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NATURAL RESOURCE MANAGEMENT

Increasing earthworms in pastures

The benefits of earthworms are well established – they can substantially improve the quality and quantity of pasture and crop production. Feeding and burrowing activities increase the cycling of soil nutrients and organic matter, and are beneficial to soil structure. Attention to some simple tactics can increase the number of these valuable soil organisms.

Key benefits

- Recognise the key species of earthworms
- Learn to encourage higher earthworm density to improve pasture quality and quantity
- Understand the effects of fertilisers and grazing practices on earthworm populations

Tactics

Assess earthworm populations

To assess earthworm populations dig up several spadefuls (to 100mm deep) of soil and note the number of worms present. Less than 10 earthworms is considered low, 15 a moderate level and more than 20 per spadeful represents an abundant population. Identifying what species of earthworm are present can be quite difficult, but guides are available to assist (see further information).

Look for earthworms during the wetter months when they are most active, mature and more easily counted or identified. Carry a spade on the ute or bike and do occasional spot checks around the farm. Choose areas that have different soil types or grazing/pasture management approaches. Checking under fence lines and in areas of remnant vegetation can also be useful. Precise monitoring of earthworm populations takes quite a bit of time and skill to do effectively, but it is quite easy to get a general indication.

Create conditions that favour earthworms

Avoid overgrazing pasture paddocks, as earthworms eat organic matter in and on the soil surface. Earthworms are likely to be most numerous when retained plant material is 1,500–2,000kg DM/ha.

Earthworms thrive in well-drained soils. Excessively waterlogged conditions can drown worms or force them to the soil surface where they risk being eaten by predators.

Adopt minimum to zero tillage practices in cropping paddocks as tillage damages earthworm habitat, reduces soil organic matter, exposes earthworms to predators and may physically injure them. Stubble should be retained and the pasture phase in crop rotations lengthened to increase food available to earthworms.

Introduce desirable earthworm species to the farm

If earthworms are not naturally present it may be beneficial to introduce them. Some valuable species include the deep-burrowing *Aporrectodea longa* (large field worm, longworm, or black head) and the topsoil active *A.caliginosa* and *A. trapezoids*.

Dig spadefuls of soil (to 75mm deep) from areas containing populations of desired species. Sods should be cut during the wetter months of the year. Place the worm-rich sods up-side-down on the new pasture at spacings of around 10 metres to achieve rapid colonisation.

Be aware that introducing foreign soil can be a risk to farm hygiene. An expert on worm species can also be consulted to ensure there is no threat of displacing native earthworms or other beneficial earthworm species.

Glossary

Worm castings (vermicast) – a mixture of digested organic matter and soil excreted by earthworms

Earthworm facts

Earthworms can be divided into three broad categories:

- Active at the soil surface (litter feeders)
- Active at the top soil (usually the upper 100mm)
- Deep burrowers that feed and deposit castings at the soil surface. (These species are valuable for their role in incorporating nutrients, lime and organic matter into the soil profile, and improving water infiltration and root penetration through predominantly vertical burrows.)

A variety of species from each of these categories is desirable if conditions allow.

Australia has approximately 3,000 native earthworm species, many of which we know little about. Native species appear to dominate undisturbed native habitats, but are rare or absent on farms, especially where cropping is regularly practiced.

There are at least 40 introduced earthworm species, of which only 10 are considered to be of agronomic importance. Introduced species dominate pasture and cereal cropping soils where introduced plant species are well fertilised. Introduced earthworms are still spreading across the continent.

The relationship and extent of competition between introduced and native earthworm species is poorly understood. However, there is likely to be a shift from native to introduced earthworms in improved pasture paddocks. Earthworm numbers tend to be higher in permanent pastures than in paddocks that are regularly cropped.

Management tips

- Abundant populations of earthworms are generally driven by plenty of high quality organic matter and good moisture levels.
- Factors that encourage higher earthworm density include: healthy growing pastures; high organic matter; higher soil fertility; high pH (more alkaline soils); and well-drained soils that are not compacted.
- Earthworm populations are lower in regularly cultivated paddocks.
- Some insecticides are harmful to earthworms, especially carbamates, endosulphan, fensulfothion and organochlorins.
- Some fungicides are harmful to earthworms, especially benomyl, thiobenzodole and copper oxychlorine.
- The impact of grazing management on earthworms is not well understood. However, grazing practices that reduce the litter can reduce earthworm numbers.
- Applying inorganic fertilisers (such as superphosphate) has shown no appreciable direct benefit to native or introduced worm numbers in trials. However, the associated increase in pasture growth and higher stocking rates can increase earthworm food supplies through extra litter and dung.
- Herbicides don't appear to harm earthworm populations. It is likely that stock drenches and pour-ons are not as toxic to earthworms as they can be to dung beetles.

Further information

This publication is part of a series of *Tips & Tools* on biodiversity that provides further details on managing native species within a grazing enterprise. For a copy of the *Biodiversity Tips & Tools* series call the MLA producer hotline 1800 675 717 or email publications@mla.com.au

Further reading

Worm Wise II – a 20-page pictorial guide to earthworms in agricultural soils of south-eastern Australia available from NRE, Victoria for $10 (includes postage). Please phone 02 6030 4500 for a copy.

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