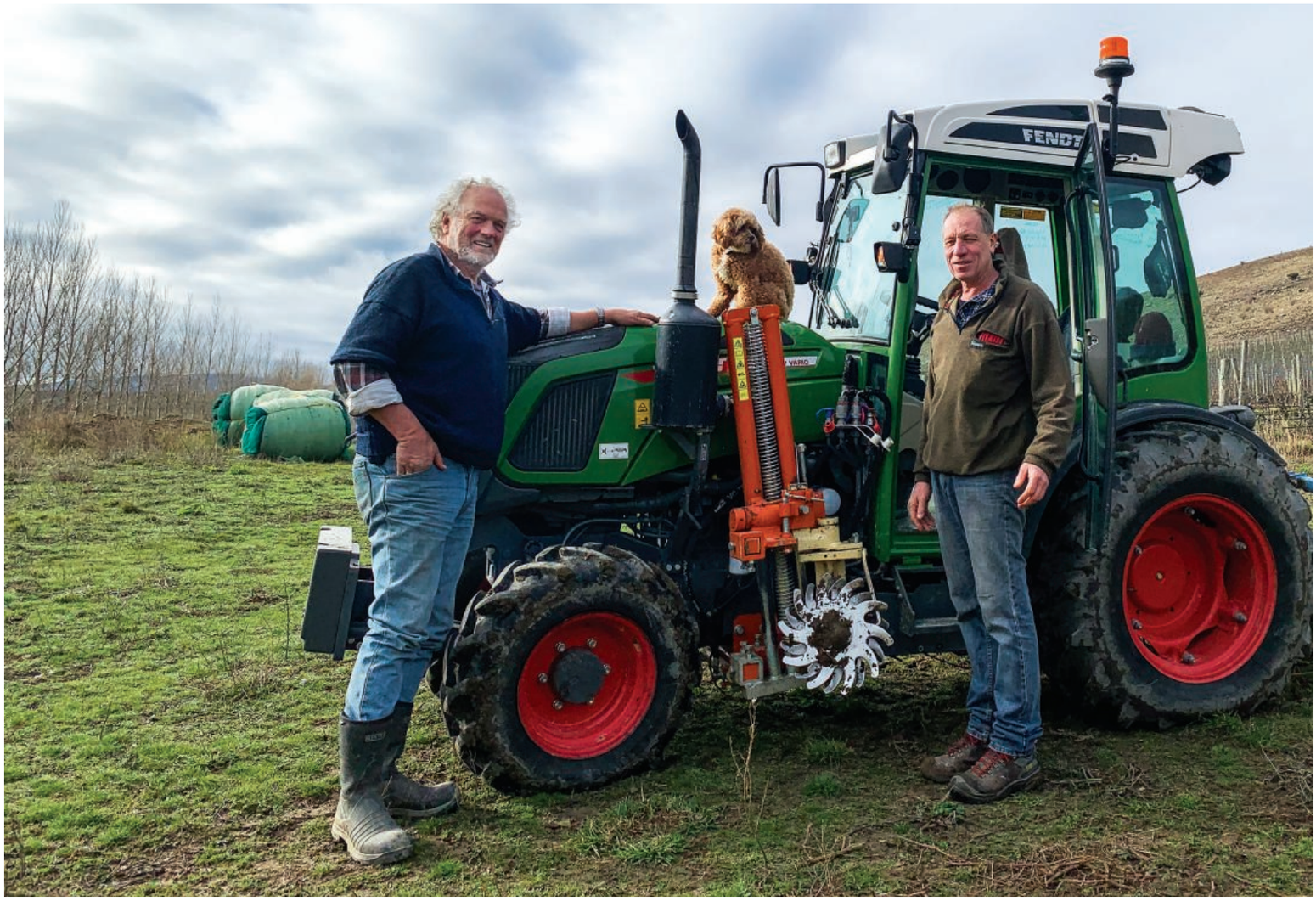
Vineyard Management

Sustainability

Non-chemical weed management

New techniques lead to vineyard innovation

Writer **Simone Madden-Grey** was recently on the ground in New Zealand to speak to a number of sustainability-focused growers about the successful changes they've implemented to control weeds in their vineyards.



Recent studies documenting increased herbicide resistance across New Zealand together with key export markets reviewing glyphosate use is driving interest in non-chemical weed management techniques amongst grapegrowers.

Weedmat and mulch

A paper recently published in the *Food Chemistry* journal documented results from a three-year weedmat trail in Gimblett Gravels, Hawke's Bay. It demonstrated good levels of undervine weed suppression by both black and white weedmat when compared with a standard herbicide treated site. The study also recorded no impact to yield, bunch numbers or bunch weight of the Malbec grapes used in the trial.

At Aurum Wines, Central Otago, Brook Lawrence successfully trialled weedmat over three years. In the subsequent planting of a new hillside plot, weedmat was again used for assistance in establishing new vines. In addition to successful weed suppression there is benefit in being able to mow the grass normally during the year rather than multiple undervine mowing passes, although Lawrence says there is still work to be done.

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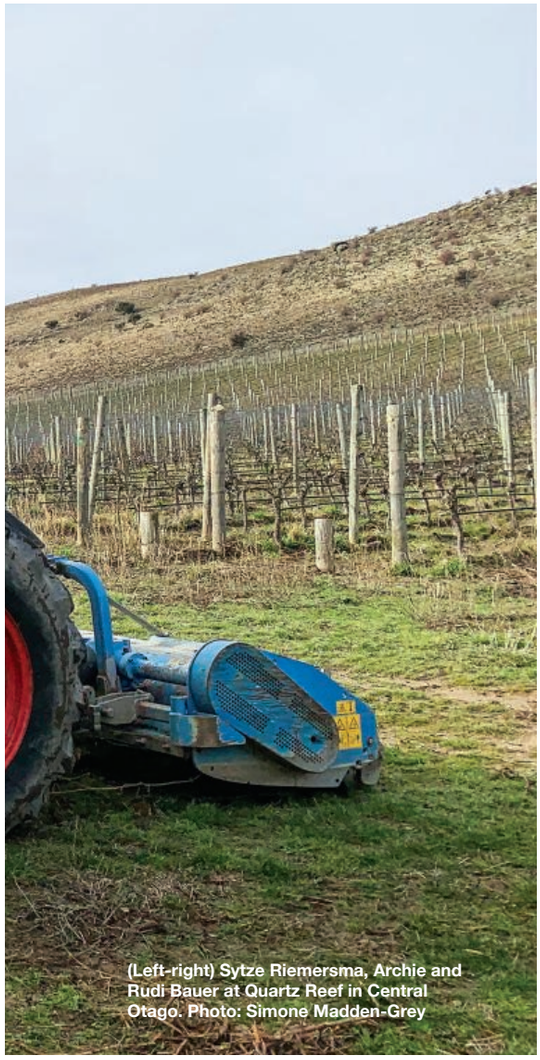


(Left-right) Sytze Riemersma, Archie and Rudi Bauer at Quartz Reef in Central Otago. Photo: Simone Madden-Grey

"After pruning, we will go through and mow, before hand-pulling anything that has grown over the mat," he explained.

"We are planning to use sheep in the future. They are great because although they may lie on the weedmat because it gets warm in the sun, they do not nibble it."

Most weedmat is produced from woven polypropylene, however some products are made from biodegradable materials such as recycled paper, wool and jute. With biodegradable products, there is potential for continued weed suppression through the decomposing material acting as a mulch. This needs to be managed because, as Dr Charles N Merfield explains in the 2019 'Vineyard Floor Management' report, mulch thickness is fundamental to successful weed suppression. Oxygen levels, temperature and sunlight are some of the mechanisms used by seeds to determine soil profile depth and thus if they are close enough to the surface to successfully emerge, typically 2cm under the soil. The addition of a thick layer of mulch will increase seed depth in the soil, inactivating seed germination triggers and regularly maintaining the mulch layer ensures continued suppression.

Undervine cultivation tools

Precision, efficiency, minimal soil disturbance and simultaneous implement operation have been fundamental in the push for greater sophistication in weeding tool design.

In Gisborne, biodynamic pioneers Annie and James Millton use a range of different tools to manage midrow and undervine weeds at their eponymous vineyard. They have used a range of Braun machinery for undervine cultivation over the years, with soil loosened using a foot blade undervine weeder and rotary star tiller, and mounded using a disc plough. Cultivation is not carried out all year, instead, an undervine mower is used during the height of summer.

At Smith & Sheth, Gimblett Gravels, Hawke's Bay, Amy Farnsworth uses the German NIKO HY40FS (Hydro 40) Caterpillar with a Boisselet cultivator, operating the Juramatic with two tynes on each side for the first cultivation pass and two tynes and two blades for the second. The tynes and blades are all metal to ensure they are strong enough to handle the stony soils of Gimblett Gravels.

At Craggy Range, Jonathan Hamlet says one of the biggest changes he has observed in his career using non-chemical weed control, is increased efficiency in undervine cultivation operations. He attributes this in large part to the relatively recent introduction of the rollhacke and the finger weeder. Depending on row width the rollhacke, a spiked disc that turns over the soil, is able to travel up to 12km/hr and can be coupled with other tasks during a pass. The round, rubber spiked disc of the finger weeder is non-powered and moves soil around the base of the vine. Hamlet estimates that a combination of these two implements will potentially improve undervine weeding efficiency by 20-30% due to increased speed and multiple tasks being undertaken during a pass.

At Quartz Reef, Central Otago, Rudi Bauer also uses a rollhacke and finger weeders, although he says he would rather have turkey or geese taking care of the weeds. These implements are used for undervine cultivation to avoid competition for water between the vine and weeds, and cover crops are used in the midrow.

Operating the rollhacke and finger weeders at Quartz Reef, Sytze Riemersma says, "I will go as close as possible to the vine to loosen up the soil and then switch implements to finger weeders, which are almost like hands. They go around the vine, push and flatten the dirt out and push the grass clumps out."

Riemersma says they are working on running the two implements simultaneously, for efficiency. "We normally have a crew of 10 guys here for a number of weeks, a couple of hours a day, with a hoe and hand weeding. It is

a lot of hard labour but with these two implements we are able to reduce the labour and time required."

Grazing

At the 2021 Organic Winemakers New Zealand (OWNZ) Marlborough Symposium, Mike Saunders at Greystone Wines, North Canterbury, said the future for the property was to move from Greystone Wines to Greystone Farm. Acknowledging the enviable position of having 180ha of farmland, of which only 50ha is dedicated to viticulture, he sees grazing as an effective tool to reduce vegetation and allow seed germination without herbiciding or cultivation. However, he said, you need to be a good farmer, "Don't be afraid of sheep. Watch your stock like you watch your crop, don't leave them untended. You have to become a farmer as well as a viticulturist".

Amy Farnsworth on NICO caterpillar tractor, Smith & Sheth Omahu Vineyard, Gimblett Gravels. Photo: Simone Madden-Grey

Preferring cattle to sheep, Anna Flowerday at Te Whare Ra Wines, Marlborough, says the cows are from the property.

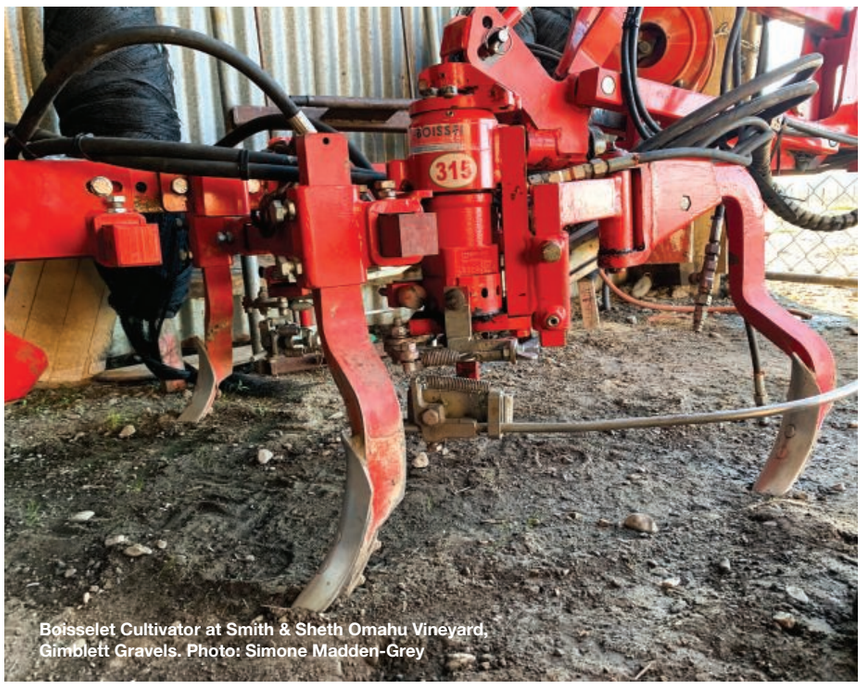
"Cows are much smarter than sheep and we think they are more beneficial because they are only on each row for a maximum of one day before heading back to the paddock at night. This minimises compaction and overgrazing issues which can happen with sheep," Flowerday said.

If livestock are not part of the property, it is possible to work with local farmers to have livestock come and graze. Katherine Jacobs at Big Sky Wines, Martinborough, completed organic certification in 2021 and says they work with their neighbour to have sheep come through the vineyard once a year in winter before pruning starts. Jared White, audit manager at BioGro New Zealand, confirms that "there are no government regulations internationally that require quarantining of non-organic livestock on entry to an organic property. If livestock are used to graze organic vineyards, they are not required to be organic."

Cover crops

As non-chemical methods of managing viticultural land continue to gain traction, what constitutes a weed is being re-examined. Merfield notes in his report that the definition of a weed has changed over time. He writes that what was once considered inconsequential prior to the advent of herbicides around the 1950s was reclassified by virtue of how easy it was to kill using herbicide.

Through the selection of a suitably competitive species, the weed suppression effect of other plant species can be exploited both in the midrow and undervine areas. This is achieved either through competitive impact or through the blocking of sunlight by another crop to prevent seed germination. However,



Boisselet Cultivator at Smith & Sheth Omahu Vineyard, Gimblett Gravels. Photo: Simone Madden-Grey

site specifications will ultimately determine the success of managing cover crops for weed suppression and both OWNZ and AWRI have tools to provide guidance.

In planting cover crops for weed control, and other benefits, aesthetics and perception must be managed. Highly manicured rows devoid of weeds remains a strong image for some vineyard managers, owners and consumers. Buy-in from all those working in the business is essential if implementing non-chemical weed control. Education is important not only for key internal stakeholders but also for consumers. A vineyard populated with various plant species is a reflection of reduced chemical use in the vineyard, a healthy ecosystem and quality fruit. Consistent messaging can make this an integral part of the brand.

In some instances, the decision to reduce or forgo weed control may be an option. Callum Linklater at Windrush Organic, Marlborough, says it is important not to impose preconceived ideas on the vineyard about how to tackle weeds: "Be observant and try and get your timing right".

After some years, he has successfully reduced row passes and limited weeding activities to between budburst and flowering in addition to using sheep in the winter.

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>
> Sytze Riemersma

At Greystone Wines, Saunders says they made a philosophical decision to phase out cultivation when considering carbon emissions from machinery.

"We trialled a 3ha block and we stopped weeding because of its topography. After 2.5 years, grasses have come away, grown up, seeded and fallen over and it doesn't stifle the canopy," he said.

In the four years preceding this decision, the vines were prepared for the additional competition by establishing deeper root systems through longer watering periods. The area no longer cultivated has been extended to 25ha and the remainder of the estate undergoes some passes to remediate the undervine before a volunteer sward is left to take over.

In wine production today a discussion about synthetic inputs is unavoidable as consumer interest increases and government bodies legislate against some inputs. Interest in non-chemical weed control techniques not only has immediate health benefits for producers, it benefits the vineyard ecosystem, the consumer, and helps reduce the impact wine production has on the environment.

Further information

1. Organic Winegrowers New Zealand (OWNZ): www.organicwinenz.com

2. Australian Wine Research Institute (AWRI). Non-Chemical Weed Management: www.awri.com.au/industry_support/viticulture/weed-management/non-chemical-weed-management

References

1. A practical guide to weed control in organic vineyards. Published by Organic Winegrowers New Zealand 2017. Scientific Consultant, Dr Charles N Merfield. Writer, Anna Lambourne

2. Herbicide reduction through the use of weedmat undervine treatment and the lack of impact on the aromatic profile and volatile composition of Malbec wines. *Food Chemistry*, Volume 343, 1 May 2021. Kenneth J.OlejarAB, M. Carmo VasconcelosB, Petra D. KingB, Richard E. SmartC, Karen BallB, Stewart K. FieldB.

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B Eastern Institute of Technology, Department of Viticulture and Wine Science, Taradale 4112, New Zealand

C Smart Viticulture, PO Box 2033, Greenvale 3059, Vic, Australia

3. Vineyard Floor Management: A Sustainability Nexus with a Focus on Undervine Weeding, October 2019. Report number 4-2019. Dr Charles N Merfield. MRSNZ, The BHU Future Farming Centre, Permanent Agriculture and Horticulture Science and Extension

4. Webinar: Non chemical weed control, September 2021. Chris Penfold, AWRI; Dr Thomas Lines, University of Adelaide; Robyn Dixon, AWRI. AWRI YouTube Channel: www.youtube.com/watch?v=2yqWouIZQGA

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