EverFarm: Piloting a strategic decision making process to improve grazing farm systems.

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Abstract

A pilot of the EverFarm process was undertaken in early 2011 to test the application of EverGraze principles on a case farm at Holbrook in southern NSW. Geographically relevant, strategic options to improve the farms grazing system were derived from facilitated discussions involving an expert panel of farmers, agricultural professionals and the case farmer. The panel met three times. The first time the panel met they heard the goals of the case farmer before inspecting the case farm. Using a structured process based on EverGraze principles, they identified constraints of the case farms phalaris based system and then prioritised strategic options for further investigation using a SWOT analysis. The second time the panel met they discussed the potential impacts on labour, operator stress, capital, risk, NRM and lifestyle, before setting parameters for modelling. The key strategic options for the case farm included increasing the area of lucerne, shifting the time of lambing and investigating alternate feed sources. Before the third meeting modelling was conducted to test the long-term productivity and profitability of these options. At the third meeting, the panel found that increasing stocking rate, sowing 26% of the farm area to lucerne, and an earlier lambing was likely to increase profitability on this case farm and minimise supplementary feeding when compared to the planned 100% phalaris system. The non-monetary impact of these options was considered to be minor, though further improvements to the modelling would be needed to build confidence in these outcomes. Analysis of system impacts of alternate feed sources was also limited due to modelling constraints. Ongoing feedback from the panel highlighted the advantages of developing rich environments for higher order systems discussions, and suggested improvements to the EverFarm process.

Key Words

Grazing systems, modelling, EverGraze, EverFarm, pilot, case study

Introduction

A trend toward larger national projects has emerged as Australian agricultural RD & E funds contract, and expectations for greater outputs from funding increase. Many projects now aim to address “whole of system” issues from central locations across the country (e.g. Friend et al. 2007, Price, 2009). Greater expectations for transparency, accountability and collaboration by research institutions and also reporting of extension activities (Australian Government 2012) now means projects need to have demonstrated adoptability and connectedness to farming systems. However, the geographic specificity of issues in agriculture, and the unique nature of individual farms add complexity to on-ground adoption. New approaches for embedding component research outcomes in farming systems for both the improved delivery of extension (MLA, 2011) and as a tool for directing future research are needed. The EverFarm process was designed to meet this need.

The EverFarm pilot was conducted at Holbrook NSW from January to June 2011. The aim was twofold:

1. to determine the long-term impact of strategic decisions with respect to livestock, pasture-base and management (based on EverGraze principles www.evergraze.com.au) on the profitability and NRM outcomes of a real commercial grazing farm; and
2. to develop a process to look at ways to make strategic changes on grazing properties.

Methods

The method employed in this pilot was based upon a Malcolm et al. (2012) process used in Victorian dairy production systems. The 396 Ha pilot case farm was a relatively simple heavy prime lamb grazing property, with flat topography, two soil types and an average rainfall of 604 mm. The pastures were mostly underutilised phalaris pastures of moderate to low legume content. The stocking rate was relatively low (~ 5 ewes/Ha) with stock numbers building. Lambing begins on the 10th July with an expected rate of 130%.

An expert panel of ten farmers, extension officers and scientists, from the region participated in three facilitated workshops over a four months. The activities conducted during these workshops are outlined in Table 1. Existing data on the case farm's productivity, profitability, environment and the owner's aspirations were assembled and provided to the expert panel at the beginning of workshop 1. The case farmer provided his ideas to improve farm profitability, including a preference to join ewe lambs at 7 months. Half a day was spent inspecting the farm facilities and pastures and gathering further detail from the case farmer. After each workshop participants were asked to evaluate the outcomes of the workshop and the process overall. The case farmer participated in all of the activities apart from the SWOT analysis at the end of workshop 1.

Table 1 Summary of EverFarm activities conducted at each of the three meetings

Workshop	Activity
1	Farm visit, overview of the farm (enterprises, stocking rate and number, fertiliser use, markets, current management timetable), discussion of farm plan (paddocks, topography, soils, pastures) and SWOT analysis of the case farm (pastures, infrastructure, grazing management, soils), risk management (drought strategy, environmental issues, water supply, pests and disease risk) and livestock enterprise (production, management, animal health and reproduction).
2	Compare the expert panels' case farm analysis with the case farmer's analysis conducted prior to workshop 1. Identify and prioritise current problems, causes and solutions for the case farm (Table 2). Discuss how these changes might work. Consider likely impacts of proposed changes on non-monetary factors e.g. labour, operator stress, capital required, NRM, lifestyle, case farmer abilities and preferences.
3	Present modelling results back to the expert panel. Review alternative scenarios for the case farm based on modelling results and modify as required. Identify knowledge gaps. Conduct an open de-brief session on what the process has delivered, potential uses, strengths, weaknesses and improvements.

Between workshops 2 and 3, biophysical and economic modelling was undertaken to assist with the expert panels' assessment of the preferred options based on the problems and causes identified (Table 2). The outcomes from the modelling were then presented back to the group at workshop 3 for discussion.

Modelling

The decision support tool *GrassGro* was used to evaluate the grazing options. *GrassGro* parameters were matched to the case farm, using local soil descriptions, topography, joining dates and with thanks to case farmers' excellent pasture and stock records. For each analysis, best practice supplementary feed thresholds were set at pasture biomass > 800 kg dry matter/ha, ewe condition score >2. Economic modelling was then carried out using outputs from *GrassGro*. This spreadsheet-based model provided a simple process for running sensitivity analyses between changes in stock sales prices, sale weights and sale numbers in relation to changing pasture types and farm variable costs. This process was accepted as a flexible, more easily interpreted method of analysing economic output than pre-generated *GrassGro* outputs. Dollar values were provided by the farmer, market and local research data. The *CATPlus* model (Catchment Assessment Tool) modelled the water balance within the farm and the wider catchment.

Results

The analyses proposed by the expert panel met the case farmer's expectations for improving farm production and profitability. Proposed strategic changes (Table 2) also matched the case farmer's farming style and aspirations for the farm. The property is relatively small, increasing stocking rates would improve profits and improve the stock:labour ratio. To successfully join maiden ewes at 7 months would require increasing weight gains to ensure joining weights of approximately 45 kg. Nutrition in autumn/winter and again in summer would need to improve for this to occur.

The expert panel identified three pasture options to be modelled (Table 2); i) 100% phalaris, ii): 82% phalaris:18% lucerne, iii) 74% phalaris: 26% lucerne. Lucerne percentages were based on the area of the farm suitable for lucerne according to soil type (26%) and the area within the paddocks that the farmer felt comfortable sowing to lucerne (18%). Increasing the legume content to improve production of current phalaris pastures was viewed as a logical first step and was therefore not considered one of the proposed alternate strategies. All phalaris pastures were therefore modelled in this high production phalaris-sub clover state. All three systems were modelled comparing low, average and high rainfall years (deciles 1, 5 & 9) and variable lamb prices. To explore the capacity of this system to handle higher stock numbers, rates of 5, 7 and 9 ewes/ha were also modelled. A split-joining system could not be modelled in *GrassGro*, so to aid discussion an earlier lambing date (20th July) was compared to the current lambing date of 25th August.

Table 2 Current problems, causes and solutions for the case farm listed in order of priority

Problem	Cause	Solution
Weaning weights in Autumn were low affecting reproductive efficiency in maiden ewes and sale weights in wethers	Associated mostly with the autumn/winter feed supply	Improve forage mix. Options include increasing % lucerne, incorporating brassicas, grazing cereals or ryegrass during pasture improvement. Explore changes in time of lambing including later lambing and split joining
Will the system improve or maintain weaner weights at higher stocking rates?	Increased demand on pastures overall and greater fluctuation during lambing season	Explore the above solutions for maternal ewe system stocked to 5, 7 and 9 ewes/ha
Exposure to price and drought risk	Small farm of simple enterprise structure and pasture combination may have more risk exposure.	Explore the impact of decile 1 and 9 years and lamb prices on farm profitability for the above systems. Investigate marketing strategy of carrying lambs to store, finishing or heavy lamb categories (post modelling other scenarios)

Modelling outcomes

In all three options, *GrassGro* supplementary feeding thresholds reduced the variation in pasture growth, stocking rate, sheep weight and joining percentage and therefore were the main source of variation in the case farm's gross margin. The majority of supplementary feeding (mainly to the ewe flock) occurred between late February and early June in all systems.

(a) The impact of changing the pasture base by increasing lucerne area

Farm profitability was not significantly improved by the inclusion of lucerne at 18% of the farm area. However, when sown to 26% of the farm area, profitability increased (Table 3). Modelled supplementary feed costs substantially changed from $27/ha and $30/ha in the 100% phalaris and 18% lucerne scenarios to $13/ha in the 26% lucerne scenario. Lucerne caused a shift in the annual feed budget with a lessening of the feed supply gap in summer and a tightening of feed supply in late winter. Modelling indicated a critical area of lucerne on the property to provide production stock sufficient access to pasture in late summer, preventing the expense of excessive supplementary feeding. Minimal supplementary feeding was desirable due to the case farmer's preference for lot feeding (100% supplementary fed diet) when critical pasture thresholds were met. This was in agreement with Bathgate and Pannell (2002) who also found optimum profitability when lucerne was sown to 25% of the farm in temperate grazing systems. Penalties occur through the development of a winter feed gap when pasture area of winter active species is reduced further. Further, the current study also indicated that the 26% lucerne system needed to be operated at a higher stocking rate to ensure higher returns from the system. Adding more livestock to the 100% phalaris and 18% lucerne systems did not change farm returns overall as increased supplementary feeding offset increases in lamb income.

(b) The impact of low and high rainfall years

All pasture systems responded similarly to the low (decile 1), median (decile 5) and high (decile 9) rainfall years, although the 26% lucerne system still required the least supplementary feeding under all conditions. Lamb sale weights increased with increasing rainfall in all systems but particularly when lucerne was present due mostly to a longer window for the grazing of green feed,. Weather conditions in high rainfall years increased both lamb mortality and supplementary feeding costs which were partially offset by a 1.7 kg / head increase in average sale weights. Lamb numbers remained high in low rainfall years due partly to supplementary feeding and higher conception rates from the previous year which generally was not decile 1.

(c) The impact of an earlier lambing time

Lambing one month earlier in the 100% phalaris system had very little impact on farm returns (Table 3). More lambs were sold in the early lambing scenario but this was largely offset by higher supplementary feed costs. Table 3 indicates that an early lambing system may be beneficial in the 26% lucerne system and may therefore warrant the further investigation of a split joining. Provided the seasonality of joining is properly captured, more advanced modelling could uncover optimal joining proportions to maximise lamb numbers, enhance ewe lamb weights and minimise supplementary feeding.

Other impacts

Generally, the proposed strategic changes to the farm system were considered to have a minor impact on non- monetary factors such as NRM, lifestyle, risk, stress, labour and capital. Erosion and run-off rates on the case farm were negligible regardless of the modelled system. However, on the parts of the farm where lucerne was planted, a significant decrease in recharge was found changing from 94 mm/year under phalaris to 31 mm/year under lucerne. Consequently, as the area of lucerne increased, the property's mean annual recharge decreased.

Table 3 comparison of 100% phalaris and 26% lucerne systems at 9 ewes/ha in early and late lambing systems

Scenario	**100% phalaris 9 ewes/ha**		**26% lucerne 9 ewes/ha**	
Lambing time	**July**	**August**	**July**	**August**
Gross Margin: decile 5 year ($/ha)	$587	$596	$552	$570
Number of lambs sold annually	4081	3848	4062	3839
Suppl. Feed ($/ha)	$97	$71	$104	$82
Variable costs ($/ha)	$373	$312	$382	$336

It was evident that the property was well equipped, and the case farmer capable of managing the farm systems investigated. Further development of water security was noted for consideration under higher stocking rates. Given the size of the farm, the stock:labour ratio was low giving the case farmer a choice of gaining off-farm income, or maximising the system's profits and concentrating all his efforts on the case farm. The case farmer preferred the latter option, and displayed a willingness to manage this increased level of risk. It was found that the property could possibly sustain a stocking rate above 9 ewes/ha. The case farmer indicated that the main stress he wished to limit was feed shortages and the need to supplementary feed. The split joining system increased farm management complexity but would help even out the case farmer's workload across the year. The farmer's preference not to maximise lucerne area on the farm mostly stemmed from uncertainty that this pasture could meet his feed requirements. The pilot findings therefore will require further consideration by the manager.

Feedback on the process

Participants enjoyed the opportunity to discuss and validate modelling at the local farm systems level. The case farmer particularly liked the opportunity of hearing the expert panels' views of the case farms' system through fresh eyes and the use of objective information in structured decision making processes. Frustrations with the pilot centred around modelling capacity to simulate the systems of interest (notably the split-joining system and forage crops) and some facilitated exercises during the workshop program. Generally, it was felt that while the pilot was useful, the time could have been used more efficiently during workshops with the people that were involved, and needed to be done iteratively over a longer period.

Conclusions

Sowing 26% of the farm to lucerne and increasing stocking rates to 9 ewes/ha were strategic changes endorsed by the expert panel and shown by modeling to increase production and profitability. Shifting either partly (split joining) or wholly to an earlier lambing time may only result in marginal increases in profitability on this case farm. These strategic changes were favoured by the case farmer and had positive non-monetary impacts. Further improvements to the model output would increase his confidence for uptake.

Many useful strategic options were highlighted by the pilot EverFarm process. The use of an expert panel enabled proper validation of models and strategic options as well as highlighting knowledge gaps and model limitations. When conducted iteratively over a long period of time with comprehensive data for the case farm, the properly resourced EverFarm process is likely to be an effective tool for extension and research.

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