

# Modernising the dried fruit industry

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**Pruned dried fruit vines**



**Figure 1: Testing the first prototype**

**T**he Sunraysia region encompassing north-west Victoria and far south-west NSW is famous for its dried vine fruit, accounting for more than 95 per cent of Australia's production<sup>1</sup>.

Production volumes vary from year to year, ranging from 15,600 tonnes in 2019 to 9,916 tonnes in 2022. It's a long way from the industry's heyday in the 1940s, when production peaked at more than 100,000 tonnes<sup>2</sup>.

In common with other farm sectors, there has been a steady exodus of smaller growers, many selling out or converting to winegrapes, table grapes or almonds.

Global demand for Australian fruit remains strong, fuelled in recent times by pandemic-related trends towards home baking and the growth of new markets in Japan, China and Southeast Asia.

But it has been difficult for processors to hold on to premium markets because of wild fluctuations in volume from one year to the next.

In 2021, then-Dried Fruits Association chief executive Anne Mansell said the industry was banking on lifting production by 10,000-15,000 tonnes over the next five to 10 years, with hopes of consistently reaching 30,000 tonnes to meet both export and domestic demand.

Those committed to a future in dried fruit have looked for innovative ways to boost production volumes, minimise the impact of weather damage and cut labour costs which have been a major impediment to expansion.

Gone are the days of hand picking grapes and spreading the bunches out on racks to dry in the sun.

Most producers have converted to swing arm trellises which allow grapes to dry on the vine and use converted winegrape harvesters or specialist radial head harvesters to bring in the fruit.

The only part of the process yet to be mechanised is pruning, although that's something researchers have been working on for the past three years.

Former Dried Fruits Australia field officer Stuart Putland said labour accounted for 20-30 per cent of crop production costs and it was hoped mechanisation of pruning would provide a cost-effective solution.

A prototype (fig. 1) developed by La Trobe University's Robotics, Automation, Mechatronics, Prototyping and Sensing (RAMPS) team led by Dr Robert Ross was revealed at the Growing Smarter in the Mallee regional horticulture summit at Mildura in May 2022.

The tractor-mounted cordon cutting system, which had been trialled in several vineyards, has evolved to use a LiDAR sensing system to control movement of the cutting head.

Winegrape pruning machines can cut spurs within 300mm of the vine, but vines for dried fruit production require much more precise pruning of the canes – to within 2-3mm of the cordon that puts out spurs for growing the next season's fruit.

Stuart said the sensing system worked well, moving the cutting head in and out to match the cordon.

"There is still some work to go getting the sensing system 'dialled in' to some peculiarities of cordon, but we are becoming more confident in the system each time we take it out for a run," he said.

At the request of growers, Robert said the second version of the machine integrated various components into a single control box that would make it easier to swap between tractors with cabins, regardless of make.

## **Eye on the future**

Merbein dried fruit producer Stephen Bennett is putting an updated functional prototype through its paces this pruning season.

In July, Stephen and RAMPS computer systems engineer Dr Matt Felicetti, who wrote much of the code, ironed out a few bugs and on its first run the machine pruned 10 rows "quite reliably".

"There's still a few mechanical things to finetune and possibly a little bit of finetuning in the control software, but at the moment it's able to do some productive work," Stephen said.

Stephen has designed a new, more durable cutting head and expects the framework it sits on to be beefed up before it becomes commercially available.

"We got quite excited when it all smoothed out and started working properly," he said.

"I think it's a very significant development for the industry. Not everybody's going to want to use it,

but it will give growers the option and I think once a few growers do start using it, they'll see the benefits of it. It's quite exciting to be honest."

A fourth generation dried fruit producer, Stephen has always kept one eye on the future.

In partnership with his brother Malcolm, he grows four types of vine fruit – sultanas, the sultana types SunMuscat and Sunglo, and Carina currants – across 26 hectares near Merbein, west of Mildura.

A qualified mechanical engineer, Stephen returned to the farm after deciding he wasn't cut out for city life and the pair have spent the past 20 years tinkering with ways to improve productivity and efficiency.

As well as the usual updates to irrigation methods and adoption of new higher performing varieties, the Bennetts have taken part in research and a range of trials to test and benchmark new technology and management techniques.

Mechanisation has been important for ensuring long-term viability. It's not only the cost of labour that has hampered the industry's expansion – it has become increasingly difficult for growers to find people willing to do the hard, physical outdoors work needed each season.

Stephen said it cost \$300-\$400 per tonne to manually harvest fruit from older vines compared to \$30-\$40 per tonne for machine picking on the new trellis system.

"That's because of a combination of higher yields and a mechanised system," he said. "It's a big difference."

And he's hopeful the new pruning machine under development will be affordable enough for smaller farmers.

"When you look at the labour costs, it doesn't take long to work out that it doesn't matter spending a little bit of money on automation and robotics," he said. "If you're going to genuinely save labour, then it will be well and truly worthwhile."

### How it works

Dried fruit production relies on grapes growing on shoots from an established section of vine called a cordon, that is two years or older and runs horizontally along the fruiting wire on a swing arm trellis.

Pruning is done in two stages. The first occurs at harvest in autumn when the fruiting stems are mechanically cut by a machine that gathers them with rotating

fingers and shakes the dried grapes into bins.

Traditionally, the short spur that's left is pruned back to the cordon by hand in winter.

Unlike wine grapes, which can be pruned on both sides of the cordon at the same time, leaving 20-50mm long spurs with two buds at the base of the cane, dried grape varieties produce fruit from the end of canes growing along the cordon. "We want to shave off all of last year's old canes that were used for the previous season's crop," said Stephen.

"And then we're trying to save all the canes on the other side that we're using for next year. We try and prune as precisely as we can, because that increases the life of the vine and the productivity of the vine."

The robotic pruner has a cutting head attached to a bar on the tractor. It uses a combination of GPS data and LiDAR technology to identify and follow the cordon, with a fast-spinning blade automatically cutting only where needed.

The GPS allows the system to dynamically adjust to tractor speed, and the tractor driver's role is to drive in a straight line along the row so the cutter is within 300mm of the vine.

A screen in the cabin (Fig. 2) shows the driver as the LiDAR identifies the edge of the cordon (red line) and the computer calculates where the pruning head has to be, within its 300mm range (white line).

"You can use the screen to position the sensor so it's in the right spot and it is pretty much self-guiding once it's set up," Stephen said.

"Then you can make some adjustments so that it's not cutting in too close or out too far away from the cordon. And once those offsets are set, it guides itself.

"It's wonderful to use. When you're driving along you can see it move in and out and move around a post. This is a pretty good system."

Stephen said he and Malcolm averaged about 100 metres an hour when pruning by hand using electric secateurs.

By contrast the machine was capable of pruning 10 times as fast.

"You can't quite compare those figures, because with the machine we've still got to go through and do a bit of tidying up," he said.



**Figure 2: Cabin screen showing LiDAR image and the cutter, which is in the bottom right corner.**

"So there's still a bit of labour left over, but it will be at least 50 per cent saving of time, I'd say. It's going to be significant."

### Next steps

The plan is for Stephen to continue testing, refining and demonstrating the system to growers and other interested parties.

Robert said the RAMPS team would continue supporting the machine's development.

"Really, it's in their hands at the moment," he said.

"We're happy to support this in whatever way we can and we're happy to do upgrades that are suggested. I think what they're wanting to do is get as many people through trialling it and viewing it as possible and getting feedback from them, so it's a bit of a proving ground at the moment."

Stephen said the pruning system had generated significant buzz outside the dried fruit industry as well as within it, and he was hopeful the adoption of new technology would help make agriculture in general, and dried fruit production in particular, a more attractive career choice for young people.

The project has been funded by Dried Fruits Australia in collaboration with Trigg Industries and the Australian Government's Innovation Connections program.

Sources:

1. Hort Innovation, *Australian Horticulture Statistics Handbook 2021/22*.
2. Hort Innovation, *Australian Horticulture Statistics Handbook 2019/20, 2020/21 & 2021/22* and *The Murray Pioneer*, p 2, 7 Dec 1944 (via Trove) <https://trove.nla.gov.au/newspaper/article/109410098>.