Project Summary

Supply chain monitoring and improvement to reduce banana quality loss

KEY POINTS

- According to the Australian Food Cold Chain Council, poor temperature management along the supply chain is responsible for $2.96 billion of fruit and vegetable waste each year (Brodribb et al., 2020).
- Accurate monitoring of perishable fresh produce temperatures during postharvest handling is an important traceability requirement to identify the root cause of any product quality loss and waste.
- Pacific Coast Eco Bananas (PCEB), a grower cooperative in north Queensland, produce Ecoganic® and organic 'Williams' Cavendish banana fruit using a certified sustainable farming system.
- While the fruit are in significant demand in domestic and export markets, PCEB have no visibility and control over their fruit once it leaves the farm which limits their ability to ensure product quality always meets expectations.

THE CHALLENGE

An estimated 10% of Australia banana consignments are rejected by the domestic and export market each year because the fruit arrive over-ripe or with chilling injury, presumably because they are handled too warm or cold. PCEB export fruit are typically air-freighted with other commodities that require low (e.g. 5°C) storage temperatures that can cause chilling injury in bananas. There is currently no monitoring of PCEB consignment temperatures which limits the capacity of growers and their supply chain partners to identify, assess and manage handling risks that may otherwise compromise fruit quality.

THE OPPORTUNITY

This project aimed to provide Australian banana growers and their supply chain partners with increased knowledge, skills, tools and confidence to successfully manage postharvest handling risks, reduce waste and deliver more predictable fruit quality. The project team worked with growers and their supply chain partners to monitor and improve existing supply chain handling practices.

Figure 1. Photograph of Ecoganic® banana fruit with chilling injury after exposure to low supply chain temperatures.

OUR RESEARCH

SUPPLY CHAIN MONITORING

The project team supported PCEB growers to monitor 51 random Ecoganic® and organic banana consignments along domestic and export supply chains. Modern real-time autonomous reporting data loggers were used to monitor handling conditions, while trained assessors in-market recorded fruit quality. The monitoring program aimed to identify opportunities for improving handling practices.

DEVELOPING A DECISION SUPPORT TOOL

Parallel supply chain simulation trials were conducted to quantify the impacts of different handling scenarios on

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banana fruit quality. A decision support tool based on mathematical modelling of trial data was developed for predicting fruit quality responses. This program aimed to assist growers and their supply chain partners to assess and manage supply chain risks to fruit quality.

ADOPTING IMPROVED PRACTICES

The project team shared project learnings to promote greater banana industry awareness and adoption of improved handling practices and technologies that reduce fruit quality loss and waste. The project aimed to build capacity of businesses along export and domestic supply chains to deploy monitoring technologies, interpret data efficiently and act on opportunities to improve fruit quality.

Figure 2. Banana growers, Frank Sciacca and Angelo Russo, placing a data logger into an Ecoganic® banana box.

OUTCOMES

The project achieved its core objective of generating new knowledge and developing industry capacity to reduce banana fruit quality loss and waste along PCEB export supply chains from 10% of all consignments in 2020 to 0% by 2023. The project team supported growers to remotely monitor handling conditions and fruit quality to identify risks to product quality. Key findings included:

- 80% of consignments were dispatched too warm (>20°C) which accelerated fruit peel colour development;
- Export fruit were exposed to variable gas-ripening durations of 1-3 days which led to inconsistent quality and shelf life; and
- 25% of domestic road freight loads and 69% of export airfreight consignments were exposed to temperatures of <13°C, which was associated with fruit chilling injury and market rejection.

By the end of the project, 50% of PCEB growers were independently deploying modern remote monitoring technology into consignments and interpreting handling conditions data. The project team developed a decision support tool that was based on modelling fruit responses to variable handling conditions. The tool incorporated a series of best practice handling guidelines that assisted growers and their supply chain partners to prioritise improved handling practices and reduce the risk of advanced peel colour development and chilling injury. The project team encouraged broader industry awareness of the monitoring technologies and decision support tool via a series of information products (e.g. articles, webinars, factsheets).

IMPACT

The introduction of supply chain monitoring and adoption of improved practices helped to eliminate all physical waste in PCEB export consignments in 2023. It also reduced food waste along the domestic supply chain by 59% in 2023, relative to 2020. Compared to pre-covid (i.e. 2020) figures, this represented 5.2 and 281 tonnes in export and domestic supply chain waste reduction, respectively, saving a combined $762,960 in annual revenue loss. Delivery of more consistent fruit quality also provided PCEB with the confidence to export entire 1,000 kg pallets of Ecoganic® fruit to Hong Kong and Japan in 2023 for the first time. This increase in export volume was accompanied by enhanced customer satisfaction and strong demand for repeat orders. Delivery of more predictable fruit quality should boost the reputation of Australian growers as preferred suppliers.

NEXT STEPS

The project played an important role in building industry capacity to monitor and improve export fruit quality. The

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legacy of this project will be measured through ongoing adoption of monitoring technologies and the decision support tool. An increased volume and value of Australian banana exports and a shift from unrefrigerated airfreight to controlled temperature seafreight will be other objective measures of ongoing project impact to monitor. Project learnings and benefits could be extended to improving Australian domestic banana supply chain practices and fruit quality outcomes.

PROJECT TEAM

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Dianne Sciacca, Frank Sciacca (Pacific Coast Produce)

PROJECT REPORTS/PUBLICATIONS

Archer, J., Nguyen, M., Macnish, A., Veivers, S. (2023). Modern monitoring technologies for improving supply chain performance. *Australian Bananas* **67**, 35.

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PROJECT WEBPAGE

https://endfoodwaste.com.au/projects/supply-chain-monitoring-and-improvement-to-reduce-banana-quality-loss/

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