The stock unit system - fair treatment for the breeding cow?

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ABSTRACT

The stock unit (SU) system has been widely used in conjunction wi~h gross margin (GM) analysis to make recommendations to farm managers on the comparative profitability of pastoral livestock systems. This information can be misleading, particularly where beef breeding cow policies are being compared with finishing cattle policies that involve high rates of liveweight gain (e.g. bull beef production). To illustrate the deficiencies of the SU system for standardising between different livestock enterprises, relative gross margins per stock unit (RGM/SU) were derived for two case study farms in contrasting environments. One property was located in the Manawatu region (Tuapaka), the other at Port Waikato (Limestone Downs) in South Auckland. Using the breeding cow as a base (=100) the RGM/SU at Limestone Downs for breeding ewes, bull beef, steer finishing and once bred heifers were 70, 158, 74 and 121, respectively. If these RGMIsu were expressed in terms of returns per kilogram of pasture consumed ($/kg) the rankings, relative to breeding cows (=100), were breeding ewes (51), bull beef (95), steer finishing (53) and once bred heifers (106). Corresponding values for breeding ewes and bull beef at Tuapaka were 59 and 65. Thus, the substitution rates between livestock enterprises varied substantially depending on the method used to account for differences in feed consumption. The implications of these findings for farm management decision making are discussed.

Keywords: Stock units; gross margins; breeding cows; relative gross margins.

INTRODUCTION

The stock unit (SU) system has had many uses in New Zealand agriculture. Applications have included land valuation, estimating livestock carrying capacity, and the comparison of alternative livestock enterprises. A SU system appears to have been first used in New Zealand in the late 1920's to assess the economic performance of the agricultural sector (Fawcett & Patton, 1929). However, no further reference to the SU system appeared in the literature until the 1960's when Jackson (1963) described its use in assessing the carrying capacity of different pastoral areas.

A comprehensive definition and description of the stock unit system for New Zealand conditions was provided by Coop in 1965. He outlined the potential uses of the ewe equivalent (EE) system (analogous to the term stock unit which later became more widely used). He also expressed the view that these factors should be applied with care, since several important assumptions had to be made in order to calculate the conversion rates between animals. The SU was based on a "standard" ewe of 54.4 kg gaining 2.3 kg per annum, rearing one lamb to 25 kg liveweight at 3.5 months of age, producing 113 kg of milk and being shorn once in the summer. This animal was estimated to consume 594 kg pasture containing 64% Total Digestible Nutrients (TDN) per year.

The data used to derive the SU value for the standard ewe, her annual consumption, and the associated relativities with other sheep classes, was based largely on New Zealand feed intake data (Coop, 1961; Lambourne, 1961; Coop & Drew, 1963). However estimates for beef and dairy cattle were mainly derived from USA and UK data obtained under indoor stall-fed conditions. Accordingly, adjustments were made to account for the additional energy required for the grazing and walking activities that occur under pastoral grazing conditions (Wallace 1956, 1961; Hutton, 1962).

Coop (1965) recognised that there were differences in the seasonal pattern of feeding for the various classes of livestock, and presented data to show the estimated monthly percentage of the annual feed-intake, consumed by each class of livestock, during a year. He commented, *"The figures obtained must therefore be regarded as approximations. Further, in applying these EE factors it must be borne in mind that additional sources of error arise from the effects of the environment (Wind, temperature, grazing pressure etc.)."* Coop recommended that the EE (SU) be used for the comparison of livestock enterprises.

Subsequently, several caveats on the use of the stock unit system were identified in an address by Coop (1967) to the Canterbury Chamber of Commerce. These included that the EE system was a "best guess possible"; and that it was a measure of carrying capacity, rather than a production figure, a measure of the pasture grown, or an indicator of what could or should be carried. Despite these reservations Coop (1967) stated the following: *"In spite of all these limitations, or rather provided they are recognised and the necessary mental allowance made, the EE I acre figure can be very useful. It can be used for the following purposes: (i) comparison of current carrying capacity on different farms; (ii) as an expression of potential carrying capacity on different farms, soil types or districts; (iii) as a rough guide to the relative carrying capacity of beef cattle versus sheep, or wethers versus ewes."*

The SU conversion factors commonly used by farm management consultants (Donaldson, 1987) have usually been derived from the original information provided by Coop (1965). Their application has often been used to imply that the

annual supply of pasture is the most limiting factor on New Zealand pastoral farms. Thus it is assumed, implicitly, that the livestock enterprises can be directly substituted at the rates suggested by the SU conversion factors. For example, to increase the beef cow enterprise by one cow on a sheep and beef cattle farm requires either the reduction of six breeding ewes, or slightly more than one steer weighing between 340 and 500 kg.

The SU has been particularly popular for standardising the gross margins of livestock enterprises (e.g. MAF Gross Margins Booklets). However, the use of gross margins introduces other sources of error. Gross margins assume that enterprises are independent of each other, and that each unit of increased production is worth as much, and costs as much to produce, as the preceding unit (Burtt & Fleming, 1991). Other factors that are not allowed for in a gross margin analysis include differences in farm type, livestock breed and their management, and climate, especially in situations where enterprises are not run on the same property. Parminter (1992) commented on some of these shortcomings where gross margins had been the basis of a recommendation that farmers adopt beef finishing enterprises in preference to breeding cow enterprises. Furthermore the use of gross margins on their own does not show the level of change required, or the adjustments in farm management that may be necessary, if a suggested change in enterprise policy (or its scope) were to be adopted (Brazendale, 1994).

The purpose of this paper is to show, using case farm examples, that the stock unit system and its implied substitution rates, when combined with gross margin analysis, may not correctly rank the perfomlance of livestock enterprises.

Farm Data

Historical income and expenditure data for sheep and cattle enterprises for a Manawatu (Tuapaka) and South Auckland (Limestone Downs) property were used to derive the gross margins for alternative livestock options. In addition, an allowance for the difference in the value of livestock wintered was included (7.5% p.a. on the total capital value of animals) to account for the opportunity cost of capital associated with running each enterprise. Thus, the gross margins (GMs) for the enterprises (Tables 2 & 3) were unique to the farm situation and its respective topography, climate, location, soil type, pastures and management system. While the GMs present an indication of the overall profitability of the properties, realistic comparisons between enterprises cannot be made until an appropriate substitution rate between enterprises is defined.

Method of Comparison

The substitution rates implied by the SU system were used to provide a 'traditional' between enterprise comparison. Two other methods of deriving substitution rates were also selected to assess relative returns between enterprise options. First, a comparison was made on the basis of the estimated annual feed consumption of each enterprise using a feed budgeting approach. Second, the gross margin was expressed relative to the feed consumed by each enterprise for the period of the year when feed supply was most limiting, i.e. when pasture growth was at a minimum. This was May to July for Limestone Downs and June to August for Tuapaka.

To derive these substitution rates a management description of each enterprise was obtained from the farm managers. Livestock flows were prepared and used to calculate a 'base situation' livestock reconciliation to determine the annual sales and purchases. This information was used to derive feed intake estimates and an associated feed profile for each property using the intake and feed budgeting models developed by Brookes *et al.* (1992). The authors acknowledge that there are other assumptions introduced by using feed intake and feed budgeting

TABLE 1: Example of a feed profile prepared for each enterprise (Breeding Cows, Limestone Downs)

Month	M A Cows		R 2 Yr Heifers		R 1 Yr Heifers		Total Daily Feed Intake	Daily Intake per In-calf Cow Wintered
	No.'s	Daily Feed Intake	No.'s	Daily Feed Intake	No.'s	Daily Feed Intake		
July	700	6. 1	250	6.4	275	3.6	6,860	7.22
August	950	7.3	275	3.8			7,980	8.4
September	943	9.6	275	4.9			10,400	10.95
October	937	10.5	272	5.4			11,307	11.9
Novomber	937	9.5	272	6.2			10,588	11.15
December	937	10.2	272	6.6			11,353	11.95
January	937	10.7	272	6.9			11,903	12.53
February	937	11.2	272	7.1			12,426	13.08
March	929	7.8	250	7.3	275	3.6	10,061	10.59
April	700	3.8	250	6.3	275	3.8	5,280	5.56
May	700	4	250	5.3	275	4	5,225	*5.5*
June	700	4.8	250	5.6	275	3.8	5,805	6.11

* Rising two year heifers join the main breeding herd in August as indicated by M A cow numbers increasing in that month.

Total feed consumed for enterprise	3,330,222
Total feed consumed during low growth period for enterprise	545,645
Total annual feed consumed per production unit	3,505.67
Average daily intake per production unit during low growth period	6.28

models and this needs to be taken into account when interpreting the results. The information from the feed profiles was then transferred to feed profiles for individual enterprises to calculate substitution rates between livestock enterprises (Crawford, 1994) (Table 1).

RESULTS AND DISCUSSION

The gross margins calculated for each enterprise are shown in Tables 2 and 3. This suggests that bull beef was the most profitable enterprise on both case study farms. The relative gross margins (RGM) using the breeding cow as a base of 100 are presented in Tables 4 & 5. Although the RGMs are derived from the gross margins, changes in the profitability ranking of the enterprises at Limestone Downs and Tuapaka are substantial when pasture consumption is more precisely accounted for through a feed budgeting equation. For example, RGM analysis using the SU system suggests that the bull beef enterprise on Limestone Downs would earn 58% more than the breeding cow, and 14% more at Tuapaka. Hence advice, using these figures, to change from breeding cows to bull beef would appear to be reasonable for both properties. However, if total annual feed consumed was used as a basis of comparison the bull beef enterprise at Limestone Downs would earn 25% more (Table 4). In contrast, the analysis based on the feed consumed by the enterprise over the period when feed was most limiting, showed that bull beef earnings would be 5% lower than for the breeding cow enterprise. The corresponding figures for breeding cows vs bull beef at Tuapaka were 5% and 37% lower respectively (Table 5).

The change in the rankings for the RGMs indicate that care must be used when assessing the merits of livestock enterprises using SU substitution rates and GM analysis. Also the GM/SU is a measure of only part of the farm business (e.g. fixed costs and differences in 'managerial' ability are not accounted for) and they are unique to the conditions that apply to individual farms. Additional difficulties are therefore created when making comparisons between farms. In these circumstances not only must differences in management systems be allowed for when recommending changes, but differences in farm topography, climate, soil types, pastures, and fertility also need to be considered.

The RGMs showed that the rankings of livestock enterprises would differ according to the substitution rates used. This suggests that the use of the SU system on its own to make decisions on the size or inclusion / exclusion of an enterprise may be misleading, particularly with respect to the amount of pasture available at the time of the year when pasture supply is most limiting. As earlier discussed, Coop (1967) recognised that factors such as within year changes in the level of feed supply, changes in the physiological status of the animals and their patterns of feed demand could be important when considering the merits of one livestock policy relative to another.

The analysis showed that the ranking of the breeding cow, in particular, changes significantly, depending upon the substitution rate used. The ability of the cow to store energy for use during low feed intake periods in the late autumn /

TABLE 3: Gross margin (GM) data for alternative sheep and cattle enterprises at Tuapaka Hill Country Farm, Manawatu (1993/94 cost & price data)

Enterprise	Breeding Ewes	Breeding Cows	Bull Beef
Income	$72,103	$34,500	$153,000
Expenses	$12,417	$18,594	$85,560
G M	$59,686	$15,906	$67,440
Capital Cost	$7,024	$2,625	$11,138
NET GM	$52,662	$13,281	$56,302
Total SU	1,949	431	1,605
G M/SU	$27.02	$30.82	$35.08

TABLE 4: Relative gross margins (RGM) for the livestock enterprises on Limestone Downs for the 1993/ 94 season.

Enterprise	RGM/ Stock Unit	RGM/kg Total Annual Feed Consumed	RGM/kg Feed Consumed during period of low growth
Breeding Cows	100	100	100
Breeding Ewes	70	57	51
Lamb Finishing	N/A	61	N/A
Bull Beef	158	125	95
Steer Finishing	74	64	53
Once Bred Heifers	121	104	106

TABLE 5: Relative gross margins (RGM) for the livestock enterprises on Tuapaka for the 1993/94 season.

Enterprise	RGM/ Stock Unit	RGM/kg Total Annual Feed Consumed	RGM/kg Feed Consumed during period of low growth
Breeding Cows	100	100	100
Breeding Ewes	88	67	59
Bull Beef	114	95	65

TABLE 2: Gross margin (GM) data for alternative sheep and cattle enterprises at Limestone Downs, Port Waikato (1993/94 cost & price data).

Enterprise	Breeding Ewes	Breeding Cows	Bull Beef	Lamb Finishing	Steer Finishing	Once Bred Heifers
Income	$550,114	$367,710	$669,240	$133,260	$352,056	$133,855
Expenses	$92,810	$19,875	$346,950	$110,120	$221,645	$43,200
G M	$457,304	$347,835	$322,290	$23,140	$130,411	$90,655
Capital Cost	$46,875	$46,191	$27,000	$1,969	$25,744	$10,884
NET GM	$410,429	$301,644	$295,290	$21,171	$104,667	$79,811
Total SU	13,220	6,773	4,275	N/A	3,190	1,478
GM/SU	$44.54	$31.05	$70.56	N/A	$32.81	$54.02

winter (Pleasants *et al.* 1992) is not recognised by the substitution rates implied by the SU system. The use of RGM/SU when comparing two enterprises assumes that they are in direct competition for the scare feed resource. There may be occasions, such as those discussed by Parminter (1992) and Pleasants *et al.* (1992) where the relationship may have a complementary component. The dangers of using RGM/SU on its own are illustrated by the differences between, and changes in, the rankings for Limestone Downs and Tuapaka. It is concluded that the performance of the breeding cow may have been underestimated where the stock unit system has been used as the only performance measure.

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