

Paddock trees

Scattered trees influences the occurrence of woodland birds: as the total area of scattered trees increases, so too does the number of bird species. More than 25 species of birds have been recorded in paddocks with scattered trees. (*Andrew. F. Bennett, Rohan Clarke, Alistair Stewart, Greg Holland and Jim Radford, 2008*)

Scattered trees are used as stepping stones for movement through the farm, provide refuge and shelter, as a place to feed amongst foliage, on trunks and fallen logs and the ground under these trees. (*Andrew. F. Bennett, Rohan Clarke, Alistair Stewart, Greg Holland and Jim Radford, 2008*)

Looking after scattered trees does not have to come at the cost of farm productivity. Scattered trees take up relatively little space, and while they might compete with crops and pasture in the immediate area, they provide many benefits for livestock and the environment. (*Linda Broadhurst 2014*)

Scattered trees actively contribute to soil and water quality improvement by recycling nutrients, helping to maintain neutral pH and improving soil friability around their root zones. They can also pump large volumes of subsurface water, helping to reduce salinity risks. (*Linda Broadhurst 2014*)

Encourage and protect new regeneration of seedlings around mature trees in the paddock, protect the veteran paddock trees to replace mature trees would take decades to preserve what we have. (*Dr Linda Broadhurst, Dr Saul Cunningham and Dr Veronica Doerr 2013*)

Looking after scattered trees does not have to come at the cost of farm productivity. Scattered trees take relatively little space and while they might compete with crops and pasture in the immediate are, maintaining them can provide environmental and livestock welfare benefits. (*Dr Linda Broadhurst, Dr Saul Cunningham and Dr Veronica Doerr 2013*)

Trees scattered 100m apart function as stepping stones for movement of native animals between larger remnants vegetation. (*Dr Linda Broadhurst, Dr Saul Cunningham and Dr Veronica Doerr 2013*)

An invertebrate survey on one River Red Gum Tree for Moira State Forest resulted in 8,456 invertebrates been collected representing an immense diversity of different types. Harmful or damaging insects were in the minority when compared to those who use the trees. (*Kate Stothers 2007*)

Bats contribute to a range of ecosystem processes, including seed dispersal, pollination and predation of invertebrates. (*Kate Stothers 2007*)

In a Northern Plains study around Barmah 80% of a micro bat diet consisted of the crop pest Rutherglen Bug. (*Kate Stothers 2007*)

Paddock trees reduce erosion in paddocks due to their ability to reduce wind erosion velocities close to ground level. Wind speed 2 meters above the ground in open grassland is twice the wind speed in woodlands. (*Kate Stothers 2007*)

Paddock trees may also enhance pasture growth by providing light shade, nutrient distribution via tree leaf and twig litter and frost protection. (*Kate Stothers 2007*)

Different species of invertebrates are involved with the decomposition of dead plant material and dead animals. They return nutrients into the soil and at the same time help soil health by burrowing and mixing the soil. Australia had a lot of ant species and their forage between the ground and above the ground parts of plants. (*Kate Stothers 2007*)

Old trees have deep root systems and can tap into underground nutrients that are beyond the reach of pasture plants. These are then released at the soil surface as flowers, leaves, twigs, branches, bark, sap, pollen, nectar and water vapour. (*Doug Robinson 1999*)

Trees can shelter an area downwind for at least 15 times their own height and conserve precious ground moisture. (*J.Dengate 1983*)

Shelter for freshly shorn sheep can reduce death if it is raining and below 5 degrees and an 18km/h wind. (*J.Dengate 1983*)

In a 5-year study in Armidale on sheep in sheltered plots produced 35% more wool and 6kg more liveweight than those without shelter. (*J.Dengate 1983*)

Heat depresses milk production and can depress liveweight gains of cattle by up to 0.6kg a day. (*J.Dengate 1983*)

Temperature as high as 88degrees have been recorded from wool on the backs of exposed sheep. The temperature in a woodlot of trees may be a cool 22degrees while in the open it is 36degrees. (*J.Dengate 1983*)

Heat stress reduced wool growth by reducing feed intake, and is detrimental to ram fertility, ovulation rate and conception in ewes and foetal development, (*G. Anderson 1986*)

For pregnant cow's heat stress may cause abortion and certainly cause calves to be born undersized and consequently more susceptible to heat stress. (*D. Saunders 1990*)

Studies involving jerseys and Holsteins have suggested the milk production declines as air temperature rises above 20degrees, dropping steeply as the temperature reaches 27degrees. (*D. Saunders 1990*)

Shorthorn cows resting in shade continue to chew their cud whereas cows in the sun abstain. Because rumination increases the heat produced, heat-stressed stock abstains so as to reduce metabolic heat production. After grazing chewing is the second most important activity of cattle, so abstaining directly affects productivity. (*D. Saunders 1990*)

Shelterbelts increase production by about 30% to a distance about ten times the height of the trees beyond the area of reduced production (=to height of trees) (*G. Anderson 1986*)

Wind can destroy blossom prior to setting, damage and discolour fruit increase fruit fall and increase insect damage in orchards. (*D. Saunders 1990*)

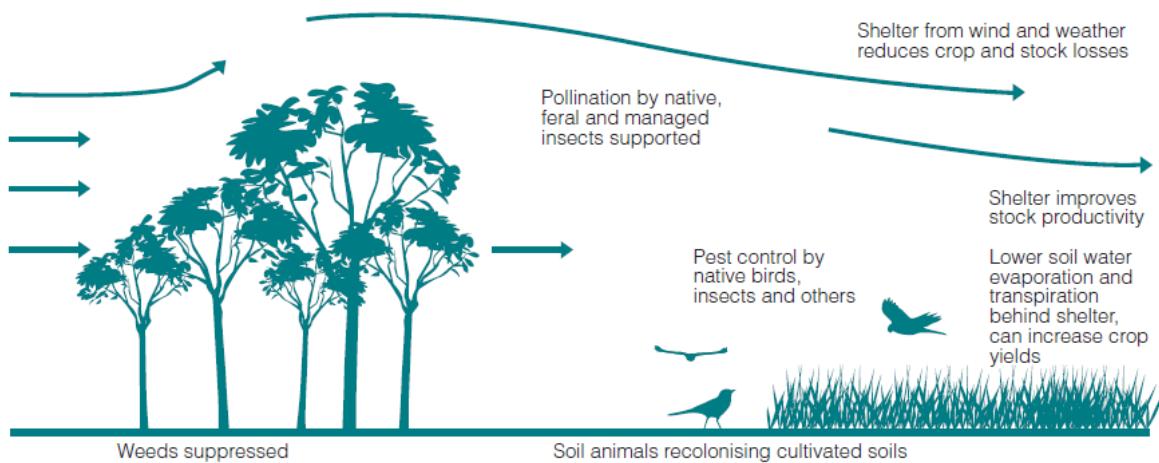
Paddock trees make up 15-25% of total native vegetation cover in the southern Australia. (*S. Carruthers and M. Hodder*)

Energy expenditure increases with extremes of heat or cold (Ames and Ray 1983). Shelter can improve animal productivity by reducing this energy loss, increasing plant growth and reducing sheep mortality. For example, lamb weaning % may be increased by 10 units, a gain of c. \$2000 from 1000 ewes, sufficient in 2 years to recover the cost of the shelter. Farmers and scientists in Australia are generally ignorant of, the effects, uses and benefits of trees in agriculture. (*P.R. Bird, J.J. Lynch and J.M. Obst*)

In a single night an Insectivore bat can consume 600 - 1,200 mosquitos and small insects in one hour eating 50% of their body weight in a night. (*SWIFT 2019*)

In a grain-growing region of Australia a survey showed that 100% of a microbat's diet were grain weevils. (*Bat Conservation & Rescue QLD. Inc 2012*)

Paddock productivity benefits



(Shelley Baker 2012)

Trees can be planted in paddocks or laneways and can reduce the radiant heat load by 50% or more (*Dairy Australia, 2018*)

Scattered trees play an active role to soil and water quality. Scattered trees can recycle nutrients, help maintain neutral pH and improve soil friability around their root zones. In addition, they can potentially pump large volumes of subsurface water, helping to reduce salinity. (*Linda Broadhurst 2014*)

The shade and shelter that trees in paddocks and along laneways provide can be used strategically to manage both heat gain in summer and heat loss in winter. (*Dairy Australia, 2018*)

Strengths: trees are the cheapest method of providing shade, trees absorb CO₂ and don't require electricity to establish or maintain, trees enhance local biodiversity. (*Dairy Australia, 2018*)

Priorities for cooling cows – use shade first – minimise heat gain – block solar radiation (*Dairy Australia, 2018*)

Keys to success when redesigning farm layouts consider orientating the long axis of paddocks north-south to help maximise shade/shelter. Aim for 4m² of shade/ cow at midday, seek recommendations on suitable tree and shrub species from an adviser, strategically plant species based on natural traits, fence outside the perimeter of the tree root systems to protect trees from excessive compaction and manure that may kill some species, locate feed and drinking water 20-30m away from trees so that cows don't defecate excessively in the shaded areas. (*Dairy Australia, 2018*)

The effect of scattered trees and plantations on wind speeds is quite different to that of shelterbelts. In the case of scattered trees, the strongest winds tend to flow evenly over the top of the canopies, leaving the wind speeds at ground level much lower over the whole area. Measurements taken amongst widely spaced trees spread across grazing land indicate that reductions in wind speed of 40% over the whole paddock are possible with just 17 large remnant eucalypt trees per hectare, or about 200 young pruned timber trees per hectare. The larger the trees or the greater the stocking rate, the slower the wind speed will be. Such areas may be valuable as stock havens for 'off-shears' sheep or developed as special lambing or calving areas. (*Farm Forest Line 2009*)

Resources

SWIFFT – State Wide Integrated Flora and Fauna Team http://www.swifft.net.au/cb_pages/common_bent-wing_bat.php

Revegetating in farm landscapes: are there benefits for wildlife? Prepared by Andrew. F. Bennett, Rohan Clarke, Alistair Stewart, Greg Holland and Jim Radford 2008

Scattered trees and their importance to agricultural landscapes produced for GRDC by CSIRO Dr Linda Broadhurst, Dr Saul Cunningham and Dr Veronica Doerr 2013

Tree decline in agricultural landscapes: what we stand to lose by Reid and Landsberg 1999

The importance of paddock trees in the landscape by Kate Stothers 2007

How wildlife habitats can benefit your property in a Land for Wildlife Note 2002

Old trees for wildlife in a Land for Wildlife Note by Doug Robinson and Wildlife Branch 1992

An uncertain future: paddock trees in agricultural landscapes by S. Carruthers and M. Hodder

Effect of shelter on plant and animal production by P.R. Bird, J.J. Lynch and J.M. Obst

The effect of trees on crop and animal production by G. Anderson 1986, Trees and Natural Resources, Vol 28. No 4.

The landscape approach to conservation: community involvement, the only practical solution by D. Saunders 1990

Windbreaks and shade trees to help landowners and wildlife by J. Dengate Habitat 11, page 14-15, 1983

Benefits of trees for farm productivity by Shelley Baker 2012

Farm Forest Line 2009 http://www.farmforestline.com.au/pages/2.2.1.1_heat.html

Cool Cows shade, sprinklers, and fans on dairy farms by Dairy Australia, 2018

Landcare for Wildlife Notes Old Trees for wildlife by Doug Robinson and the Wildlife branch 1999

"Microbats what are they eating?" Bat Conservation & Rescue QLD. Inc 2012 <http://www.bats.org.au/about-bats/microbats.php#2>

The importance of scattered trees in the Agricultural Landscapes, Linda Broadhurst 2014