Waste not, want not

The origin of that saying is really not clear, unlike its meaning; *if one is not wasteful then one will not be in need.* Why is there suddenly such a focus on the waste we generate and what we choose to do with it?

We like big things in this country and the scale of waste we generate is quite simply staggering. Based on the latest available audited Australian data from 2016/17, we create 67 million tonnes of waste each year. On a per capita basis, that's the equivalent in weight of six grand pianos! Each.

There is no doubt that tackling waste is one of the great challenges for this century, and even our political system is finally catching up. The Australian Government has appointed a Minister for Waste (and Environmental Management) so for the first time in the 200 years since colonial settlement we now have a Minister with "waste" in their title.

As individuals and as businesses, we each have a responsibility to play our part in being champions of the solution, and across the future editions of the Australian Berry Journal, we will be bringing you the latest waste focused projects that have direct relevance for the berry industry.

In this edition, we hear about exciting developments being explored at the University of Queensland, recognising that fruit and plant waste has value; value that can be tapped in different and interesting ways.

Our second feature provides an overview of a recently completed project funded by Hort Innovation using the Strawberry Fund and the Raspberry and Blackberry Fund and funds from the Australian Government. Dr Doris Blaesing from RMCG explored the reuse potential of waste coir (MT17016) and she shares a summary of the project findings and its main recommendations.

Biorefinery for berry waste valorisation

Energy, nutrients, valuable products

This project is being carried out by the Solid Waste Management Group at the School of Civil Engineering at the University of Queensland (UQ). Our aim is to evaluate different technologies to allow the valorisation of organic waste generated in the berry sector, including rejected fruit, post-harvested plants and waste coir.

The research follows the philosophy of the circular bioeconomy, where these biomasses are considered resources to be valorised instead of waste to be dealt with. The research group is currently developing two different projects in this field; one project looks to translate waste into an energy source and the second to release valuable compounds with multiple applications.

An integrated approach for the sustainable closed loop management of agricultural residues

This project is being carried out by Arinze Ezieke as part of his PhD Thesis. The objective of the project is to investigate the feasibility of sustainably closing the energy and nutrient cycle through the integration of anaerobic digestion and self-sustaining smouldering processes for the management of agricultural waste. Anaerobic digestion is a bioprocess where microorganisms, in absence of oxygen, are able to transform organic mass into biogas, a renewable energy source. Smouldering is a flameless combustion technology that is able to burn substrates with a very high moisture content without extra energy requirements.

The combination of both technologies is proposed to produce energy in the form of biogas from the easily biodegradable substrates, i.e. waste fruit and plants, whereas smouldering can reduce the coir and the final effluent from the anaerobic digestion process to a small volume of ash. Therefore, integrating both technologies could help to solve the challenges of waste management at berry farms by producing energy and reducing the waste volume (and its transport cost) to a small volume of inert ashes.

The present project will seek to determine optimal operational conditions to combine both technologies, assess its practicality and sustainability in terms of energy, environmental and economic context, and establish a framework for its successful implementation/deployment.

To date, laboratory results support the suitability of anaerobic digestion for energy production from waste fruit and plants, whereas the integration with smouldering seems to be highly energy efficient. As an example, laboratory results show that one tonne of waste berries are enough to generate around 120 kWh, which could be enough to provide electricity to up to 4 houses per day.

Accumulation of bioactive compounds from wasted strawberries through anaerobic fermentation under controlled acidic conditions

This project aims to develop a novel technique for obtaining bioactive compounds from rejected strawberries that are currently sent to landfill. The project aims to create a cost-effective technology to suppress one of the main limiting steps for obtaining bioactive compounds: the solubilisation process. The proposed technique is based on adjusting operational parameters of an anaerobic digestion process to provide the optimal conditions to the microorganisms to solubilise strawberry waste.

This project is funded thanks to a University of Queensland Early Career Researcher Grant 2019 (project UQECR1945969).

Through the technology developed by our group, we have been able to triplicate the amount of soluble bioactive compounds in our reactors. Concretely, high concentrations of the phenol p-coumaric acid and the anthocyanin pelargonidin 3-glucoside were obtained. Recovery of these compounds from strawberry waste represents a market opportunity, with multiple applications in pharmacy, cosmetics and the food industry. The next steps will focus on the assessment of this technology in continuous operation for its potential industrial implementation.

We would like to thank our industry partners; LuvaBerry® , SunnyRidge® and Pinata® farms for their support by providing berry samples and necessary information to go ahead with the investigations.