



## PROJECT SUMMARY

### ***‘Advancing regional agri-food waste valorisation’ project***

#### **KEY POINTS**

- Waste mapping of organic waste produced by intensive livestock industries and related food processing sectors was conducted in the Toowoomba Region.
- A business case was developed for Toowoomba regional Council to increase capture and beneficial processing of food waste from municipal organics.
- Three businesses from the horticulture, animal feed milling and food processing sectors in this region were surveyed for opportunities to transform food waste to value add products and a detailed pre-feasibility study conducted.

#### **THE CHALLENGE**

The national food waste baseline indicated that 55% of food waste occurs within the primary production and manufacturing sectors of the supply chain. Consequently, regional agricultural centres such as Toowoomba will become strategically important in value-adding to wasted food and associated agricultural residues. However, the current state of waste residue mapping in regional centres is poor. As a result, it is difficult to attract investment to the area to value-add to waste agricultural organics.

#### **THE OPPORTUNITY**

This project provided an opportunity to update the state of knowledge on agricultural and food waste production in the Toowoomba LGA. Specifically, waste mapping was conducted on a region-wide scale with a greater focus of providing residues to a biorefinery hub, and at a local level in the context of value-adding to waste streams and increasing business sustainability and profitability.

#### **OUR RESEARCH**

This research took the form of three principal activities, including 1) waste mapping of residue production in the Toowoomba LGA; 2) development of a business case for Toowoomba Regional Council to value-add to municipal organic waste, and; 3) development of three pre-feasibility

assessments for agricultural businesses in the Toowoomba LGA.

A desktop study was conducted to identify agricultural waste production in the Toowoomba LGA. A stakeholder engagement survey was constructed and distributed to Toowoomba and Surat Basin Enterprise (TSBE) networks to identify waste types, quantities, current waste management practice, and appetite for value-adding. Identification of waste in the LGA was difficult due to low survey completions and the absence of available data at the LGA level. Consequently, the investigation focused on data from the Australia Bureau of Statistics statistical area level 4 data for the Darling Downs – Maranoa. Using this data, waste residues for all intensive livestock, broad acre cropping, and horticulture were estimated. Image analysis was used to estimate the fraction of residues produced in the Toowoomba LGA.

The University of Southern Queensland’s Centre for Agricultural Engineering worked closely with Toowoomba Regional Council (TRC) to identify and cost organics collection and processing scenarios for food and garden organics. Collection scenarios included both weekly and fortnightly collections for both 3-bin and 4-bin collection systems, allowing for iterations of collection of source-separated food organics, garden organics, and combined food and garden organics from households in the Toowoomba LGA. Processing technologies included composting, anaerobic digestion and gasification were investigated both in isolation and in combination, and outcomes were additionally combined with collection scenarios to create 16 new unique collection and processing outcomes.

Finally, pre-feasibility assessments were conducted for three stakeholders: pb Agrifood, Nippon Ham Oakey Beef Exports, and Barden Farms to investigate opportunities for value-adding to their respective organic waste streams. Value-adding pathways included anaerobic digestion, bioactive extraction, composting, gasification, and insect protein production. Stakeholders declared their appetite for each pathway as part of the stakeholder engagement survey, and only desirable pathways were investigated. Pre-feasibility assessment determined feedstock suitability for each pathway and estimated waste management savings, product yields and values, and high-level capital and operational expenditure were estimated.



## OUTCOMES

Waste mapping identified 795,739 dry tonnes of recoverable crop residues from cereal, non-cereal and horticulture industries within the Darling Downs – Maranoa. Due to a sustainability demand in the Northern Grains Region, only 166,525 dry tonnes are available for value adding stemming from non-cereal crops and horticulture. Image analysis indicated the potential for 67,493 dry tonnes to be located within the Toowoomba LGA.

A business case for TRC to divert organics from landfill. Over a 20-year period, TRC can divert over 527,000 tonnes of municipal organic waste from landfill, into more appropriate processing solutions. This quantity of organics has the potential to generate 65,000 MWh of electricity or 378,000 GJ of heat, or 514,000 GJ of biomethane and 52,478 t of food-grade carbon dioxide. Alternatively, TRC could generate 399,000 tonnes of compost from this organic waste. Both of these initiatives were costed and estimated to be more cost-effective than the business-as-usual approach if owned and operated by TRC.

Pre-feasibility assessments were completed for pb Agrifood, Nippon Ham Oakey Beef Exports, and Barden Farms. pb Agrifood generate around 3,000 tonnes of milling waste residues annually and dispose of this waste at great cost. All forms of value-adding were of interest to pb Agrifood, and due to the wide range of wastes produced by pb Agrifood, various technologies have suitability to manage this waste. Sending contaminated wastes for composting at cost was a more cost effective outcome than sending wastes for incineration. Alternatively, on-site gasification provides an opportunity for pb Agrifood to significantly reduce their solid waste production while recovering heat for on-site use and biochar as a saleable product. Greatest value potential was estimated from insect protein production. While insects can safely consume contaminated milling wastes, further research is needed to ensure that insect protein reared on contaminated milling residues is safe for animals to consume.

Nippon Ham Oakey Beef Exports (OBEX) were principally interested in processing their paunch and low-grade tallow waste. Low-grade tallow remains highly valuable and it was recommended that tallow is sold through traditional markets. However, tallow was included in assessments to

provide future pathways for this material. The two principal pathways of interest to OBEX were advanced composting, gasification and insect protein production. Composting is already conducted on-site, and high-level assessment indicated that it was not cost-effective to introduced advanced composting techniques. Gasification was not suitable for treating wet paunch or tallow. However, if this material can be solar dried, gasification may be a viable pathway for minimising waste, recovering heat energy, and producing a saleable biochar product. Insect protein production was the highest-value pathway, though importantly, current legislation in all States and Territories does not permit insects reared on abattoir waste to be fed to ruminants or pigs, and in Queensland it is not permitted as poultry feed. Changes to legislation must be monitored.

Barden Farms produce 8,500 tonnes of horticultural waste annually, and were principally interested in producing compost and generating insect protein. Currently, Barden Farms provides this waste to farmers as animal feed free of charge and consequently, pays no disposal fee. As a result, the introduction of a composting process was not economical. However, the rearing of insect protein on this waste stream was highly valuable. Additionally, due to rearing on a vegetable waste stream, this insect protein is not as strictly regulated as protein reared on restricted animal products or prohibited pig feed products.

## IMPACT

- Reduction of kerbside-collected organic fraction of municipal solid waste sent to landfill by introducing a new waste collection system.
- Recovery of higher value from kerbside-collected organic waste using either composting, biogas, or gasification.
- Development of a survey to extract information on more granular data for the Toowoomba local government area using an agrifood industry-wide survey.
- Opportunities to engage with small and medium enterprises in the Toowoomba region who have an organic waste management problem.



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**TOOWOOMBA**  
**REGION**

## PROJECT WEBPAGE

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