

FROM SPUDS TO SOLUTIONS: REPURPOSING POTATO WASTE

Food waste is a hot issue in Australia, resonating with individuals across the country. Nobody likes to see resources go to waste. So what is being done?

Potato waste stems from various sources, from the rejected produce judged not perfect enough for 'Big Grocery', through to the waste generated through the manufacturing process in the form of peels, pulp, and rejects.

Reducing food waste not only addresses environmental sustainability issues, but also yields economic benefits. This symbiotic relationship between sustainability and profitability is increasingly recognised, driving initiatives globally.

Innovative solutions are emerging that convert potato waste into myriad useful products ranging from packaging, fuel and building materials. These developments highlight the creative problem-solving occurring worldwide to tackle the food waste challenge.

BIODEGRADABLE PLASTICS

The inspiring story of Australia's *Great Wrap* illustrates the outcomes possible when innovators and scientists work together to find solutions to complex problems. Plastic waste, along with climate change, are *the* complex problems of our time.

Through clever collaboration, entrepreneurial couple Julia and Jordy Kay teamed up with material scientists to convert potato waste into biodegradable plastic. This wrap is made from potato starch and polymers, using potato waste from food products such as fries and potato chips. With everyone keen to reduce their environmental footprint, biodegradable packaging is making headway into the market despite costing a little extra. With plans and funding to soon open their own biorefinery in Melbourne, the couple

hopes that the cost of their clingfilm will soon match conventional plastic products.

Last year, the company launched the world's first biodegradable pallet wrap, available to Australian buyers now and soon to be exported.

Julia commented to *Business News Australia* that although the domestic cling wrap and the pallet wrap are similar, it took plenty of research and development for the pallet wrap to meet the tensile strength requirements for commercial customers.

"The new formula that we'll be launching is made from a combination of cassava and potato waste, and then we've developed a bioplasticiser made from used cooking oil," she said.

"That's been super incredible because we're using another type of waste, but it's also allowed us to get our pricing down to a point where we're



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Great Wrap's potato starch pallet wrap. (Image: greatwrap.com.au)

comfortable we can compete with petroleum plastic."

Across in the USA, a company from Idaho has also turned to the state's beloved potatoes in a bid to reduce plastic waste.

BioLogiQ founders have developed plant based polymers that used within normal manufacturing processes. Their BioBlend XD products can be partnered with a range of other polymers, including polypropylene and high density polyethylene.

The system converts potato starch into natural resins. These can be blended with partner resins to produce everything from flexible films to hard plastic containers. BioBlends containing 5 to 40% plant based material are not only stable, but can increase material strength, allowing thickness to be reduced.

Inclusion of the BioBlend material also reduces the fossil fuel used. So polyethylene bags containing 25% NuPlastiQ were not only 30% thinner, but used 50% less fossil fuel to manufacture.

Although the blended films are still strong and durable, they provide microbes with relatively easy food sources as part of the matrix. This means they are more easily composted. For example, blends of 40% NuPlastiQ GP with LLDPE were 91 to 96% broken down (relative to pure cellulose) after approximately one year.

Perhaps next year, potato bags made (partly) of potatoes.

BIOENERGY

Biofuel from potato waste might be the white whale of many growers. Converting crop waste into fuel not only greatly reduces energy costs, but it is the ultimate closed-loop goal. While already used by some European farmers, it has yet to become a widespread viable solution for Australian growers.

As the world seeks alternative energy sources, potato peel waste is likely to play a role in biofuel production. The carbohydrates contained in potato peel can be readily converted into bioethanol through a combination of processes (saccharification, fermentation, and treatment that adds mould and yeast). Bioethanol is a renewable fuel that can be blended with petrol or used independently in vehicles. Studies are still in their early stages but moving fast towards efficiency and improvement, with



At Cavendish Farms on Prince Edward Island, digesters break down potato waste, producing biogas that fuels the boilers in the company's nearby French fry processing facility. (Image: Pat Martel/CBC)

researchers across the worlds addressing these challenges.

Meanwhile, researchers at the University of Prince Edward Island (UPEI) in Canada are pioneering a novel method for producing hydrogen from waste materials, offering a potentially more sustainable and cost-effective alternative to conventional hydrogen production techniques. Spearheaded by Yulin Hu, an assistant professor in the Faculty of Sustainable Design Engineering at University of Prince Edward Island (UPEI), the project aims to extract hydrogen from diverse waste sources, including used plastics and agricultural residues such as potato peelings.

The process uses a catalyst to break down the waste materials, releasing hydrogen gas. Currently, the research team at UPEI is working to refine the process and scale it up for industrial applications.

BUILDING MATERIALS

Bizarre as it sounds, British innovators have created strong materials based on potato waste.

Researchers at the University of Manchester have created a green alternative to concrete. Designed for space and known as 'StarCrete', it also shows great terrestrial promise.

This innovative material is twice as durable as conventional concrete. The researchers combined potato starch, salt and synthetic Martian soil to yield a concrete-like material, boasting a strength of 72 Megapascals (MPa), surpassing typical concrete's 32 MPa.

Calculations indicate that a 25 kg bag of dried potatoes contains enough starch to produce nearly half a tonne of 'StarCrete'.

Looking ahead, DeakinBio, a startup co-founded by Dr Aled Roberts, Research Fellow at The University of Manchester's Future Biomanufacturing Research Hub, is striving to refine 'StarCrete' for use on Earth. If successfully upscaled, 'StarCrete' could offer a greener alternative to traditional concrete production. Moreover, it

can be fabricated in a standard oven or microwave, drastically reducing manufacturing energy costs.



Block of 'StarCrete', made from potato waste, salt and dust. (Image: designboom)

Staying in the UK, a London-based group have designed an eco-friendly alternative to conventional medium-density fibreboard (MDF) using potato waste. Their innovation, aptly named Chip[s] board, is derived from non-food-grade industrial potato waste, addressing concerns about toxic compounds commonly found in MDF.

Peelings are refined through various processes to create a binding agent, eliminating the need for toxic resins and chemicals. This agent is then applied to fibres including potato skins, bamboo, beer hops, and recycled wood, forming a composite that is heat-pressed into sheets suitable for manufacturing furniture and building materials.

So whatever your need - food, packaging, energy or shelter - potatoes can potentially provide it!

SOURCES

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AUSTRALIA'S -AWARD WINNING GIN AND VODKA TURNING POTATOES INTO PROFITS



Ruby Daly checking out local delights at the WPC in Ireland in 2022

Tasmanian farmers the Daly family, frustrated that 20% of their harvest was wasted each year due to cosmetic imperfections, turned frustration into opportunity.

After extensive research, they decided to transform their second-grade potatoes into value-added products. Thus, Daly Potato Co. and Hellfire Bluff Distillery were born.

Daly Potato Co. received a boost from a Regional Jobs and Investment Packages grant, allowing them to establish a facility specialising

in ready-made potato products. The venture not only uses the second-grade potatoes but also created 30 new jobs in the local area. Using their popular Nicola potatoes, Daly Potato Co. began producing potato salads, mashed potatoes, and pre-seasoned roasting potatoes, leveraging consumer trust in the variety.

The second venture, Hellfire Bluff Distillery, produces potato vodka and gin. With mentorship from UK-based Chase Distillery, Ruby Daly and her team perfected the recipe just in time for the launch at AgFest 2016.

Both ventures proved successful in achieving their key mission: providing a home for the 20% of second-grade potatoes that would otherwise go to waste. However, regulatory requirements proved challenging and costly to the Daly Potato Co.. The family found a solution by selling the processing function to Pure Foods Tasmania, while still ensuring that Daly Farm remained the sole supplier of second-grade potatoes.

Hellfire Bluff Distillery now consistently wins awards for their innovative spirits. Not only did the distillery pay off its initial investment, but it also became a significant purchaser of second-grade potatoes from Daly Farm.

Ruby Daly's insights underscore the importance of embracing risk, seeking expertise, and empowering the younger generation in agricultural innovation. The Daly family's efforts were recognised nationally when they won the Australian Farmer of the Year Award in 2019, a testament to their innovative approach and commitment to sustainability and community development

Here are Ruby's top three tips for value-adding:

1. Be willing to take a risk to value-add If you don't take a risk and try something new, second-grade or undervalued products will continue going to waste. There is profit in value-adding, so give it a try.

2. If you're not the right person for the job, find the right people to help If you have an excellent idea for a value-add but don't know how to get started, ask for the help of experts or consultants.

3. Let the younger generation have a go: Ruby has found that she has a skill for reading the market and staying ahead of trends. Susie and Gerard have encouraged Ruby's creativity, which has catalysed the distillery's success.

Read the full case study at Growing Country

<https://growingcountry.com/case-studies/daly-farm-value-add-journey>