

Managing cover crops: optimising results

Writer **Simone Madden-Grey** explores the methodology that underpins a range of ways to manage vineyard cover crops.

Scientific research has benefitted greatly in the last decade from advances in technology. As a result, previously agreed paradigms in some areas of research have shifted. The science of soil is one such example. A recently published paper in *Advances in Agronomy* collated the latest research in this area, highlighting the role living plants have to play in cover crop management.

The term cover crop is now part of the viticultural lexicon and is often used as a catch-all phrase for plants in a vineyard, other than vines. However, clarification is useful and for the purposes of this article, cover crops will refer to those non-cash crops grown in the middle of the row.

It is a commonly held belief that external organic amendments to the soil are a primary driver for soil health. The latest research challenges this. It concludes that while amendments may be helpful for poor quality soil, they are not the main quality driver. When speaking to attendees at an Organic Winegrowers New Zealand seminar last

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year, agronomist Dr Charles Merfield likened external soil amendments such as compost and manure to a Band-Aid rather than a driver for soil quality.

The idea that materials such as dead plants, insects, animals, wood and so forth would eventually break down to provide a surface residue that could be cultivated into the soil for amelioration is widely acknowledged. However, the

paper in *Advances in Agronomy* offers an alternative understanding. The paper includes data that moves the focus for soil quality from above to below the ground. It shows that up to 40 percent of total plant photosynthates are secreted through root exudates. After accessing key nutrients from the atmosphere, a plant uses photosynthesis to push those nutrients down to the root system and out into the soil. The nutrient rich exudates are consumed by soil microbes. Microbial activity then locks away those simple organic compounds in soil minerals such as clays. These are heavier compounds that are more compact and vastly slower to decompose, in the order of tens to thousands of years. This challenges the notion that humus drives soil quality. Instead the key element for soil quality is the mineral associated organic matter (MAOM) derived from plant root exudates.

The promotion of MAOM in soil is therefore directly linked to a plant's photosynthetic capability, which only occurs when the plant is alive. Thus, in this context sowing annual cover crops has fewer benefits than permanent pasture due to the hiatus period without living roots in the soil.

Merfield acknowledged during our interview that we are discussing ideal scenarios and that every vineyard will have requirements and limitations peculiar to the site and the business around it. He also clarified that for the purposes of our discussion about midrow cover crop plants, he makes a distinction between permanent pasture and annuals that are planted in the midrow. Merfield sees multiple benefits in working with perennial pastures rather than annual crops, primarily due to the consistent presence of living plants and also for reduced labour, fuel, emissions and chemical use. The data points to a mixed species of plants for optimal results. Merfield suggests a minimum of 10 different species in pasture across



Post crimping at Felton Road. Photo: Gareth King

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the three fundamental plant groups of grasses, legumes and forbs/herbs.

Crimping

One method that is becoming increasingly common to manage cover crops is crimping. This is a large, heavy cylinder with metal flanges attached at an angle to a roller drum. Towed in front of or behind a tractor, as the crimper rolls, it pushes the cover crop down, crimping the stem. Crimping is a technical operation and one which Merfield says requires a thoroughly researched cover crop species selection, as only specific species are killed by crimping. The plants must also to be at full flowering or the crop will not die off. It is quicker to crimp a cover crop than, for example, to mow it, and less energy is expended. A crimped crop also lays

down a thatch over the ground providing a source of moisture for soil microbes, weed suppression and protection from the sun.

Not all cover crops are suitable for crimping and Merfield points to his experience with vetch, citing an example where hairy vetch crimped successfully and common vetch did not. This is echoed by Gareth King at Felton Road in Bannockburn, Central Otago. In his experience, King says red clover and white clover behave very differently. White clover is very difficult to crimp due to its thin stem, so to manage this King sows a cereal in the mix to help the white clover roll down.

Frost risk can also be a challenge with crimping due to the need to wait until the plant is in full flowering. This can delay knocking the crop over for up to two weeks, potentially increasing frost risk. Nick Paulin, AONZ national viticulturist, says that at Manata Estate in Lowburn, Central Otago, the 3ha block that is crimped will be left as long as possible. If they know a frost event is coming they head to the vines and

begin crimping immediately in order to mitigate risk.

For Paulin, he says his lightbulb moment about crimping came from problem solving in the vineyard. Originally intending to mow a block but not able to access a mower, Paulin decided to roll the crop instead. At the end of the season he ran an undies trial to assess soil quality. Reaching behind his desk during our Zoom interview, he pulls out two pairs of Rio briefs. He holds up the remnants of a pair of teal coloured briefs that were buried beneath a mixed species cover crop that was crimped. It is easy to see how the material quickly decomposed in the soil, leaving only a threadbare waistband. For the other pair buried in a grass turf row, very little had changed. Paulin says this confirmed the soil quality benefits of crimping and informed the way he worked with cover crops. In the long term he plans to use crimping across as many properties as possible.

Mowing

Mowing the midrow pasture can be used



Undies cover crop. Photo: Nick Paulin



Undies grass. Photo: Nick Paulin

strategically to encourage flowering, providing nectar and pollen for beneficial insects. New flowers are encouraged to grow if plants are mowed when they are shifting from flowering to seeding, and




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A distinction is made between permanent pasture and annuals that are planted in the midrow.

a continual presence of flowers can be achieved through sequential mowing of alternate rows.

In terms of fuel usage, Merfield encourages vineyard managers to think critically about each mower pass and to consider the type of mower used. For him, the sickle bar mower is a strong contender because its power requirements, and therefore fuel usage, is much lower than compared to a rotary or flail mower. A bit of customisation in the workshop could produce a sickle bar mower, he says. This could be towed behind an electric side-by-side or a quad bike, further reducing fossil fuel consumption and soil compaction.

Cultivation

Cultivating cover crops as a mulch to add back into the soil is often used as a method to improve soil quality, but the issue of soil disturbance deserves further investigation. A study led by Dr Michael H. Beare at the New Zealand Plant & Food Research Institute compared five different plots each with different treatments; intensive tillage, minimum tillage, no till, continuous grass pasture and continuous herbicide fallow. The researchers took an annual

measurement of soil carbon for each plot over a period of 11 years spanning 2000-2012. Soil carbon is a measurable component of soil organic matter, so it is possible to calculate soil organic matter by multiplying the soil carbon measurement by 1.72. The results of the study showed that the greatest loss of soil carbon, and thereby soil organic matter, occurred where plants were killed from tillage, minimal tillage or herbicide. This would suggest that cultivation, where cover crop plants are killed, contributes to significant losses in soil quality.

While strategic access is fundamental to vineyard operations, the latest data on soil quality challenges growers to consider the preservation of midrow crops while maintaining access. An informed evaluation of practices that create soil disturbance is also being assisted by an increased understanding of soil function. Cover crop management will continue to evolve as the library of soil science research expands. Implementation of these learnings within the parameters of each individual site offers significant benefit beyond the vineyard to the global ecosystem.

Simone Madden-Grey is a writer based in Melbourne, Australia writing about

the people, places and stories she has discovered on her travels. Her portfolio can be found at happywinewoman.com including articles on climate and sustainability in the wine industry and travel covering the wine, regions and gourmet destinations of Australia and her home country, New Zealand.

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