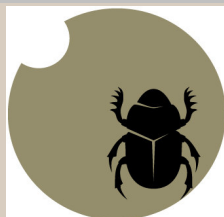


Deep-tunnelling dung beetles for southern Australia: Benefits and purchase

Bernard Doube, Dung Beetle Solutions Australia



This DBSA fact sheet outlines the agricultural and environmental benefits of the deep-tunnelling dung beetles *Bubas bison* (active from May to October/November) and *Geotrupes spiniger* (active from December to May) and how to purchase, release and manage starter colonies in southern Australia.

Benefits

Increased pasture production

Where the deep-tunnelling dung beetles *B. bison* and *G. spiniger* are well established and abundant, each completely buries cattle dung within days of its production over several months each year. DBSA field trials have shown that dung burial by both species can increase pasture production by 25% in field plots. This has so far persisted for three years.

Increased plant nutrients in the subsoil

Deep-tunnelling dung beetles such as *B. bison* and *G. spiniger* increase levels of plant nutrients (phosphate, nitrate, sulphur, organic matter) in the subsoil. These effects have persisted for at least 2.5 years. Dung burial also increases levels of soil carbon and contributes to the removal of greenhouse gasses from the atmosphere.

Reduced fertiliser use

Because dung beetle activity increases plant nutrients in the subsoil, the need for chemical fertilisers is reduced. A one-off investment in dung beetles can offer long-term cost savings.

Increased earthworm numbers

Dung burial by *B. bison* and *G. spiniger* opens up the soil, allowing earthworms to burrow and work the soil deeper. Earthworm abundance increases in these conditions.

Free clay spreading

For every litre of dung buried by *B. bison*, just over one litre of subsoil is brought to the surface. Each winter–spring in regions where *B. bison* is abundant, dung burial brings about 300 tonnes of subsoil (at 30 to 50+ cm) to the soil surface for every group of 100 mature cattle.

Increased rates of water infiltration into soil

The disruption of the surface soil by dung beetle tunnels increases the permeability of the soil to water. Increased rates of water infiltration into dung beetle-affected soil have persisted for 3 years after dung burial.

Improved quality of run-off water

In one trial so far, dung burial by *G. spiniger* completely removed organic pollution from run-off water.

About deep-tunnelling dung beetles

Soil and dung type preferences

B. bison breeds well in loam and clay soils but it does not breed well in deep sand. However, it can persist in a mosaic landscape with patches of deep sand interspersed with favourable soil types. *G. spiniger* breeds best in well-drained alluvial soils. Both species will breed in cattle and horse dung.

Seasonal activity

In most of southern Australia, adult *B. bison* emerges from the soil in about May each year. They spend some weeks feeding, mating and maturing eggs in shallow tunnels under dung pads and then dig deep tunnels (to 50+ cm) in which they breed. Breeding continues under successive dung pads until the adults die in spring or early summer. In warmer regions the beetle has a 1-year life cycle but in cooler climates many have a 2-or 3-year life cycle in which the larvae enter a 'diapause' that delays the emergence of the adult beetles. In these areas it is best to release beetles in two successive years to ensure that they are subsequently present in all years.

G. spiniger has a one-year life cycle in which the adults emerge from the soil between December (in warm climates) and February (in cooler climates). They remain active until May–June.



Beetle-friendly irrigation strategies

The larvae of *B. bison* (found at 30 to 50+cm in the subsoil) drown in heavy soils that become excessively wet (by rainfall or irrigation) in spring and summer. Wet winter soils are not harmful. However, regular light irrigation throughout the spring and summer can maintain pasture production without killing the dung beetle larvae.

Potential distribution of *B. bison* and *G. spiniger* in Australia

Both species are, as yet, poorly distributed throughout their potential range. The potential distribution of *B. bison* and *G. spiniger* in southern Australia has been estimated using the known distribution of these species in Europe.

This analysis suggests that *B. bison* will establish well across much of the southern agricultural regions of WA, SA, Victoria, NSW and possibly in parts of Tasmania; *G. spiniger* is likely to do well in northern Tasmania and the elevated higher rainfall regions of Victoria and NSW. It may also establish in southern WA, parts of SA and in other areas of Tasmania, Victoria and NSW.

Other deep-tunnelling dung beetles

Onitis caffer (from South Africa) and *Copris hispanus* (from Europe) are established in limited parts of their potential distributions in southern Australia and are active in autumn and spring. They need to be mass reared for release.

Purchasing & establishing deep-tunnelling dung beetles

Dung beetle Solutions Australia supplies *B. bison* and *G. spiniger* to suitable regions and for appropriate conditions. *B. bison* is usually available in May and June and *G. spiniger* in February and March.

One starter colony contains 1000+ dung beetles. This is generally adequate for a small herd. Producers with larger herds may choose to release 10–20+ colonies to speed the establishment of large numbers and fast track the production benefits and fertiliser savings.

2009 prices for *B. bison* and *G. spiniger* starter colonies

1 to 9 colonies: \$600 each +P&P + GST

10 or more colonies to one address: \$550 each +P&P + GST

Starter colonies of both species can be secured for \$550 per colony (\$500 per colony for 10 or more) by paying a \$50 per colony deposit (by 30 November 2008 for *G. spiniger* and 31 March 2009 for *B. bison*).

Ordering

Starter colonies can be ordered by telephone or email through:

Bernard Doube Bridgewater SA; ph 08 8339 4158; email: bernardo@internode.on.net

Linc Willson Kangaroo Island SA; ph 08 8553 8203; email: linc.willson@bigpond.com

Dispatch

Beetles are packed in a light substrate in a beetle-proof container and dispatched by the quickest feasible method available to your area, such as the Australia Post overnight Express Post service. We will contact you when your beetles are ready for dispatch to discuss the quickest means of delivery.

Releasing your beetles

The beetles should be released as soon as possible after they have arrived. They can be released under all weather conditions and at any time of day or night. They will be ready to fly at dusk and at dawn. Choose a well-drained patch of pasture, preferably on a loamy soil or a light clay. Avoid deep sand and regions that remain waterlogged in spring and early summer.

Release them onto fresh dung pads (up to 3 days old) over an area of about one acre, placing a handful (about 20) on top of each dung pad. Beetles may remain inactive for some time after release. A few beetles may die during transit. This is to be expected.

Stock management

Ensure that cattle remain in the vicinity of the release site for some weeks after releasing the beetles to provide them with a regular supply of fresh dung. Make sure the cattle have not been drenched or sprayed with toxic chemicals for some time (depending on the chemical) before and after you release the beetles. Some veterinary chemicals used for parasite control make the dung toxic to dung beetles. To avoid killing your dung beetles with toxic chemicals use drenches that are not toxic to dung beetles, but if a toxic drench is unavoidable, use it only at a time when adult dung beetles are scarce and ensure that drench and insecticide withholding periods are met before releasing dung beetles.

It is also important that stock are present in the vicinity of the original release site when beetles are due to emerge in the two years following the original release.

Please note: The beetle benefit information in this pamphlet is based upon scientific evidence and is provided in good faith. However, we do not guarantee the successful establishment of populations of dung beetles.

