Comparative Stocking Rate (CSR): Definition and link to farm performance and Operating Profit (1-4a)

Comparative Stocking Rate (CSR) provides an alternative to the traditional measure of cows per hectare (ha). It is a method of assessing the balance between feed demand and supply on farm. As farms now import significant amounts of supplements, cows per ha is an inadequate description of this balance, and can be misleading when comparing farms which vary in the amount of brought in feed/ha, or have different breeds (e.g. Holstein-Friesian versus Jersey). CSR, along with other indicators, improves the estimation of the balance between annual feed supply and feed demand.

Comparative Stocking Rate is

\[
\text{Average lwt (kg/cow) x no. cows/ha} \quad \text{total feed (t DM)}
\]

where

**Average liveweight** (kg per cow) is for the herd (including first calvers) as measured or estimated two months before calving starts.

and **total feed** is the total amount of feed supplied to the herd over 12 months including pasture, crops and any bought in supplement or cow grazing. This is best expressed as t DM/ha (see Penno, 1999).

**Why use CSR instead of cows/ha?**

Describing stocking rate in terms of cows/ha is popular because it uses real measures, cows and hectares that can be made easily. But cows/ha has the following inadequacies.

1) **Cows are not the same weight**

Liveweight impacts on the feed requirements per cow and changes feed demand per ha. For a similar level of milksolids (MS) production per cow a smaller cow has a lower annual feed requirement than a heavier one (see Table one).

**Table 1: The feed requirements (t DM/cow) of three dairy breeds if each is producing 400 kg MS/cow**

<table>
<thead>
<tr>
<th></th>
<th>Friesian</th>
<th>Crossbred</th>
<th>Jersey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average herd lw (kg)</td>
<td>500</td>
<td>450</td>
<td>400</td>
</tr>
<tr>
<td>Annual Feed Req</td>
<td>5.5</td>
<td>5.3</td>
<td>5.0</td>
</tr>
</tbody>
</table>

* assumes average energy content of feed eaten of 11.0 MJ ME/kg DM.
2) Not all hectares grow the same amount of feed

Pasture production per ha across New Zealand can vary two-fold within and between dairy farms. The range is approximately 10 to 20 t DM per ha. A farm at the lower end of this range could be appropriately stocked by fewer than two typical Jersey cows per ha, and not rely on significant purchased feed (see Table 1). Using the cows/ha indicator means that commonly this farm could be considered under-stocked rather than appropriately stocked.

3) Imported feed/ha is not counted using cows/ha.

Imported feed per ha varies widely between farms, from none (system 1) to more than 40% of total feed (system 5). Farms adding large amounts of imported feed can increase stocking rate to more than 5.0 cows/ha and still provide adequate annual feed per cow.

Using CSR to balance feed supply and feed demand

Comparative stocking rate describes the balance between the total feed supply and the feed demand on a farm. When the feed supply and feed demand are well matched a balance occurs (think of a balanced seesaw, Figure 1). Where an imbalance occurs, physical and economic inefficiencies result, e.g. cows not well fed, extra costs incurred, insufficient milk revenue. Adjustments need to be made to restore balance. A CSR calculation can be used retrospectively to confirm (along with other indicators) if the feed supply and feed demand are in balance. Improved information will result when several successive years can be analysed for the farm. CSR can also be used to predict how proposed changes in feed demand and supply will impact farm performance in the future.

Figure 1: The components of CSR which need to be balanced for efficient and economical milk solids production

Optimum CSR for Maximising Profit

A research farmlet trial (Macdonald et.al. 2008) identified that there is an optimum CSR for operating profit /ha. This is less than the CSR required to maximise MS production/ha (Figure 2). The trial compared five herds over a range of CSR from 60 to 91 kg Lwt/ t DM for three years. Operating profit was maximised at a CSR of 76, while MS/ha was maximised when CSR was 91. The drop in profitability was not large as CSR changed either side of the optimum. This indicates other important management decisions can reduce the impact of not optimising CSR.
Managers of a new farm could use an estimate of optimum CSR to determine the herd size and annual feed requirements. The optimum CSR for a dairy farm can change over time and is influenced by changes in cow genetic merit, input costs, feed grown and milk price. While a farm’s CSR may not need to be changed frequently, it is important that farmers regularly (annually) calculate CSR as one indicator of the farm’s likely efficiency and profitability.

Factors that are likely to impact on feed supply and feed demand and, therefore, CSR are:

1. Improved genetics (Breeding Worth) leads to higher annual feed requirements per cow, increasing feed demand even with a constant herd size. For example, there is evidence that 20 years of genetic gain in the NZ Holstein-Friesian reduced CSR at the point of profit /ha was optimised. As a herds breeding worth ($BW) increases, they require increases in annual feed allowance per cow over time to optimise profit.

2. Farming within nutrient limits will require some NZ dairy farmers to reduce farm N surplus, requiring a reduction in N input, (both fertiliser and additional feed). This will reduce feed supply /ha and force a re-examination of CSR for these farms if annual feed allowances per cow are to be maintained or increased.

Analysis of data from 20 years of farmlet research at DairyNZ has determined relationships between changing CSR and changes in farm performance. (Glassey et.al. 2012)

Reducing CSR by 10 units will result in:
- Decreased pasture utilisation of 5%;
- Increased MS/cow of 45 kg MS/cow;
- Increased MS as a percentage of Lwt of 7.5%.

The study confirmed that a reduction in pasture utilisation /ha could be expected when reducing CSR, but the expected increase of 45 kg MS/cow could compensate for uneaten pasture provided pasture utilisation is maintained at more than 70%.
Managing a lower CSR can be challenging and will require changes to pasture management and feed allocation.

To optimise profitability, research suggests that CSR is 75-80 kg Lwt/ t DM offered. Many highly profitable dairy farms already operate with a CSR in the range from 75 to 80 kg Lwt/t DM. Profit is expected to be maintained for well-managed reductions of CSR, where an imbalance between annual feed supply and feed demand previously existed (e.g. CSR more than 85 kg Lwt/t DM offered).

References:


