of the oldest and most significant human activities, making a substantial contribution to feeding the global population and national economies. Farmers all over the world face a series of challenges, especially concerning climate influences [4]. Global climate change, temperature fluctuations, and rainfall variability have become increasingly unpredictable and intense, affecting agricultural production and food security. Here are some specific challenges related to heavy rainfall in viticulture:

1. **Risk of Fungal Diseases** - Increased humidity resulting from heavy rainfall creates a conducive environment for the development of fungal diseases, such as mildew and botrytis. These diseases can affect both the

leaves and grape clusters, reducing crop yield and quality.

2. **Grape Damage** - Heavy rains can lead to grape damage, especially to the grape berries, causing them to crack and develop surface blemishes, affecting the quality and commercial appearance of the grapes.

3. **Ripening Issues** - Excessive rainfall can influence the ripening process of grapes by diluting sugar concentration and affecting acidity. This can have a negative influence on the storage of grapes in refrigerated facilities.

4. **Economic Impact** - Losses caused by heavy and continuous rainfall can have a significant impact on the income of grape growers and on local and international table grape markets. An example of this can be seen in the current year, 2023, in Italy.

5. **The Need for Agricultural Solutions** - Faced with these challenges, viticulturists are seeking agricultural solutions to protect the grapevines and the harvest, and rain covers represent one of these solutions.

These challenges underline the importance of rain cover in viticulture and the need to find effective ways to protect grape crops from the adverse effects of heavy rainfall.

**The positive effects of Pergola Table Grapes production system:**

<p style="text-align: center;"><b>Protecting the harvest</b></p>	<p>Protecting table grape crops is one of the biggest challenges faced by viticulturists during rainy periods. Heavy rains can damage grape berries, causing them to crack and promoting the development of botrytis diseases, significantly reducing the quality and value of the harvest. Rain covers involve the installation of a special waterproof film above the grapevine support structure. These act as a shield against rain, keeping the grapes dry and healthy.</p>
<p style="text-align: center;"><b>Disease prevention</b></p>	<p>Heavy rains and increased humidity during such periods create an ideal environment for the development of fungal diseases in grapevines. Two of the most common diseases, mildew and botrytis, can cause significant damage to table grape crops. Rain cover reduces the contact of leaves and berries with raindrops, limiting moisture and the spread of fungal spores. As a result, the risk of infection is significantly reduced, reducing also the need for phytosanitary treatments and contributing to more sustainable viticulture practices.</p>
<p style="text-align: center;"><b>Keeping the quality of the grapes</b></p>	<p>The appearance and quality of table grapes are of paramount importance for consumer satisfaction and the commercial value of table grapes production. Heavy rains can wash away dust, dirt, and impurities from grapes, thereby diminishing their authentic appeal and taste quality. Rain covers aid in preserving the appearance and flavor of grapes, thus maintaining their market value and customer satisfaction.</p>
<p style="text-align: center;"><b>Yield increase</b></p>	<p>Protecting table grape crops against excessive rainfall significantly contributes to increased agricultural yield. Farmers can achieve a larger and healthier harvest, resulting in higher income and improved profitability. Furthermore, superior-quality crops can access more discerning markets and better prices.</p>
<p style="text-align: center;"><b>Resources management</b></p>	<p>Rain covers contribute to more efficient agricultural resource management. By reducing the need for pesticide applications to combat diseases and the amount of water used for irrigation due to minimal evaporation, farmers conserve resources and reduce their environmental impact. This aligns with the global trend toward adopting sustainable agricultural practices.</p>
<p style="text-align: center;"><b>The precise scheduling of the harvest</b></p>	<p>The timing of harvest is critical in viticulture as it directly influences the quality and taste of table grapes. Rain cover allows farmers to schedule their harvest at the optimal moment, when the grapes are fully ripe and have reached the desired concentrations of sugars and dry matter. This is essential for maintaining good quality with the characteristics demanded by the market.</p>

**Source:** elaborated by the author

In the Republic of Moldova, the adoption of rain cover technology has had a significant impact on table grape production and wine exports. A relevant example is the cooperative of viticulturists in southern Moldova, C. I. Grape Line [1].

This cooperative made the decision to implement rain covers for a significant portion of their table grapes plantations. As a result, they have observed a significant reduction in crop losses due to rain and an increase in the quality of table grapes. This has allowed them to produce high-quality table grapes that gained recognition in international markets. Moldovan table grape exports have increased substantially, by up to 95%, contributing

to the economic development of the cooperative [2].

These real-life examples illustrate how rain cover technology can be successfully applied in intensive table grapes production and can have a positive impact on both local production and international exports of table grapes.

#### **Covering materials used**

Rain cover involves the use of specially designed materials to protect grapevines and the harvest from heavy rains. There are several types of covering materials used in viticulture, including:

1. **Plastic Films** - Plastic films made of polypropylene with various thicknesses (ranging from 120 to 200 microns) are the most commonly used

materials. These are used to cover the entire grapevine or to protect critical areas of it. By using waterproof plastic films that allow air and light penetration, farmers can prevent and protect the harvest from damage caused by rainfall.

2. **Retractable Tents** - These are mobile structures that can be quickly deployed over the grapevines before anticipated rains. Tents are made from waterproof materials and can be easily managed.

**Installation and management techniques**

Installing and managing rain covers are essential processes to ensure the effectiveness of this technology. Farmers should consider the following techniques:

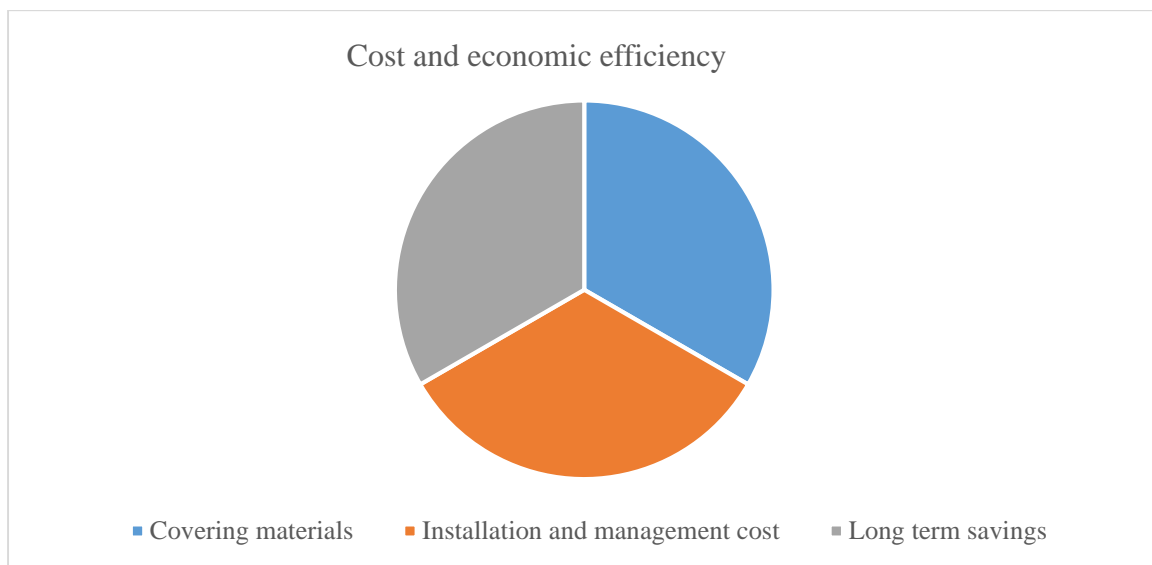
1. **Proper Material Installation:** Rain cover materials should be evenly stretched over the grapevines and securely fastened to withstand rain and wind.

2. **Weather Monitoring:** Farmers should closely monitor weather forecasts and be prepared to remove the rain cover in case of high temperatures, exceeding +37°C, to prevent leaf burn.

3. **Management of Mobile Structures:** If retractable tents or other mobile structures are used, there should be an efficient management plan in place. This involves deploying and retracting them as needed based on requirements and weather conditions.

**Cost and economic efficiency**

Costs associated with rain cover technology can vary depending on the materials used, size, thickness, and specific manufacturing technology. It's important to conduct a cost assessment to determine the economic efficiency of this technology. Factors influencing costs include:



**Figure 1. Cost and economic efficiency**

**Source:** elaborated by the author

**Covering materials** - Depending on the thickness of the film, which can range from 120 microns to 200 microns, costs can vary (from 0.70 EUR/m<sup>2</sup> to 0.98 EUR/m<sup>2</sup>) depending on the type of film, creating a difference of up to 30%.

**Installation and management cost** - This includes the costs for the initial installation of the rain cover and its management throughout the agricultural season.

**Long term savings** - Farmers can save money by reducing crop losses and using resources more efficiently, such as water for irrigation and pesticides by reducing the need for frequent treatments. Additionally, matured grapes can be kept on the vine for a longer period and harvested based on market demand, avoiding storage costs in refrigerated facilities and preserving freshness and commercial appearance, potentially increasing selling prices by 25% to 30% [7].

Evaluating costs and benefits is essential to determine whether rain cover technology is a viable economic investment for table grape producers throughout the region.

**Perspectives on Development and Innovations:**

1. **Advanced Technologies:** The development of more advanced and durable covering materials that can be easily installed and managed may make this technology more accessible and efficient.

2. **Monitoring Systems:** Using sensors and Internet of Things (IoT) technology to monitor real-time weather conditions can help automate the installation of rain covers before rainfall and efficiently manage them.

3. **Automated Management Techniques:** The development of automated rain cover management systems that can be controlled remotely or programmed based on weather forecasts can make this technology more convenient for farmers.

These innovations have the potential to enhance the effectiveness and accessibility of rain cover technology in viticulture, further improving crop protection and overall agricultural sustainability [3].

**Integrating Sustainability into Rain Cover Technology:**

1. **Environmentally Friendly Materials:** The

development and use of rain cover materials that are biodegradable or environmentally friendly can contribute to reducing the impact on ecosystems.

**2. Resource Efficiency:** Efficient use of resources such as water and energy within rain cover technology can contribute to more sustainable agriculture.

**3. Effects on Biodiversity:** Evaluating the impact of rain cover technology on local biodiversity and developing strategies to minimize these impacts can be an integral part of sustainable management of table grape vineyards.

**Conclusions.** By considering sustainability principles in the development and implementation of rain cover technology, viticulturists can not only protect their crops but also minimize their environmental footprint and contribute to long-term agricultural sustainability.

#### **Impact of Climate Change on the Need for Rain Cover:**

**Rainfall Variability:** Climate change can bring alterations in rainfall patterns, making heavy rains more frequent or unpredictable. This can increase the necessity for rain cover technology.

**Warmer Climate:** Rising temperatures can affect the timing of harvest and influence the development of diseases in grapevines, which can have implications for the use of rain cover technology.

**Adapting to Climate Change:** The future of rain cover technology may include strategies for adapting to climate change, such as adjusting the installation schedule based on new climate patterns and forecasts.

As climate change continues to affect weather patterns and temperatures, farmers may need to adapt their rain cover practices to ensure the continued

protection and quality of their grape crops [5].

These ideas provide an insight into possible directions for the development and evolution of rain cover technology in table grapes production, considering innovations, sustainability, and the impact of climate change [8].

In conclusion, rain cover represents an essential technology in table grape production, offering numerous benefits to farmers and grape producers.

This technology protects the harvest from the negative effects of heavy rains, preventing grape berry cracking and the development of fungal diseases. Additionally, rain cover technology helps maintain grape quality, increases yield, and allows for more efficient resource management.

Rain cover plays a key role in ensuring the success of viticulture, especially in regions prone to heavy rains or climate changes. Protecting the crop and grape quality is essential for producing high-quality grapes and increasing the profitability of vineyard businesses. This technology helps farmers more effectively manage the risks associated with unpredictable weather conditions.

While rain cover technology has brought significant benefits, continued research and development in this field remain crucial. Ongoing climate changes may pose new challenges, and farmers in the sector must be prepared to address them. Research can contribute to the development of more efficient covering materials, technological innovations, and adaptation to new climate conditions. Furthermore, sustainability should be a central element in the evolution of this technology to minimize its environmental impact.

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