Farm Optimisation Group

Analysis of Optimal Pasture Area

2023

Problem description

The aim of this analysis is to examine the economics of reducing pasture area in response to the recent downward price trends.

Current management	
Stocking rate	13 DSE/WgHa
Pasture area	636 ha
Genotype	Medium wool Merinos
Number of ewes	4000 plus ewe lambs
Oldest ewe age group	5 years
Proportion of ewe lambs mated	50%
Sale of drys	Yes, after scanning
Wether sale age	10-12 months
Time of lambing	15th August

Method

The process of making optimal livestock decisions is complex and multifaceted. To facilitate this analysis we employed Farm Optimiser, an advanced whole-farm optimisation model. Farm Optimiser is designed to encapsulate both the economic and biological intricacies of a farming system. It encompasses modules for rotations, crops, pastures, sheep, crop residues, supplementary feeding, machinery, labour, and financial considerations.

Farm Optimiser proved to be a suitable tool for the analysis due to its precise representation of the entire year's feed supply and demand on the farm, along with a comprehensive depiction of the cropping enterprise.

For a more comprehensive understanding of the model, please refer to the model's documentation available at Model Documentation.

In preparation for this analysis, Farm Optimiser was calibrated with on-farm data, as outlined in the calibration document. This calibration process was undertaken to ensure that the model provides customised and highly accurate results.

The current farm plan, which served as our base case, comprised 636 hectares of pasture and a livestock population of 4000 ewes, plus ewe lambs. Wethers were sold at 8-10 months of age. The stocking rate in this base scenario amounted to 12.9 Dry Sheep Equivalent (DSE) per winter grazed hectare grazed (WgHa). To assess the economic consequences of altering pasture area, we conducted several sensitivity analyses involving adjustments to pasture area and prices.

Price

The prices utilised in this analysis were derived from a dataset spanning the past decade, incorporating historical price fluctuations. Over this period, a cyclical upturn in meat prices was observed, which has recently transitioned into a downward trend within the last 12 months, as illustrated in Figure 1

To illustrate how the price outlook can influence the optimal farm scenario, a +/-25% price sensitivity was incorporated:

1. Low – Lamb prices at $4.5/kg DW and 21-micron fleece prices at 1053 c/kg clean.
2. Medium – Lamb prices at $6.0/kg DW and 21-micron fleece prices 1404 c/kg clean.
3. High – Lamb prices at $7.5/kg DW and 21-micron fleece prices at 1755 c/kg clean.

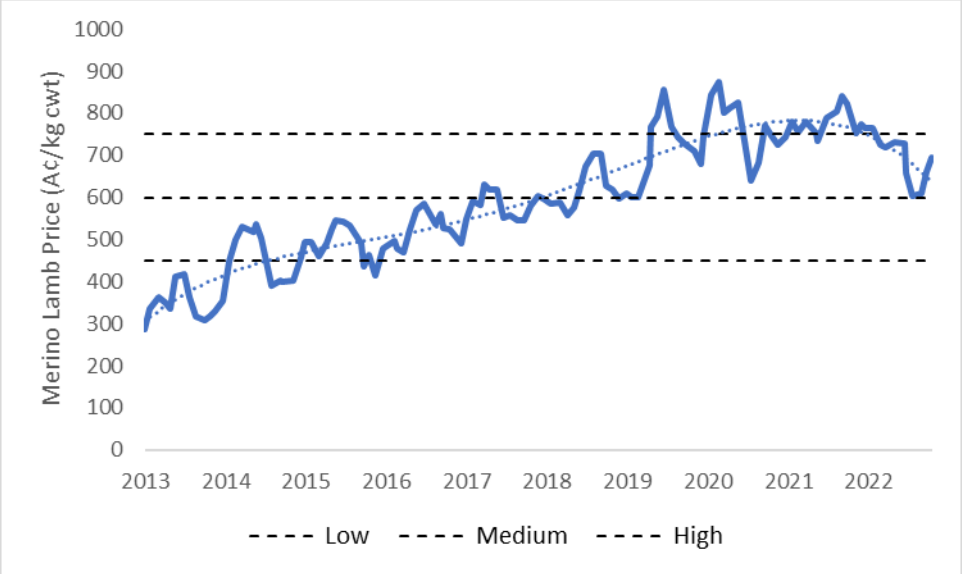

Figure 1: Ten-year historical merino lamb prices for NSW.

Results: Selecting the optimal area of pasture for a given price outlook

One of the pivotal determinants influencing pasture allocation is the relative profitability between the stock and cropping enterprises. This decision is contingent on a complex interplay of factors, including the topographical features of paddocks, soil composition, prevailing weather conditions, commodity price dynamics, and the managerial competencies and practices of the farming operation, including the crucial aspect of stocking rates.

However, arriving at the optimal pasture area is a multifaceted undertaking that transcends the simple identification of the most profitable enterprise for each paddock. This complexity arises from various considerations, such as the ability to supplementary feed to reduce the need for pasture, constraints imposed by labour and machinery resources, and the synergy between the cropping and livestock enterprises. This synergy encompasses elements such as rotation effects (e.g., pest control), crop grazing, stubble utilisation, as well as the efficiency gains achieved through labour and machinery coordination.

The presented results in part A of this report comprehensively account for all these factors to provide tailored and informed guidance for decision-makers.

The determination of the optimal pasture area within your system is linked to the relative profitability of the livestock enterprise. Consequently, when making decisions regarding pasture allocation in your system, it is imperative to take into account the price outlook. To facilitate this process, we have developed tailored pasture percentage curves for your system, spanning three distinct price levels (for an explanation of these price scenarios, please refer to the methods section).

The 'high' price outlook aligns closely with the prices observed over the past four years. During that period, your pasture area has averaged around 440 ha, which is approximately 60 ha lower than the optimum identified in the positive price scenario. However, given that your pasture area has been within the range of +/-10% of the optimum, the foregone profit is relatively minimal amounting to less than $10,000 per year, as illustrated in Figure 2.

Over the last 12 months, prices have retraced towards the 'medium' price outlook, prompting a slight (80-100 ha) reduction in the optimal pasture area. In this revised context and with your increase in pasture allocation in 2023, the current pasture allocation exceeds the identified optimum by approximately 200 ha and results in $36,000 foregone profit.

Under all circumstances, it's important to recognise that pasture plays a vital role in generating profit for your farm business. This is because 17% of your land is non-arable, and an additional 15% has acidic soil conditions that are less favourable for cropping. However, based on your current farming practices, it is not economically advantageous to exceed a 550 ha pasture allocation. This is because the reduction in stubble and crop grazing availability results in an exponentially larger requirement for supplementary feed (Figure 3). Furthermore, pasture starts taking up the better sandy loam soils and labour synergies begin to reduce.

The shape of these curves reflect your specific farm conditions. However, it's important to note that through management changes, such as conserving fodder, adjusting machinery utilisation, modifying flock structure, or genetics, it is possible to alter the characteristics of these curves.

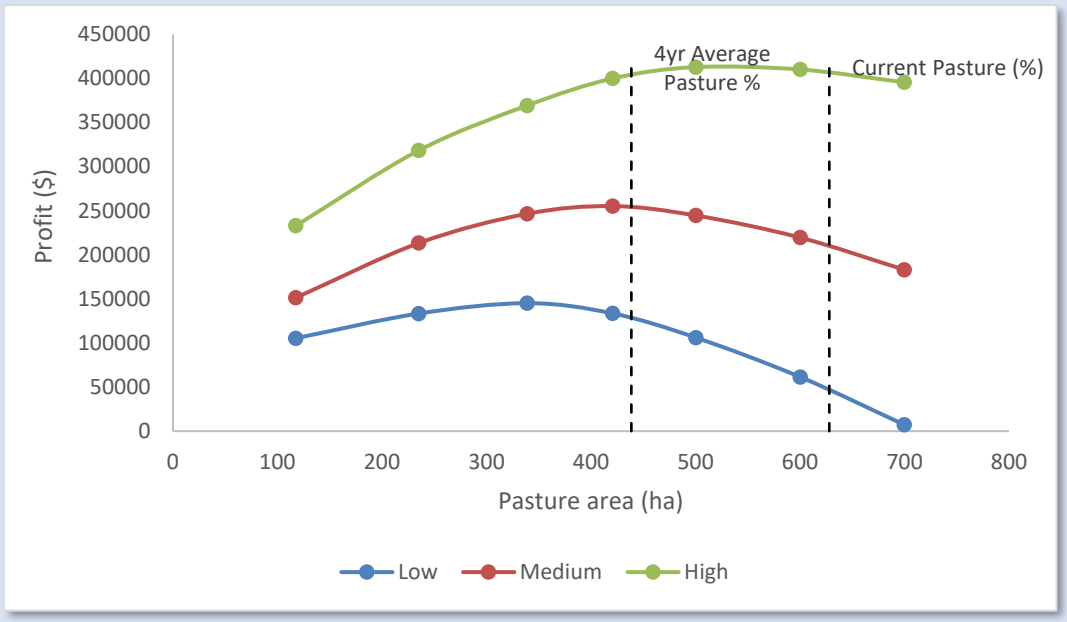

Figure 2: Farm profit at different allocations of pasture and crop for low, medium and high price outlooks (stocking rate is optimised for each point).

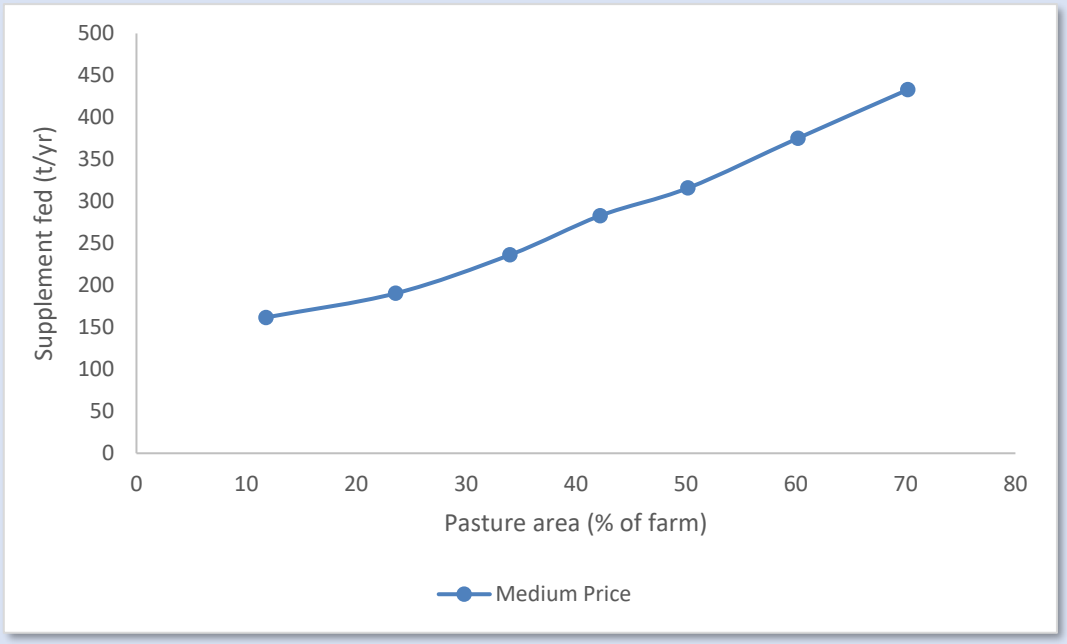

Figure 3: Supplementary feed required at different allocations of pasture and crop for low, medium and high stocking rates.