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LIVESTOCK IMPROVEMENT CORPORATION LECTURE

Farm performance measurement – Linking monitoring to business strategy

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ABSTRACT

Farm monitoring and evaluation are elements within the control function of management. Control is directly linked to planning: through planning performance, targets are set and outcomes are measured and assessed relative to these. The use of formal monitoring by farmers has been lower than expected. To redress this, more emphasis is now being placed on tying farm performance measures (or indicators) to business strategy. The aim is to transparently connect day-to-day (operational) management to the goals of the manager/owner. This shift in the focus of farm monitoring and evaluation concentrates performance measurement around a limited number of factors that are critical to the successful execution of strategy. Data collection and analysis is therefore directly integrated with adding value to the farm business. It also facilitates the correct application of benchmarking to continually improve performance through farmer learning. The balanced scorecard provides a mechanism to integrate farm monitoring results with farm mission, strategy and target performance in a condensed and easy to read format. This should further encourage farmers to monitor and benchmark their production and management systems in order to gain feedback for evaluating decisions (learning) and help them to continually update their strategy to sustain high performance.

Key words: farm monitoring; performance measures; farm business strategy; balanced scorecard.

INTRODUCTION

Farm monitoring and evaluation is part of the control function of management. It provides information about the farm's current and future state, and has the aim of improving the quality of the manager's decision-making. In addition, monitoring is required to ensure compliance to legislation and industry quality standards. "Control" has received far less attention in the farm management literature than planning, despite the direct link between the two functions in achieving efficient management (Blackie 1971; Boehlje & Eidman 1984; Parker *et al.,* 1997). Recently however, more focus has been given to ensuring farm performance measures (or indicators) are tied to farm business strategy (Shadbolt 1997) through techniques such as economic value added (EVA; Kirton *et al.,* 1994) and the 'Balanced Scorecard' (Kaplan & Norton 1996). The aim of these new approaches to monitoring for performance is to transparently connect day-to-day (operational) management to the goals of the manager/owner. Thus, monitoring is not restricted to the current year's business plan.

The purpose of this paper is to: review farm monitoring in the context of management, discuss why adoption of formal monitoring by farmers appears to be low and suggest ways in which the collection and use of information on farms can be further improved. In doing so, three commonly held beliefs concerning farm monitoring are challenged: increased monitoring increases farming efficiency; improved physical productivity ratios correspond to economic efficiency and are therefore good indicators for management action; and average performance measures for one farm (or a group of farms) are a reliable guide for suggesting changes to another (see also Makeham & Malcolm 1994 (p.4); Ferris & Malcolm 1999).

THE MANAGEMENT CONTEXT FOR MONITORING

Monitoring should be viewed within the wider context of three functions of management: planning, implementation and control. The control function can be broken down to three parts: monitoring (measurement) the actual outcomes for plans as they are implemented; comparing actual and planned values; and correcting, if required, deviations from these either by modifying the original plan or formulating a new plan (Parker *et al.,* 1997). Control therefore requires a plan: plans without control are subject to the "whims" of the farm's environment rather than the directing influence of management (Boehlje & Eidman 1984). This is the basis of the adage "You cannot improve [manage] what you do not measure". Measurement is a communication medium that is more powerful than 'words'. It conveys a sense of what is important to achieve success and drives change in a farm's focus and activities. Evaluation, or review and learning, is viewed to be an integral part of control by most farm management writers (e.g. Barnard & Nix 1982), but others (e.g. Bradford & Johnson 1953) have distinguished learning because of its importance to the continuous improvement of a farm system.

Performance indicators, measurement techniques and sources of error are important elements of efficient monitoring and evaluation. The techniques for monitoring can be broadly classified as objective (using scales for liveweight or the current account balance for cashflow) or subjective (visual and intuitive assessment of pasture mass). Alternatively, they can be classed as being either formal (structured) or informal (hap-hazard accumulation of knowledge over time) (Blackie 1971). Typically, objective measures are univariate (e.g. mm of rainfall per day, pasture

height in cm) whereas subjective measures are usually a composite of several factors (e.g. frame size, body condition, coat colour and guesstimate of liveweight change for animal growth). Objective measures are repeatable, provide clarity to communication and can be calibrated against standards (which gives them portability), but these advantages may be offset by greater direct costs, more time and instrument failure compared to subjective assessment. Hence, many farmers prefer informal visual methods of monitoring (Gray & Lockhart 1996; Paine 1997). Furthermore, aspects of a farm business, such as social values and personal satisfaction, are usually best expressed and monitored in qualitative terms.

Errors may arise from three sources when monitoring for control: environmental (uncontrollable variables such as climate), sensor (or instrument) and imprecision in implementing plans (Athans, 1972). Improving instrument accuracy and measurement technique cannot eliminate the other sources of error. In this respect, Barioni *et al.,* (1997) showed that farmers would gain no economic advantage by improving the accuracy of pasture mass measurement to a coefficient of variation of less than 20%. Since pasture measurement tools already exceed this performance level, they argued research emphasis should now be placed on how to save farmer's time in taking and interpreting pasture measurements, rather than further improving instrument accuracy. Over-investment in enhancing the precision of other farm monitoring technology is likely - modelling approaches such as that of Barioni *et al.,* (1997) should be used to avoid this in the future.

FARM MONITORING IN PRACTICE

Despite heavy promotion by extension personnel and others, reported evidence suggests formal monitoring of production by New Zealand pastoral farmers remains relatively low. For example, in 1993 Parker *et al.,* established that 22% of dairy farmers prepared a feed budget, 35% estimated pasture growth rates (primarily by the difference method) and 90% visually assessed pastures (Table 1). While 10% said they "never" assessed pastures, 62% and 17% did so weekly and fortnightly, respectively, particularly during the spring (62 versus 35% in winter at weekly intervals). The same survey also revealed 29% of farmers did not condition score (CS) their cows (Table 2) and, perhaps even more surprisingly, that 17% used a 1 to 5 scale to do so even though it is not officially used in New Zealand. There were notable differences between regions in the CS method, suggesting variation in the information made available to farmers. Nuthall (1992) reported 59% of dairy farmers did not use formal feed budgeting. A 1998 survey of Manawatu dairy farmers (n=38) who attended discussion groups suggested that their ability to use monitoring data for feed budgeting had not improved in the interim. For example, 50% did not calculate the correct answer to a "simple" feed budget question using data routinely collected through herd and pasture monitoring (Stantiall 1998 *pers. comm*.). Lockhart's (1988) research indicated that financial monitoring by farmers is not strong either:

TABLE 1: Dairy farmer feed budgeting and pasture assessment methods (% responses) by region. Regional differences were not significant for any of the parameters. Figures in brackets are the number of responses. For pasture assessment methods respondents could tick more than one category. (Source: Parker *et al*., 1993).

Parameter	Northland	Waitoa	Sth Taranaki	West Coast	Southland	Overall
Prepare feed budget	28	25	23	21	15	22[a]
Pasture assessment method:						
Visual	92 (37)	92 (33)	87 (34)	85 (33)	95 (37)	90
Cow grazing days	45 (18)	61 (22)	56 (22)	54 (21)	46 (18)	52
Rising plate	13 (5)	14 (5)	3 (1)	3 (1)	13 (5)	9
Capacitance probe	3 (1)	6 (2)	3 (1)	8 (3)	0 (0)	4
Swardstick/ruler	3 (1)	6 (2)	5 (2)	3 (1)	3 (1)	3
Other	3 (1)	3 (1)	5 (2)	0 (0)	0 (0)	2
Estimate pasture growth rates	35 (14)	31 (11)	36 (14)	29 (11)	51 (20)	35

[a]n = 193 respondents.

TABLE 2: Seasonal frequency of cow condition scoring. (Source: Parker *et al*., 1993).

	Frequency of scoring (% of respondents)				
Season	Weekly	Two Weekly	Four Wkly	4+ Weeks	Never
Spring	26	15	13	8	37
Summer	14	7	22	15	42
Autumn	35	26	12	7	19
Winter	39	27	10	7	17
Annual	29	19	14	9	29

"Approximately 60% of farmers budget, and of these only a third update [monitor and control] this budget during the course of the financial year."

The situation with sheep and beef cattle farmers is less clear than for dairying, but the general perception is that formal monitoring of production is less common. Nuthall (1996), from a 1992 national survey, reported 71%, 76%, 80%, 82% of sheep, sheep/beef, deer and beef cattle farmers, respectively, never used formal feed budgeting. More difficult terrain, older farmers, larger farm size and a greater range of livestock classes are popularly cited as reasons for this (de Freitas *et al.,* 1993), but as discussed later (see Appreciating the farmer's world view) this explanation is simplistic.

During the 1990s monitoring has been strongly promoted through programmes such as the MRDC Monitor Farms (Rhodes & Aspin 1993). Also, farm monitoring has been a regular feature of Conference programmes for sheep and beef cattle farmers. For example, Lowe (1990) stressed the value of objective measurement and targets for lamb and beef production, Webby (1992) described farm monitoring methods and benefits, and Parker (1994) and Morris (1995) outlined how liveweight monitoring is integral to achieving heavyweight steer production and high lamb growth rates, respectively. In addition, monitoring groups have been established by farmers and/or their consultants specifically to improve productivity and profit (e.g. WaiTech in the Wairarapa (Baker *pers. comm*.), CF2000 in South Otago (Shaw 1999); and farmer monitoring groups in the upper North Island (Sheath *et al.,* 1999)). The national impact of these programmes on the monitoring behaviour of non-participating farmers has yet to be quantified. Nevertheless, the group's proponents and members are gener-

ally very enthusiastic about the benefits realised (e.g. Ussher *et al*., 1996; Sheath *et al*., 1999).

WHY THE SLOW ADOPTION OF FORMAL MONITORING?

The advocates for more formal monitoring point to increased economic returns on case farms where it has been introduced (but they rarely discuss this in terms of the net change in profit). Although more farmers may be monitoring now than at the beginning of the decade, they are still likely to be in the minority. Some reasons why farmers are reluctant or non-adopters of monitoring are outlined below. These point to ways that monitoring methods can be changed to better meet farmer needs, although in doing so the thoughts of Hardaker & Anderson (1981) on "why farm recording systems are doomed to failure" should not be overlooked.

Visual assessments have proven adequate for achieving production and financial goals

Visual assessment is faster, more convenient (than measuring instruments) and can provide acceptable accuracy when it is calibrated against a standard. Written records of routine visual assessments are usually not kept. Gray & Lockhart (1996) reported "expert" dairy farmers used informal monitoring systems during the summer to identify potential feed deficits because ... "they found it difficult to calibrate pasture height to kgDM/ha owing to high levels of dead (and dry matter) in the sward." Instead, with the cows on a rotation of 24-30 days over the summer, they could observe the shortest and longest paddock on the farm each day and verify this by a farm walk every 3-7 days. Gray & Lockhart (1996) commented "they appeared to pattern-match the state of a paddock against a mental picture based on experience to identify when the level of pasture cover had declined below [a] critical level." Similarly, cow condition was monitored routinely by observing the young and thinner cows when shifting the herd. The three farmers observed by Gray & Lockhart over four seasons had developed decision rules around milksolids production and visual observations as in Rule 2 below:

> If milksolids production falls below 1.1 MS/cow/day
> AND there is not silage surplus to autumn and winter requirement
> AND the herd is in good condition (>4.5)
> AND cull cows are identified
> AND the crop is still actively growing
> AND the crop is still of good quality
> THEN sell the cull cows and continue on a fixed round till the crop is ready to graze.

This heuristic shows that the farmers used a mix of formal and informal measures, and that these had been moderated by their experience with local conditions.

Formality discontinued once skills learned

In some situations farmers have progressed from regular formal recording to a system of monitoring through "integrated" visual assessment. Objective measures enable farmers to associate visual "cues" with livestock (or pasture) performance, but these measures become more difficult to justify as their discrepancy with visual estimates reduces. Formal monitoring builds a farmer's confidence in his/her informal measurement techniques.

Farmers have never learnt the skills required

The case that some farmers have never learnt the skills to formally collect and analyse information is also valid – Nuthall's (1992) survey indicated that younger, more highly educated farmers are more likely to use formal feed budgeting. More contentiously, Buggie (1977) argued that intellectual capacity constrained the allocative ability[1] of farmers and their ability to innovate: "... I suggest that there are many farmers whose intellectual capacity and other attributes are such that they are not going to significantly benefit from attempts to teach them decision-making/record-keeping procedures that are different to those they use now" (p. 55). The solution to this is to provide learning opportunities that are tailored to the learning styles and needs of the farmers concerned (Paine 1993), recognising that in some cases farmers are completely satisfied with their own informal methods.

Economic benefits of monitoring are unclear

Farmers are busy people and increasingly so as the size of their farm business grows. Time is a scarce resource and most is allocated to non-negotiable tasks (e.g. milking and feeding the herd), essential farm maintenance and support roles (purchasing inputs), urgent jobs (e.g. attending to a sick animal), general information gathering (Mendez-Lemus *et al.,* 1996) and personal (family) interests. Farm monitoring is perceived as a "non-urgent, important" task and without careful time management gets relegated to a "job to be done when there's some spare time." Almost one third of the farmers in Nuthall's (1992) survey indicated extra time and resources were the dominant constraints to them undertaking feed budgets. Most writers on farm monitoring do not explicitly provide a cost:benefit analysis of the opportunity cost of the farmer's time, or that of the equipment necessary for monitoring. In one of the few examples, de Freitas *et al.,* (1993), estimated the annual cost of feed budgeting using the indicator paddock technique to be about 15% of that for animal health on a bull beef farm. They suggested that this "is relatively low in comparison with the potential of the information to assist the farm manager minimise feed deficits and surpluses" (p. 96). In simple economic terms, the manager needs to know whether extra returns from improved farm production and environmental performance offset the additional costs incurred in formally collecting data to enhance decision-making (Hardaker & Anderson 1981). There is strong evidence that farmers will modify monitoring practice if there is clear economic benefit in doing so. Using somatic cell count (SCC) information when the economic penalty for high

[1] Huffman (1976) defined allocative ability as 'the human agent's ability to acquire, decode, and sort market and technical information efficiently'. Buggie (1977) equated this to "intelligence".

counts is increased, is an example (Paine 1997). While economic penalties can modify farmer behaviour they do not necessarily result in the optimum solution. Consequently, processing companies (and environmental management agencies) are increasingly choosing to work with their suppliers/producers to help them use monitoring information efficiently (Paine 1999 *pers. comm.*).

No clear link to farm business strategy or the farmer's goals

Farm monitoring generally has not been clearly related to the goals of the owner/manager. The "disconnect" between monitoring to assist day-to-day (operational) management and business strategy means farmers may have no clear idea how recording cow condition score, for example, contributes to goal attainment. Kirton *et al.,* (1994) discussed this issue in relation to the physical and financial monitoring of a dairy farm and proposed the use of value chains and economic value added (EVA) as a means to focus monitoring more directly on wealth generation. In the corporate world, Kaplan & Norton (1996) identified the same lack of linkage between performance monitoring and strategy as a major reason for the failure of businesses to successfully implement plans. They introduced the "Balanced Scorecard" as a mechanism to redress this (see later Section for a farming example). Parminter & Perkins' (1997) work on North Island farmer goals, values and motivational factors points to how measurement systems could be meaningfully integrated into business strategy. It would be difficult, for example, to achieve a high commitment to environmental monitoring amongst farmers who are strongly motivated by a goal set of "production, autonomy, capital and business", unless a positive contribution by the "environment" to their dominant aspirations can be proven.

In a similar vein, MacLean *et al.,* (1997) identified four distinct areas where dairy farmers are seeking information to improve their business – farm profitability, labour management, environmental sustainability and business management skills. Relatively little has been written on how farmers might meaningfully monitor the last three aspects of their business. Shadbolt *et al.,* (1997) argued indicators for environmental sustainability should be linked to farm financial performance or viability and suggested ways that this could be achieved. "Business management skills", using Kaplan & Norton's (1996) scorecard, could be incorporated as a performance measure within "Learning and Growth" (see Figure 2).

Inadequate data processing and interpretation support

In a survey of Wairapapa sheep and beef cattle farmers, Parker (1984) found that of those who did weigh their sheep (60%), most did not process the raw data to calculate the mean liveweight or have a liveweight plan against which actual measures could be compared. Furthermore, one third of the farmers only weighed their sheep once annually. Anecdotal evidence (Mulvaney 1999, *pers. comm*.) suggests that recorded data are still not processed by most farmers. Computerisation to automatically calculate sample statistics and graphically present these relative to planned targets should therefore be worthwhile (e.g. as with the Tru-Test weighing platform), but more importantly farmers need to learn that the expression of performance targets is a prerequisite to the effective use of monitoring data (Parker *et al.,* 1997). With respect to the latter, most dairy farmers still do not have a planned lactation curve with 10-day production targets; neither do most beef producers have a detailed liveweight profile for steer or bull growth (Parker 1994). It seems in this respect, little has been learnt since Mentz & Longworth (1976) commented:

"Perhaps extension personnel could contribute more to improving the managerial efficiency (decision-making capacity) of farmers by devising and explaining simple analytical procedures which will make better use of the records most farmers already maintain, than by trying to persuade farmers to record new and more detailed information" (p. 204).

APPRECIATING THE FARMER'S WORLD VIEW

Paine (1997, p. 141) identified that the highest ranked information priorities of dairy farmers were consistent amongst themselves, but not necessarily with those of non-farmers. Furthermore, farmers strongly emphasised the integrated nature of their information gathering and interpretation, as reflected by the following quote (p. 143):

"But in fact what the farmers came up with today, which really changed my views as a science person, was they are actually integrating all their observations. So they don't need to record condition score and pasture cover or whatever else because they have some umbrella index ... that they use as a guide to where their farm is ... Therefore we may be setting off down the wrong track to say you [farmers] should be measuring these individual things".

This highlights a critical issue: farm information systems have historically been "framed to norms of researchers and professionals and failed to appreciate the world of the farmer" (Paine 1997, p. 143). The failure to get widespread uptake of decision support systems (DSSs) is further evidence that researchers over-engineer and fail to "deconstruct" professional models designed to assist farmers with information management (Cox 1996). Cox claimed "the expectation that farmers could usefully exploit DSS technology to improve their own practice is seriously flawed", because they require considerable technical support to operate effectively, frequently require monitoring data which farmers find difficult to collate, and are based on an information platform (the computer) which few farmers currently use as a planning tool. The failure of researchers and consultants, to put themselves "in the shoes of the farmer" is an important factor in the non-adoption of monitoring (and other) technology. Hardaker & Anderson (1981) expressed this as: "Perhaps the greatest defect of farm recording systems ... has been the apparent failure of their

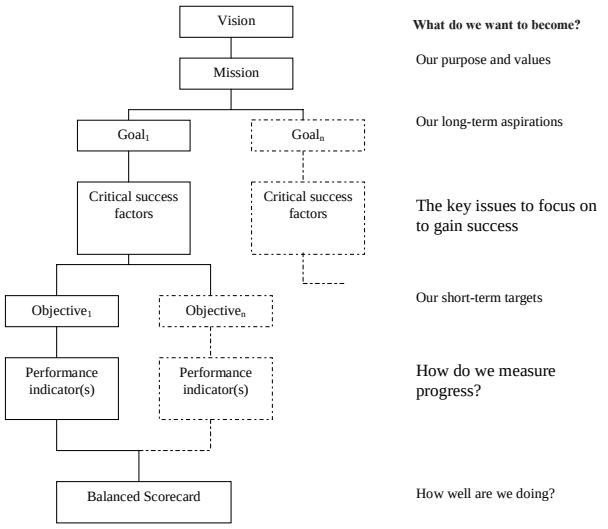
designers to understand the nature of farmers' decision-making processes" (p.201). Thus, farm monitoring and its promotion *per se* are not at fault; rather it is because the product does not address the needs of most farmers.

THE BALANCED SCORECARD

Kaplan & Norton (1996) developed the balanced scorecard to integrate strategy execution and performance measurement, and to facilitate organisational learning. The scorecard balances between short- and long-term measures and incorporates indicators for the strategically important non-financial dimensions of a business. Their scorecard comprises four broad areas: productivity and efficiency (internal processes), financial performance, customer and external perception, and learning and growth (this structure is illustrated for the farm business in Figure 2). Gubman (1996) simplified the scorecard to three dimensions: shareholder value, customer value and employee value. The exact format of the scorecard is dependent on the nature of the business, but it is critical that the links between vision, strategy and measurement are clear (Figure 1). Gubman (1996) suggested the scorecard might include five types of measures:

"Valuation – to assess the worth of what's measured
Navigation – to help set and stay on the course of business direction
Diagnosis – to determine what needs attention, what problems exist
Monitoring – to assess progress or performance against a standard
Accountability – evaluate whether commitments are met."

FIGURE 1: The linkage between performance indicators (monitoring and measurement) and vision for a farm business.



The key performance indicators (KPIs) in the scorecard may be an index of a more detailed set of measures on a particular aspect of the farm. For example, a corporate farm with a portfolio of enterprises might have a sheep productivity index based on wool, lamb and surplus stock sales in order to simplify reporting to senior management. Similarly, a dairy farm owner might 'stair-case' pasture cover and lactation records (used for operational management) to an overall summary measure "total MS production". Most farmers face data overload and mis-information. Having as few measures as possible (hence the term 'key' indicators) is a guiding principle in designing effective performance measurement systems: Kaplan & Norton (1996) suggested 15-25 for a scorecard. These should focus on the factors critical to a strategy's success (i.e. the focus of meas-

FIGURE 2: A balanced scorecard layout for a dairy farm.

Learning & Growth	Goal	99 FY Target	Actual
Business skill development (d/yr)	5	5	
Holidays (d/yr)	14	10	
Health & Safety (breaches)	0	0	
Computer-based IT systems	90%	30%	

Productivity & Efficiency	Goal	99 FY Target	Actual
Total MS production (kg)	95000	80000	
• Protein/cow/d (kg)	1.0	0.7	
• Lactation days	285	265	
Mid-point calving (days)	12	17	
Feed conversion			
• Pasture utilisation (%)	82	80	
• kg DM/kg MS	11	13	

Our Mission:
Financial success through the marketing of high quality milk and livestock.

Our Strategy:
Efficient MS production with existing herd by optimising days in milk and daily yield of protein (type *x*) and grow revenue-base by investing in dairy processing and marketing.

Our Values:
- Quality family time
- Recognition for accomplishment
- Life long learning and personal growth
- Building for the next generation

External Perception & Environment	Goal	99 FY Target	Actual
Milk quality (SCC, 000)	100	150	
Animal welfare	7[1]	6	
Nutrient balance (%)	0	-10	

[1] Seven point scale: 1=bad, 7=excellent

Financial			
Net farm income/cow ($)	700	500	
EVA ($)	110k	45k	
• Farm	65%	100%	
• Off-farm shares	30%	-	
Feed cost (c/MJME)	12	14	
FWE/GFI (%)	40	50	

urement is on strategy, not tactics, and on the 'cause and effect' relationships that are hypothesised to generate outstanding performance). Further, the measures should: comprise a mix of lagged, current and leading indicators; focus on the needs of the owners and/or other key stakeholders; and relate to specific targets derived from analysis and research (Brown 1996). Measures should be adjusted to reflect changes in strategy. The balance of lagged (historical) and leading (future and predictive) indicators is important: focussing solely on the past (e.g. accounts analysis, last year's lambing percent) could generate completely irrelevant information for management decision making (Blackie 1971; Kaplan & Norton 1996). Leading indicators for future sheep performance could, for example, revolve around the liveweight of replacement hoggets, the genetic merit of rams, pregnancy scanning results for hoggets/two tooths and the farmer learning new business techniques. In essence, these measures communicate 'today' information about a farm's performance 'tomorrow'. A notable recent advance in farming has been the provision of long-range weather forecasts. This "leading" information has been widely acted on by farmers (e.g. early sale of lambs). More effort to define leading indicators that are strongly associated with the primary drivers of farm business performance (e.g. as climate is to pasture production) are required.

BENCHMARKING

Benchmarking has replaced sustainability as the 'buzz' word in agricultural business. Unfortunately the concept, as evidenced by its claimed application in both Australian and New Zealand agriculture, is both widely misunderstood and abused. Almost without exception benchmarking is conducted and applied in the same manner as the use of comparative analysis and farm standards in the 1960s and 1970s. This means the real power of benchmarking to change farm business performance is not being utilised - in fact, as the Massey University agricultural economists Candler & Sargent (1962) pointed out in the early 1960s, the current use of benchmarking is very likely not to identify technical or economic efficiency at all. Consequently, changes in technology or practice may be in the wrong direction when they are based solely on a farm's values relative to standards (now often incorrectly termed benchmarks) (Makeham & Malcolm 1993; Ferris & Malcolm 1999 elaborate in detail on this topic).

Fundamentally, benchmarking is about understanding management processes and achieving organisational (or in the case of owner-operator farms individual) learning. The purpose of learning is to obtain continuous improvement in performance by transferring/adapting 'best practice' and in doing so, achieve efficiency gains more rapidly than otherwise would be the case. Farmers, instinctively "benchmark" in an informal manner by exchanging ideas and questioning each other why particular practices succeed when they meet. Benchmarking may occur internally (e.g. for a multi-farm business) or externally (O'Dell & Grayson 1998) and it may be conducted using both quantitative and qualitative data.

The three steps in benchmarking are to:

identify superior performance (at least top 5% either in a defined area of business or the overall business). These performance values can become the basis of target values for a scorecard;

define 'best practice' by investigating and understanding the management practice(s) (and associated technology) that gives rise to superior performance. It is important to appreciate that the term 'best' is situation specific and dynamic (O'Dell & Grayson 1998); and

adopt (and if necessary adapt) "best practice" to an individual farm business in order to better meet its performance goals (i.e., 'smarter' management, better use of technology). Due consideration should be given to the owner's/manager's personal aspirations and learning styles when preparing ways to achieve best practice uptake.

To date most 'benchmarking' reports on farm businesses have stopped at Step 1 (see for example, McCorkindale 1999). Furthermore this step is often completed poorly because the businesses in the comparison are not the industry leaders but the average for the local district. While a farmer may gain some satisfaction from being above the 'benchmark' average, or in the top quartile, this knowledge in itself will not stimulate continuous improvement or cause the farmer to set even more ambitious targets for the farm business. Further, if they are in the lower quartile, it is not necessarily correct for them to conclude they are less technically or economically efficient, than those ranked higher than them (Candler & Sargent 1962; Makeham & Malcolm 1993).

So where does this leave comparative analysis that has been so widely used in New Zealand farm production and financial analysis (Fitzharris 1982, Anon. 1998)? There is merit in comparing across-year performance within a farm, providing adjustments are made for between-year transfers (for example of feed or other production inputs) and the effect of one-off events (a major overhaul of the tractor) are recognised (Shadbolt 1997). Trends through time provide lagged evidence of the outcomes of management plans (i.e. how well did you do?), and can help the farm's management to achieve superior outcomes (i.e. what could be done better or differently?). However, just as lagged indicators may mis-lead management, so can reliance on a single indicator - to elaborate from Candler (1962):

" ... there are an infinite number of ratios that can be calculated, and there is no *a priori* way of telling which ratios are important and which unimportant. Most farm standards are of the output per unit of input type, though there is no reason why equal attention should not be given to the ratio of outputs .. or the ratio of inputs ... Certainly there are many situations ... where an improvement (or increase) in one ratio may involve a decline in the other...".

As noted earlier, between-farm comparisons are less valuable except where the comparison is deliberately against the "best" farm(s) as an overall business or a particular part of the business. The latter is important: one farm (or MacDonalds) may have exceptional labour management, but mid-level financial indicators. If the primary limitation (constraint to productivity and efficiency gains (Goldratt 1997)) to the case farm is labour management, a visit to the property and interviews with the owner and staff to identify the bases of their success, and to evaluate the suitability of their practices for the case farm, may stimulate far greater improvement in the business than reviewing the farm with the highest economic farm surplus (EFS). Also, the businesses against which the property is benchmarked may not be located in New Zealand or even be involved in farming.

In summary, benchmarking does have a lot to offer in relation to farm monitoring and performance management providing it is focussed on helping farmers to learn (see also Sheath *et al.,* 1999). If it continues to be confined to a reinvention of "comparative analysis" little will be gained.

SUMMARY AND CONCLUDING REMARKS

Limited empirical evidence suggests that formal monitoring is practiced by less than 50% of New Zealand farmers. This is despite significant and on-going investment in extension programmes to encourage its adoption. Attempts to redress this by providing new measurement tools have had some success (e.g. the Ellenbank Pasture Meter, liveweight scales) in increasing monitoring, but their use by farmer's tends to diminish over time as they learn to calibrate visual observations and outcomes with those derived from the equipment. Monitoring is most likely to be used where the variable being measured has a clear financial reward or penalty and where the measure is explicitly connected to goal attainment. New management techniques from manufacturing and service industries can help motivate farmers to select and focus on a limited set of measures associated with factors critical to the successful execution of their business strategy. Some popular measures (e.g. MS/ha/day or even average pasture cover) may not be relevant to realising the vision of some farmers. Non-traditional areas of the business such as the farmer's personal growth and development need to be monitored, since his/her knowledge and skills are often the barrier to change rather than a physical resource, and because these factors are usually the lead indicators of future performance. In some cases farmers do not need to monitor more, but to process and apply the data already collected more effectively and efficiently. The balanced scorecard provides an integrated framework for focusing and using monitoring information efficiently. Benchmarking can assist farmers by helping them learn 'why' and 'how' superior performance is achieved.

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