

# INFORMATION PAPER

## *Dung Beetle Ecosystems Engineers*



## Status of Dung Beetle research under MLA management

### 1. Purpose

To update MLA stakeholders on the current status of MLA-funded dung beetle RD&E.

### 2. Background

There have been four phases of work introducing dung beetles to Australia:

1. 1965-1985 - More than 50 species were introduced by CSIRO with the primary aim to reduce the bush-fly population. Forty three of these were released to the field. Twenty three of these became established.
2. 1990 - 1992 – CSIRO imported four species of dung beetle from Spain for bush-fly control in WA. Few beetles were released and none of the field releases were successful.
3. 2012-2016 - Two spring-active dung beetles species (*O. vacca* and *B. bubalus*) were imported as part of an MLA-CSIRO project, leading to establishment of commercial breeding operations.
4. 2018 – ‘Dung Beetle Ecosystem Engineers’ RRDfP project commenced and concludes 2022.



**Australian Government**  
Department of Agriculture  
and Water Resources



While initial introduction of the dung beetle, both summer active and winter active species (found in the north and south respectively), was as a pest control mechanism, further research into the species has highlighted their significant impact on pasture growth, soil health and carbon sequestration.

The dung beetle has been slow to spread across the country and at present populations are not effectively managed in areas where they can best impact change. This is due to the limited release sites under previous introduction programs, the slower reproductive rates reported in the cooler southern states and the lack of successful adoption initiatives.

### 3. Summary of past work

In 1999, "Dung beetle survey of south east Queensland" was undertaken to determine the species of dung beetle, both imported and native, located in the region and attempted to quantify the impact of the beetle on buffalo-fly control. 13 species of imported spring-active beetles were identified through the survey, with 4 biologically important species, *Onthophagus binodis*, *Euoniticellus africanus*, *Onitis pecuarius* and *Copris elphenor*, reported in large numbers. The previously under-studied native species *Onthophagus wakenbura* was also found in large numbers. The survey concluded that the presence of a well established active dung beetle population reduced buffalo-fly survival rates by 80-90%.

MLA study "The pasture growth and environmental benefits of dung beetles to the southern Australian cattle industry" was conducted in 2007 as a first in Australia to investigate the relationship between the role of dung beetles and their effect on pasture growth and soil fertility changes over time. The effects of the winter-active dung beetle *Bubas bison* saw an increased pasture production (dry matter) by 30%, with increased production persisting for 3 or more years following dung burial. Additionally, findings from this study suggested yearly *B. bison* resultant carbon sequestration in the subsoil could be equivalent to that sequestered by 400,000 hectares of eucalypt plantation. The researchers recommended the 4 species of deep-tunnelling dung beetles, *B. bison*, *Geotrupes spiniger*, *Onitis caffer* and *Copris hispanis* be established throughout their potential range in southern Australia.

In 2011, the impact of dung beetles on the control of *Haemonchus contortus* (Barber's poll) in sheep was investigated through the project "Dung beetles and internal parasites of sheep". The project concluded dung beetles reduced the numbers of larvae obtained consistently with the total amount of faeces removed from the surface, so if 50% of dung was buried, the instance of *H. contortus* larvae would decrease by 50%. Dung beetles were reported to remove approximately 1g of faeces per beetle from freshly deposited sheep dung.

Reported in 2016, the project "Field establishment of dung beetles in South Australia" involved importation of *Onthophagus vacca* and *Bubas bubalus* from Europe to fill a gap in dung beetle activity in early spring across SA. The beetles were reared by CSIRO and in spring 2014 a small number of each species was released to high-care field nurseries. These beetles are being used in current work.

## 4. Current work

Awarded a \$9,174,174 grant from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit Program, “Dung beetle ecosystem engineers (DBEE) – enduring benefits for sheep and beef producers via science and community action in a new partnership model” is a five year project led by MLA in conjunction with multiple funding and research partners. No producer levies are invested in the project; \$2,147,147 via the MLA Donor Company, \$2,439,940 from numerous other project partners, in-kind contributions of \$8,932,275.

The project aim is to improve the soil in grazing systems, reduce the spread of flies, pests and diseases, increase pasture health and reduce nutrient run off into waterways through the introduction of 3 new dung beetle species/strains (plus increased rearing and release of the existing *Bubas bubalus* and *Onthophagus Vacca* beetles) and the provision of management information to producers. Investigations will be undertaken into how dung beetles can improve profitability and productivity for primary producers by; rolling out a dung beetle services to a network of producers and producer groups; improving access to information such as a dung beetle database, infield training packages; quantifying the benefits of dung beetles to encourage changes in farming practices.

The project involves collaboration between MLA, Universities (Charles Sturt, Western Australia, New England), Western Australian Department of Primary Industries and Regional Development, CSIRO, Landcare Research NZ, Dung Beetle Solutions International, Councils (Warren Catchments, Leschenault catchment) and the Mingenew-Irwin Farmer Group (note other farmer groups are welcome to join).

MLA has appointed Charles Sturt University to carry out the day to day running of the project. A criticism of the project is that sampling 120 sites across southern Australia is reinventing the wheel. This is not true. Previous work focused on Queensland and summer rainfall dung beetle species. The DBEE project focusses on southern Australia where there is a different suite of species of dung beetle. The seasonal and geographic distributions of these species has not been previously assessed, except in some localised studies. Thus the DBEE project will build on previous survey work in Queensland to provide a nation-wide survey of seasonal activity, which is an essential component of determining what species are missing and therefore what species should be introduced.

Producers interested in getting involved in the current research project can contact Doug McNicholl (dmcnicholl@mla.com.au) and/or the project manager at Charles Sturt University, Leslie Weston (dungbeetle@csu.edu.au).