



Economic and environmental impacts of rabbits in Australia

Introduction: The European rabbit (*Oryctolagus cuniculus*) is a serious environmental and agricultural pest throughout Australia. Rabbits can have considerable impacts on farm productivity and native ecosystems, leading to financial loss and environmental devastation¹. The community also suffers indirectly, as they might pay higher prices for rabbit-affected commodities (such as wool)² or bear the loss of ecosystem services at the catchment scale³. Many of these costs cannot be accurately estimated in a financial sense. Where estimates have been calculated, assumptions and figures vary and are highly conservative^{2,4,5}.

“ It takes less than one rabbit per hectare to prevent the successful regeneration of many native trees and shrubs¹ ”

Competition and land degradation by rabbits is listed as a key threatening process in Australia⁴. Rabbits can cause damage by:

- overgrazing native and sown pastures, leading to loss of plant biodiversity and reduced crop yields
- competing with native animals and domestic livestock for food and shelter, increasing grazing pressure and lowering the land's carrying capacity
- building warrens, causing land degradation and erosion
- preventing or inhibiting the regeneration of native shrubs and trees by grazing
- increasing and spreading invasive weeds^{3,6}
- acting as a food source for introduced predators, which can lead to increased lamb losses and disease prevalence, and a decrease in small mammal diversity^{1,3,7,8,9}.

All of these impacts eventually lead to higher management costs⁷, loss of productivity^{6,8}, and huge financial losses for Australia's farmers⁹, as well as other land managers (eg national parks)⁷. Although biological controls (myxoma virus and rabbit haemorrhagic disease virus, or RHDV) have provided ongoing rabbit control for over 60 years with little cost¹⁰, they have not eliminated the problem⁴. The overall loss caused by rabbits to agriculture and horticulture in Australia was recently estimated to be about \$206 million per year¹¹.

Management costs and loss of production:

Rabbit damage and control costs at the property level vary depending on the land use or enterprise, climate and rainfall, and control methods used^{1,5} (see table). The cost per rabbit also varies depending on the value of the affected commodity (eg crop type). For example, rabbit damage to high-value crops such as canola might be more financially devastating than damage to lower-value crops (eg lupins, barley), which generate lower returns per hectare¹² (Figure 1). The return on investment in rabbit control is greater when high-value commodities or resources are protected from damage.

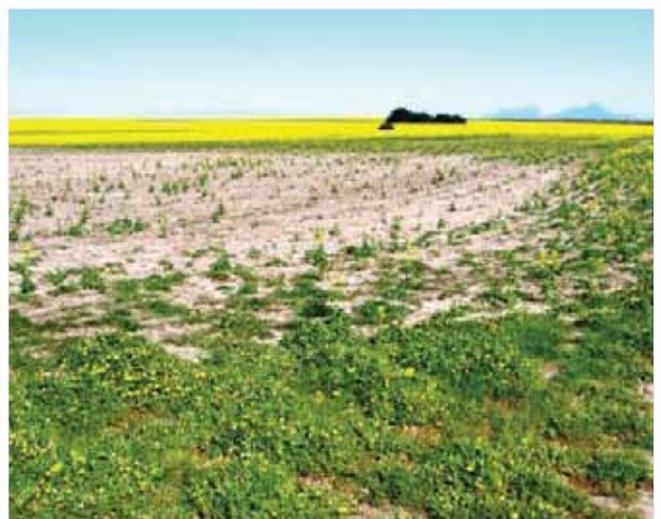


Figure 1: Damage to a canola crop caused by rabbit grazing. Image: from Wheeler et al (2002)¹²

An estimate of the costs of rabbits to agricultural enterprises*

Enterprise	Approximate cost (/rabbit/yr) (\$)
wool	1.85
store cattle (property bred)	2.40
trading cattle (grow out for 12 months)	2.85
stud cattle	13.90
broccoli (/ha)	9.90
lettuce (/ha)	2.35
lucerne (irrigated, /ha)	6.80
wine grapes (/ha)	65.60

*Production costs, grazing pressure (DSE) and value of product where applicable were taken into account. Adapted from DPI&F (2008)⁵

While the initial costs of rabbit control can be high (eg warren ripping costs are about \$10-\$20 per warren¹⁰), the benefits can be long term. Often costs can be recouped by added livestock or crop production, or minimised by being shared among neighbouring properties using a coordinated approach¹. Taking no action against rabbits is likely to result in higher costs in terms of lost production and ongoing damage⁵.

For a wool producer, the cost of grazing competition between sheep and rabbits is a major cost typically measured in terms of dry sheep equivalents (DSEs). In general, about 16 rabbits/ha is equivalent to one DSE, or about 12 rabbits per DSE in higher-rainfall areas^{1,2}. For example, if one sheep is conservatively considered the grazing equivalent of one warren of 12-16 rabbits¹⁴, a paddock containing 500 warrens is already bearing the equivalent of 500 grazing sheep, before the paddock is even stocked.

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Grazing competition between sheep and rabbits can affect wool production by reducing the quality and amount of wool produced per sheep. In central New South Wales, a paddock experiment found that as rabbit density increased, pasture productivity decreased⁶. Sheep that were not competing with rabbits had a 7.23 kg greater average liveweight

after three years, compared with sheep that were competing with a high-density population of 72 rabbits per hectare^{6,8}. Sheep that were not competing with rabbits also produced 21% more greasy wool per head per year⁸.

Rabbits also cause extensive losses to forestry and are a potential threat to new tree plantations designed for carbon offset or sequestration benefits^{1,15}. They can graze plants to ground level, preventing regeneration and limiting seedling establishment¹. The cost of tree planting programs is often increased because of the need to erect tree guards. In forestry plantations, damage from browsing rabbits can equate to one year's loss of growth – up to \$800/ha at clear-felling. In private forests, rabbit control costs can be as high as \$80/ha when trees are vulnerable to damage¹.



Figure 2: Browsing damage caused by rabbits. Note the 45° 'secateur-like' cuts through the twigs. Image: Brian Cooke



Figure 3: Vegetation degradation and erosion damage caused by rabbits on world heritage-listed Macquarie Island. Image: Australian Antarctic Division

Environmental impacts: Low-density rabbit populations can cause significant damage to native plants and pastures, suggesting there might be no ‘safe’ level of rabbit density¹⁶ (Figure 2). It takes less than one rabbit per hectare to prevent the successful regeneration of many native trees and shrubs¹⁶, which are vital for biodiversity and farm productivity. Removal or loss of vegetation makes soils prone to wind and water erosion (Figure 3), which on farms can lead to reduced soil fertility and siltation of dams^{1,3}. These impacts are intensified and particularly evident during and after droughts⁴.

With declining populations of many small Australian mammal species over the past 200 years, it is possible that rabbits have partially filled an ecological niche³. Rabbit warrens provide refuge for some native species such as echidnas and large reptiles³. However, cats and foxes also use rabbit warrens for shelter and dens for their young, thus helping these predators to persist in hot, arid areas³.

Rabbits also eat and disperse viable native plant seeds, performing an important function in the ecosystem³. However, they can also spread weeds and permanently damage native seedlings in the process^{2,16}.

Rabbits as a resource: Rabbits are a commercial resource that provides employment and income, mainly in rural areas⁹. Wild rabbits are harvested to

supply meat for the game and pet meat industries, and skins for the felt hat industry^{1,4} (Figure 4). Rabbit meat is considered a high-value gourmet product, although the market price depends on consumer acceptance and demand⁴. Indigenous Australians and recreational hunters also use rabbits as a food source⁹.

Before RHDV became established, the value of the wild rabbit industry was estimated at about \$10 million per year¹⁷. The farmed rabbit industry now dominates the supply of rabbits for domestic and overseas consumption, leading to a steady decline in the commercial harvest of wild rabbits⁹. Although these trades have suffered as a result of fewer rabbits post-RHDV, the benefits of rabbit control to agriculture and the environment far outweigh these losses¹⁷.

Estimated costs: Before the release of RHDV, rabbit-induced production losses in the Australian wool industry were about \$130 million per year¹¹. It was estimated that reduced rabbit populations as a result of RHDV would increase agricultural production by \$600 million annually, including about \$300 million for the wool sector, \$150 million for cattle, \$80 million for cropping and \$70 million for sheep meat¹⁷. Recent estimates have valued the cumulative benefit of myxomatosis and RHDV to Australia’s pastoral industries at about \$96 billion over the last 60 years¹⁰.

Although RHDV has effectively reduced the impact of rabbits across many parts of Australia, it is unlikely to keep populations down over the long term^{18,13}. Rabbit populations are now on the rise, potentially putting Australia’s growing carbon-offset industry and agricultural sectors at risk. Because of the high fecundity of rabbits and the damage likely to be caused by subsequent generations⁷, on-ground management actions – in conjunction with biocontrol – are expected to provide substantial benefits to primary production and biodiversity. The impact of rabbits on agriculture and conservation will continue to grow, unless continuous effort is put into long-term, integrated rabbit control.

Further information:

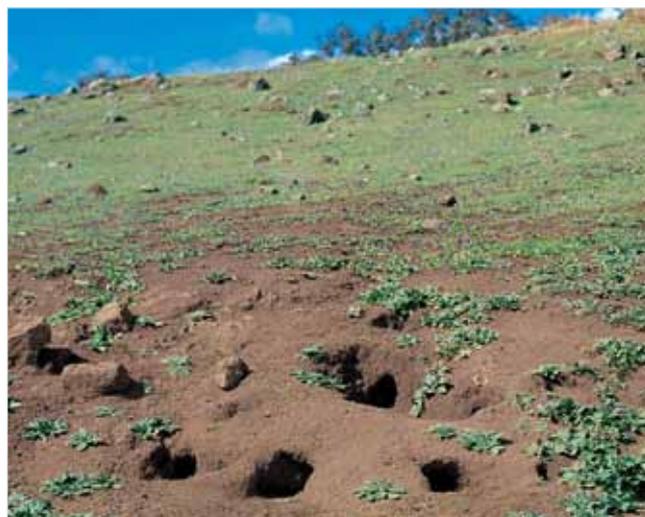
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Figure 4: Workers process rabbit carcasses at a farmed rabbit processing facility. Image: Australian Broadcasting Commission



Rabbits are a food source for introduced predators, including foxes. Image: Daniel Schembri



Rabbit warrens can encourage weeds and cause soil erosion. Image: Alf Manciangli