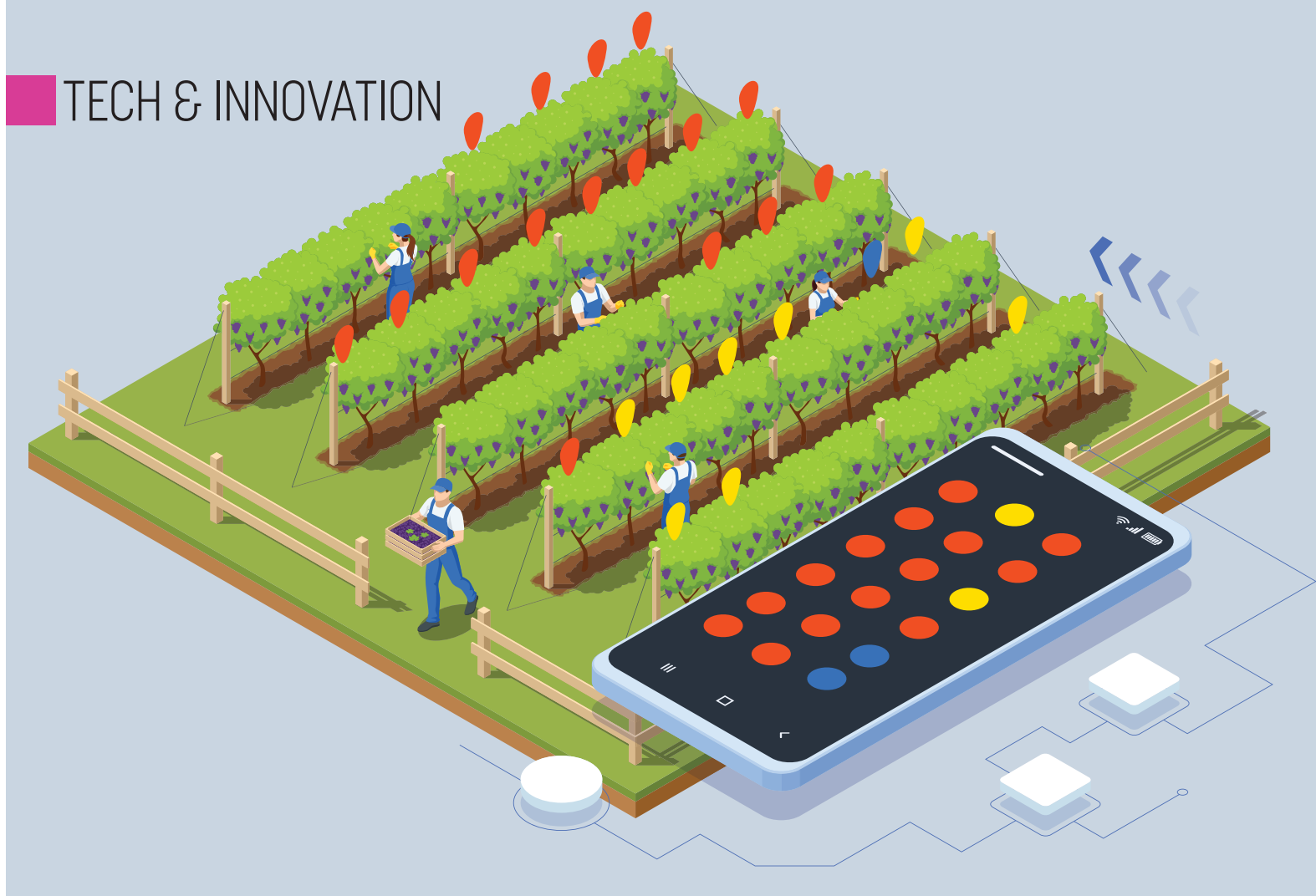## TECH & INNOVATION

Sentinel's technological revolution in vineyards worldwide

An innovative tool is helping wineries to capture detailed vine-level data and manage their crops more effectively. **James Bayley** reports

SENTINEL VINE MANAGER is changing the way vineyards operate across the globe. The innovative tool, developed by Shawn DeMartino and Christian Sidak, is revolutionising vineyard management with precise, vine-by-vine data collection. This new approach is transforming vineyard operations, offering a more efficient and effective way to manage and maintain vineyards.

DeMartino, the CEO and founder of Sentinel, has a decade of experience in the wine industry, having worked with brands such as Screaming Eagle and Harlan. Currently the director of Grace Family Vineyards, DeMartino pioneered the development and implementation of Sentinel Vine Mapping technology. His extensive experience in the wine industry informed the customisation of Sentinel's products.

Sidak, Sentinel's CTO and co-founder, brought his expertise from Palantir Technologies, where he developed AI products for the defence and healthcare

Sentinel can create and maintain individual records for each vine

"Customers with large vineyards can now access information about each vine on their phones, updating data in real time"

Shawn DeMartino

sectors. Together with DeMartino, Sidak shaped the technical and engineering aspects of Sentinel, translating user needs into practical applications. Their combined efforts resulted in a product that operates offline, handles complex infrastructure and offers precise location data through Global Navigation Satellite Systems (GNSS).

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SPECIFIC NEED

The concept of capturing detailed, vine-by-vine data has long been a goal for high-end viticulturists. DeMartino recalls using Excel tables, hand-drawn maps, and other tools to track historical and spatial data on each vine. Despite diligent efforts, these methods were limited and time-consuming. The collaboration between DeMartino and Sidak led to the realisation that existing agricultural technologies hadn't addressed this specific need.

While GNSS technology had been used in agriculture for self-driving tractors, it had not yet been employed to survey millions of vines with such precision.

After a year of development, Sentinel officially launched and now operates in five countries: "The challenge was not only in creating detailed workflows but also in making them scalable across hundreds of acres," says DeMartino. "Customers with large vineyards can now access information about each vine on their phones, updating data in real time."

The technical complexity of Sentinel lies in its ability to function offline and manage a vast amount of data. Unlike most software that assumes constant WiFi access, Sentinel operates without it. The system involves multiple components: phones going out to collect data, external GNSS hardware

communicating over Bluetooth, and data syncing back to the cloud. Each part of this infrastructure is a separate programme, adding to the complexity.

"Before Sentinel, there were no specialised tools for the wine industry to capture detailed vine-level data," says DeMartino. He continues: "General survey tools existed, used for mapping various infrastructures like telephone poles and oil prospecting sites, but they didn't meet the specific needs of vineyards.

"The breakthrough with Sentinel was in creating a medical record-like system for each vine, acknowledging that vineyards, much like patients, have diverse and long-term care needs. Vineyards are unique in that they can have vines of varying ages and health conditions within the same block, making individual records essential."

Since its launch, Sentinel has seen other tools emerge in the wine industry, but none appear to match its depth. The critical differentiator for Sentinel is its ability to create and maintain individual records for each vine, allowing for a detailed historical and spatial understanding of a vineyard.

Sentinel also supports multiple languages, recognising the bilingual nature of vineyard crews around the world. From the outset, the product has supported French, Spanish and English, with Italian and Romanian quickly following.

"This internationalisation ensures that crews, often the most knowledgeable

"The breakthrough with Sentinel was in creating a medical record-like system for each vine"

Shawn DeMartino

about the vines, can input data directly into the system," says DeMartino.

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MITIGATION STRATEGIES

The potential impact of Sentinel technology is significant. If it had been available decades ago, the wine industry could have potentially better managed devastating vineyard pests such as phylloxera. Although some challenges, like the spread of certain viruses, might not have been entirely preventable, the detailed data provided by Sentinel would have enabled better management and mitigation strategies.

DeMartino adds: "Vineyards, often planted on steep slopes and at high densities, are poorly mechanised. Despite this, human workers interact with the vines on a detailed level, making vine-by-vine management feasible. Sentinel leverages this human resource, allowing vineyard workers to input valuable data into the system."

He continues: "The technology enables vineyard managers to make informed decisions based on comprehensive data. For example, they can track the spread of viruses, manage irrigation more effectively, and make informed decisions about replanting. Sentinel's ability to provide actionable insights from detailed data sets marks a paradigm shift in vineyard management."

Traditionally, vineyards are managed at a block level, summarising data for an entire acre or hectare. However, this approach often leads to a significant percentage of non-producing vines within a block. Sentinel allows for more precise management, identifying issues at the vine level and extending the productive lifespan of vineyards.

This approach is particularly valuable in the face of financial challenges in the wine industry.

As replanting costs rise, extending the life of existing vineyards becomes crucial. Sentinel provides the tools to manage vineyards more efficiently, reducing the need for costly replanting and increasing overall resilience.

The future of vineyard management looks promising with Sentinel. As the technology continues to evolve, it will likely see widespread adoption, especially with its global relevance and multilingual support. Sentinel is not just a tool for today but a transformative approach that can redefine vineyard management for the future, making data-driven decisions accessible and actionable for vineyard managers worldwide. ■