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RECEIVED 01 October 2024
ACCEPTED 30 October 2024
PUBLISHED 14 November 2024

CITATION
Fuentes S (2024) Editorial: Methods
and protocols in viticulture, pomology,
and soft fruits.
Front. Hortic. 3:1504703.
doi: 10.3389/fhort.2024.1504703

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Editorial: Methods and protocols in viticulture, pomology, and soft fruits

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KEYWORDS

epigenomics, climate change, remote sensing, sap flow, plant water status

Editorial on the Research Topic

[Methods and protocols in viticulture, pomology, and soft fruits](#)

Introduction

The horticultural sector is transforming, characterized by the adoption of sophisticated digital technologies. This editorial explores the implications of these innovations and the corresponding need for developing methodologies and protocols that align with these advances. As climate change and population growth intensify the demands placed on agricultural systems, integrating new technologies becomes a vital strategy for ensuring the resilience and productivity of horticultural crops.

Novel sensors in horticulture and remote sensing

Emerging sensor technologies, including those capable of real-time monitoring environmental conditions, are pivotal in the horticultural sector and will provide integrated sensor networks for comprehensive and continuous monitoring of horticultural environments. However, by implementing these novel technologies, also new challenges emerge, such as sensor calibration, data synchronization, and fusion from multiple sources and software to acquire, compile, present graphically and analyze increased volumes of data with high temporal and spatial resolution.

Remote sensing has revolutionized data collection in horticulture with capabilities and current near ubiquitousness of aerial and terrestrial uncrewed vehicles (ATVs/UAVs) equipped with cameras that capture spectral data across ultraviolet, visible, and near-infrared ranges. Applications of these technologies range from assessing crop status, monitoring growth patterns, and optimizing resource usage. The benefits and limitations of various platforms (e.g., fixed-wing drones vs. multi-rotor systems) compared to satellite platforms can be compared in different horticultural contexts depending on specific requirements and extensions of orchards.

While data collection techniques are advancing rapidly, developing data analysis methodologies is equally significant. For example, the application of computer vision and big data analytics in processing images captured by remote sensing devices have been focused on machine and deep learning approaches. Therefore, in this Research Topic, novel technologies presented in four papers are critical for i) Epigenomic data integration for understanding the resiliency of plants to climate change applied to grapevines (Tan et al.), ii) regulatory mechanisms and agroclimatic requirements to assess plant responses to environmental stressors for apple dormancy assessment (Noguer et al.), iii) the predictive analytics for disease detection through laser-induced fluorescence and pattern recognition algorithms for grapevines (Kölbl et al.) and iv) assessment of plant water status and usage using sap flow sensors in cherry trees (Tharaga et al.).

Interdisciplinary nature of new methodologies and challenges

Innovations in digital technology necessitate interdisciplinary collaboration among horticulturists, data scientists, engineers, and environmental scientists. The importance of creating cross-disciplinary teams that can develop protocols that integrate diverse expertise and methodologies, such as case studies where interdisciplinary research has led to successfully implementing new digital technologies in real-world horticultural settings.

Looking ahead, we will consider the ethical implications of data use in horticulture and how these technologies might influence agricultural practices and policies. Standardized protocols and methodologies are needed to ensure interoperability among different digital tools. Potential barriers, including economic constraints and the need for workforce training, may hinder the adoption of advanced technologies in the sector.

Conclusion

Integrating new and emerging digital technologies in horticulture presents challenges and opportunities for the sector. Policymakers, researchers, and practitioners must collaborate to create robust frameworks that promote the development of methodologies and protocols aligned with these advancements. By doing so, we can drive innovation, increase efficiency, and foster a more sustainable horticultural future.

Author contributions

SF: Investigation, Writing – original draft, Writing – review & editing.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of *Frontiers*, at the time of submission. This had no impact on the peer review process and the final decision.

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