



Case Study

Demonstrating the benefits of dung beetles for prime lamb enterprises – Enhanced Producer Demonstration Site



*Releasing dung beetles (*Bubas bison*) at the Keiller's property, Cashmore Park.*

Producers: Keiller family, 'Cashmore Park'
Location: Cashmore – 10 km west of Portland

Property size: 1600 ha

Soils: sand, sandy loam, clay loam

Rainfall: 830 mm

Enterprises

Prime and feeder lambs, seedstock rams, breeding ewes, store cattle

Dung beetles have been the focus of on-farm demonstrations that are underway within the South West Prime Lamb Group (SWPLG). Despite a wealth of cattle related research, there is limited completed on dung beetles in sheep production systems.

The group established an Enhanced Producer Demonstration Site (EPDS), co-funded by Agriculture Victoria and Meat & Livestock Australia (MLA) and sought support through the Dung Beetle Ecosystem Engineers (DBEE) project.

Johno, Brigita and Dean Keiller hosted dung beetle demonstrations on their property 'Cashmore Park' near Portland. The Keillers were interested in the nutrient cycling qualities of dung beetles and had released several colonies around ten years ago to establish more species on their farm.

Establishing what's out there

Cashmore Park was one of eight farms to undertake monthly trappings, with an aim of identifying what beetles are active on sheep dung at different times of the year, and a focus on the seasonal gaps that could be filled by introducing various beetle species.

Nine species were found on Cashmore Park, including six introduced and three native species. A further two species were found on other group members' properties. *Onthophagus taurus* was the most commonly trapped beetle, found from late spring to autumn in large numbers. *O. taurus* is a small, introduced beetle, but in the large numbers observed at Cashmore Park, they're capable of shredding dung pats within a day, making them valuable for cleaning pastures and cycling nutrients.

The three-horned dung beetle, *Onthophagus mnisznechi* (Fig. 1), was also found in good numbers throughout the year. This native species evolved to feed on the coarse, pellet-like droppings of marsupials and was previously dismissed as a non-dung burier. However, it has proven to be adapting to livestock dung with dung-filled tunnels observed to a depth of 20cm.



Figure 1: Native three-horned beetle

Most of the species trapped at Cashmore Park are active over the warmer months, with a noticeable gap in abundance observed in winter and early spring. To help bridge that gap, Johnno has selected three winter-active species (*Onthophagus vacca*, *Bubas bison* and *Copris hispanis*) and has established on-farm dung beetle nurseries to breed up populations for release.

Benefits for soil fertility

The Keillers also hosted dung burial trials to demonstrate and measure changes in soil fertility from the action of the winter-active species *Bubas bison* on three different soil types. *Bubas bison* is one of the four deep tunneling dung beetles found in Australia and is known to bury dung to 60cm. The trial compared 50x50 cm plots of *Dung+Beetles*, *Dung Only* and *Control* (no dung or beetles). Five kilograms of sheep dung was added over ten weeks to the *Dung+Beetle* and *Dung Only* plots, and 15 pairs of *B. bison* were added to the *Dung+Beetle* plots. Spare plots were excavated in spring to observe the action of dung beetles, and soil testing was undertaken across treatments the following winter at 0-10, 10-30 and 30-60cm.

Figures 2-6 show the excavated plots including dung tunnels approximately 40 cm long and around 2.5 cm across found beneath the beetle plots, with egg chambers at the base. Large numbers of earthworms were found under the plots and wrapped around the dung tunnels and plant roots had clearly travelled down the soil profile through dung tunnels.



Figure 2. Plant roots and an earthworm travelling through the dung tunnels

Figure 3. Dung beetle egg buried at 37cm in dung tunnel

Figure 4. Part of the tunnel containing a dung beetle egg in a ball of dung

Figures 5 & 6. Large numbers of earthworms were found under the dung+ beetle plot

Soil testing showed that the burial action of dung beetles had increased phosphorus (Olsen P) and potassium (Colwell K) to depth (Figs. 7 and 8). *Dung Only* plots had the highest surface phosphorus and potassium levels, however dung beetles had mobilised nutrients moving them down the soil profile into the 10-30 and 30-60 cm.

We would expect that the tunnelling activity from dung beetles and the increased nutrient levels at depth drives plant roots further down the soil profile, allowing them to access moisture from deeper down. This action could potentially increase the growing season, with removal of dung from the surface also reducing pasture fouling and the potential for nutrient runoff.

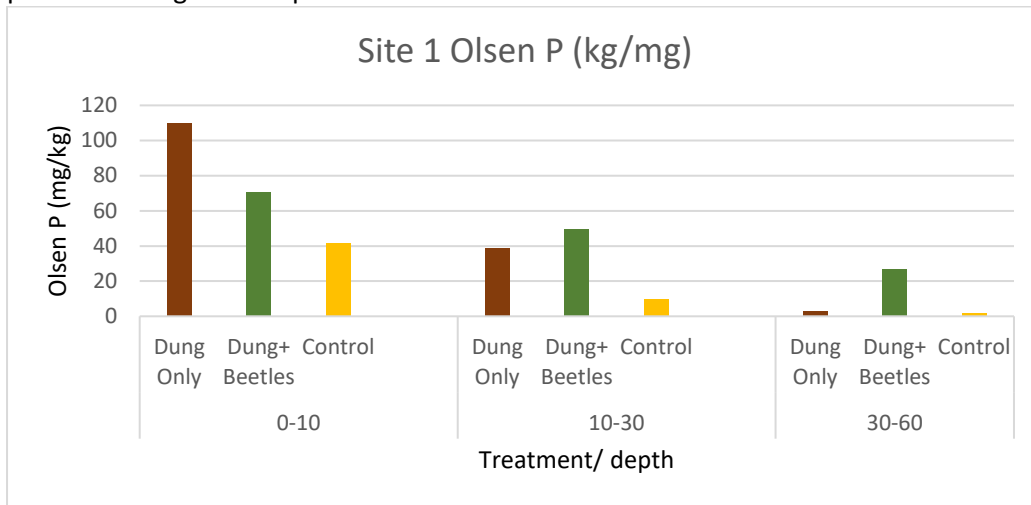


Figure 7: *Dung Only*, *Dung+Beetle* and *Control* Olsen Phosphorus June 2021- 1 year after burial

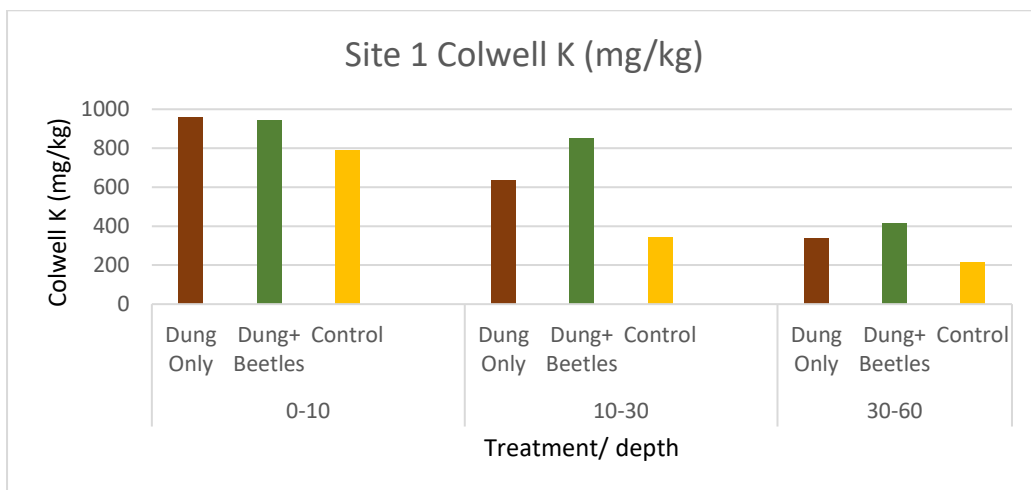


Figure 8: *Dung Only*, *Dung+Beetle* and *Control* Colwell Potassium June 2021- 1 year after burial

Next steps

Whilst these demonstrations have finished, the SWPLG are continuing involvement with dung beetles and recently began a project investigating the effects of drenches and the development of drench tolerance within dung beetle populations.

As for Cashmore Park, the Keillers have set aside a dung beetle refuge area in cattle paddocks that will remain free of recently drenched animals and insecticides while dung beetle populations are bred and released. For Johno, success will be when he finds wild bred populations of the spring and winter active *O. vacca* and *B. bison*.

Information sheets have been developed for the beetle found on SWPLG farms using identification photos by Russ Barrow ([DBEE](#)). To view these, click on the links below.

- [Aphodius fimetarius](#) - Introduced
- [Bubas bison](#) - Introduced
- [Euoniticellus fulvus](#) - Introduced
- [Euoniticellus pallipes](#) - Introduced
- [Geotrupes spiniger](#) - Introduced
- [Onitis aygulus](#) - Introduced
- [Onthophagus australis](#) - Native
- [Onthophagus binodis](#) - Introduced
- [Onthophagus mniszewski](#) - Native
- [Onthophagus posticus](#) – Native
- [Onthophagus taurus](#) - Introduced



Figure 9: Inspecting a dung beetle nursery at Cashmore Park

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