INTEGRATING TREES FOR PROFITABLE LIVESTOCK PRODUCTION

Gordon T. Williams
"Eastlake"
Uralla NSW

INTRODUCTION

With many of our environmental problems we probably have 90% of the answers. We should be starting to do something about them and to add new ideas or solutions to that 90% as we proceed. If we wait until we get all the answers we will never start.

Loss of trees from rural Australia is a rapidly emerging problem, and in the higher productivity stock and cropping areas tree loss will increase even more rapidly in the next few years, if steps are not taken to at least halt, if not reverse this problem.

However, trees are not some magical "cure-all" for all our environmental and stock management/production ills, but I am sure that trees can be integrated in some way into all of our agricultural systems for increased profitability in the medium to long-term.

In the short-term, profitability will be reduced because of cash outlays, but I am sure that we as land managers can not afford to do nothing, because the long term consequences will catch up with us eventually, and at that time we will have even less financial capacity and probably less will, to patch up an even bigger mess. Most problems associated with land degradation increase exponentially over time, so the sooner a start is made, the less is the final real cost in time, dollars and effort.

LAND MANAGEMENT PRIORITIES

We need to assess the role of trees in each particular agricultural operation, but firstly whether lack of trees is the major problem that we have within the operation. In other words, get the land use priorities right, and don't go off on a tree planting programme to save a few tax dollars in a good year, and then sit back self-satisfied and call yourself a conservation farmer, if in fact your land is overstocked, or has areas cultivated that are quite unsuitable for such use.

In the New England area for example, I believe that up to 30% of properties are overstocked, and that regular cropping with oats, particularly on the lighter soils, is environmentally, and often financially dubious.

RURAL PROPERTY MANAGEMENT

Trees are only part of a complex system which must be considered in rural property management. A checklist would include all or most of the following.

1. Stock/crop/day to day management decisions.

2. Financial management of the business

3. Land/resource management

- Stocking rates
  - high
  - low
  - optimal
- Livestock mix
  - sheep
  - cattle
  - goats
- Monoculture agricultural systems versus diversified systems
- Salinity
- Acidity
- Soil structure/fertility/fertilizers
- Crops; which crops? - Should we crop at all?
- Pastures; native; sown, or mix of pastures
- Erosion
  - gully
  - wind
  - sheet
- Water Management
  - creeks/rivers
  - dams
  - contours
- Tree Management
  - maintain trees
  - clear trees
  - plant trees; native? exotic?

This presentation of property management highlights that trees are only one part, though undoubtedly a very important part of a complex system.

VALUE OF TREES IN RURAL PRODUCTION

1. Aesthetics and Capital Value

The aesthetic and comfort value to people of having sufficient trees around a property is fairly obvious.. It is difficult to put an exact dollar value on such improvements if the property is for sale when I think that judgement can be left to the individual.

2. Salinity

We have all heard of, or encountered, the emerging dryland salinity problem in Australia. This has been brought about by hydrological imbalance, in many cases due to either local or regional removal of trees in "recharge" areas. This has allowed excess water infiltration which has resulted in the rising of water tables and with that salts, in lower areas. The income loss to agriculture of salting is enormous and if trees can help alleviate this, investment in well sited trees, or well planned clearing will pay for itself many times over.

I realize this is a very complex problem, and professional advice should be sought if you suspect salinity is, or could be, a problem.

3. Nutrient Cycling

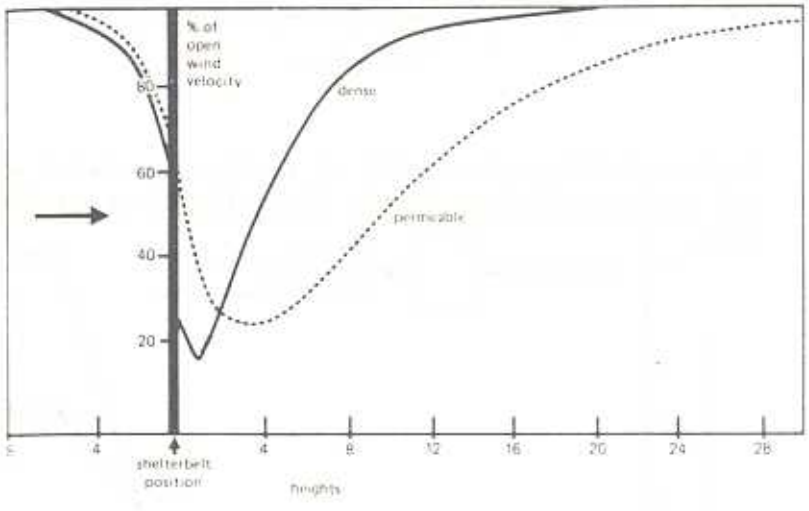
Trees do act as double-acting pumps in our environment. On the one hand they "pump down" water tables, or prevent water tables rising by using infiltrated water before it can add to the underground water reserves as previously outlined, and on the other hand their roots penetrate into rock, clay and sub-soils, extracting nutrients which are then transported and cycled through the root system into higher soil levels, or to the top of the ground via leaves bark and timber. This tree litter improves soil structure and moisture holding capacity.

This is the process by which many Australian soils were formed or are maintained, and obviously if we lose all trees, cycling will virtually cease because shallow rooted grasses are unable to do this effectively. Therefore, in treeless systems, soil formation is zero and there is no way to replace any soil lost through erosion. Although a very long-term value of trees, this aspect should not be overlooked.

4. Crop and Livestock Production

Shelter belts do have considerable effect on microclimate. It is clear from Fig. 1 that there is a large reduction in windspeed due to a shelterbelt. Soil temperature, air temperature, and relative humidity may be higher in winter and spring in the sheltered area. However frost may be increased near trees (not under) if the trees block a cold air drainage line, or on the southern side where winter sun may not reach.

Figure 1. Shelterbelt density and wind abatement. Source: Bird, 1984.



Generally well planned shelter belts will ameliorate the extremes of climatic conditions for both stock and pasture.

In hot areas there is good evidence that readily available shade increases grazing time by cattle and also increases lamb and calf survival significantly.

Figure 2 shows the losses and gains in crop yields due to the effect of a shelter belt. Shelter will reduce evapotranspiration of water from pasture; at Armidale a study over 29 days in early summer showed a saving of 12 mm of water.

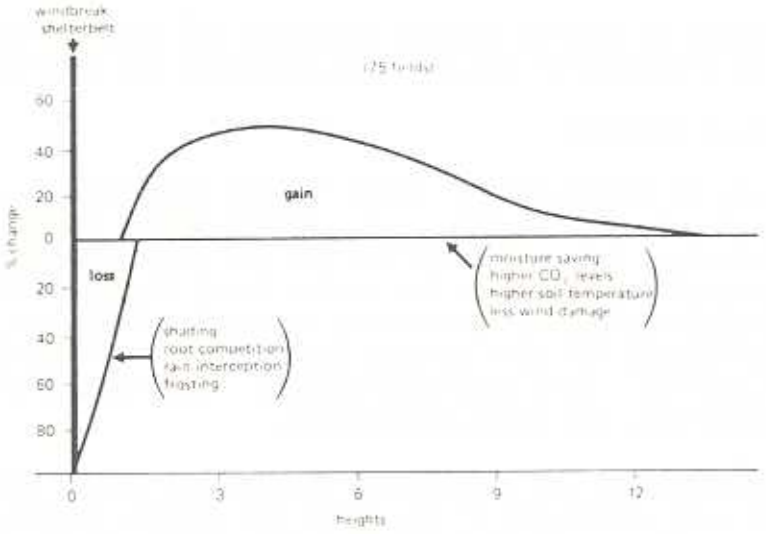


Figure 2. Shelterbelt effects on crop yields. Source: Bird, 1984.

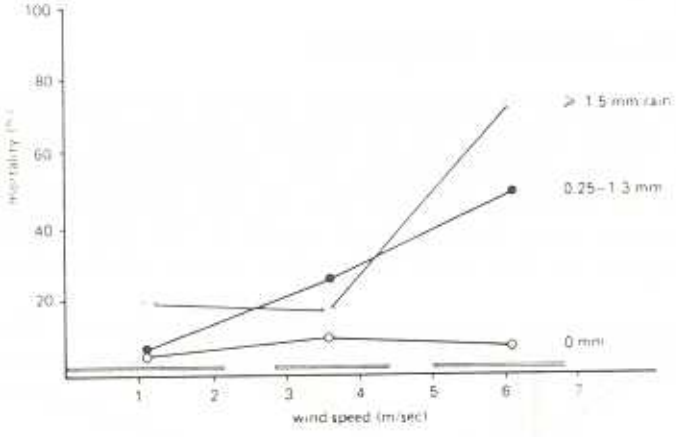


Figure 3. Lamb mortality within 72h of birth associated with rainfall and wind conditions in the first 6h. Source: Obst and Ellis, 1977.

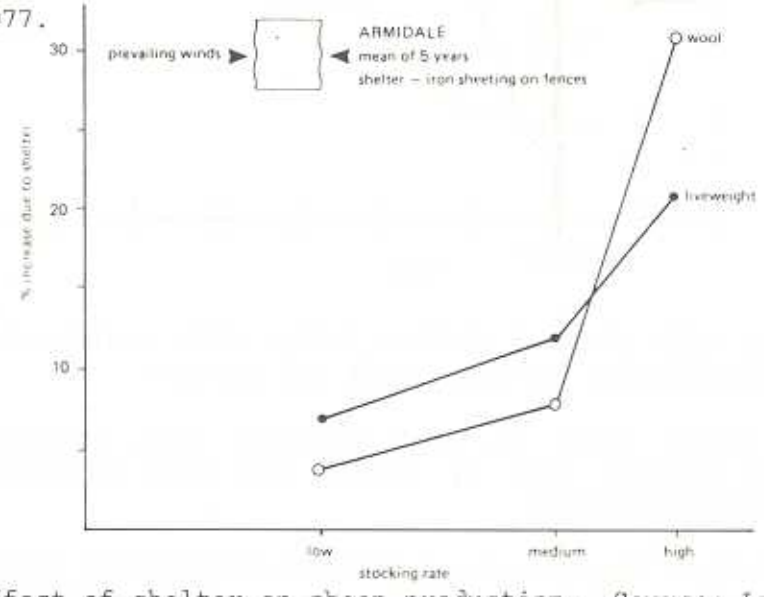


Figure 4. Effect of shelter on sheep production. Source: Lynch and Donnelly, 1980.

Shelter from wind can reduce mechanical damage to plants, which of course means greater plant production. Shelter belts always have some adverse effects on plant growth, but this loss near the shelter is virtually always more than compensated for with increases further out in the paddock (See Fig. 2)

Obviously trees can alleviate hot and cold stress and increase survival, production and reproduction. For example a shorn sheep will be subject to a similar cold stress at 10° C and 1m/sec wind as at 21° C and 5m/sec wind. Rain of course aggravates this situation as it can reduce the insulation of the coat by 30%.

Dead sheep and lambs are obvious losses (See Fig. 3) but either heat or cold increases maintenance energy requirements, which in turn reduces the animals ability to produce wool, meat or milk. Pasture intake and feed conversion are adversely affected with temperature extremes.

At Armidale grazing sheep provided with shelter showed an increase in wool production of 4-30% and liveweight of 7-20% (See Fig. 4).

On my own property, if sheltered paddocks save only 20 sheep per year after shearing, and we mark 2% more lambs, i.e. 60 lambs, which are all valued at $30 per head, then we will gain $2400 in 1 year. This figure approximately equates the cash outlay for 1 year on trees and fencing materials, and these trees should have a useful life of about 40 years. Increases in wool growth, body weight, pasture growth, and unseen gains of lower feed intake in sheltered areas are not taken into account in the above figure so the actual gain would be higher.

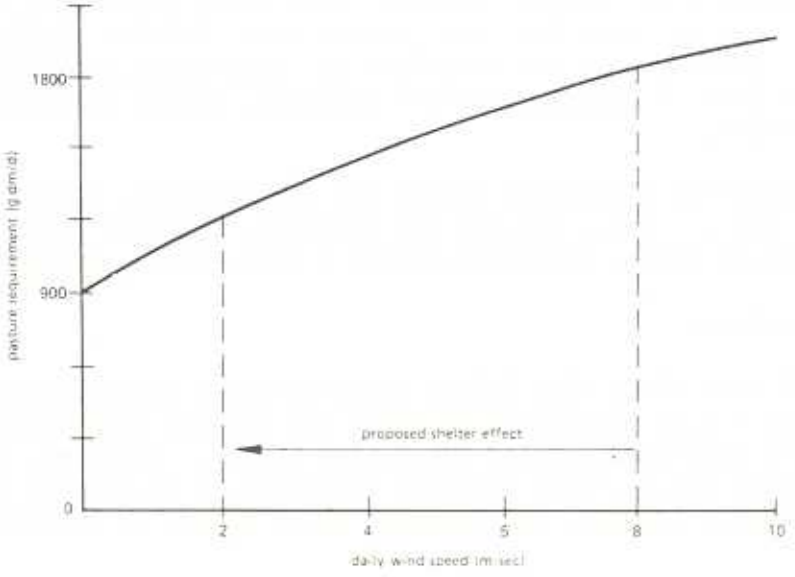


Figure 5. Predicted effect of windspeed on maintenance needs of shorn sheep. Source: Black & Bottomley 1980.

Cold stress in cattle is not so clear cut, and although maintenance requirements are increased, cattle can apparently compensate later by increasing intake. However, cattle are very prone to heat stress and this affects feed intake and liveweight gain.

In tropical Australia heat stress causes significant losses in calves and lowers cow fertility and calf birthweight. These losses as well as lowered ram fertility can also occur in sheep.

There is also good evidence that dairy cattle are very prone to thermal stress.

5. Fire Protection

In Western Victoria well developed shelter belts had very beneficial effects in reducing fire damage in the Ash Wednesday fires in 1983, and this aspect deserves better recognition and promotion.

6. Erosion Control

Trees play an important role in preventing soil erosion. The accelerated run-off from treeless slopes after rain can cause sheet or gully erosion, and if combined with salinity problems this erosion may be increased. In the rehabilitation of eroded areas trees with fibrous root systems may play an effective role in stabilizing these areas.

Wind erosion can be substantially reduced with adequate tree cover (See Fig. 1)

7. Timber Reserves

Although not directly affecting animal production, timber reserves for fencing, building, fire wood or honey production from tree blossom can be of overall dollar benefit to the farming operation.

8. Wildlife Habitat

Areas of trees can become refuges for both good and bad forms of wildlife. Foxes, rabbits and hares can invade shelter belts or regeneration areas, but the benefits of increasing predatory birds and insects that feed on problem pasture insects, should outweigh any adverse effects or costs.

The maintenance of diversity within an agricultural system by including native and exotic trees, shrubs and grasses, together with a mixture of livestock and/or crops, generally means a more stable enterprise.

9. Fodder Trees

We would all know about the fodder value of some native trees such as the Kurrajong, so I will not dwell on them, but lately tree lucerne, and some other exotics have been hailed as wonder plants. However, although they may be of some value, with present evidence it is highly unlikely that they can replace legumes and grasses as a major or economic source of fodder.

I would suggest that wide ranging advice be sought before proceeding with any large scale fodder tree planting.

CONCLUSION

To quote Bird (1984) "Putting the tree back into the rural landscape is regarded as an essential pre-requisite for maintaining long-term environmental stability and sustainable agriculture. From 5-10% of the farm could be devoted solely to trees with no impairment to agricultural productivity. In fact, productivity could be much improved".

Bird, Lynch and Obst (1984) have suggested that, "Farmers and scientists in Australia are generally ignorant of the effects, uses and benefits of

trees in agriculture." We have a lot of information now, we all have the need to learn a lot more, and I hope this presentation has kindled some interest in this important facet of agriculture.

REFERENCES

Bird, P. R. (1984) Effects of trees on agricultural productivity. In Focus on Farm Trees II ed. J. A. Hofler, pp13-29.

Bird, P. R., Lynch, J. J. and Obst, J. M. (1984). Effect of shelter on plant and animal production Proc. Aust. Soc. Animal Prod. 15:270.

Black and Bottomly, (1980). Australian J. Expt. Agric. Anim. Husb. 20, 654.

Lynch and Donnelly, (1980) Aust. J. Agric. Res. 31, 967.

Obst and Ellis, (1977) Agr. Rec. 4, 44.

APPENDIX

4 P's of Tree Management

1. Planning

Overall Farm Planning

Utilize existing Resources -

Regeneration Potential
Existing Fences
Stock Routes/Timber Resources

Site Priority Selection

Fencing Needs

Costs - Fences
- Labour
- Trees

Special Selection:

Native - Will they Survive?
Exotic - Weed Potential

(Hawthorn, Privet, Silver Poplar, Elm)

Source of Supply of Trees/Seeds.

2. Preparation

Ripping
Fencing
Slash Grass
Grazing Down
Herbicide - Toxic Effects?
Residual Effects?
Other Grass Control

3. Planting

Method - Hand
- Machine
- Direct Seeding Methods

Tubed/Potted
Open Rooted
Timing
Water at Planting?

Mulching - Straw, Grass, Hay.
- Newspaper
- Wood Chips, Sawdust
- Hessian
- Commercial Mulch Mats

Protection - Guards for Hares/Rabbit
- Grow Tubes
- Tyres

4. Post Planting

Fertilizer
Weed Control - No. 1 Priority - Herbicide Toxicity?
Water?

FURTHER REFERENCES

Focus on Farm Trees (1984 Conference Proceedings - Armidale)

Trees for the Back Paddock (Nan Oats and Brian Clarke-1987-Goddard & Dodson)

Trees - Why We Need Them Countrywide (A.B.C. 1986 - Nina Riemer Editor)

Think Trees, Grow Trees (Aust. Govt. Publishing Service - Canberra 1985)