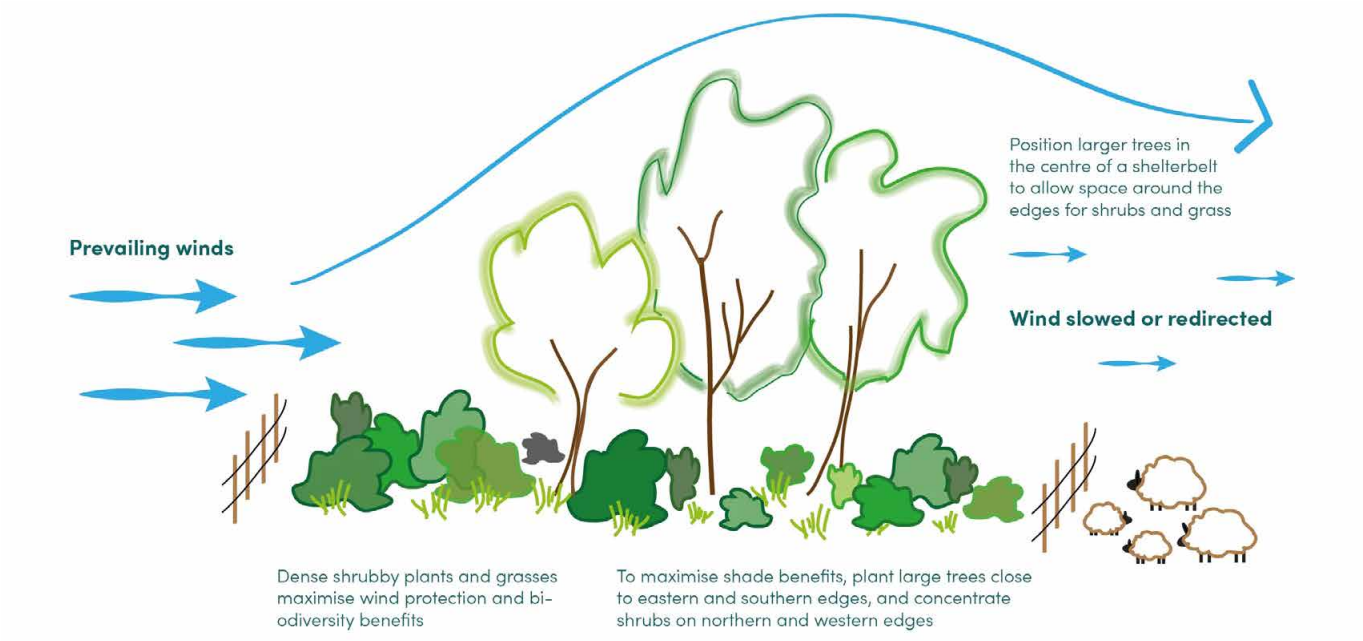
Fact sheet

Co-benefit of trees on farm: Productivity benefits



Functional shelterbelt design (Source: ANU Sustainable Farms)

Trees on farms can provide benefits for livestock and the environment. With careful management and planning, we can create a balance between the two. This factsheet outlines some of the considerations for producers managing trees to optimise animal health and welfare, animal production, pasture production and water quality.

Shelterbelts

Trees on farms can provide animal health and welfare benefits. Trees in shelterbelts on farms can reduce wind speed and improve farm productivity. The shelter benefit from cold winds for lambs is well supported but evidence of improved weight gain in cattle is limited.

The ability of trees to reduce wind speed over a paddock depends on the orientation, height, and porosity of the shelterbelt. Porosity of the shelterbelt – meaning the extent to which it lets through or blocks wind is important. The more tightly trees and understory are grown together, the more the windspeed is reduced close to the shelterbelt, however the less it is reduced at medium distances. A porosity of about 25% to 50% is recommended as it reduces windspeed over a larger area.

Improved survival in cold conditions

Shelterbelts reduce wind speeds, which reduces the chill experienced by livestock. Chill index varies with temperature, rain and wind speed (Fig. 1).

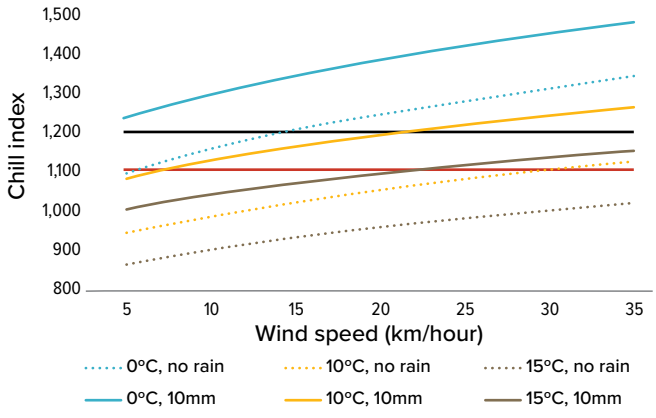


Figure 1: The chill index for sheep in southern Australia. A chill index of 1100 is a high risk of chill (horizontal red line) and 1200 is a severe risk (black line)

Reduced chill experienced by animals has consistently been shown to lower lamb mortality. A study in the ACT found lamb mortality in the first three days of life was largely determined by the chill index, especially

for multiples. A study in southwest Victoria found lamb mortality in a bush paddock was 16% compared with 25% in a neighbouring unsheltered paddock. Mortality of 19% for singles and 27% for multiple births was observed in unsheltered paddocks, compared with 6% for singles and 13% for multiple births in sheltered paddocks. A demonstration site in southwest Victoria found a 10% increase in lamb survival in twin-bearing ewes in the paddock with more shelter. Anecdotal evidence indicates that shorn sheep with access to adequate shelter also have reduced mortality.

The potential to reduce lamb mortality with a shelterbelt will depend on the property's exposure to winds during lambing and the shelterbelts design in reducing wind speeds. For example, at an exposed site in Hamilton in western Victoria, modelling indicated lambs per ewe increased by 6.4% with 30% lower wind speeds. At a less exposed site at Bairnsdale in eastern Victoria, the increase in lambs per ewe was only 2.3% with a 50% lower wind speed. The average chill index in Hamilton during lambing is just under 1,100, while in Bairnsdale it is about 960. Lambs in Bairnsdale will still benefit from shelter in some years, but these benefits occur less frequently than in Hamilton.

Liveweight gain

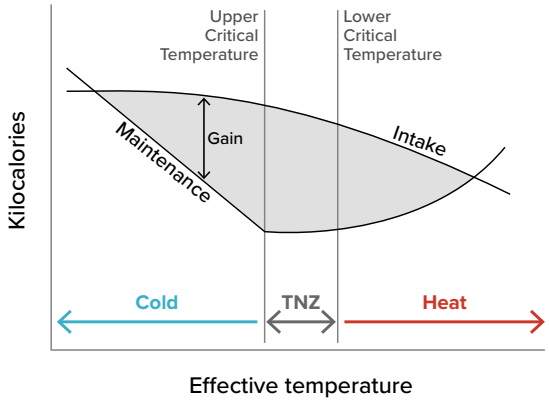


Figure 2: Schematic of the relationship between intake and maintenance energy requirements at different temperatures (Anderson, 1986)

Despite clear physiological understanding of the effects of chill and heat stress on liveweight gain in livestock (Fig. 2), evidence for the impact of trees on liveweight gain in Australian livestock systems is limited. It is well understood that dry matter intake is reduced in hotter conditions, and that shade can reduce this impact. Research has largely focused on the impact of shade structures on milk production in dairy systems and liveweight gain in feedlots. In Queensland, Angus steers with access to shade had exit weights on average 17.7kg heavier than non-shaded animals after 120 days. Similarly, average daily gain over 90 days from early January in shaded Black Angus steers in a Queensland feedlot was 0.74kg/day greater than unshaded animals. Trees can be more effective at reducing temperature and related stress indices than shade structures because they provide evaporative cooling as well as shade.

Water related benefits

Trees and other vegetation with fencing around dams can improve water quality by reducing nitrogen, turbidity, algal blooms, and bacteria such as E. coli and faecal coliforms. Improved water quality has been associated with increased liveweight gain in cattle. A cost benefit analysis suggests there is greater than 70% chance that liveweight gain would compensate for the cost of enhancing poor quality dams (Dobes et al., 2021). Strategically placed plantings can reduce the impacts of salinity or waterlogging allowing grazing in previously ungrazed areas, increasing the productive area of the farm.

Pasture productivity

In some instances, trees compete with grasses for moisture and nutrients and can reduce yields of nearby pasture. However, increases in production in the sheltered zone often offset losses in the competition zone nearer the trees (Fig. 3). An analysis of Australian studies found that in paddocks over five tree heights wide, the increased pasture production observed in the sheltered zone typically offsets reduced growth in the competition zone. For a sheltered paddock 20 tree heights wide, the predicted increase in growth was 6.5%. Increased production was most likely in drier sites and years and in windier locations. However, results were highly variable and, in some situations, shelter did not offset losses in the competition zone. This indicates the need for good planning and design to optimise benefits of tree shelter.

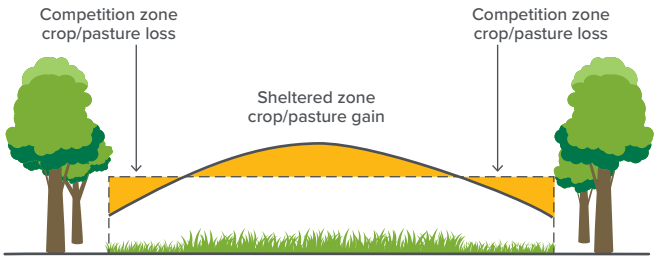


Figure 3: The impact of trees at varying distances from the shelterbelt and the net benefit of trees on pasture production (Abel et al., 1997)

References

Abel, N., et al. (1997). *Design principles for farm forestry : a guide to assist farmers to decide where to place trees and farm plantations on farms.* Rural Industries Research and Development Corporation, Barton, A.C.T.

Anderson, G., (1986). The Effects of Trees on Crop and Animal Production. *Trees and Natural Resources, Vol 28*. No 4.

Dobes L, Crane M, Higgins T, Van Dijk AIJM, Lindenmayer DB (2021) *Increased livestock weight gain from improved water quality in farm dams: A cost-benefit analysis.* PLoS ONE 16(8): e0256089. https://doi.org/10.1371/journal.pone.0256089

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