A systems approach to feeding the liquid milk herd

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Summary

- A systems approach to feeding the liquid milk herd for profit involves a structured analysis of the main factors affecting the balance between feed supply and demand on the farm. Decisions on best feeding policy are made based on maximising farm profit, subject to internal constraints (e.g. herd yield potential, labour) and prevailing external conditions (e.g., milk price, EU regulations).

- Correct diet formulation is centrally important to feeding management. However, factors other than diet formulation alone, such as stocking rate, herd fertility, and alternative cropping practices, have a fundamental bearing on overall feed costs.

- Feeding system decisions based on chasing short-term *'per cow per day'* marginal responses can prove very costly in the longer term, particularly if they are driven by incomplete financial analysis. Full consideration must be given to additional capital costs, labour requirements and feed costs.

- There is clear evidence, across a range of milk payment schemes, that farms producing a greater proportion of milk from forage are more profitable. Maximising the amount of milk produced from home-produced forage must therefore be prioritized, irrespective of the milk payment scheme.

- To achieve better forage utilisation, grazed pasture needs to be considered a feed ingredient, rather than as an alternative to feeding. This requires greater focus on pasture quality and budgeting. The principles of least-cost diet formulation should be extended to include grazed pasture as an economic feed source.

Introduction

Exploiting the cheapest source of the nutrients required for milk production underpins profitable feeding of the dairy herd across a wide range of economic and environmental circumstances. In Ireland, getting maximum use of pasture remains a logical route to follow in order to achieve this goal. The rationale behind seasonal grass-driven milk production has been well tested and explained for Irish conditions and as with all systems, accepted thinking is constantly undergoing review at research and farm level in response to the changing policy environment.

The requirement for a consistent milk supply curve presents a significant challenge to utilising seasonally available pasture on liquid milk farms. There is much farm-to-farm variation, but National Milk Agency data consistently shows an average annual peak to trough supply ratio of 1.8 to 1.0 for registered producers, compared to 8 to 1 for overall national production. This flat supply pattern underlines the amount of milk being produced from conserved forage and concentrates on liquid milk farms. Given the extra feed costs associated with this aspect of the enterprise (estimated at 7c/l more than milk from pasture), it is unsurprising that discussion on feeding management with producers in the liquid sector inevitably turns to focus on issues surrounding feed ingredient prices, least cost diet formulation of indoor diets etc. However, it is essential to recognise that many other factors can have a direct influence on total feeding costs. The objective of this paper is to outline the most important of these factors including:

- i) Stocking rate
- ii) Milk contracts and calving pattern
- iii) Feed budgeting and alternative feeds

A systems approach to feeding, with an overall objective of maximising profit return from the unit will be emphasised. A feeding system plan must incorporate all information that affects the balance of feed supply and demand on the grazing platform. Components cannot be dealt with in isolation but interact with each other and must be considered on a whole-farm basis. Using this approach, it is likely that many individual liquid milk farms could identify areas for reducing their cost base and improving farm profitability.

<u>Key Elements in the Feeding System</u>

i) Stocking rate

Stocking rate is expressed as livestock units per unit area e.g. 80 cows on 40 grazing hectares equates to 2.0 cows/ha. From a feeding standpoint, stocking rate is used to give an approximation of feed demand relative to potential feed supply on the grazing platform. As such it is an important descriptor the dairy system, but it has obvious shortcomings. Firstly, on the supply side there is an assumption that every hectare supplies equal feed when in reality this can range from 8 to 18 tonnes per ha. And on the demand side, requirements per cow can vary from 4.5 to 5.5 tonnes depending on milk yield, bodyweight and purchased feed inputs. These factors in combination determine the balance of feed supply per hectare on the grazing platform:

Total growth per ha – (Stocking rate * Feed demand per cow)

Decisions such as increasing stocking rate or reducing purchased feed inputs increase demand per hectare, while improvements such as reseeding old pastures improve feed supply. Changes of this type should interact at a systems level, for instance improving forage yield by reseeding programme should be used to drive a reduction in concentrate input. Forage utilised per hectare provides a useful measure of the current balance of these factors at farm level.

ii) Forage utilised per ha

Forage utilised per hectare measures the amount grass harvested (grazed and silage) on the grazing platform and is calculated as a product of stocking rate, imported feed and milk yield. It has a strong positive relationship with overall farm profit per hectare across a range of production systems (Figure 1). This data, collected through Teagasc Profit Monitor 2008, showed a range of forage utilisation from 5 tonnes to almost 14 tonnes per ha, with an average of 8.2 tonnes, meaning that some farms are take almost 6 tonnes of feed extra per hectare than the average- equivalent to around €37,000 worth of rolled barley for a 40 hectare grazing platform. The consequences for farm profit are clear.

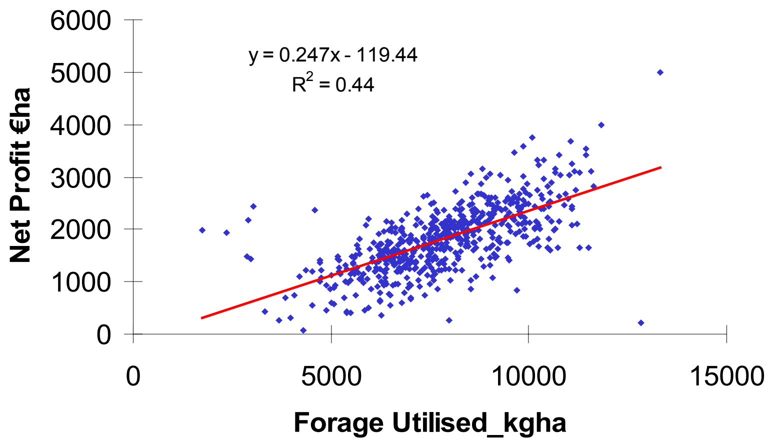

Figure 1. Forage utilised per ha and farm profit

Stocking rate in itself was positively related to farm profit in the above data. However, further analysis showed that, when corrected for its effect on forage utilisation, stocking rate actually became negatively related to profit. This means that increasing stocking rate will improve profit per hectare if it drives forage utilisation, but may not if achieved by importing extra feed. The worst possible scenario from a profitability viewpoint is to have a rising stocking rate coupled with a low (or even declining) level of forage utilisation.

ii) Milk contracts and calving pattern

Liquid milk contract proportions and winter milk bonus payments provide the main reason for disparity between herd feed demand and forage supplied by pasture across the year. They also provide an opportunity to generate additional revenue on a per hectare basis. Variation in contract proportions between farms and milk supply conditions between processors means that no set calving pattern blueprint can be recommended, but the guiding principle for all herds is that milk supply is planned to maximise returns from available bonus payments at least cost to the overall system. Given the fact that month of calving has a significant effect on annual feeding costs (€620, €750, €830, €690, for 7,000 litre cow calved February, May, August, November, respectively) this inevitably means taking control of calving pattern to minimize the amount of milk supplied surplus to bonus in high cost months.

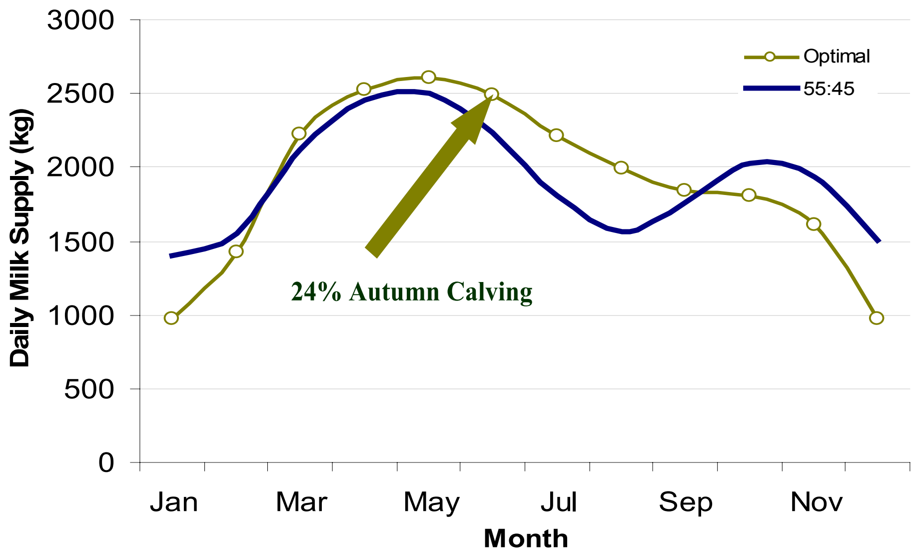

Figure 2. Optimising calving pattern to reduce feed costs.

The effects of genetic selection for improved fertility are sufficiently dealt with elsewhere in these proceedings to merit further discussion. It suffices to say that at a systems level, a change in breeding policy to include fertility can have a major effect on feed costs by enabling tighter control of calving pattern. For example, optimising calving pattern and milk supply at 50% liquid contract a can generate 1.0 - 1.5c/l in feed cost reduction without any change in technical efficiency, by minimising winter surplus supply (Figure 2). The requirement for adjustment of herd calving pattern becomes increasingly important in a herd expansion scenario, whereby liquid milk supply requirements decline as a proportion of overall supply if contract levels remain static. Furthermore, improved herd fertility reduces the proportion of 'carryovers' required in the system. This can reduce feed costs per litre of milk at a herd level, because feed conversion efficiency declines markedly after 10-12 months in lactation irrespective of genetic potential for milk yield. This forms the basis of the 305-day lactation length optimum in high input systems. The practical reality on farms of <200 cows in scale is that these animals are not readily divided and rationed according to requirements.

iii) Feed budgeting and alternative feed costs

As described above, winter milk supply contracts should be considered the basis of disparity in feed supply and demand in the liquid milk system. In practice, many liquid milk herds also incur high feed costs during the 8-9 month period when there is a supply of economical feed available in the form of grazed pasture. The nutritional reasons for this are manifold (balancing protein in grass, effective fibre etc) but essentially the motive boils down to pushing extra milk yield per cow-sometimes for profit, sometimes not. It is most interesting to note that Teagasc Profit Monitor data shows no relationship between milk yield per cow and farm profit on winter milk farms, a trend that is consistent for numerous international dairy benchmarking studies. This indicates that yield per se is not an important factor in farm profit, because high and low yielding herds can be either high or low profit. It shows rather that it is *how* milk yield is arrived at, in terms of production costs, should be of primary concern. High milk yield should be the consequence of a well-designed system instead of a target within it.

Considering the previously described relationships between profit, grass utilised, and milk yield per cow, it is essential that any feeding system for the liquid milk herd should look to capitalise on the benefits of increasing grass utilisation. This means that use of feed supplements in the system should be used as a strategy to sustain the overall stocking rate in time of feed deficit (short term inclement conditions excepted). An example is presented in Figure 3, which shows the feed budget for a herd stocked at 4.0 cows per hectare.

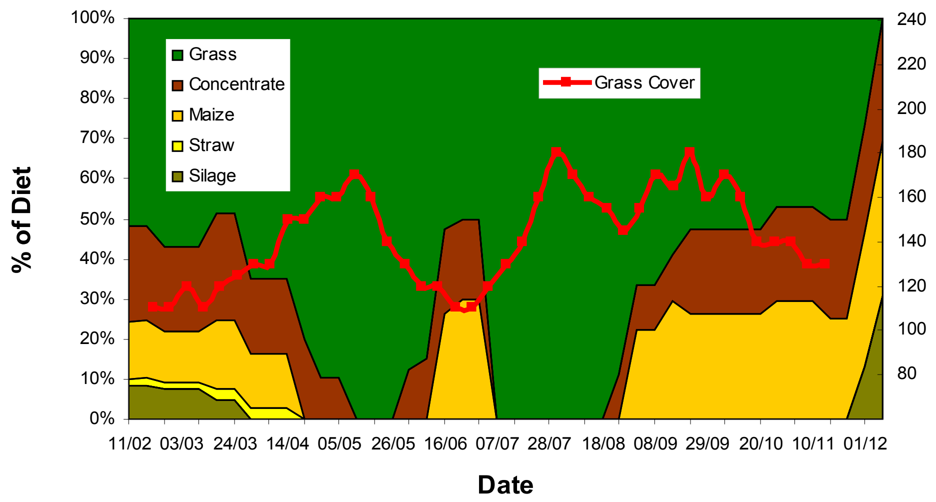

Figure 3. Budget for buffer feeding at 4.0 cows per hectare.

The key element here is the use of weekly grass cover (depicted by the line) measurement and budgeting to determine the level of buffer feeding (in this case predominantly maize and concentrate) required each week. In other words, the decision to introduce feed is based on how much pasture is available to the herd. It can be seen that feed is used during the first and last rotations. A high level of grass utilisation is achieved across the season by offering a daily feed allowance and managing post grazing sward heights, ensuring that there is a low substitution rate. Luxury feeding of a set level of buffer feed could increase milk yield per cow, but would increase feed costs and compromise pasture quality in subsequent rotations. Feeding for the short-term response can be very misleading in this regard.

Relative cost of buffer feed ingredients

The above diagram shows a sizeable requirement for purchased feed in addition to high grass utilisation. This arises directly due to the high stocking rate (160 cows on 100 acres) and for the most part should not be a major concern for lower stocked farms at grass. However, the question as to what is the most appropriate source of this buffer feed is an important one in the high stocking rate context.

There is an important distinction to be drawn between the value of purchased feed and the cost of same. Outlined in Figure 4 are a range of production costs per unit feed energy for producing alternative forages, including land charge, fertilizer, contract charges handling and storage. The value of the feed for the dairy farmer is determined by its price relative to the alternative energy and protein sources available (i.e., barley and soya).

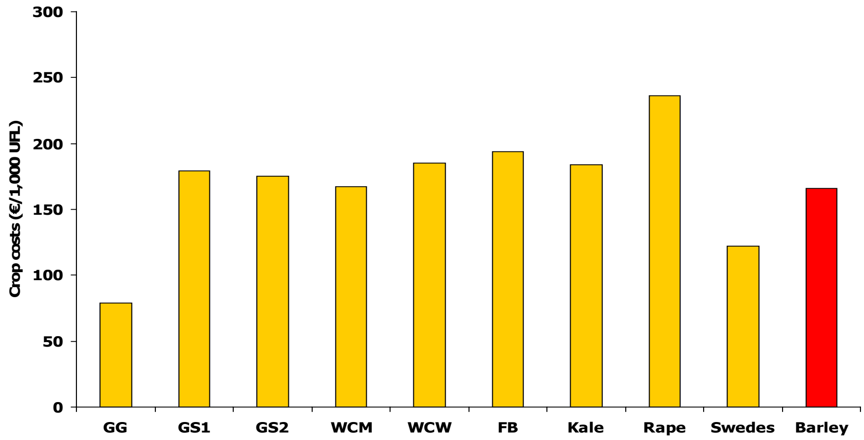

Figure 4. Comparative cost of grazed grass, grass silage grass silage, maize, whole crop wheat, fodder beet, kale, rape, swedes and purchased rolled barley

The relative success of the high stocking rate system relies on securing the cheapest possible alternative to make up the shortfall of grazed grass and including this feed without compromising grazing efficiency. While there may be some need to provide a base of adequate forage, the decision as to which feed source to use will for the most of the grazing season will be based on relative value per unit energy and protein. This means that the best ingredient this year may be so in the following year, so alertness to the feed markets flexibility in purchasing are important in this system.

Feed Systems Research in Johnstown Castle

The first year of feed systems research for winter milk has recently been completed with the Johnstown Castle herd in County Wexford, in collaboration with Teagasc Moorepark. This work follows on from numerous years' work on autumn grazing and alternative winter cropping systems. The project involves a 100% autumn calving herd. The objective is to define the most suitable feeding and grazing management practices for autumn calving herds the context of the overall system. Mean calving date for the herd is 8 October. There is an emphasis on compact calving with a 14 week breeding period imposed. Sire selection is for high EBI with a balance of production and fertility traits. The herd goes fully dry for two weeks in August. Milk is supplied to Wexford Co-op on a winter scheme- bonus is paid on all litres supplied if at least 30% of total is supplied from Oct-Feb. Approximately 53% of milk from all groups is supplied during bonus months. There are numerous trial groups (24 cows per group) involved, but for present purposes the two most divergent systems will be described:

> **GRASS 2.75-** Stocking rate of 2.75 cows per ha on the grazing platform. Closed system with winter forage produced off this area. Winter diet consists of silage and parlour-fed concentrates.
> **TMR 4.0-** Stocking rate of 4.0 cows per ha on the grazing platform. Little winter forage produced on grazing area, imported at least cost. Total mixed ration TMR during winter months and buffer feeding according to grass available during grazing season. Milk production and feed input results for Yr1 are shown in Table 1.

Table 1 Milk production and feed inputs for Johnstown Castle 2008/09.

	Grass 2.75	**TMR 4.0**
Milk per cow	6636	6959
Milk per hectare	18249	27836
Milk solids per ha	1306	2056
Feed imported per cow	1.2tDM	2.9tDM
Grass Utilised	12.4	12.0

The data presented is part of a 3 year study and as such is subject to the usual health warnings but it can be used in its current state to illustrate the point regarding open and closed systems. This feed and milk yield output data in Table 1 was combined with 2008 average winter milk profit monitor figures for other fixed (ESB, insurance etc)) and variable costs (AI, vet etc) and adjusted for system differences in labour and machinery inputs to derive a comparative financial performance (Figure 5).

TMR 4.0 is an example of an open system because it functions by importing raw materials (feed). It operates on a high output, lower unit margin principle. GRASS 2.75 pasture system represents a more closed-type system because it sources more of its raw materials (feed from pasture) out of its own resources. The slope of the each line represents the sensitivity of the system to fluctuation in milk price, i.e., the steeper the line the greater the change in farm profit with changes in milk price. The TMR4.0 system performs well at a high milk price but is more vulnerable to fluctuations. **It is essential to remember that any profit advantage the TMR4.0 system at higher milk price is being driven by the stocking rate. Higher inputs at low stocking are invariably reduce profit** (Note the similar levels of grass utilisation in Table 1). The base costs for each individual farm will be different, affecting the milk price at which the relative profitability of the systems will shift. It should also be clear the at the relative risk to profit of is lower for the pasture system,

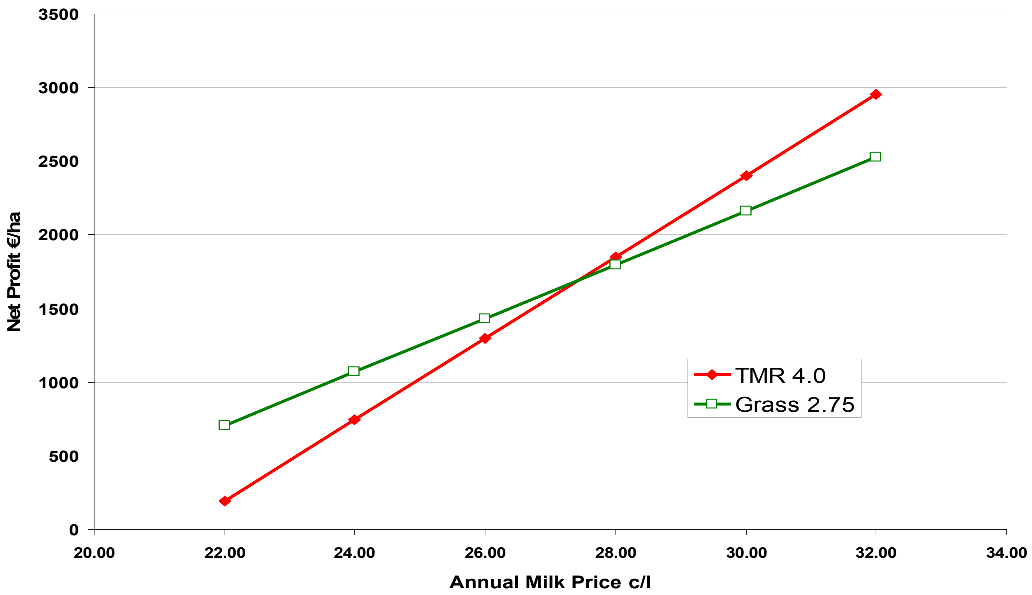

Figure 5. Relative profitability of feed systems at different milk prices.

Summary and Conclusions

The factors affecting feed costs on liquid milk farms are varied and encompass many aspects of management, from sire selection to reseeding policy. Choice of alternative feeding strategy is important, but only in the context of a planned overall farm feed budget. Increasing the tonnage of forage utilised on the grazing platform is strongly related to dairy farm profitability and must be prioritised.