

## Dung Beetles in New Zealand

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### Dung Beetle Friendly Management Practices

#### Getting started with dung beetle releases on your farm

There are some simple pre-requisites needed before you seed your farm with a starter colony of dung beetles. These are listed below and should be put into practice 24-48 hours prior to receiving dung beetles.

Please note dung beetles are for all livestock farms types (i.e., beef, dairy, sheep, deer, alpaca, goat, horse), and all farming practices (i.e., conventional farms that use drenches, organic farms, biodynamic farms).

This [two page document](#) will help you maximise your establishment success.

#### Drench programme modifications

To establish dung beetles on farms some simple modifications of existing drench programmes may be required. Active constituents in 'drenches' can persist in dung for several weeks and can have varying degrees of toxicity to dung beetles depending on the method of application. For example: dips, pour-ons and injectables result in the highest doses absorbed into animals and are thought to deliver greatest volume of residual chemicals in dung. The drench type is also important. For example, most macrocyclic lactones (MLs) can be hazardous to dung beetles, particularly for the first 1-2 weeks after application. However many moxidectins, also part of the ML family, applied at recommended dose rates have been tested as dung beetle friendly. The anthelmintic family of drenches used extensively for intestinal worms, flukes etc, are not considered harmful to dung beetles. There is little or no information available about the impact on dung beetles from organophosphates (OPs), growth regulators, and amines (see table). Synthetic pyrethroids (SPs) can cause increased mortality and reduced breeding. Varying degrees of resistance development by the target pests to the active compounds in drenches means "cocktails" or combinations of drenches are increasingly used and the effect of these on dung beetles will also need to be considered.

If possible, switch to products whose active chemicals are less harmful to dung beetles and stick to the recommended dosage rates. However, if using higher risk chemicals (e.g. MLs, SPs) can't be avoided when most dung beetles are active (spring-autumn) then consider reducing the frequency of treatment. If feasible, treat only specific groups of livestock (e.g. yearlings) and specific pest(s) that have reached the highest burden in that group rather than treating the whole herd. Farms that have just established a breeding colony of dung beetles in the centre of their farm may benefit from isolating the treatment group (s) to a 'quarantine' or outlying downwind paddock well away from the initial release area, where dung beetles may be less likely to find them during the critical period following treatment with a high-risk chemical. Other farming practices that reduce pasture contamination by the infective stages of livestock gut parasites, such as cross or rotational grazing, should also be considered to help reduce reliance on drenching. Over time the need for drenching should decrease as parasitic reinfection of stock will decline if thriving dung beetle populations are present.

#### How Long To Establishment?

The mystery question is determined by the time that elapsed between a species' release and when it becomes detectable (as an indication of establishment). This period is influenced by timing and intensity of search effort, and establishment success is can be influenced by a number of factors including Drench type and frequency of use, soil conditions, seasonal conditions, dung quality/quantity and numbers of beetles released. Edwards (2008)

provides a review of all species released in Australia and those that established versus those that failed to establish (see Table for species applicable to NZ). For the 23 established species the average was 3.5 years. For the species permitted for New Zealand the average was 2.9 years. Note the founding populations of *D. gazella* imported to NZ originated in winter rainfall regions of South Africa, not from summer rainfall populations of the same species established in Australia. Thus the Australian release/recovery data may be inaccurate for the NZ release populations for this species.

The important thing to note is not only could it take several years before the species is encountered again once released, but several more years could pass before its impact becomes noticeable as well. We estimate under ideal

REPORTED EFFECT ON DUNG BEETLES *				
	Mature adults	Young adults	Breeding females	Eggs/larvae
ENDECTOCIDES - Macrocydic Lactones				
Avermectins: Abamectin, Doramectin, Eprinomectin, Ivermectin	No known Effect	Increased Mortality	Reduced Breeding	Increased Mortality
Moxidectin**	No Known Effect			
ECTOCIDES - Synthetic Pyrethroids				
Cypermethrin	Increased Mortality	Increased Mortality	Reduced Breeding	Increased Mortality
Deltamethrin	Increased Mortality	Increased Mortality	Reduced Breeding	Increased Mortality
Flumethrin^	Not Tested			
ECTOCIDES - Organophosphates				
Chlorfenvinphos	Not Tested			
Diazinon	Not Tested			
ECTOCIDES - Growth Regulators				
Fluazuron	Not Tested			
ECTOCIDES - Amines				
Amitraz	Not Tested			
ANTHELMINTICS				
Albendazole Fenbendazole Levamisole Mebendazole, Morantel Oxfendazole	No Known Effect			

\* This is a synthesis of information contained in CSIRO Contracted Report #56 by K. G. Wardhaugh (2000) and scientific papers or reports either mentioned therein or located independently. Effects noted have been reported at least once for one or more species.

\*\* When used at recommended rates for cattle, has no known impact on *Onthophagus gazel*, *O. taurus*, *Euoniticellus intermedius* and *E. fulvus*.

^ Refers to the spray formulation only; the pour-on is no longer available.

Effects of drench types on *Onthophagus gazella*, *O. taurus*, *Euoniticellus intermedius* and *E. fulvus*. Table courtesy of AgForce Queensland, 'Consider your Dung Beetles when using Parasiticides' (Brochure), April 2003.

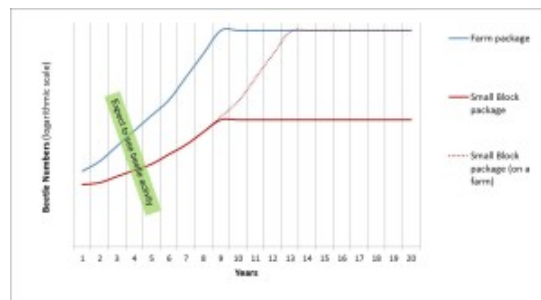
Dung Beetles permitted for NZ	Introduced to NZ	2015 imports via Aus	2016 imports via France	No. years to notice establishment in Australia
Bubas bison		X		2.0
Bubas bubalus			X	Not Established
Copris hispanus		X		8.0
Copris lunaris			X	Not Established
Geotrupes spiniger	X			2.9
Onitis alexis		X		1.6
Onthophagus binodis	X			1.2
Onthophagus taurus	X			3.9
Onthophagus vacca		X		Released 2014
Digitonthophagus gazella	X			0.9

circumstances establishment and population growth to abundant levels where impacts become significant is around 9-11 years.

When properly established, beetles breed rapidly and environmental and economic benefits will start to be noticed after 4 – 6 years. Full carrying capacity is reached in 9 – 10 years.

The carrying capacity is a function of the quantity of dung available.

Reducing the initial number of beetles released, i.e. purchasing a small block package for a farm situation, increases the time to reach carry capacity pushing it out from 9 to 13 plus years.



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