

The Reuse of Food Loss and Waste in the Viticulture Sector

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SUMMARY

The concept of Food Loss and Waste (FLW) is a global challenge and it is receiving increased attention from both the academic and policy sectors. This problem is becoming more widespread and is increasingly mentioned especially in underdeveloped and developing countries. This article proposes to discuss the problem of FLW in the grape crops in order to offer solutions for reusing the leftovers from the crop. The paper will present the current state of knowledge of FLW, the supply and value chain of the crops and also a detailed analysis of quantities produced, imported, exported and processed. This paper is based on the research done in the IPSUS project that considers the use of techniques for recovering recycled plant and seaweed proteins from raw materials. This project is in its first year of development, in other words it is in the research phase. Also, the quantity, quality and upcycling opportunities of FLW along the value chain will be investigated. Furthermore, a sketch of the supply and value chain was composed for grape crops trying to consider all environmental issues associated with all phases of the value chain. The results of the research will demonstrate the importance of the reuse of grape crops thus offering new possibilities of development in the agricultural field in Romania.

INTRODUCTION

Food loss is a global issue. Approximately 815 million people lack enough food, and about one-third of all produced food is wasted yearly. Policymakers worldwide, along with international organizations, NGOs, and scholars, are increasingly concerned about this problem. The research performed as part of the IPSUS project (Climate-smart food innovation using plant and seaweed proteins from upcycled sources) serves as the foundation for this essay. The goal of this research is to investigate ways to extract plant and seaweed proteins from recycled raw materials, which would prevent an additional 1.6 billion tonnes of food from being wasted and lost globally each year. Also, the U-GARDEN project, which encourages the inclusion of urban gardens and agroforestry experiences as important components within the strategic framework for sustainable urban development in European cities, has had an influence on the work of this article. The purpose of this research is to thoroughly examine the amount, quality, and prospective opportunities for food waste reuse along the entire value chain. The examination of food waste from viticulture, both quantitatively and qualitatively, is an essential part of this strategy.

MOTIVATION AND DESCRIPTION OF WORK

Grape seeds and skins are valuable by-products of the wine industry, rich in antioxidants and polyphenolic compounds. Grapes are primarily used in winemaking, but their residues, known as "pomace," contain valuable substances such as oils and active compounds like dietary fibers, polyphenols, anthocyanins, flavonoids, and resveratrol.

Our goal is to analyze the quantity, quality, and potential opportunities for reusing food waste throughout the production chain. We will use an Internet of Things (IoT) system to monitor environmental parameters such as air temperature, humidity, soil moisture, and precipitation levels. These data will help us accurately estimate the quality and quantity of the harvest, contributing to the reduction of food losses.

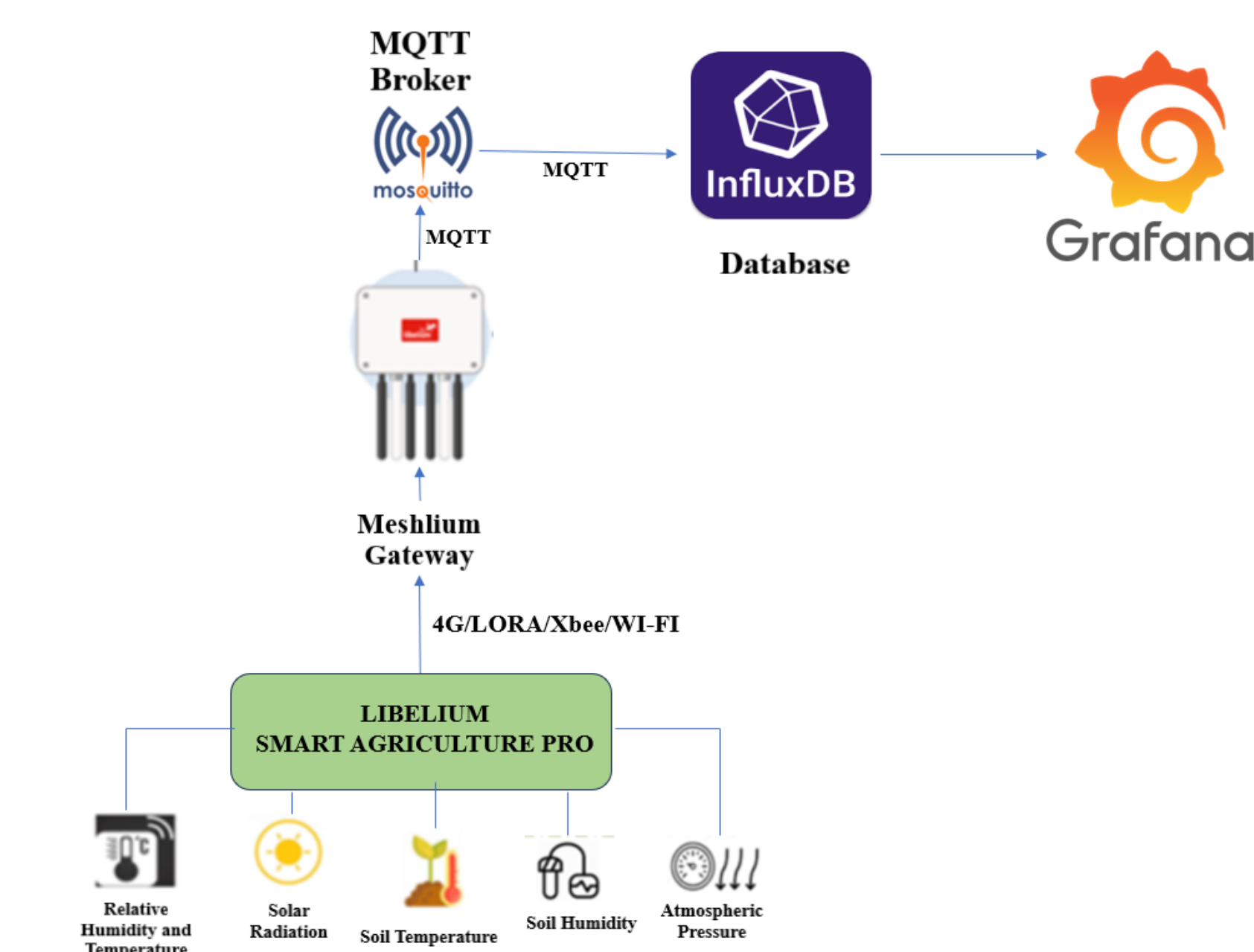


Fig. 1 System architecture

The above diagram shows the macro architecture of the vineyard monitoring solution. The data collection will be done through high precision sensors that will communicate with a microcontroller compatible with 4G, LoRa, XBee or Wi-Fi technology, allowing the data to be transmitted to the gateway and then to an MQTT server. This protocol has been specifically designed for monitoring solutions and has a low power consumption. Once the data reaches the MQTT server, it will be routed to a database where it will be stored and accessible for querying via a viewing platform, which is part of the web application.

The grape production and distribution chain begins with either farmers or specialized companies involved in grape cultivation. After harvesting, grapes are inspected for quality and then processed to obtain must. This must is fermented to produce wine, which is subsequently matured in wooden barrels to develop its flavor. Finally, the wine is bottled, packaged, and distributed through sales networks to reach consumers.

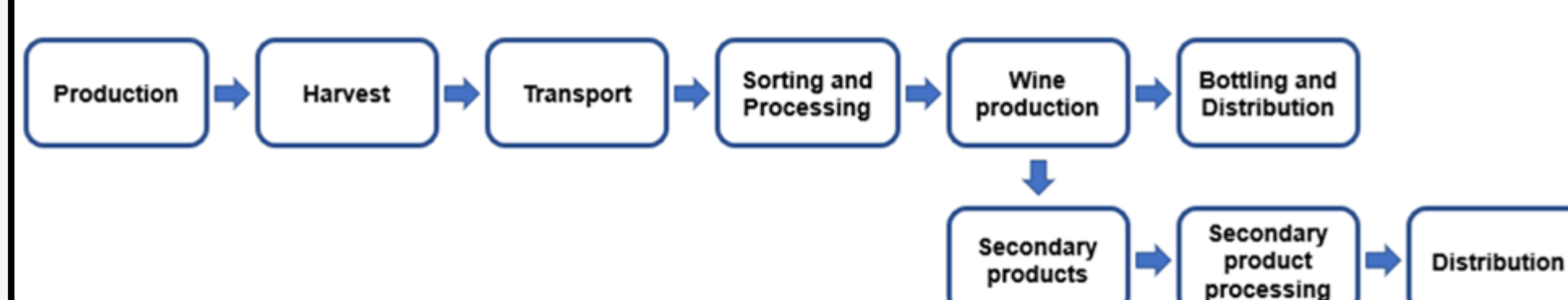


Fig. 2. Values Chain Diagram

RESULTS

The Results section highlights the significant impact of Romania's wine industry, illustrating an annual export of over 30 million bottles of wine, evenly distributed between international markets and local retailers. In 2020, Romania achieved a wine production of 3.8 million hectoliters. However, it's worth noting that the total vineyard area under cultivation at the national level continued to decline in 2021, reaching 179.3 thousand hectares (Figure 3). This decrease has been a result of ongoing vineyard restructuring and conversion processes, supported by EU funds from Romania's national support program, which allocates €47.5 million annually during the 2019-2023 budget period.

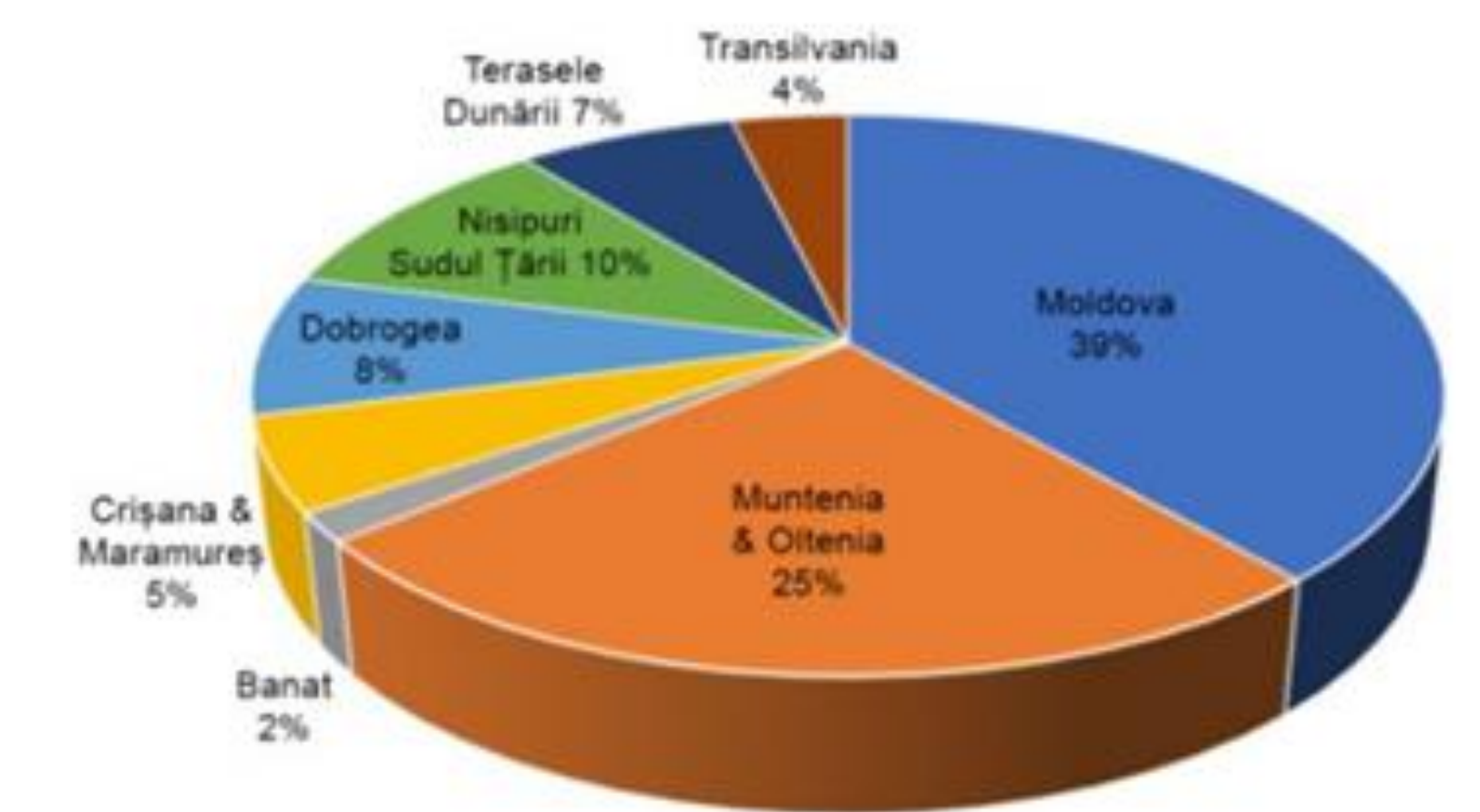


Fig. 3. Wine-growing area in 2021

Through the application of IoT technology, we have acquired crucial data regarding the quantity and quality of the grape harvest. This data plays a pivotal role in identifying and reducing food waste (FLW). Figure 4 and 5 provides a graphical representation of the parameters monitored in the vineyard field.

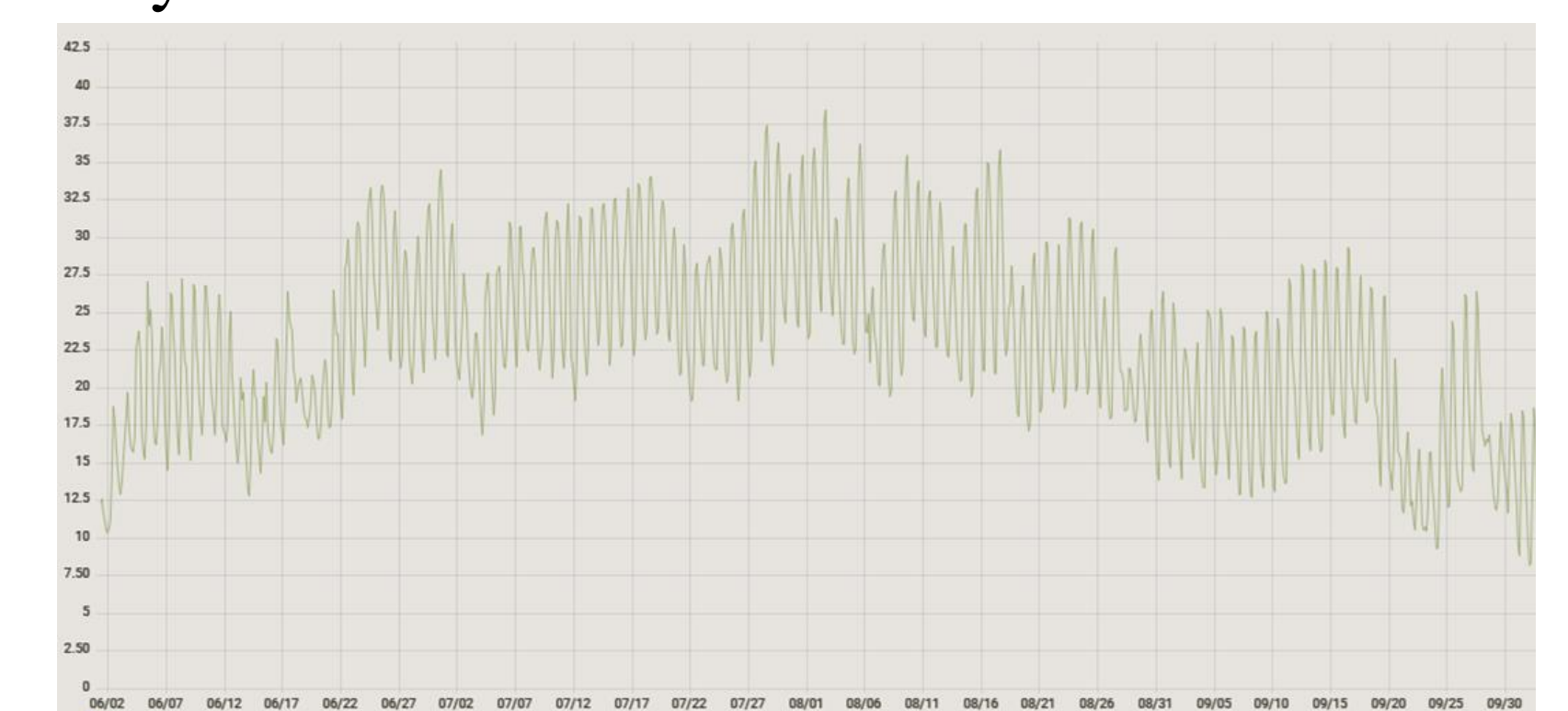


Fig. 4. Air temperature variation

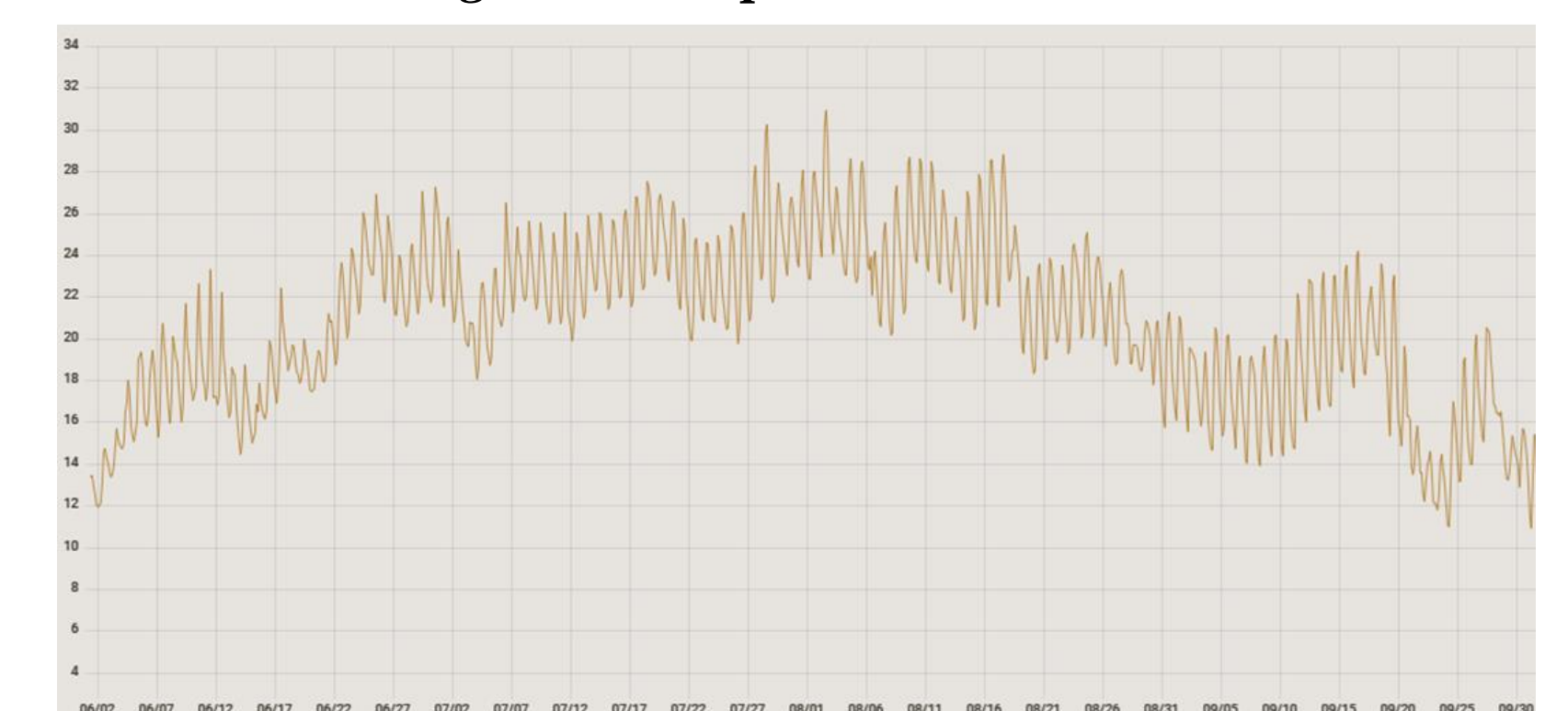


Fig. 5. Soil temperature variation

Acknowledgments

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Conclusions

Food loss and waste is an issue that affects the entire world and is spreading quickly. Less developed countries are particularly affected by this problem. This article proposes strategies for reusing the remains of the wine production process and is primarily focused on addressing food loss and waste within the viticulture industry. The IoT is proving to be an effective tool in the fight against food loss and waste in this situation. The tools required for a thorough understanding of vineyard environmental conditions are provided by our IoT vineyard monitoring system, which is outfitted with a variety of environmental sensors. This data establishes the basis for well-informed choices, which significantly reduce food loss and waste. It opens the way for more effective and sustainable wine production by taking a proactive stance and thoroughly analyzing the data gathered.