PADDOCK DESIGN

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SUMMARY

Fencing based upon amalgamated and subdivisions 'basic mob demarcation' and rabbit control has historically created the design of paddocks inherited by the current generation of landholders and these paddocks could be quite inappropriate for good livestock management.

Fencing paddocks into certain configurations can influence both the joining and lambing performance of mobs of sheep. Graziers should be aware of ram/ewe contact factors when selecting suitable paddocks for joining or when creating additional paddocks by subdivision fencing. The main design factor for lambing paddocks is that shelter should be provided where sheep are forced to use it. Sheep have the natural ability to pick differences in altitude down to 1 metre. Sheep prefer to camp on the highest, driest location in the paddock generally facing north-east. Fencing can be erected to modify paddock shape/design to prevent ewes camping and lambing in exposed locations thus putting their lambs at risk of death from windchill.

INTRODUCTION

Paddock design is linked to historic land subdivision based on portions of 1 square mile (640 ac) and parts thereof down to 40 ac (16 ha) (K. Brown pers comm). The initial land grant in a parish was designated portion 1 which was set out on a NSEW basis. The next portion 2 could be some distance away taken on a bearing from a corner of portion 1. This process continued until some irregular shaped areas remained which were given the final portion numbers (K. Brown *Pers. comm*).

Once land comprising one or more portions was purchased, a homestead site was usually located next to permanent water or a dam site. Small paddocks close to the homestead for house cows, ration sheep and horses were the first fenced (Pearse 1965) and would double as woolshed holding paddocks.
Further subdivision of paddocks around watering points occurred with 3 paddocks being recommended for 4000 acres (Pearse 1965) presumably one each for breeding ewes, wethers and weaners. In Tableland areas subdivision of wether paddocks (generally poorer, steeper country) from country carrying better quality native grasses suitable for breeding stock took place.
Conveniently sized areas were later fenced off with netting as part of rabbit control programs.

This fencing for basic mob demarcation and rabbit control superimposed upon amalgamated land subdivisions has created the design of paddocks inherited by the current generation of landholders.

PADDOCK DESIGN

Fencing paddocks into certain configurations can influence both the joining and lambing performance of mobs of sheep.

Joining paddocks

Fowler (1972) proposed that paddock characteristics had major implications in selecting the number of rams to use at mating, as the determination of ram numbers was dependent on four factors:

- Paddock size
- Topography
- Nutrition
- Vegetation
- Water

The ideal paddock is round saucer shaped with one watering point in the middle surrounded by a ring of tall trees and would have a belt of timber large enough to provide shade for the entire mob. The feed should be green and about 7-8 cm high (Fowler 1972). If such a paddock is used for a mob of 500 ewes, 6 rams (1% +1) are required.

When paddocks deviate from this ideal an extra ram should be added for each factor that makes the paddock worse. For example, in a big hilly paddock with poor feed and a mob of 500 ewes; 6 + 1 (hill) + 1 (size) + 1 (nutrition), total 9 rams would be required.

Graziers should be aware of ram/ewe contact factors when selecting suitable paddocks for joining or when creating additional paddocks by subdivision fencing. When soil conservation programs are put in place, in some cases it is recommended that gullies be fenced out and re afforested. Such intrusions into the body of the paddock could cause sub flocking particularly if additional watering points are involved as a consequence of the overall program. Such paddocks can detract from ram/ewe contact (Nicholls *et al* 1976) with financial losses for the producer.

The creation or use of poorly designed joining paddocks can cost the landholder $800 pa for 400 ewes.

The reason is instead of 1% +1 (5 rams) being joined to 400 ewes, 8 rams (2%) are used subconsciously covering bad ram/ewe contact factors.

Consider the following example. An 80 hectare paddock (200 acres) was stocked with 400 ewes at joining time.

This paddock had 2 watering points and a ridgeline down the centre.

The paddock could be allocated 8 rams: 2% or 1% + 1 (5) + 1 (size) + 1 (extra water) + 1 (hilly) = total 8. If the paddock was subdivided in half and 2 mobs of 200 placed in the same area, 6 rams (1% + 1) could be used.

The financial considerations of such a strategy follow:

Woolgrowers need to consider wethers or not investment in extra fencing returns sufficient benefits to compete with alternative relevant investments.

The timehorison for the investment is the expected lifetime of the fence, which in this example is set to 20 years. The cost of supply and erection of an 800 m ringlock fence is set to be $2080. After 12 years the fence needs maintenance worth $500. the total present value of the costs of the fence is calculated by adding the present value of the $500 paid in year 12 to the initial investment of $2080.

In this example a real discount rate of 8% is used. This rate is based on a nominal interest rate of 16% less an inflation rate of 8%. Thus, the present value of the costs of the investment is:

$$PVC = 2080 + 500/(1+0.08)^{12} = 2080 \quad 199 = \$2279.$$

The investment gives rise to benefits in terms of reduced expenditures on ram purchases. All other things being equal the extra fencing brings about an annual saving equal to the purchase of two rams. The price of rams is set to be $400 per head. The present value of the benefits of the investment can be calculated as the present value of an annuity of $800 over the lifetime of the investment, i.e. 20 years:

$$PVB = 800((1+0.08)^{20} - 1/(0.08(1+0.08)^{20})) = 800*9.8181 = \$7854.$$

The net present value of the investment is the present value of the benefits less the present value of the costs:

$$NPV = PVB - PVC = 7854 - 2279 = \$5575.$$

This is equal to a net annual saving of $568 for 20 years or an internal rate of return of about 39%.

If the flock structure requires that 6 or 8 new rams are purchased every fourth year only for the with and the without fence paddock design respectively then the present value of the benefits will equal $2372, or an internal rate of return of about 9%, all other things being equal.

We can convert this saving into a return per $1000 of livestock capital invested for a medium wool flock, as follows:

Gross margin of medium wool flock of 1000 ewes $34.28/head

Capital invested in livestock including rams at 2% 25.50/head

Capital invested in livestock including rams at 1% + 1 23.46/head

Improvement in return per $1000 livestock capital

((1000/23.46 - 1000/25.50)*34.28/1000)*100% = 11.7%.

From these calculations for a hypothetical flock it can be seen that the use of joining paddocks requiring higher percentages of rams is reducing profitability even assuming no change in lambing percentage. Agencies and individuals involved in farm planning should therefore take note of ram/ewe contact factors if proposing changes in fence lines or when creating a new paddock.

Lambing paddocks

Whereas with joining paddocks wind can have beneficial consequences by keeping the mob together (Fowler 1972) the exact opposite applies to lambing paddocks. Wind (with or without rain) has been the main killer of lambs and Obst & Ellis (1977) observed that with wind speeds of more than 8 kph and rain upto 5 mm per day significant lambs losses occurred.

In a given locality wind from certain directions is more frequent and of higher speed and this fact should be taken into account when locating lambing paddocks and building windbreaks. The physical characteristics (aspect, slope, sward, height, topography) of a paddock can affect the chill index and value of a paddock for lambing (Holst and Marchant 1989).

For example the windspeed on the lee side of a hill is 60% of that on the windward slope; soil temperature of a northerly aspect can be up to 40% greater than that on an adjacent southerly slope with obvious affects on pasture growth.

Attention given to nutrition in late pregnancy and during lactation is of major importance and the selection and design of lambing paddocks to reduce windspeed at lamb height should also take account of the fact that many ewe mobs are placed in lambing paddocks for 6-10 weeks. Other factors to be considered when designing special lambing paddocks are:

- Minimising accidental lamb loss
- Minimising primary predation
- Minimising social stress
- Minimising disease risk
- Minimising lamb losses through mismothering in gullies or drowning in contour ditches.

Social stress is affected by stocking rate leading to mismothering and is affected by paddock/mobsize interaction. The maximum mob sizes recommended are:

Twin bearing mature ewes 100

Single bearing mature ewes 400 - 500

Single bearing maiden ewes 350 - 400

The main design factor for lambing paddocks which has been identified by several workers studying lamb survival and shelter is that shelter should be provided where the sheep are forced to use it (Obst & Ellis 1977), as sheep were less inclined to use shelter as paddock size increased (Lynch & Alexander 1980). Observations on the camping behaviour of sheep (Taylor, *et al.* 1984) have given a lead as to how the sheep can be persuaded to use shelter. They found that sheep have natural ability to pick differences in altitude down to 1 metre. Sheep prefer to camp on the highest, driest location in the paddock, generally facing north-east. Thus, if fencing can be erected to modify paddock shape/design ewes can be prevented from camping and lambing in exposed locations putting their lambs at risk of death from windchill.

Fences can be erected to steer ewes from camping on exposed high locations to camping on high sheltered locations. Where this has been done lambmarking percentage improvement (without the use of twin scanning) has been from 9% - 20%.

For example, in a case at Roslyn in 1989, Rabjohns (*pers comm*) subdivided a paddock using electric fencing so that ewes could not camp on a high exposed ridgeline. A mob of 600 woolly Merino ewes joined to Border Leicester rams was divided with one half put into this paddock and the other half put into a "normal" unsheltered paddock which had not been re-fenced. The mob in the "engineered" paddock had a lamb marking of 107%; in the normal paddock it was 87%.

Computer modelling has shown that re-design of lambing paddock investing $2080 in new fencing with interest at 19%; a 25% taxation rate and medium wool ewes returning a gross margin $41.34 per head, for a 10% increase in lambmarking percentage; a positive cash flow can be achieved within 3 years (fence alone) or 6 years if $1500 is spent on an additional dam in the second paddock. However, the engineering of totally exposed paddocks to include windbreak plantings to shelter a campsite on the highest point in the paddock takes many years before a positive cashflow is achieved.

The use of windbreak plantings to shelter off shears sheep in bad weather has been shown to have considerable benefit in whole farm planning if the risk of losing sheep is greater than 0.5% per annum. Computer modelling has shown if 5% of the farm is devoted to a shelter network the financial profitability of the farm will be increased in the long term (Bird pers comm). As well increases in land value related to the aesthetics of tree planting cannot be ignored.

CONCLUSION

Better paddock design or selection on many tableland properties has the potential to reduce expenditure on the ram flock by allowing a lower percentage of rams to ewes. On properties with an undulating topography rapid improvement in gross margin through better lambmarking percentage can be achieved by designing lambing paddocks to take account of sheep camping behaviour and to ensure they select a sheltered camp site in which to lamb.

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