High and low production systems: the importance and cost of resources

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As changes in the cost of energy and emissions impact on business, so the cost, quality and efficient use of all inputs should be reassessed. In any system, as one input changes in quantity, quality or price, the system should adjust to make best use of the change.

The volume of bought-in feed is often driven more by the desire to produce specific volumes of product rather than by the most efficient use of the inputs. There has also been a natural tendency to overlook and neglect the importance of the 'free' resource (pasture) when the 'margin over feed costs' (MOFC) has shown impressive margins.

An earlier article touched on this method of valuing feeds. Suffice to say it is analogous to a silage contractor charging only the cost of fuel. As feed costs rise, the value of pasture should be better appreciated but there are some very important factors to recognize when planning to minimize costs by relying more on pasture.

The quality, quantity and relative costs of all resources are important when combining stock, feed and economics into a profitable system. As quality declines, stock intakes also decline and less production is possible. If those stock are bred to produce milk at the expense of body condition, higher quality feeds must be supplemented at an increasing cost to minimise excessive body condition loss. This in turn comes at an increasing cost.
So just where do the antagonistic demands that different production levels, feed costs and product prices balance out to provide an ideal integration?

The answer is obviously not an easy one. In fact the reality is that there is no one answer.

In order to illustrate this apparent confusion, a stepwise analysis of two different cow types and three different pastures has been completed. Depending on the time taken to examine the figures, the results can either be confusing or enlightening.

Pasture types:

- The very good pasture type has high ('High') quality of 11.8-12.4 megajoules of metabolisable energy per kg dry matter (MJME/kgDM). This is compared with a good average pasture ('Med')quality of 11.0 to 11.5 MJME/kgDM and a poorer pasture ('Poor') of 10.0-10.8 MJME/kgDM. These equate to different areas of New Zealand (Southland, Manawatu, Northland) but the medium and very good pastures are similar to many dairy pastures in England and Ireland.

- Two different cow types are then grazed on these pastures:
  500 kg mature weight cows producing 360 kg MS/ year (about 4500 litres) and 650 kg mature weight cows producing 500 kg MS/year (about 6500 litres).

- All prices and costs of supplements in the first part of Table 1 (Run 1-12) are current for New Zealand for 2008. These are then updated to better reflect the prospects for the 2009 year.

The Runs (13-16) reflect a likely lowered MS payment from NZ$7 (about 20 pence / litre) to $6.30/kgMS (about 18.6 pence per litre at NZ$2.70 per pound.).

Price increases for nitrogen (10%), fertiliser (45%) and maize silage as supplement (15%) for the Medium pasture have also been added and additional Runs completed.

It should be noted that although the pasture, cow size and cow production are fixed, the analysis method allows feeds and cow number to be fixed or varied (Optimised) to allocate all resources on a 'best economic return' basis. This allows feed purchase and substitution to occur along with variation in cow numbers when resource quality and value change and adds another dimension to the more normal 'least cost feed' calculations.

TABLE I

Run Type	Past. Type	No. of Cows	Farm Silage KgDM	Buy Silage KgDM	Conc. Buy KgDM	KgMS Total /year	$ Income	$ Exp.	$ surplus
1 Opt	High	308*	116 t	0	0	117856	854326	404774	449552
2 Fix	High	335*	74 t	143744	0	128301	930013	482510	447503
3 Opt	Med	278*	106 t	0	3792	106585	772543	372527	400016
4 Fix	Med	335*	18.4 t	312835	4565	128301	929965	540375	389590
5 Opt	Poor	279*	106 t	27962	60065	106872	774652	421467	353184
6 Fix	Poor	335*	16 t	332643	72108	128301	929965	591891	338073
7 Opt	High	306**	0	396148	877	151503	1106932	552554	554378
8 Fix	High	335**	0	604136	959	165607	1210000	672372	537639
9 Opt	Med	272**	0	320671	12083	134503	982554	489088	493466
10 Fix	Med	335**	0	761357	16160	162839	1195633	759876	435756
11 Opt	Poor	267**	0	308391	79465	132143	965319	522683	442636
12 Fix	Poor	335**	0	784684	99589	165607	1209785	812312	397473
	2009	**costs**	**prices**						
13 Fix	Med	335**	0	687573	58620	160554	1074382	854684	219698
14 Opt	Med	226**	88 t	0	11876	108314	724807	340374	384433
15 Fix	Med	335*	18 t	308500	7650	128301	840156	608834	231321
16 Opt	Med	275*	112 t	0	3750	105400	690211	367994	322217

Key

Table 1 compares different quality pastures grazed by 2 different cow types:
500 kg LW producing at medium levels of 360 kg MS/ mature cow (308 cows producing at 360 kgMS = 308*)
650 kg LW producing at higher levels of 500 kg MS/ mature cow (306**)

The cow number is either optimised to best suit resources and produce highest $surplus (Opt) or cow number fixed at 335 cows (Fix).

The $surplus is Income from milk, cull cows and excess calves less Expenses. These expenses include all farm-working expenses but do not include any finance costs, depreciation or reward for management.

Current exchange rate NZ$2.70 per pound or 0.37 pound per $NZ.

Table 1 summarises these combinations.

- As has been shown in previous articles there is little $ advantage in increasing cow number and production past a specific point (Opt vs. Fix rows).
- As the base resources decrease in quality, there is a need to allocate resources in a more informed manner rather than continuing with an existing system (Run Type 3 vs. 4; 5 vs. 6).
- As the quality of the base resource declines the need for higher quantities of better quality and more expensive feeds increases. This increases the cost vs. income ratio (1 vs. 6; 7 vs. 12).

This effect is clear where optimisation can be included and price dictates substitution of feeds or cow numbers. This effect is obscured when simple gross margins are used and where differences in resource between individual farms is ignored in an attempt to have all performing equally ('Benchmarking').

- Higher production per cow (in this example) always results in better $surplus (1 vs. 7; 3 vs. 9; 5 vs. 11) if feed resources of sufficient quality (and appropriate cost) are provided. This changes for runs 13-16 when costs are increased and output price reduced (Appendix 1)
- Simple systems that are almost self-contained (1, 3) will be least affected by increases in costs.
- An indication of whether systems are near optimal (in this example) are where costs as a percentage of income are less than 50% (1,3,7,9).
- The quality of the base resource is extremely important as even high producing cows cannot avoid an increased cost structure as resource quality declines (High vs. Med vs. Poor). This is due to the increasing quantity of better quality feed required and the increased costs to efficiently feed this.
- When 2009 prices are added (13-16) the relative advantages between cow type change.
- With no change to the existing system (Fix 335 cows) the high producing cows suffer a large decrease in $surplus of $216,000 (10 vs. 13) due to the committed use of supplement. (Note that in this case, the resource allocation model has substituted more concentrate and reduced maize

silage purchase due to the relative increase in the cost of maize silage compared to concentrate.)

- This change also alters the relative profitability between the higher and medium producing cows (13 vs. 15) with the medium producers now being better.
- If however, resource allocation is optimised, better cows still maintain a (reduced) margin (14 vs. 16).

SUMMARY

In this example, high production cows were more profitable over all pasture types provided feed quality, quantity and cost were managed.

Changes (reduction) in stock number will provide added advantages as base feed quality declines. There will be a need to analyse both numbers and production of stock if supplementary feed costs increase relative to product prices.

Analysis must be an ongoing process with emphasis on systems that allow substitution of resources as both input and output factors change.
These results should sound a warning to those who continue with established systems as circumstances change or are tempted to purchase marginal land at inflated prices at times of high product prices.

If product prices decline (and costs continue their inexorable rise) the slide from moderate profit to loss will be rapid and (almost) unavoidable.

Some formal risk analysis must be incorporated into any farm management planning.

APPENDIX 1: INPUT/OUTPUT FACTORS USED

All pastures grow 12,150 kg DM per ha. per year.
500 kg LW cow with 18% replacement rate; 2% losses; 9 years in herd. 360 kgMS/cow/year. Seasonal calving spring.
650 kg LW cow 25% replacement rate; 3% losses; 6 years in herd. 500 kgMS.

Maize silage 10.8 MJME/kgDM and 0.35c-2008 (and 0.41 -2009) /kgDM 85% utilisation and 0.07c/kgDM feedout cost.

Concentrates 13 MJME/kgDM and 0.55c 2008 and 2009. 85% utilisation and 0.07 c/kgDM feedout cost.

Nitrogen cost $2.18/kg Nitrogen 2008. $2.40/kg 2009. Application cost $12/ha.
Response rates 10 kgDM per kgN 1-50 kg/ha and 6:1 for 51-75 kgN /ha.

$7.00 per kg MS 2008 and $6.30 per kg MS 2009. Per cow costs (all farm working expenses but no depreciation, finance or reward for management) $950 for 2008 and $1100 for 2009.

Grazing off farm costs of $6; $10 and $18 per week for weaners; heifers and mature cows if required. The number grazed off will depend on economic viability in all 'Opt' optimisation runs.