SOILCAM

Specialising in Dung Beetles
for Landcare

www.dungbeetleexpert.com.au

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The ability of Dung Beetles to mitigate the effects of Climate Change in Australia

Environmental and Economic benefits

- Carbon burial and sequestration direct into soil.
  - Reduces the loss of CO_2 to atmosphere (greenhouse gas).
  - Assists soil to retain moisture and nutrients.
  - Provides a readily available source of biological carbon for soil and plant dependent biology.
  - Reduces input-costs of growing crops and pastures.
- Nitrogen in animal dung buried and sequestered direct into soil
  - Minimises the loss of nitrogen in NH_3 (ammonia) form to atmosphere.
  - Minimises the loss of Nitrous oxide (N_2) to atmosphere.
  - Reduces the requirement for nitrogen fertilizer and all ancillary and associated costs.
- Recycling of phosphorous contained in animal dung direct into soil.
  - Peak P is more significant to agriculture than climate change.
  - Also minimizes shipping, cartage, storage and application costs of Phosphate fertilisers and the enormous production of CO_2 associated with the importation of this fertilizer.
- Aeration of soil by burrowing beetles.
  - Enhances infiltration of rainfall to minimize loss from a reduced rainfall (as climate changes also increasing the drying trend with higher temperatures and evaporation).
- Almost immediate burial of wet and odorous dung from soil surface to soil.
  - Removal of dung required for laying of fly eggs and larval support before hatching and subsequent transport on wind, resulting in a significant sources of annoyance and to harm humans and animals. Reduction of fly numbers of up to 99%.
  - Reduction in the use of human fly repellants and insecticides.
  - Reduction in the use of insect repellants for commercial animals.
  - And associated costs for all of the above.
- Provides opportunities for employment in new industries.
  - Provides opportunities for small business and employment in collection, research, breeding and distribution of beetles.
  - Provides direct involvement by children of school age and is an ideal medium for education of the wider community in agricultural production.
- Supports the principles and practices of sustainable agriculture.
  - Underpins the principles and practices of Reduce, Reuse and Recycle.
  - Reduces the requirement for Nitrogen and Phosphorous in agriculture.

- Re-cycles and re-uses expensive plant nutrients.
- Reduces demand for the supply of unsustainable nutrients (P).
- CSIRO published a high level of dung beetle activity can reduce bushfly numbers by up to 99%.

Social impact benefits

- CSIRO has published studies indicating that a high level of dung beetle activity can reduce bush fly numbers by up to 99 percent.
- Potential to significantly lessen the social costs associated with annoyance resulting from flies (with multiplier costs and benefits).
- Potential to significantly reduce the incidence of disease and food spoilage (and costs) resulting transference of pathogenic microorganisms by flies (with multiplier costs and benefits).Eg Trachoma in aboriginal communities and pink eye with stock Bush fly are the vectors of both of these viruses.

Climate change effect on flies and other insects in Australia that utilise animal dung for their breeding cycle

- Increasing air and soil temperature permitting the spread of buffalo and bush flies in both agricultural and social settings.
  - Increased breeding of flies further south into southern Australia. E.g. buffalo fly have been reported at Glen Inness and Hunter Valley NSW
  - Increasing the subsequent potential for development and transmission of disease organisms.
  - Increasing direct and indirect costs involved in prevention of veterinary and medical treatment resulting from flies acting as disease vectors.

- Increased drying of soils with less rainfall and greater evaporation on southern soils (as predicted by CSIRO and other modeling).
  - Requirement for increased power for agricultural implements to penetrate dryer and tighter soils (which could be mitigated by dung beetle burrows) and carbon in soil.
  - Increase water penetration and retention of rainfall, enabling otherwise marginal lands to be farmed productively and economically, with direct impacts on the social and economic viability of rural regions, and production of domestic and export commodities.
  - Increase penetration of water runoff into dung beetle tunnel systems reduces herberside, insecticide, wetting agents, fertilizers and nutrients from dung and other sources from reaching dams, creeks, rivers estuaries and oceans when water filters through soil the above chemicals are retained in paddocks where nature microbial activity eventually neutralizes the chemicals.
  - Increased penetration of water runoff into dung beetle tunnel systems reduces the leaching of herbicides, insecticides, wetting agents, fertilisers and nutrients from dung and other sources into dams, creeks, rivers, estuaries and oceans when water filters through soil. The foregoing chemicals are retained in paddocks where nature's microbial activity eventually neutralises them.

THE ADDED VALUE OF DUNG BEETLES

For some time now, SOILCAM has been promoting the value of dung beetles and their role in nutrient cycling. We had always thought that the amount of Nitrogen and Phosphorous, which is lost from properties when dung remains unburied, would be substantial and we now have some hard figures to back that up.
By combining the studies of a number of experts* on these two important nutrients we have extrapolated the following figures:

For every 100 head of cattle there is a potential loss of 387 kg of Nitrogen and 108 kg of Phosphorous per annum. These figures reflect the nutrient loss that occurs from unburied dung and natural return to the soil through leaching and weathering, which is estimated to account for 24 to 34 per cent of the deposited dung. Dung burial allows these nutrients to be incorporated into the soil at the plant-root zone where microbial activity makes them readily available to plants - leading to healthier pastures and improved meat/milk production. Dung burial also reduces the quantity of nutrients and other organic matter from entering our river systems – by an estimated 15%. Such run-off chemicals can increase the incidence of algal blooms in aquatic environments.

Putting a dollar value on the potential benefits of an efficient dung beetle population is a relatively simple exercise – for every 100 head of cattle, unburied dung is equivalent to the cost of approximately 0.8 of a tonne of Urea and 1.2 tonne of Single super per annum. Add to this the expense of parasiticides to control pest species which live, breed and feed in the dung, and the price paid for a colony of introduced beetles is clearly worth every cent.

There are several CSIRO dung beetle scientists who feel the above figures are a minimum. In grazing systems such as dairying and intensive beef production in which large herds are grazed for short periods and large tonnages of bovine dung are concentrated over a small area, this dung can be buried in two to four days (as shown in the attached photographs which show dung burial by a single species, *Bubas bison*). The benefits dung beetles generate by increasing sustainable yields and the general health of a grazing system is clearly considerable.

SOILCAM's objectives are to establish eight to twelve species of dung beetles in most of the beef and dairying areas of Australia, south of the Queensland border.

**The information used to obtain these figures comes from studies by Richard Eckard and Malcolm McCaskill; Lott, Powell and Sweeten, and the Victorian College of Agriculture and Horticulture.*