Traceability Innovation: Tagging Trust into Every Berry

Kirsty Hall, Head of Marketing and Compliance, Natural Trace

As food fraud and provenance concerns grow across global supply chains, Australian growers are turning to breakthrough biotechnology. Natural Trace offers a natural, GMO-free tagging method applied directly to the produce, enabling secure, in-product traceability. Recent successful trials have demonstrated that this innovation can authenticate and trace berries without impacting quality or existing workflows..

You can watch Kirsty's talk by visiting bit.Ly/bqi25-kh **or by scanning this QR code**

Traceability is fast becoming one of the most important factors in modern food systems, particularly in high-value horticulture. In the berry industry, where freshness, provenance, and sustainable practices are paramount, ensuring supply chain integrity isn't just about logistics - it's about trust.

At Natural Trace, we've developed an innovative, science-based approach to embed traceability directly into food products themselves. Our solution, NaturalTag™, is the world's first food-safe, natural, and GMO-free tagging system applied to the berry itself, not the packaging. The result? Unmatched traceability that starts at the farm and follows the fruit across every link in the supply chain.

Natural Trace is a biotechnology company based in Singapore, founded in 2021 during the rapid evolution of PCR (polymerase chain reaction) testing technology for mass diagnostics. Our team brings together expertise across life sciences, food safety, and bioinformatics, and we are proud to collaborate with leading institutions like the National University of Singapore and the UK's Food Authenticity Network.

We manufacture in a fully licensed and ISO-certified facility in Singapore and were honoured to be named the Most Innovative Digital Solution at the 2024 Fi Europe Startup Challenge for our contribution to food and beverage traceability and you can find us in the 2024 FoodTech 500 by Forward Fooding.

A $50 Billion Problem

The World Trade Organisation estimates food fraud causes over $50 billion in losses annually, surpassing some illicit trades like tobacco. This fraud takes many forms, including mislabelling, ingredient substitution, dilution, counterfeiting and adulteration where products may be tampered with maliciously or for financial gain. In all cases, the outcomes are the same: lost trust, compromised product integrity, and infringement on intellectual property (IP).

From the farm gate to international retail shelves, knowing exactly where each punnet comes from has never been more critical. Growers dedicate substantial time, resources, and innovation, including intellectual property and sustainable practices into the produce and products they create, making it essential to protect that investment.

Our Solution: NaturalTag™

NaturalTag is a 100% natural, GMO-free, and food-safe biological barcode made from inactivated probiotics. It's applied at molecular level (parts per million or less) with zero sensory impact, therefore no change in taste, texture, or appearance. The tag can be read out reliably even after foods or in this case, fruit is processed further.

Each NaturalTag is unique and customisable, capable of verifying country of origin, a specific grower or block, harvest season or batch, species or variety.

The NaturalTag system is part of a broader three-part solution:

1. **NaturalTag™** – Applied to the product itself
2. **NaturalDetect™** – A PCR-based testing method that identifies the unique tag
3. **NaturalCloud™** – A secure digital platform that connects verified data with the supply chain

This enables multi-level traceability and ensures authenticity at every stage.

Field Trials with Hillwood Berries

We recently partnered with Hillwood Berries, a family-owned Tasmanian producer renowned for its innovation and premium-quality crops across all four berry categories, to trial our technology in strawberry production. The goal was to demonstrate that NaturalTag can seamlessly integrate with existing farm practices and provide reliable traceability from farm to lab without impacting fruit quality.

Trial Process Diagram. Photo credit: Natural Trace

Trial One: In-Field Proof of Concept

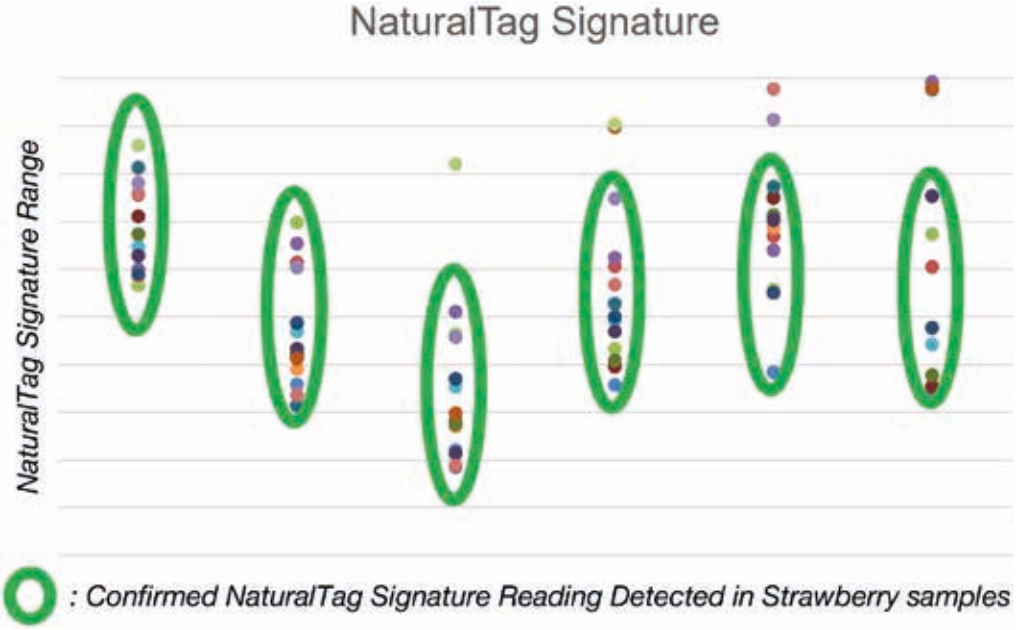
The initial trial was conducted on a one-hectare block of strawberries, where NaturalTag was seamlessly integrated into an existing fungicide spray and applied during routine spraying. The strawberries were harvested, packed, and shipped to Natural Trace's laboratory in Singapore. There, the unique bio-barcode was successfully detected on multiple fruit samples, confirming the tag's presence without impacting fruit quality. This proof of concept established the feasibility of using NaturalTag in real-world farming conditions without disrupting normal workflows or compromising the final product.

(A) Tagged spray applied to strawberry plants, (B) freshly tagged strawberry. Photo credit: Natural Trace

Trial Two: Multi-Week Detection Study

Building on these promising results, a second, larger-scale trial was undertaken across 15 tunnels of strawberries to evaluate tag stability over time. NaturalTag was applied during Week 1 and reapplied in Week 3, with weekly sampling continuing through to Week 5. A total of 280 data points for 2 hectares of strawberries were collected and despite environmental exposure and routine spray applications, NaturalTag remained consistently detectable throughout the trial period.

Importantly, internal sensory evaluations conducted by the Hillwood team found no changes to the strawberries' flavour, texture, or shelf-life. This validated our approach as not only effective, but also grower friendly.



Representation of consolidated test data points identifying NaturalTag signature in strawberry samples
Photo credit: Natural Trace

How NaturalTag Works Across the Supply Chain

Berry supply chains can be complex, particularly when exporting. During our presentation at BQI25, we shared how NaturalTag can support traceability and verification at every key stage in the supply chain, including the following:

- NaturalTag can be seamlessly applied during existing spray or post-harvest processes, no extra packaging or workflow changes needed
- Distributors or supermarket distribution centres can verify origin before stocking
- Importers can authenticate the fruit's country of origin at the receiving port

Because NaturalTag is embedded in the product itself, it provides a layer of verification that travels with the fruit, even if labels are removed or packaging changes. Each tag links back to a secure NaturalCloud record, giving full visibility from paddock to punnet.

Regulatory Confidence

Our patented tag creation and detection process ensures the protection and exclusivity of our technology. NaturalTag has been self-determined as GRAS (Generally Recognised as Safe) in the United States by two independent scientific assessors. In Australia, New Zealand, and the EU, our regulatory advisors have developed a matrix-specific decision tool, ensuring compliance with food regulations in line with how and where the tag is applied.

What's Next?

Following the success of our strawberry trials, we are now expanding into other berry varieties, including blueberries, blackberries, and raspberries. Further trials are planned to explore seasonality, weather conditions, and extended supply chain routes.

We are also engaging with supply chain partners to integrate NaturalTag into broader traceability strategies and ERP (Enterprise resource planning) systems offering seamless, scalable protection against fraud and loss of brand value.

Natural Trace offers a first-of-its-kind technology that enhances and complements existing traceability systems. Our mission is simple: to support growers, producers, and brands in delivering their promise by making sure every great product comes with a trusted provenance story.

Acknowledgements

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Kirsty Hall is Head of Marketing and Compliance at Natural Trace with a background in Environmental Health and extensive experience in food safety, quality assurance, and regulatory compliance across FMCG and government sectors.

A certified ISO 22000 and HACCP Lead Auditor, she specialises in new product development and supply chain integrity. Kirsty currently leads a biotech-driven traceability project in the berry industry, focused on combating food fraud and enhancing transparency.

NATURAL TRACE

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