

## Getting to know the earthworms in your vineyard

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These notes provide additional context to a series of short videos on the role of earthworms presented by Lee Fieldhouse from Island Biologicals on behalf of the EcoVineyards team.

You will find a copy of the following short videos on the EcoVineyards knowledge hub <https://ecovineyards.com.au/soil-health-indicators-for-australian-vineyards/>:

Introduction (0.30 minute)

1. The great Aussie EcoVineyards earthworm count (4.0 minutes)
2. What is the value of earthworms in the vineyard (3.20 minutes)
3. How to improve earthworm habitat in the vineyard (3.12 minutes)
4. Earthworm interesting facts (2.48 minutes)
5. How to use liquid vermicast in the vineyard (3.25 minutes)

### Video 1: The great Aussie EcoVineyards earthworm count

Join us in digging for earthworms! Earthworms are often referred to as ‘ecosystem engineers’ as they help to decompose plant material and increase plant available nutrients. They also aerate and create soil pores, which in turn improves soil structure and aggregate stability.

Earthworms are vitally important and provide an indicator of vineyard soil health.

We would like to find out more about earthworm populations in vineyards and encourage you to take part in the great Aussie EcoVineyards earthworm count <https://ecovineyards.com.au/newsthe-great-aussie-ecovineyards-earthworm-count/>

Read more about how to assess and identify earthworms in the ‘Soil health indicators for Australian vineyards’ booklet and poster, which are available for download here <https://ecovineyards.com.au/soil-health-indicators-for-australian-vineyards/>

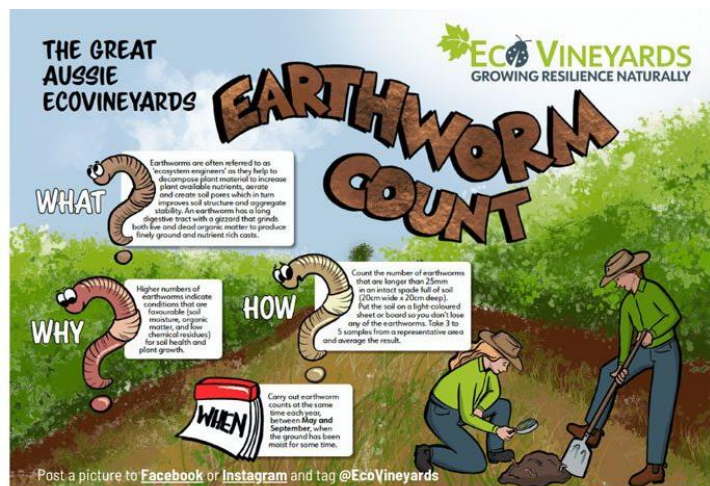


Figure 1. The great Aussie EcoVineyards earthworm count



## Video 2: What is the value of earthworms in the vineyard?

Have you ever wondered what earthworms are doing when they are consuming soil, creating tunnels, and excreting casts?

There are a range of benefits that can be found in a vineyard with earthworms present:

- Earthworms move organic matter from the soil surface into the soil and move minerals from deep in the soil profile to the surface.
- The minerals found in earthworm castings are in a plant available form (Grant, 2019) and are rich in both humus and nitrogen (Thu Hoang et al., 2020). The mucous surrounding an earthworm is also a source of plant-available nitrogen (Shutenko et al., 2022).
- Did you know that one earthworm can produce 4.5 kg of castings per year (Weil and Brady, 2017).

If you have 10 earthworms per shovel full of soil, you will have up to 2.5 million earthworms per hectare (Retallack, 2023). Multiplied by the number of earthworms in a healthy soil, it would be impossible to purchase this volume of cast and incorporate it in your soil as the earthworm does.

- The diversity and abundance of beneficial microorganisms throughout the soil and the increased microbiome found in association promotes greater mineral cycling and inhibits pathogens through competition.
- Earthworms provide plant stimulating hormones and plant signalling molecules that helps promote grapevine growth and health (Puga-Freitas et al., 2012).
- They create a more conducive environment for microbes to live, which effectively deepens the topsoil.
- Their tunnels allow roots to penetrate further and more easily (Puga-Freitas et al., 2012) and aeration is increased by making pathways for oxygen and water to be stored in the soil (Grant, 2019).

Looking after earthworms in your business is one of the best things you can do for your bottom line, and your overall soil health.

***“All of the fertile areas of this planet have at least once passed through the bodies of earthworms” Charles Darwin***



**Figure 2.** a) *Eisenia fetida*, tiger worm is an epigeic or compost earthworm that lives in the surface or litter layers, b) earthworm 'prill' a mix of excavated soil and earthworm droppings or 'cast', a sure sign of earthworm activity, c) earthworms mating, joining at the clitellum (or saddle). Earthworms are hermaphrodites, both earthworms will produce a cocoon after this coupling [Photos: Lee Fieldhouse].



### Video 3: How to improve earthworm habitat in the vineyard

As we have outlined above earthworms are valuable in a vineyard setting. If you wish to encourage their presence, there are some things to avoid including:

- Reduce mechanical intervention, as earthworms are soft bodied and are easily damaged.
- Reduce the use of 'icide' chemicals (e.g., pesticide, fungicide, herbicide).

Some of these chemicals kill earthworms, but all create an environment which is less microbially, and plant rich and will reduce earthworm activity (Eijsackers et al., 2005; Grant, 2019).

Things to consider and promote to support populations of earthworms (Grant, 2019; Retallack, 2023):

- Have 100% functional ground cover and active root growth, 100% of the time where possible.
- The shade produced via plant growth and mulch helps to limit temperature extremes.
- Plants feed the earthworms detritus, and root exudates drive microbial communities which are also essential to the survival of earthworms.

Having good groundcover in your vineyard is one of the best things you can do!



**Figure 3.** a) multi species planting, b) Large quantities of earthworm 'prill' in an area with heavy litter or plant residue, c) multi species plantings can enable more microbiology as seen by the fungi in this multi species planting [Photos: Lee Fieldhouse].



#### Video 4: Earthworm interesting facts

While earthworms might look like a simple pink tube with a stomach, there's a lot more going on!

Earthworms are well designed for their role in improving soil:

- The front end is like a shredder, perfectly designed to break down detritus.
- They have a gizzard which is used to further grind the material it consumes.
- Its guts are like a fermentation crock, proliferating microbes.
- The rear end is the bio-stimulant distribution point, delivering the cast to where it's needed in the root zone.

Some other interesting features of earthworms:

- They are covered in hairs called setae, which the earthworm uses to 'lock in' and prevent itself being pulled from the soil.
- It is an air breathing animal with no lungs, instead it absorbs oxygen through its skin.
- They have no eyes.
- They are hermaphrodites, with both male and female reproductive organs. When two earthworms' mate, both earthworms are fertilised and create a cocoon containing 1 to 20 baby earthworms per cocoon. Earthworms can breed prolifically in healthy conditions.
- They have five pairs of aortic arches (instead of hearts). Their circulatory system runs both lengthways and around their body (no, you can't cut them in half and get two earthworms)!
- They have a 'hydrostatic skeleton' – fluid goes between two layers of skin, acting like a pump for the earthworm's propulsion.



**Figure 4.** a) earthworm eggs or cocoons, b) earthworm showing segments, c) Mature *Eudrilus eugeniae*, African nightcrawler a large endogeic species of earthworm that can burrow deeply into soil profiles [Photos: Lee Fieldhouse].



## Video 5: How to use liquid vermicast in the vineyard

Aside from having abundant earthworms in your soil, there are other ways to enjoy the magic of earthworms in your vineyard.

Worm cast can be added as a top dressing; however, it can be very expensive for the quantity required and supply cannot be guaranteed.

The most practical and flexible way is to use a liquid, such as a liquid vermicast bio-stimulant. This is a product made by dissolving earthworm castings.

It can be applied in the following ways:

- Fertigation at around 25 L/ha
- Foliar applications on the vine during the growing season at 25 L/ha
- Foliar application on the interrow at 5 L/ha
- Seed inoculation for seeding in the interrow at 125 – 250 ml per 25 kg of untreated seed

**Case study:** Old Inn Road Vineyard, NSW

- 2700 vines/ha
- Fertigated at 25 L/ha per pass (around 10 ml/vine)
- Four applications per season during the growing season, starting at bud burst.
- Benefits were observed in plant health, with greater resilience to pests and diseases.

For more information, contact Island Biologicals [www.biocast.com.au](http://www.biocast.com.au)



**Figure 5.** A low disturbance planter fitted with an in-furrow liquid inject system for applying bio-stimulants while planting [Photo: Lee Fieldhouse].



## References

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- For further information on earthworms please visit <https://ecovineyards.com.au/soil-health-indicators-for-australian-vineyards/> .



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