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Present and future grazing systems

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INTRODUCTION

We have heard from Dr Black and Professor Hodgson something about the forage factors that can affect animal performance. My role is to look at the grazing systems required to integrate these and other factors into actual animal production systems - what these systems are at the moment and how they might change in the future.

There are two features that dominate any consideration of grazing systems in New Zealand. The first is the diversity of systems that exist. At one extreme is the South Island high country where feed supply is largely extremely fragile native tussock communities growing on infertile soils at temperatures below the threshold for growth for 3-5 months of the year. As a consequence they accumulate as little as 1-2 tDM/ha/year. Output of animal product is a few tens of kg/ha/year. At the other extreme is the intensive dairy farm on the very fertile flat to rolling country. The feed supply is a highly resilient ryegrass - white clover association and product output is up to 2-3 t/ha in the form of milk solids and net carcass gain of surplus animals. Despite this diversity of productivity and appropriate grazing systems, common principles apply.

The second dominating feature is that, depending on the product, 80 to nearly 100% of the output is exported. Returns to the producer depend almost entirely on export prices and these are low relative to those in other countries. Economic survival demands low cost systems of production with minimal use of expensive inputs like labour, machinery, and supplementary feeding. All systems involve year-round grazing with legume-based pastures being almost the sole feedstuff. A consequence of this almost complete dependence on grazed pasture is that the feed supply is highly seasonal with up to 80% of annual feed production occurring during the five months of September to January. This is the fundamental issue that determines the productiv-

ity and profitability of individual farming enterprises - the degree of success achieved in coping with seasonality of feed supply. Two broad strategies are involved in coping with this seasonality: stock and grazing management policies. Stock policies involve a complex of variables such as how many animals or stocking rate, the class and genetic quality of the animal, their reproductive efficiency in terms of number of offspring born, when and how dispersed these births are, and when or what stock are bought, sold, culled, dried off, or grazed off the home farm, and how the various stock classes are integrated.

Most importantly, the number of stock that can be over-wintered is quite inadequate to utilise the pasture growth in late spring-early summer. The required feed demand has to be engineered. This is done primarily by controlling reproduction so that lambing and calving are in the spring. The increase in feed demand is generated by concentrating high lambing and calving percentages so that the feed demands of milk production, growth, and fattening are made to coincide with high pasture growth rates. Where this increase in feed demand is not engineered because of inappropriate or mismanaged stock policies, then low productivity and a host of associated problems are the inevitable consequence.

The second general strategy is grazing management. This involves controlling the rate of feed use, the timing, severity, frequency and duration of grazing. Its primary role is to assist with matching the feed demand with the feed supply and to transfer feed from a time of low to one of high animal responsiveness. The strict rationing of dairy cows and ewes during winter to maintenance or sub-maintenance levels of feeding so as to transfer quality pasture to the more responsive period of early lactation in early spring is an example of this transfer. It can also be used to transfer late spring feed surpluses through to times of summer or autumn deficits by means of deferring grazing on a portion of the

farm.

It is not my intention to debate here the relative importance to animal production of the stock and grazing policies. To my mind the evidence is overwhelming that the stock policy is far more important than grazing management. This is particularly so where there is resilience in the pasture community, due to the species present, the climate, and soil conditions, and also resilience in the stock, due to their ability to call on body reserves of energy in times of feed scarcity and to replenish them some time later.

The success of a given management system can be readily measured in terms of dollars or product output per hectare, per stock unit or labour unit. Such measures do not indicate the reasons why between-farm differences in productivity occur. This requires monitoring the critical variables that indicate how successfully feed requirements and demand are matched and provide the earliest possible warning of impending problems. This inevitably involves knowing what the important variables are and the values that indicate impending success or disaster. As has been so often the case in the past, those involved in dairying have shown the way in identifying and quantifying those variables.

The important ones are as follows:

1. The liveweight or condition of the stock at the start of calving or lambing. This is an important prerequisite since it reflects the extent of body reserves of energy that lactating stock can call on to make up feed deficits that often occur in early lactation.
2. The amount of feed on the farm at the start of lambing or calving. Unless this reaches the target amount, then feed shortages may occur in early spring that are too large and too prolonged to be buffered by the mobilisation of body reserves of energy.
3. Amount of feed on the farm in mid-spring. The objective of early spring management is to avoid severe and prolonged feed shortages. These are avoided by not allowing the amount of feed on the farm to fall below critical levels since this is one time of year when pasture growth rates are dependant on the amount of feed on the farm. If feed on the

farm is reduced below these critical levels then pasture growth rates are decreased with the effect that the feed shortage is extended further into early summer. A prolonged period of reduced animal performance is the consequence.

4. Amount of feed on the farm in early summer when pasture growth rates are at or near maximum. This defines the extent of pasture surplus. Avoiding serious surpluses is necessary to maintain the quality and growth of pasture into the summer, avoid the suppression of clover, and achieve acceptable plant density and survival.
5. Liveweight or condition of stock in the autumn. The feed shortage that occurs during dry summers results in stock that are too thin or light at the start of winter. Replacing these losses during autumn or winter is very expensive in terms of feed during a time when that feed is not available. The most effective way of avoiding this expense is to reduce stocking rate during dry summers by the early reduction of non-capital stock through early culling, early sales of fattening stock, or off-grazing of appropriate stock classes. These variables are now reasonably well recognised and defined, at least for some situations. They are macro variables. Too often even now, farm managers and their advisors attempt to monitor grazing systems by micro variables such as herbage allowance, daily DM intake and residual mass. These are short-term indicators only and give no early warning of management going awry.

The small size and uniform topography of dairy and some other farms means that monitoring of management by estimating amounts of feed on the farm is realistic and worthwhile. This is not likely to be so for less intensive systems because of their larger size, variable topography, and the inherent inaccuracies of all methods of measuring herbage mass. Improving current levels of feed utilisation and stock performance on these farms will be much more difficult to achieve, if not impossible.

One of the easiest production systems to manage must be intensive dairying. It involves 1 or 2 classes of stock, only pregnant animals need be overwintered, an enormous increase in feed demand can be engineered to

coincide with the surge of spring growth, and conservation, topping, deferred grazing and fast rotations are all available to control late spring surpluses of feed. Compare this with the mixed stock hill country system where there are many stock classes, large within-farm variation in contour, slope, aspect and altitude of land, and a topography that often excludes the use of machinery to help control pasture surpluses. These pasture surpluses are an invariable problem on hill country systems and will remain so until economics favour high cattle to sheep ratios, and the reproductive efficiency of the hill breeding stock can be lifted beyond their present modest levels.

What are the changes of the future that may have an impact on our grazing systems?

Farm size

The major mechanism for retaining profitability on individual farms in the face of declining real dollar returns per unit of output is to increase farm size and output per labour unit. In the case of dairying for example, during the last 20 years herd size has increased from about 100 milking cows to nearly 160 and output of milk solids per labour unit has more than doubled. Similar changes have occurred with other farm systems. Undoubtedly this trend will continue into the future. Its effect will be that new technology will not be taken up unless it is simple to apply, fits readily into routines, and is perceived to improve life style and productivity. The development of a cow that can maintain high production under a once daily milking routine is one such development for dairying but neither this nor larger herd size will modify the grazing system currently being recommended.

Feed production

A key factor accounting for the increased output per hectare seen on many farms has undoubtedly been an increase in pasture production. This has been brought about by fertiliser practices that have increased clover growth and therefore soil nitrogen, by improved drainage, and by a gradual dominance of high fertility responsive grasses. These changes have been completed on the better farms and further increases cannot be expected in the future. This plateauing of pasture

production is because of the physiological limits to growth, because annual pasture yields are largely insensitive to wide variation in grazing management, and because the breakthrough in achieving more productive species has yet to come. Even if there was a breakthrough the current recommendations for grazing systems would still apply.

Genetic quality of stock

The genetic ability of the average dairy herd to produce milkfat in 1960 was given a value of 100. The best herds now have a value of about 140 and increased rates of gain are expected in the future. The greatest challenge facing the dairy farmer is how to exploit this genetic potential. It can only be achieved in two ways, by increasing feed intake and by lengthening lactation. In view of the unlikely prospects for increasing pasture production, increasing feed intake will involve a reduction in stocking rate. Whether high utilisation of the feed grown can still be maintained at the reduced stocking rates is at this stage speculation, since the necessary data do not exist. Achieving higher per cow performance through longer lactations offers considerable potential since days in milk average about 260 instead of the standard 305. Increasing lactation length by adding extra days at the start or the end of lactation will greatly increase the risks of not being able to achieve the important milestones of successful management outlined earlier.

It seems unlikely that either the growing of crops such as maize, or increased conservation in the form of high quality silage, are realistic strategies because of the disproportionate increase in their associated costs. Both also add to the complexity of the system. Probably the single factor that would have significant impact on grazing strategies would be the advent of a cheap, energy-rich supplement. The most likely source is Australia, since feed grains there are about one-fifth of the cost of those in New Zealand. Perhaps the day will come when those farming animals other than dairy cows will have to allow for improved genetic merit in their grazing systems.

Product quality

The traditional emphasis of grazing systems has been

on product quantity. Increasing attention is now being given to product quality. In the case of dairying, this is reflected in the new payment system based on the yield of fat and protein less a volume charge. There is little that the farmer can do about this other than through breeding, since the relative yields of fat and protein over a whole lactation are not appreciably affected by level or quality of nutrition.

The present emphasis on large lean lambs has a much greater potential to cause mischief. This will result in an increased number of stock classes on the farm, reduced potential to destock in early summer, and an increased requirement for the accurate integration of stock classes such as breeding cows or goats in order to control early summer surpluses. Pursuit of the lean lamb temptation will be most appropriately restricted to those areas where good summer pasture growth is assured. It will certainly be attempted by some who have neither the skill nor the right class of land, so disasters are inevitable. There will also be appreciable pressure on those farming more marginal land to adopt policies involving a greater degree of finishing of either lambs or store cattle. Disasters will occur there also. The more marginal the land, the lower will be the inputs (particularly of fertiliser), and the greater will be the seasonality of pasture growth. Such conditions call for a greater, not lesser, dependence on breeding policies since it is these that offer the potential for controlling surpluses and preventing land reversion and degradation.

Environmental and welfare considerations

The greatest forces that would cause changes in our current grazing systems and recommendations are those associated with the clean green image and animal welfare. A complete rethink of our grazing systems would be required if consumers were to demand animal products obtained without the use of chemicals. Similarly, animal ethics are potentially an explosive issue. Practices such as docking, dehorning, velvet production, the docking of cows' tails, induced calving, the hormonal control of reproduction and growth, the high stocking intensity of long winter rotations, and even herd or flock size, must all eventually come under close scrutiny.

CONCLUSIONS

It seems to me that a long era of grazing systems research has drawn to a close. That era can be regarded as starting with McMeekan 35 years ago. He concluded at the 1956 International Grasslands Congress that extremes of grazing methods were associated with only small effects on per hectare yields of animal product from grazed pasture. Despite the large number of noisy followers, including myself, that conclusion still stands. All that has been achieved in the interim is a better understanding of the factors involved and some definition of the yardsticks appropriate for real life situations. Apart from some environmental and welfare issues, there appears to be no reason why current recommendations for grazing management will not apply in the future.

Perhaps the most disturbing feature is that the best farmers have nowhere else to go. They have reached the attainable levels of production and the challenge is no longer there. This bodes ill for us all.