GREENSWARD

JOURNAL OF THE SOUTH-WEST AND CENTRAL SCOTLAND GRASSLAND SOCIETIES

No. 22

MAY, 1979

CONTENTS

FOREWARD

With increasing EEC pressures, a new government at Westminster and the poorest spring for 25 years, one question in all minds must be 'What of the future?' Will farm incomes increase sufficiently to meet the steeply rising variable and fixed costs; will the forecasted cuts in government expenditure lead to a retraction of the service offered by agricultural research, development and advisory work; will government aid to farming be sustained, or better, improved; will the grass recover from the late start?

Grassland has taken a severe knock during this last winter and spring with the winterkill syndrome being only too apparent in old and new leys alike. Fortunately such a climatic combination is a rare occurrence in the West of Scotland (1968/69 was the last bad winter) and we should not abandon our trust in ryegrass as the lynch pin to sward productivity. An open back-end encouraged grass growth which could not be properly utilised on many farms due to wet conditions, then, delayed slurry application led to heavier than normal dressings when the spreaders could get on the land. These two factors undoubtedly added to overwintering problems. On top of this, the late spring growth has enabled such pests as leatherjackets to make their presence only too noticeable when their voracious appetite outstripped the early growth rate of both grass and cereal plants.

Many farmers have been forced to plough and resow alternative forage crops in order that silos will be full at the end of the season. Perhaps it was fortuitous that the Societies had discussed such crops fairly fully over the last two winters. Stand-by 'buffer' supplies of hay and silage are mostly exhausted and this, along with the replacement of winter-damaged swards means that many grass farms will take some years to recover from the vagaries of the 1978/79 winter.

Experiences such as those encountered this spring show how exposed high intensity production can be to sudden breaks in the supply of grass and awkward situations arise which would not have appeared in the bygone years of lower stocking rates. In order to avoid the repetition of such events we must strive to better use our grass and further development is needed of crop plants which can withstand the intensity of use which often is necessary to ensure survival under todays economic stringencies.

The contents of this issue of Greensward look towards the 1980's and contributions from notable 'grasslanders' should help us to answer the question 'What of the future?' There is one fact however, which is absolutely certain and that is that efficient grassland farming will be an increasingly important keystone in the nutrition of our ruminant animals and in the profitability of livestock farming. It is hoped that the activities of our Societies and the articles reproduced in our Journal help to fulfil these objectives.

Finally, I wish to thank Mrs N Lennox for typing the manuscript of the Journal.

Ronald D Harkess - Editor

INTERNATIONAL CODE NUMBER ISSN-0017-4092

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

EXECUTIVE COMMITTEE, 1978-79

Chairman 1978-79	J Lamont, Gorsehill, Corraith, Symington, Ayrshire.
Vice-Chairman 1978-79	Dr W S Jamieson, Kirkland, Thornhill, Dumfriesshire.
Past Chairman	T C McCreath, Garlieston Home Farm, Garlieston, Newton Stewart.
Secretary	Dr J Frame, The West of Scotland Agricultural College, Auchincruive, Ayr.
Treasurer	Dr M E Castle, The Hannah Research Institute, Ayr.
Journal Editor	Dr R D Harkess, The West of Scotland Agricultural College, Auchincruive, Ayr.
Ayrshire Members	J Watson, Creoch, Ochiltree. G McKinney, Dumfries House Home Farm, Cumnock. G Berry, College Office, 20 Miller Road, Ayr.
Dumfriesshire Members	J Rome, Ingleston, Irongray. D I Martindale, No. 1 Todholes, Eastriggs, By Annan. J Thorburn, College Office, St Mary's Industrial Estate, Dumfries.
Kirkcudbrightshire Members	J McCrae, Airds of Balcarry, Auchencairn. R Ramsay, Lodge of Kelton, Castle Douglas. M J Wrathall, College Office, St Mary's Industrial Estate, Dumfries
Wigtownshire Members	W McWilliam, Colfin, Lochans, Stranraer. M C Dunlop, Baltersan, Newton Stewart. C R Phillips, College Office, Edinburgh Road, Stranraer.
Co-opted Members	R Allbrooke, The Central Scotland Grassland Society, College Office, Beechwood, Stirling. Principal J S Hall, The West of Scotland Agricultural College, Auchincruive, Ayr. A E Parkinson, Advisory & Development Service, The West of Scotland Agricultural College, Auchincruive, Ayr.

THE CENTRAL SCOTLAND GRASSLAND SOCIETY

EXECUTIVE COMMITTEE 1978-79

Chairman	Robert Simpson, Duchlage, Crieff.
Vice-Chairman	Basil Baird, Windhill, Eaglesham, Glasgow.
Past Chairman	Robert Yuill, Walston Mansion, Dunsyre, Carnwath, Lanark.
Secretary	Ray Allbrooke, College Office, Beechwood, Stirling.
Treasurer	David Marshall, College Office, Portland Place, Lanark.
Committee Members Retire A.G.M. 1979	G Millar, Gallamuir, Plean, Stirling. D Baillie, Calla, Carnwath, Lanark. J Warnock, East Langton, Mid Calder.
Retire A.G.M. 1980	M Milne, Solsgirth Estate, Dollar. A Brown, East Gartmillan, Airdrie. R Russel, Burnhouse, Kirknewton, Midlothian.
Retire A.G.M. 1981	G Neilson, 23 Glassford Road, Strathaven. W Graham, Cameron Farm, Greengairs, Airdrie. R Howie, Drumfork, Helensburgh, Dunbartonshire.
College Representative	C C Watson, 73 Craiglaw Avenue, Eaglesham, Glasgow.
Co-opted Members	W Andrew, Crossflat, Kilbarchan, Renfrewshire. J Frame, South West Scotland Grassland Society. G Ritchie, B.O.C.M., Wright Street, Renfrew. J D Edward, Dunallan, Murray Place, Dollar. G Blackhall, Hill of Westerhouse, Carluke.

GRASS IN THE 1980s

Professor Alec Lazenby

Grassland Research Institute, Hurley

An address to the Central Scotland Society in the Bladnock Hotel, Paisley on 29th November and to South West Scotland Grassland Society in the Newbridge Hotel, Dumfries on 30th November 1978.

Speaking about grass in the 1980s is no easy task - indeed to do full justice to the subject requires a crystal ball of proven effectiveness! Yet there seems little doubt that the national level of animal production from grass will be subject increasingly to political decisions and output will also be affected by the cost of concentrates of which cereals at least are likely to remain fairly cheap for the next few years.

It is possible in this country to produce much more energy and protein from grass than it is from grain. Having the right plants, providing them with good conditions for growth and using the herbage which has been produced are major factors. However, more management decisions are necessary and more things can go wrong in achieving a high level of animal output based largely on grass, than in producing a good crop of wheat or barley. The farmer has to have a system which suits his particular circumstances, which is simple, effective and cheap enough to be competitive with cereals. If he finds grass too hard or too expensive to produce, it just won't be exploited fully for intensive livestock enterprises.

Good grassland farming must be based on predictability and confidence. The more uncertainties that can be taken out of such farming, the greater chance of grass being properly exploited. A knowledge of the various factors and decisions likely to influence grass growth, grass quality and effectiveness of use will help to build the confidence necessary to achieve high levels of animal production from grass, and achieve them efficiently and profitably.

By selecting factors or situations that have real practical significance, or might have such significance in the next decade, and placing a major research and development investigation into them will help to reduce uncertainties in production and could influence grassland farming in the 1980s.

GRASS VARIETIES

There are grassland workers and advisers who believe that having the right plants is all-important in almost every circumstance, and for sharp contrast, there are those who think they are of little consequence anywhere. Certainly if you are sowing down a ley of a particular duration, it is obviously important to pay attention to the characteristics of the plants when selecting a seeds mixture; plants sown for a two-year ley would need to perform in a very different manner from those for a 5 or 6 year ley. There are enough good varieties to get us a long way to producing a basis for good performance in most of our grassland environments.

However, in permanent or long-lived pastures, species may be of much less significance than some other things - at least to the extent that I wouldn't advise the automatic and wholesale use of the plough on many of the lowland pastures in England and Wales, or in Scotland. There are a lot of other things that could be done with £130 per hectare than use it uncritically for ploughing and reseeding.

A greater proportion of our research effort has gone into selecting good varieties than is warranted in future. There is a place for the grass breeder, though it is unlikely that the major breakthrough which would be required to make a significant impact on our overall grassland production will occur in the immediate future.

SWARD PRODUCTIVITY

As far as research is concerned significant changes in grassland practice in the 1980s are most likely to come from investigations into factors affecting grass growth and utilization. A much better knowledge is required of:

(i) the potential production of grass in different parts of Britain, i.e. how seasonal and total yields are determined by factors over which man has no control - radiation, temperature and rainfall.

(ii) how much variation there is in such production from one year to the next and which of the factors is responsible for this.

(iii) the variation in output on individual grass farms, and the contribution to such variation of the various factors over which man has control.

Of all the factors under man's control, the one which is most significant in affecting grass growth (both biologically and economically) is nitrogen, whether it be supplied through the bag or via the legume. We have taken the 'fertilizer nitrogen route' much more than the 'legume route', not in such an extreme way as in the Netherlands, but very much more than in Ireland or, if one looks further afield, than in New Zealand or Australia which for all practical purposes depend entirely on legumes to supply nitrogen to grass. Nitrogen usage in Britain has increased markedly during the last decade but on average more than twice as much is applied to leys (160 kg/ha) than to permanent grass (70 kg/ha).

RESPONSE TO NITROGEN

Data have been collected from 21 sites in England and Wales from monoculture plots of S 23 cut frequently (5-6 times annually) over a four-year period. In all but 3 of the 84 site/years, there has been a linear response in terms of dry matter up to 300 kg N applied per hectare. The generalised response indicates that the point of fall-off in response coincides, perhaps fortuitously, with the economic break-even point, i.e. 10 kg DM/kg N applied. So the farmer knows that at least for a frequent cutting regime, he is almost certain to get a linear response in his herbage production up to 300 kg/N applied.

What he doesn't know is just how much response he will get for each kg N he applies. Results from the 21 sites (taken as the mean of 4 years annual production data) show that it could be as much as 30 kg DM or, at the other extreme less than 15 kg DM (most sites were between 20 and 25 kg DM/kg N). Differing responses were obtained from a series of sites. In Cambridge, the experiment was sited on an agriculturally light soil, and the linear response in herbage production was not only less than at most other centres, but it occurred up to only about 250 kg/N in 2 years. Yields at Aberystwyth (12.7 t DM/ha) were almost twice those at Cambridge (6.5 t DM/ha), and at Wenvoe (S Wales) (15 t DM/ha) were more than twice as big. Differences occurred, not only in the size of the response to N and in total yield at the different sites, but also in the amount of variation in total yield from one year to another at any one site.

SEASONAL YIELDS

The seasonal distribution of yield can be manipulated by using nitrogen. The even distribution of N over 6 cuts gives a spring peak followed by a fluctuating seasonal drop in yield. Applying half the fertilizer in spring and the other half equally in summer and autumn produces a greater spring and less summer and autumn production. Application of half the total nitrogen in summer gives much more even production with a higher proportion in both summer and autumn than the other two regimes. The total yield throughout the season is identical for the nitrogen has been applied.

A great deal is known about the response of herbage to nitrogen on cut plots, and some data are available on nitrogen losses by leaching. There are other factors about which less is known e.g. the factors influencing the gaseous loss of N by de-nitrification, how organic N gets into the soil solution and therefore becomes available by uptake. Yet no method exists for assessing available soil nitrogen; this is a particularly important gap in our knowledge as the yield on the S 23 plots already referred to and to which no N had been applied varied from less than 0.5 tonnes to 6 tonnes per ha. Clearly the soil N which is available to the plant is a very important factor in determining yield.

It is especially unfortunate that no convincing data exist on the response of a grazed sward to nitrogen. There are, of course, some animal production data, but reliable sward data are non-existent. There are indications from other trials of a fall-off in response at a lower level following grazing than in cut plots. Whilst this seems reasonable, research is obviously needed both to make a better comparison of cut and grazed swards in their response to N, and to provide a sounder basis than presently exists for determining N fertilizer policy for the latter.

WATER

A major factor influencing yield (total and year to year variation) is the water available to the grass during the growing season. The two factors influencing the amount of water available are the rainfall during the growing season, and the moisture holding capacity of the soil.

When these two factors were combined, 37% of the variation in yield was accounted for in the national grassland manuring trials. Looking at the relationship between yields at individual sites in the four years and the changes in the total water available for growth at such sites, the correlation becomes much higher and 62% of the variation in yield from one year to the next at any one site is accounted for by the variation in available water from one year to another.

THE LEGUME

The second method of supplying N to pasture is via the legume, particularly white clover. For example in one experiment at the Grassland Research Institute in 1979, S 23 plus S 100 provided the equivalent of 250 kg N in its effect on yield and S 23 plus Blanca typical of the new, larger leaved varieties of white clover provided the equivalent of some 315 kg N/ha.

Not only does white clover have an effect on yield, but also on quality. Data on liveweight gain of growing lambs from the various experiments in which monoculture white clover has been compared with monoculture grass when the amount of the material on offer was non-limiting shows increases up to 75% in rate of liveweight gain.

For practical purposes it is more logical to compare a grass/clover mixture with a monoculture grass. The experimental data available show that with the amount of available herbage non-limiting, but with the proportion of white clover in the mixture variable, all but one experiment provided an increase in the growth rate of sheep and as far as one can determine, the increase was directly proportional to the content of the clover. This improved production is due to (a) intake - which increases with an increase in the percentage of white clover in the grass mixture and (b) a greater proportion of the metabolizable energy in white clover being available for animal maintenance and production.

The variable contribution of white clover, and therefore of N input from one year to the next, makes production of grass/white clover pastures less reliable than grass + N. Clover is less tolerant of low temperatures and of drought than our grasses; in addition, management to provide a fairly uniform white clover contribution is less certain and more difficult. Other problems include difficulties of establishment and in animal health, though the bloat danger is frequently exaggerated.

A broadly-based programme of research on white clover is necessary - if only for insurance reasons. For example, it seems important to look at just how high N fixation and release can be following selection of the best combination of rhizobium strains and white clover genotypes; competitive studies between clover and grass (also with N being supplied artificially) seem necessary to determine just what sort of contribution clover can make to our swards, and which plant characteristics are important in determining the survival of white clover plants and their contribution to the sward. Such information is required to provide varietal blueprints for a breeding programme. The investigations on white clover should provide a bank of information which might be used in our ever-increasingly uncertain world, providing alternative production strategies should they be necessary. For dairy production it is not likely that white clover will replace fertilizer N but in such less intensive systems as beef and sheep, clover could have a more definable role in the short-term, certainly in the 1980s.

GRASS UTILIZATION - GRAZING

The biggest challenge in our grassland research and practice is the provision of an economic means of realising its potential for animal production. Thus efficient systems of using grass just have to be found, and this means both better understanding the exploitation of grazing and conservation.

More of the energy and protein produced by grass is consumed by the grazing animal than is eaten as conserved feed but we know much less about grazing than we should. As part of a series of experiments designed to both improve understanding and provide practical advice, the GRI (Grassland Research Institute) has been examining the relationship between herbage availability, intake and milk production under two managements viz. strip grazing and continuous grazing. Just to cite one example, an experiment has been conducted in three consecutive years, 1976-78, to examine the question: 'How much herbage should be kept in front of the cow to maintain maximum milk production per animal under a continuous grazing management?' In 1976 the question was examined on a weight of herbage basis and in 1977 and 1978 in terms of pasture height by using a put-and-take system with animal measurements carried out on a core of 6 animals retained on each 2.5 ha area. Sward height, monitored in the 3 years provided a simple means of defining grazing severity. Maximum milk production per cow was obtained at a grazing severity maintaining the sward height at approximately 8 cm whilst maximum reduction in milk yield of some 15-20% was obtained when the herbage was only 4.8 compared with 8.4 cm in height.

These data highlight a very important need for the farmer, namely the provision of some simple method of helping to estimate when there is sufficient grass to enable intake at a level to sustain maximum milk production. Substantial progress might be possible in achieving this objective in the next few years and if successful would help remove another area of uncertainty from our grassland farming.

As knowledge of pastures has increased during the past few years, so we have gradually come to realise that there are many more significant things to learn about grazing than which is the best grazing system - how much time and effort has been spent on arguing the advantages of rotational over continuous grazing!

There is a real need to step up research on grazing, a topic both important and unifying; researchers who are specialists in many different fields would benefit. The studies could provide the strategic worker with a better understanding of the cycling and redistribution of nutrients occurring during grazing, information on the carbon balance of the pasture and how this is related to tiller growth and regrowth, and on the energy expenditure of the grazing animal. Further studies on sward regrowth, structure, composition and production during grazing, and on the habits of grazing animals and their intake when differing amounts and qualities of herbage are on offer, would provide the more applied worker with a better understanding of the effects of the animal on the sward and the sward on the animal. Such studies should also enable the development of logical fertilizer and management practices for the farmer and enable better prediction of animal production.

HAY MAKING

The traditional view of both hay and silage is that they are roughages, not capable of supporting high animal production without supplementation. Certainly the digestibility of farm hay (average < 60D) is poor and lower on average than silage; at this quality it contributes little to the production part of the ruminant diet. Its low quality is a major factor limiting animal production from grassland. The real challenge in improving hay is to provide a technology which is cheap i.e. not involving any greater expense of labour, fuel and equipment than that needed to produce grain. Using solar energy for wilting or drying will make least demands on expensive equipment.

A factor limiting successful production of hay is the time necessary to reach a moisture content when the hay can be stored without deterioration by moulding. Our research has shown that a considerable proportion of the time taken to dry the hay is needed for the removal of the last few percent of moisture down to 20%, the safe level for storage. It is particularly frustrating when the energy available during an average summer day is ample to evaporate all the water needing to be lost from the crop; whilst it is possible to set up laboratory methods to achieve this, it has just not been possible to develop any field method to achieve anything like this. So we have to take another tack and reduce the time that the hay crop has to stay in the field by baling it at a higher moisture content and storing after either barn drying or adding a preservative at baling.

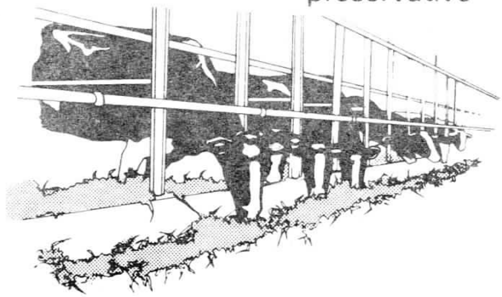
Barn drying has been available to farmers for 25 years, but the technology has not been taken up extensively largely because of (i) high labour demands for moving bales into and out of the drier, (ii) fuel costs, and (iii) the low capacity of many barn hay drying systems. Modern developments have overcome these objections to a large extent.

Chemical preservation is more attractive and can be used tactically in poor weather. Ammonium bis-propionate (Add-H Mark II) is less volatile, safer to handle and as effective as propionic acid in controlling heating and moulding in moist hay during storage. However, even distribution of the additive in the hay is absolutley essential and this has not yet been fully achieved in the farm situation.

Recent work at Reading University has shown a substantial improvement in the digestibility of hay (55 to 70D) following the addition of sodium hydroxide (Na OH). At GRI a crop of tall fescue was made into hay with 3.8 tonnes DM/ha

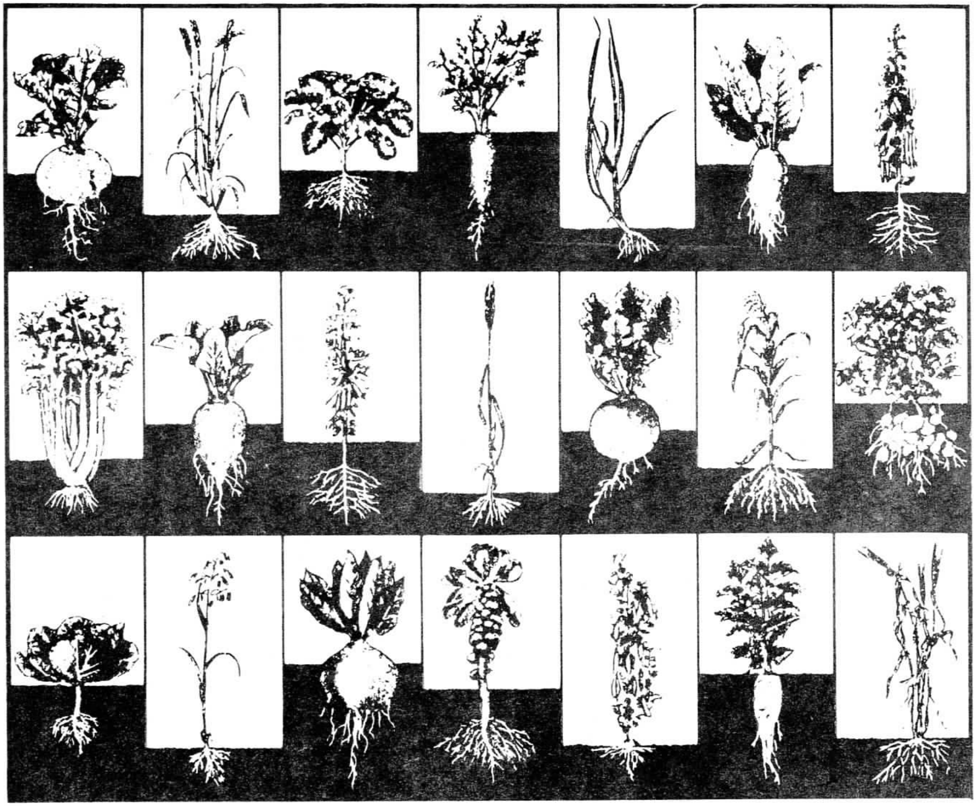
Hay keeps its cool and its full feed value with Add-H

Add-H is the one form of hay preservative you really can rely on. For Add-H controls the temperature of your valuable stored hay and prevents the growth of harmful moulds and bacteria. Cuts out nutrient loss between harvesting and feeding.
Safe to use, easy to handle and easy to apply, Add-H is also non-corrosive. It's the **proven** hay preservative



BP nutrition

BP Nutrition (UK) Limited,
Agricultural Products Division,
Stepfield, Witham, Essex CM8 3AB.
Tel: (0376) 513651.



and 65 D-value. Part of the crop was left to bulk to 7 tonnes DM/ha (49D) and made into hay with and without Na OH. Addition of Na OH to the mature hay crop increased the digestibility of DM by 14 units and increased the DM intake by 66%.

We have now reached a stage where we can look forward not only to minimizing losses but to actually improving the quality of conserved material as a result of adding alkalis. Indeed, there is real hope of breaking the compromise between yield and quality both in making hay and silage following such treatment. There are on-farm problems in applying a strong alkali such as Na OH, but silage has been made successfully from alkali-treated straw, in this instance by using calcium hydroxide. The lengthy period in the silo was sufficient to compensate for the slow rate of action of this less toxic alkali. Though there is still a long way to go, the prospects for these techniques are exciting.

SILAGE MAKING

As for silage, though the process is much less weather dependent than for hay, farmers have just lacked confidence in their ability to make it, at least until recently. The type and extent of the fermentation processes were so unpredictable that the farmer never knew just how good or how bad his silage would turn out to be. But during the last decade our ensilage technology has developed to such an extent that grass can now be conserved efficiently and with pretty good predictability on the farm. The result has been a spectacular rise in the amount of silage made in the last five years most resulting from better use of grass rather than replacing hay; indeed more grass is still made into hay than is ensiled.

The ensilage process involves the fermentation of water-soluble carbohydrate (WSC) to lactic and acetic acid, carbon dioxide and water. If there is sufficient WSC and the conditions are right (i.e. are anaerobic) the pH falls to 3.8 to 4.3, an acid level which is a preserving medium and which the vast majority of acid is lactic acid. If WSC is short, there will be insufficient acid and the lactic acid produced may be broken down by clostridial action to acetic and butyric acids which are undesirable. Proteins are broken down by enzymes to amino acids which may be deaminated and decarboxylated by bacteria. Whereas the dry matter of original grass may have 5-30% WSC, 2.5% organic acids and with 80% of the N as true protein and none as ammonia, silage dry matter commonly has less than 1% WSC, 5-15% organic acids, less than 50% of N as true protein and 5-20% as ammonia.

Digestibility of the original material and the efficiency with which the animal uses energy are generally little affected by ensiling; in contrast the process can affect considerably voluntary intake and the efficiency of use of nitrogen compounds. Research has given a much better understanding of the fermentation process and ways of controlling or manipulating this process, and of the causes of deterioration in the silo and after the silage is exposed to the air. High quality silage is dependent on highly digestible material being ensiled and clostridial fermentation being restricted. Whilst chopping aids intake and there is some evidence that wilting results in better conditions for fermentation, additives are especially important both in reducing such fermentation and protecting some of the protein thus enabling an increased amount of such protein to be used by the animal although this latter point still offers some problems.

Some recent work with the autumn calving herd at GRI has been designed to evaluate just what part good quality silage could play in the diet of the high yielding dairy cow, if possible reducing the proportion of concentrate fed. In our feeding policy, concentrate has been fed at a low flat rate, irrespective of the yield potential, for the first 150 days of the lactation (6.3 k/day) in 1977/78 whilst allowing the animal free access to high quality silage. High yielding cows ate more silage than lower yielding animals, whilst milk yields have risen from just over 5000 litres per lactation in 1974/75 to 5800 in 1977/8, in a herd comprising three-quarters cows and one quarter heifers. Comparing the yield with Milk Marketing Board Recorded Herds producing similar milk yields, our usage of concentrates has been considerably less in total and per litre of milk produced.

Yet we have not only to demonstrate just what it is biologically possible to produce from grass, but also just how efficiently such animal output can be achieved. Whilst our dairy production data show very healthy gross margins, I cannot claim that the experiments have been carried out over the four year period in a properly conducted farm system, and when all is said and done, results from grassland research just have to be evaluated in farming systems which, as I said earlier, have to be simple, effective and cost competitive.

Nationally we haven't been very successful in promoting grass for milk production at least if experiences on the MMB least cost farms are typical! A very close relationship exists between the increased milk production and a greater concentrate usage, a trend particularly apparent in 1975/76 and 1976/77. The possibility of the drought during those years having some influence on the results, just might offer a crumb of comfort! The increased milk production was associated with a higher use of grass, though there was little indication of a real increase in stocking rates on these farms.

THE FUTURE

How then does all this affect grass in the 1980's. Certainly we should have a much clearer picture than we have now of the production possible at the national level, and that being achieved at the farm level. Further, the increased knowledge of just how important individual factors and decisions are in influencing output will improve the predictability of such production at farm level.

There will be an increase in total fertilizer N usage, but the ceiling of such use is fast approaching on some of our intensive N-use farms; as efficiency of production becomes more significant, and more evidence on N-use is collected, better fertilizer policies are likely, relating more precisely grassland output (in economic terms) to fertilizer input and allowing more manipulation of the herbage available during the growing season. More effective fertilizer use will include P and K as well as N. Legume N is unlikely to replace fertilizer N in dairying, though clover could have a role in beef and sheep enterprises, and is likely to be the key to any intensification of grassland output for the uplands.

There will be more appreciation than presently exists of the need to use grass effectively. Grazing systems will generally become as simple and cheap as possible with some form of set-stocking increasingly used where it suits the farm circumstances. Effectiveness of grazing might well be increased by the development of a simple monitoring technique allowing farmers to better relate animal needs with the grass available. Better technology will allow improved quality of hay to be made where required; as for silage, better predictability of quality is likely. More effective use of the nitrogen in silage in the ruminant diet remains a major challenge but more silage will be made, overtaking hay as the major method of conservation. The more predictable quantity and quality of these and a better knowledge of animal requirements will make the supply of nutrients for the animal via the grass more precise. The progressive grassland farmer will become more conversant with terms such as megajoules, Metabolizable Energy and degradable protein which will increasingly become part of common language used to describe grass production and quality in much the same way as digestibility and D-value are used today.

Opportunity and challenge faces both the research worker and grass farmer. Research, especially on factors important in affecting grass growth, and of even more significance, in using grass properly will provide invaluable information enabling a higher animal output to be achieved from grass, and achieved more efficiently and profitably than at present. The farmer has his part to play in keeping the research workers feet on the ground by pointing to problems which he sees as major factors limiting such output from grassland which remains the greatest source of untapped potential in British agriculture.

DISCUSSION

The speaker was first asked about the quality of silage. In experiments at GRI, with dairy cows yielding 5000 litres per lactation, a high quality silage was essential. The ME must be around 10.5-11.0 (70D). Lower quality silage with an ME of 9.5 (63D) limits intake. The aim is to make as much first cut silage as possible at the higher quality. There is a yield penalty of up to 25 per cent in going for high quality. Careful consideration of the proportions of silage and grazing areas is necessary especially in the early part of the year to ensure adequate silage is made.

This point also involves the efficiency of N use for maximum production. In the grazing situation an even production of herbage is required but for good quality silage there is a case of pushing the yield with adequate N in the early part of the year and then to ease off later in the season when the response is poorer. Mid-season depression in yield can be partially overcome by adjusting the level of N applied, using more of the annual application in June/July than in April/May.

In terms of improved predictability and utilisation efficiency the speaker felt that zero grazing is a marvellous way of using grass but at present only in certain specific circumstances is it financially viable.

On the subject of seeding and seed mixtures, the Aberystwyth philosophy that real improvement is only obtained by ley farming is still prevalent, hence ploughing and reseeding is widespread. However the best permanent pastures can yield as much animal production as leys. In many circumstances the role of vegetation in pasture is not absolute. If soil pH, drainage and fertility are reasonable and if there are some good plants present then with balanced fertilizer use and judicous management, these plants can be encouraged to spread and sward output improves. This would particularly apply to the grazing situation. Care is needed with a cutting only regime which is an exhaustive cropping system. Species and strains of grass for the 1980's will still show a bias to perennial ryegrass. The existing varieties, properly managed will aid farmers to achieve high outputs and there is nothing yet apparent in new plants which will lead to a major breakthrough in the immediate future.

The water deficiency situation over the last two summers has highlighted soil moisture deficit problems so interest in irrigation was expressed. Only on intensive grass enterprises where grass is vital to the business will it pay to use irrigation on the grass crop.

In our climate and sward management systems the use of legumes is plagued by three problems namely, unpredictability, unreliability and dubiety concerning persistency. Because clovers are less adaptable than grass, an extra dimension is added to the management problem. The new large leaved clovers may offer a step in the right direction in overcoming these problems.

The technique of reseeding without the plough depends very much on reducing or eliminating competition from the unwanted plants. Several machines are available, some for drilling into pre-sprayed swards and others offer a system which applies the herbicide, opens a slot and spreads the seed fertilizer and pesticide in a single pass.

Observations in the west of Scotland have noted that the single pass machine has too wide a space between the drills for effective and quick improvement. Drills with closer spaced coulters tend to be better. All machines are more successful in the lowground situation rather than on the hill.

GRASSLAND AND ANIMAL HEALTH

I A Macmillan MRCVS,

Mauchline, Ayrshire

A talk to the SWSGS in the Milton Park Hotel, Dalry (Kirkcudbrightshire) on the 18 January 1979.

When given the title of this talk it was pleasing to read the optimism in the topic as so often veterinary surgeons are asked to speak on animal disease! There are two main factors in the grassland farmers creed viz., with the ruminant animal, there is a high correlation between good grassland utilisation and profitability and secondly there is no room for complacency since the present average production from grass is only 5000 kg dry matter per hectare. Good grassland farmers are reaching 12-15000 kg whilst experimental plots can produce over 22,000 kg dry matter per hectare.

One of the factors limiting animal production from grass is livestock health. There is no reason why grass feeding and animal disease should go hand in hand. Most diseases linked with grass are nutritional, where input is not balancing requirement or output.

Water, protein and energy are the three major input factors. Occasionally water deficiency can occur due to inadequacy of supply and it is important especially for dairy cows that water is always available. Scarcity of water during some of our recent summer droughts undoubtedly created stress among cattle. Protein deficiency at grass has been suggested especially now that animal yields are increasing but this is a rare occurrence. More likely is protein in excess, particularly with kale or silage highly fertilised with N and where these fed along with a high protein cake. This can lead to ketosis which is an imbalance of the ratio energy to protein.

Energy is in the main the most likely nutrient to be deficient. Cows can compensate to offset a shortage of energy by using up body reserves but a rapid weight loss can lead to ketosis. In the spring, care should be taken when turning out fat cows on to lush wet grass.

Energy deficiency can cause a delay in cattle coming on heat and a failure to hold to the first service, although many other factors can influence reproductive physiology. Much information is now being made available from computers and reproductive failure has been linked with energy shortage.

Always be careful on autumn grass as this is the time we all tend to overlook the deficiency of energy in the daily ration of the cow.

Major minerals These comprise potassium, sodium, calcium, phosphorous and magnesium.

As far as potassium is concerned there is usually plenty in grass but sometimes the young calf diet is deficient. Sodium shortage can occur in drought conditions. Calcium is also usually present in sufficient quantity in grass. Two problems arise if calcium is deficient. Rickets, due to insufficient bone calcium, occurs especially in calves on hay/cereal diets and particularly if a high proportion of the feed is barley. Milk fever is the other problem arising from calcium deficiency. Intravenous injection is best since it reacts faster. Subcutaneous injection can take up to one and a half hours to react. One bottle of 40% calcium is ideal, more or less than this is a waste of time and money. Farmers should learn the technique of intravenous injections themselves. Always use a sharp needle, the single-use needle only costs 3 pence. Multi-use needles are much more expensive but will become blunt.

One technique suggested to avoid milk fever is to keep the cow on a low calcium diet during the dry phase. This encourages the metabolism of the cow to extract more calcium from the digestive tract and to mobolise calcium in the bone. Then at calving, a high level of calcium is fed. This together with the other two actions encourages adequate blood calcium. This approach is not really possible where cows are out at grass as it means considerable manipulation of the diet. However, where cattle are permanently housed and fed complete diets, the system is possible.

Vitamin D_3 has the same effect. If the cow is treated 2 to 8 days before calving it enables better use of dietary calcium and mobilisation of bone calcium. Dufafral (Vit D_3) helps to reduce the incidence of milk fever - its about 70 per cent effective and can be used especially in autumn.

High phosphorous diets are also claimed to reduce the incidence of milk fever but if this is injected it must not exceed 30 mg per day. Deficiency in dietary phosphorous causes aphosphorosis in the bone and hypophosphataemia in the blood. There is plenty phosphorous in concentrates so well fed cows should not be deficient. Infertility is often associated with phosphorous deficiency but barley feeding supplies both the mineral and energy. If fertility is being affected it is likely that other symptoms of malnutrition or disease will appear first. However, the agricultural use of phosphorous has been dropping, no doubt due to its rising cost so it would be wise to be careful. Again pasture grass usually has sufficient phosphorous for animal needs but in drought conditions or in mature crops the phosphorous content could be low.

Magnesium imbalance and grass staggers is a condition well known to many. Often nitrogen is blamed but in fact high N use increases the magnesium level in herbage. Lush grass is low in energy and magnesium but deficiency systems may not occur until stock is subjected to stress, for example, cold weather or reduced feed intake. The application of potassium to grass does lower the magnesium content hence the advice on the need for care when using this element as a fertiliser on grazing swards. Wet weather, high yielding cows and potash use are all warnings that staggers might occur, so be prepared. Magnesium can be supplied in proprietary cobs, in the drinking water or dusted onto the pasture. 'Bullets' are also available.

Trace elements are vital to healthy stock although they are only required in minute amounts. Copper can be low in the blood and likely areas of soil deficiency are known. EEC regulations are suggesting lower levels of copper in animal feeds than are at present used in the UK. Copper can be injected once or twice a year where deficiencies are known to occur. Cobalt and Vitamin B_2 are not limiting in cattle but can be in sheep. Again deficient areas are known. Cobalt bullets in sheep can offer protection for up to 3 years or injections up to 3 weeks.

Selenium deficiency causes white muscle disease and is sometimes seen in heifers when they first go to grass. Vitamin E deficiency is tied in with the selenium problem and can result in a retained placenta. Selenium is somewhat dangerous to handle so it is better not to use it in home mix feeds.

Interactions occur between these trace elements which complicate the picture. The dangers of fertiliser nitrogen are largely a myth. Indeed, in general, livestock health is better with N use since there is more grass and hence more energy available for the stock.

Other 'inputs' which have caused trouble are fluoride, lead and copper from sludges and slurries applied to the sward. This is due to direct intake from the soil or from the slurry adhering to the grass, rather than a high content of these within the herbage.

Worms For husk (hoose) injections are well worthwhile. Do not miss a year even if things seem to have cleared up. The more cattle around, the more careful one must be. Stomach worms can be minimised by good grazing control and several systems are well known to ensure the young stock go on to clean pasture first and that sheep are offered clean ground each year. For cattle strategic dosing at 3 and 4 weeks after turnout is helpful. If grazing starts very early a third dose at 9 weeks after turnout may be needed. The main build up of worms is in the July/August period.

Panacure is very effective against overwintering larvae and should only be used after the stock are housed.

With adult stock, claims have been made that worming with thibenzole at calving has lead to improved milk yields but further information is required on this topic.

Liver fluke is not usually a problem in cattle. It would take upto 400 flukes in a liver to cause visual symptoms and usual counts are less than five. Cattle can recover from liver damage but sheep, with a much smaller liver, cannot. If fluke is known to exist and young stock are grazed on that area then treatment is recommended.

Discussion

When injecting with a 40% calcium for milk fever, care is necessary. A slow infusion is recommended, somewhere around 10 minutes for one bottle. This injection alters the heart beat slowing it down prior to a strong pick up. If the cow obviously has a temperature caution is needed. Where a subcutaneous injection has been given then a calcium:phosphorous solution with 20% calcium is likely to be adequate.

Intravenous injection of magnesium is likely to be lethal. Subcutaneous or oral dosing is the safe approach. However usually a calcium injection is given first and if there is no response, magnesium is then administered.

Nitrate poisoning on grass is fairly rare. It is more likely to be seen when feeding kale, stubble turnips or cut swedes. Cattle can acclimatise to high nitrate levels in grass and claims of nitrate poisoning are more likely to be energy starvation.

Blackface ewes on low ground farm in the spring, need to be watched. Again deaths frequently can be associated with inadequate energy. The suggested approach is to feed whole barley over a long period from mid winter right into early spring grass. The rate should increase from 50 g to 0.5 kg per ewe per day.

If there is a copper deficiency problem this element can be added to barley. Mid-summer is the critical time to look out for copper deficiency.

Mastitis is a major worry. Dry cow therapy will remove about 70 per cent of existing infection but there is some suggestion that this will only encourage the increase of E.coli.

Humid housing and wet bedding in the cubicles increases the spread of E.coli so cow house environment is important. Give the teats time to dry after milking and before the cattle have access to the cubicles. There is nothing wrong with concrete if it is dry. Rubber mats always seem to be wet and mat plus sawdust could aggravate the situation. Some farmers are now finishing off the outside 12-14 inches of standing with a metal float so that the smooth finish will run off the water and encourage the floor to dry. Shavings are probably drier and safer to use. If sawdust is used, keep it dry until needed; warm moist sawdust encourages problems.

Techniques for mastitis control are many, from breeding resistant animals to various chemical concoctions. It is a good idea to alternate the products being used, between summer and winter or between dry and milking cows. Remember that chapped or damaged teats encourage mastitis.

Pasturella pneumonia usually occurs following a change of pasture or environment. Vaccination can cure. For example, a sudden change from a bad to a good pasture can trigger this complaint in young stock or in adult sheep following lambing. Twice yearly vaccination in August and again pre-lambing is required for ewes where the problem arises but blanket vaccination of store lambs is not recommended.

THE ARC PROTEIN RATIONING SYSTEM FOR RUMINANTS

Dr N W Offer and Dr G D Barber

The West of Scotland Agricultural College

The value of feedstuff as a protein source depends on its ability to supply amino acids to the animal's tissues. Any system for expressing feed protein value should make allowance for the factors which regulate this amino acid supply.

In ruminant animals there are two major sources of amino acids made available to the absorptive regions of the gut. These are:-

1) microbial protein - protein synthesised by the microbial population in the rumen - usually the major source;

2) undegraded dietary protein - protein that has escaped breakdown in the rumen.

As a result of this complication, a great many factors regulate amino acid supply to ruminant tissues.

Supply of Amino Acids

Three important factors affecting the supply of amino acids are as follows:-

1) crude protein intake;

2) protein degradability in the rumen;

3) the amount of energy made available to the rumen organisms.

Protein degradability in the rumen (factor two) determines the proportion of the feed crude protein that is available for use by the rumen micro-organisms and also the proportion that escapes breakdown in the rumen. The energy supply to the micro-organisms (factor three) is usually the limiting factor for microbial protein synthesis in the rumen.

At present the protein value of feeds for ruminants is expressed in terms of digestible crude protein (DCP g/kg DM). This measure has proved unreliable, in practice, leading to both over and under estimation of protein value. The DCP system does not provide a sound basis for ration formulation because it makes no allowance for variation of protein degradability and microbial energy supply from ration to ration. A further weakness is that the microbial nitrogen requirement is not considered. This can have serious consequences since limitation of microbial activity in the rumen by inadequate nitrogen leads to reduced digestibility and intake of forages. Furthermore, the DCP system does not permit assessment of the relative merits of sources of either non-protein or true-protein (amino acid) nitrogen as supplements for rations.

ARC System

The ARC system for protein evaluation overcomes the major inadequacies of the DCP system. The principle of the new approach is that two requirements for protein are considered separately:-

A Microbial protein requirement:

Expressed as a requirement for rumen degradable protein (RDP g/d).

Satisfied by non-protein nitrogen (NPN) since rumen micro-organisms use ammonia, obtained from dietary NPN or dietary degradable true protein, as their main nitrogen source.

The RDP requirement depends upon the energy available to the rumen micro-organisms and is calculated from the equation:-

$$\text{RDP (g/d)} = 7.8 \times \text{ME (MJ/d)}$$

Any shortfall in RDP can be made up by supplementation with sources of NPN, e.g. urea.

B Animal protein requirement:

Expressed as a requirement for total tissue crude protein (TP g/d). TP represents amino acids actually available to the animal's tissues for useful activities. The requirements for TP are already known for different levels of maintenance and production and can be tabulated in the same way as those for DCP at present.

Satisfied ONLY by true protein (amino acids) provided to the tissues as:

1. Microbial amino acids (microbial nitrogen requirements having been met by RDP as discussed above).

2. Rumen undegraded protein amino acids (from the rumen undegradable protein -UDP).

The UDP requirement is calculated from known TP requirements from the equation:-

$$\text{UDP (g/d)} = 1.91 \times \text{TP (g/d)} - 6.25 \times \text{ME (MJ/d)}$$

Any shortfall in UDP can be made up ONLY by supplements of true protein (NOT NPN) since only amino acids can be utilised by the animal's tissues.

The requirement for UDP may be zero. This means that the animal's tissue protein requirement are met entirely by microbial protein and only the microbial requirement for RDP need be considered in ration formulation.

In any ration evaluation or formulation problem BOTH the microbial and animal requirements must be considered. Calculation of the requirements for RDP (g/d) and UDP (g/d) involve knowledge of only the ME intake (MJ/d) and the TP requirement (g/d).

Feeds

The requirements for RDP and UDP (g/d) can be met only if the RDP and UDP values of feeds (g/kg) DM) are known. Both values can be obtained from the crude protein content (CP g/kg DM) of a feed and its protein degradability in the rumen (dg):

$$\text{RDP (g/kg DM)} = \text{CP (g/kg DM)} \times dg$$

$$\text{UDP (g/kg DM)} = \text{CP (g/kg DM)} \times (1-dg)$$

dg is the fraction of the feed crude protein which is degraded in the rumen whilst (1-dg) represents the fraction that escapes breakdown.

Feed protein degradability (dg) ranges from 0.3 (for some fish meals and formal-dehyde treated silages) to 0.9 (for untreated casein). For many "high-protein" supplements (e.g. soya bean meal) the value of dg can be greatly affected by the extent of processing of the feedstuff. The application of the new system requires that the dg values for a wide range of feedstuffs be know. The values for RDP and UDP will then be given in feed tables. Unfortunately, few dg values are known at present which is the main reason for the delay in the introduction of the new system. The direct measurement of dg involves the use of cannulated animals and complicated chemical methods to distinguish between microbial and dietary protein passing through the intestines. This method is too slow and expensive for routine use and so attempts are being made to predict dg from indirect measurements. The most promising of these involves measurement of the loss of feed protein from nylon bags suspended in the rumens of sheep or cattle.

Conclusion

This note provides an explanation of the background to the proposed ARC protein rationing system. Although the system is based upon sound and well established principles, much work remains to be done before all of the factors which affect the protein value of rations are elucidated and can be given precise mathematical values. The system has been designed to allow the introduction of new knowledge as it becomes available. At the moment, reliable figures are not available for the protein degradability of many feeds and feed components. Furthermore the system as described depends upon a number of as yet untested assumptions. It would, therefore, be premature to adopt the system for routine rationing at this time.

Footnote: This contribution is reproduced from The West of Scotland Agricultural College Technical Note No 47, March 1979 pp 3.

Do not be misled by reference to this system by feed manufacturers. RDP values are required for all ration components (silage, hay, straw, draff etc) before the system can be used and these are just *not* available at present - Editor.

BRITISH GRASSLAND SOCIETY - WINTER MEETING
LONDON 1978

Dr W S Jamieson

Kirkland, Thornhill

The British Grassland Society Winter Meeting is a one-day event held in London during Smithfield week. This years theme was Grazing - Sward Production and Livestock Output. In the morning, four invited speakers each gave half hour papers on different aspects of the subject, discussing current knowledge and future needs.

In contrast, the afternoon was devoted to a series of short papers describing the results of recent research.

It would be impossible to condense the entire days proceedings into a few paragraphs - a copy of the proceedings is in fact obtainable from B.G.S. Therefore, I shall briefly mention some of the aspects which interested me from the point of view of 'take-home' messages.

Having said that, the first paper by Dr J Hodgson (HFRO) was perhaps the most theoretical of the day although possibly of greatest long-term significance. He discussed the effect of grazing management on herbage production suggesting that the principles affecting herbage production in cutting trials (frequency and severity of defoliation) did not appear to operate in a similar manner in grazing studies under a typical range of UK conditions. In addition there was no evidence that increasing stocking rate depressed plant growth. Past arguments about the merits or otherwise of rotational grazing versus continuous grazing therefore had no firm basis from a herbage production point of view. The importance of herbage decomposition as well as growth in influencing the amount of herbage available was mentioned if only to say that little as yet was known about this subject and that it warranted greater research effort in the future. Dr Hodgson concluded: 'The evidence suggests that there is relatively little scope for influencing annual rates of herbage output by grazing management in the UK. Therefore, at present, it is perfectly sensible to choose a grazing system on the basis of convenience, or the needs of particular sets of grazing animals'.

In the second paper, which related to beef production, Mr R D Baker (GRI) pointed out that from MLC figures improvements in grassland utilisation (in terms of live-weight gain and concentrate usage) had been very small over the past 10 years and the only real sign of progress was in stocking rate. He considered that in many situations grazing behaviour could limit herbage intake because as a sward gets shorter and closer to ground level, bite size is reduced requiring an increase in grazing time to maintain herbage intake. Results were quoted which indicated that herbage intake was unlikely to be depressed too much until the height of the sward fell below 7-8 cm (that's certainly short). Mr Baker could find no evidence that high nitrogen usage depressed daily liveweight gain and suggested

Fisons Extra-Grass gives you up to 17% more grass than straight N alone.

Fisons fertilizers

FISONS

that up to 350 kg N/ha, the response to 1 kg N was of the order of 0.8-1.0 kg liveweight gain with only 0.36 kg of that gain being required to cover fertiliser costs.

The third paper by Dr F Gordon from N. Ireland concentrated on dairy cattle at grass. He was very concerned about the interaction between high output per hectare and high output per cow. Trial results have shown milk outputs during the grazing season of between 15,000 and 17,000 kg/ha but in these cases individual cow performance has been reduced by 10-25%. Supplementation is one method of overcoming this per hectare/per cow conflict but this had been shown to be uneconomic in the past and in a recent trial with cows yielding 28 kg at turnout, the response had only been 0.33 kg milk/kg concentrates. However Dr Gordon did not discount supplements altogether but questioned the validity of the traditional cereal-based, low protein supplement as opposed to, for example, high quality silage. Other attempts to minimise the hectare/cow conflict such as alternate grazing and cutting or leader-follower systems have also been mainly unsuccessful.

Fortunately Dr Gordon did not only deal with the grazing season (few of us milk cows for only six months a year) and described some interesting results for his January/February calving cows. These suggested that high levels of concentrates before turnout (greater than 7.0 kg per day with *ad lib* silage) reduced performance at grass when concentrates feeding was stopped, compared with cows receiving less than 7.0 kg concentrates prior to turnout. This effect differs from the established principle relating to indoor feeding that the higher the peak yield achieved the greater total lactation performance. In Dr Gordon's experiments total lactation performance was similar for high and low concentrate groups.

In the final paper detailing reasons for the gap between potential grassland performance and actual on-farm performance, Mr J Johnson (ADAS) discussed the significance of farmer attitudes to incentive, risk, education and innovation in maintaining this gap. One worthy statistic - arable farmers tend to have a higher level of education than livestock farmers, only proving that you don't have to be daft to milk cows but it helps!

Several subjects were covered in the afternoon session but the most popular was set-stocking of dairy cows. A number of significant points emerged from these reports. Cow contentment has been stressed as an advantage of set-stocking but it was pointed out that the fact that cows appear contented does not mean they are being adequately fed. Under conditions of herbage shortage cows will increase grazing time in an effort to maintain herbage intake but this grazing time reaches a maximum at around 9.5-10.5 hours per day. Even though daily herbage intake may continue to fall, cows will not graze for any longer and neither will they show any obvious signs of restlessness.

Two papers dealing with farm survey and long-term trials said that sod-pulling was a common occurrence under set-stocking but doubted whether it had any significant long-term effect on sward output. Experimenters from GRI, Hurley, warned that perhaps the most critical time from a management point of view was late May and early June when it was essential to prevent undergrazing leading to aerial tillering and a build up of unacceptable herbage. In a report from Lancashire, paddock grazing was superior to set-stocking by 11% (in terms of milk output/ha) in year 1 but this changed progressively till by year 4 set-stocking was 4% superior. The paddock grazing and set-stocking areas remained the same throughout the trial and there was a gradual increase in the density of the set-stocking sward so that by year 4 the respective densities were 6116 and 9317 live tillers/m² for paddocks and set-stocking areas.

A final practical point was a report from a farmer on his use of the chemical Nortron to control annual meadow grass and chickweed in grass reseeds. Although expensive at between £40 and £50/ha he was in no doubt of the increased sward productivity obtained.

The day was thoroughly enjoyable and I was surprised by the amount of information available at the meeting. I recollect two main points from the day's outing - stocking rate is all important in determining grazing system output and don't trust British Rail; little sleep on the way there and only freshly margarined sandwiches and limited liquid refreshment on the way back!

My thanks to SWSGS for sponsoring me to attend the meeting.

SWSGS INNOVATION COMPETITION

Members of the SWSGS are to be invited to participate in a new competition. Members of the committee have suggested it would be interesting to offer a prize for novel ideas on the farm. The competition will not necessarily be an annual event and will be judged by the committee of the SWSGS. There will be no entry fee for this competition!

Members will receive full information about this competition along with application forms for the silage and hay competitions. In the meantime if you have introduced an innovation, invention or novel idea linked to the growing or feeding of grass or conserved products remember that it may be worth a prize - so have a go.

SWSGS SILAGE MAKING SURVEY

Dr R D Harkess

The West of Scotland Agricultural College

A report on the survey undertaken in conjunction with the SWSGS silage competition 1977.

The information in this report is linked to the chemical analyses presented in Greensward No 21 1978 pages 27 and 28. The farm code numbers enable the two sets of data to be examined for each silage sample.

Following the very poor silage making season of 1976, the weather at silage time in 1977 was markedly better. Table 1 summarises the weather statistics from 1973 to 1977 and the large improvement in silage D value in 1977 (67 cfd 61) reflects the improved conditions at cutting time.

Table 1 Weather at Auchincruive, 14 May to 7 June 1973-77

	Sunshine (h)	Rain (mm)	Dry days	D value
1973	156	55	5	61
1974	169	50	7	62
1975	286	29	18	68
1976	112	74	0	61
1977	276	63	16	67

The same questions were asked in this second survey as in the previous year and Table 2 records the replies to the questionnaire. All farmers entering silages completed the form and competitors are complimented on this 100 per cent response.

In Table 2, the silages have been grouped into the top nine, i.e. those on the short list for inspection by the judge, the bottom nine silages and the middle group of 39 silages. Tower silages are listed separately.

Results (Table 2)

First Cut Silage: N use was higher at 122 kg N/ha in the top group as opposed to 88 kg N/ha in the bottom group. Days from fertiliser application to cutting date were 49 days compared to 96 days for the top and bottom groups respectively. Cutting date in days after 1st May (26 and 60) indicate that the best silages were cut around 26 May compared to 30 June for the bottom silages, however, there were only two primary cut silages in the bottom group.

Weather was generally good for all groups and wilting and chopping, showed little inter-group variation. Additive use was fairly widespread.

Table 2 Data from silage survey (1977)

Code		Date N applied - days after 1 April	Nitrogen applied (kg/ha)	Days from fertiliser to harvest	Date of cut - days after 1 May	Weather rating
Clamp silages						
KS1		2	125	50	22	7
KS20		4	125	48	22	10
AS3		5	138	53	28	10
KS3		4	75	52	26	1
AS6		-4	125	59	25	10
AS2		5	138	56	32	10
KS9		13	100	43	26	10
AS10		29	143	25	24	10
KS11		2	125	56	28	10
Average		*7*	*122*	*49*	*26*	*9*
KS21		6	125	48	24	10
DS13		4	113	58	32	10
KS5		5	125	55	30	10
DS6		-11	178	70	29	10
KS4		5	125	58	33	10
WS13		7	128	55	32	10
DS3		-6	88	66	30	7
KS2	R	61	94	36	65	10
KS10	R	64	88	31	65	10
KS15		-16	133	52	37	8
AS1		0	125	53	23	10
WS5		12	125	45	27	10
KS13		-6	94	56	20	7
WS4		17	113	48	35	10
KS7		-7	125	69	33	10
WS1		20	72	40	30	10
KS19		6	125	50	26	10
DS9		5	100	58	34	10
WS8	R	82	100	91	143	10
WS11		-15	125	77	31	10
WS7		25	251	40	44	9
DS4		-8	151	69	31	8
WS9		5	125	64	39	8
KS17		8	125	47	25	10
KS16	R	70	100	49	89	10
DS10		5	125	43	23	10
WS12		67	151	55	92	10
AS5		26	94	35	31	10
AS14		32	88	39	41	10
WS3		13	113	45	28	10
DS5	R	70	113	45	85	10
AS11	R	61	107	30	60	8

Wilting period (hours)	Length of chop (mm)	Type of forage harvester	Additive Type	Rate (l/t)	Silage pH
48	14	P	F	2.25	4.4
48	38	P	F	2.25	4.0
30	178	DC	F	2.25	4.2
24	25	P	Nil	-	4.1
24	51	P	F	2.25	4.3
30	178	DC	Nil	-	4.3
18	25	P	Agil	1 kg	4.2
24	64	P	F	2.25	4.4
24	38	P	F	2.25	4.1
30	*68*	-	-	-	*4.2*
24	25	P	F	2.25	3.8
24	19	P	F	2.25	4.2
24	38	P	F	1.50	4.3
24	38	P	F	2.25	4.0
48	38	P	F	1.5	4.2
24	32	P	Sy	2.25	4.3
24	38	P	Nil	-	4.3
48	7	P	F	2.25	5.0
18	25	P	Si	0.9 kg	4.3
30	51	P	F	2.25	4.5
24	38	P	F	0.75	4.4
52	25	P	Nil	-	4.8
60	13	P	Nil	-	4.7
48	25	P	GAP	1.8 kg	4.3
24	51	P	F	1.8	3.8
24	13	P	K	1.8 kg	4.1
42	10	P	Sy	2.8	4.1
12	35	P	F	2.25	3.9
48	25	P	Nil	-	5.1
24	51	P	Nil	-	4.5
54	25	P	Nil	-	4.6
36	25	P	F	2.25	4.2
60	13	P	Nil	-	4.2
24	19	P	F	1.8	4.3
30	51	P	F	2.25	4.4
18	25	P	Nil	-	4.0
48	51	P	Nil	-	4.5
24	19	P	Nil	-	4.2
36	25	P	F	2.25	4.5
48	25	P	GAP	1.8 kg	4.7
24	25	P	F	1.7	4.3
24	64	P	F	2.25	4.4

Table 2 (continued)

Code		Date N applied - days after 1 April	Nitrogen applied (kg/ha)	Days from fertiliser to harvest	Date of cut - days after 1 May	Weather rating
AS8		30	151	45	45	10
DS11		4	146	65	39	5
KS12	R	68	88	43	81	7
AS9	R	91	100	40	107	10
DS8	R	107	146	42	119	10
KS8	R	69	151	45	84	10
WS6	R	78	63	45	93	9
Average 1st cut		*6*	*126*	*54*	*32*	*9*
Average 2nd cut		*74*	*108*	*46*	*90*	*10*
DS7	R	61	147	40	70	10
WS10	R	85	125	61	116	1
DS1		-6	88	75	39	10
KS18		58	100	58	86	10
KS6	R	65	100	37	72	5
DS12	R	77	113	48	95	10
DS2		-6	88	117	81	10
WS2	R	127	72	48	145	8
KS14		60	94	61	90	10
Average 1st cut		*-6*	*88*	*96*	*60*	*10*
Average 2nd cut		*76*	*107*	*50*	*96*	*8*
Tower silages						
AS13	R	67	125	30	67	10
AS12		11	125	51	32	10
AS15		30	182	46	30	10
AS17		19	151	42	31	1
AS4		20	113	56	46	10
AS16		4	125	53	27	10
AS7	R	107	88	32	109	8
Average 1st cut		*17*	*139*	*50*	*33*	*8*
Average 2nd cut		*87*	*107*	*31*	*88*	*9*

R: regrowth crop, 2nd cut
Weather rating: 1 = bad, 10 = good

Wilting period (hours)	Length of chop (mm)	Type of forage harvester	Additive Type	Additive Rate (l/t)	Silage pH
48	25	P	GAP	1.8 kg	4.2
36	25	P	F	2.25	4.3
9	38	P	F	2.25	4.0
36	25	P	GAP	na.	4.5
24	38	P	F	2.25	4.2
24	51	P	F	2.25	3.6
120	25	P	Nil	-	4.7
34	*28*	-	-	-	*4.3*
38	*35*	-	-	-	*4.4*
24	38	P	F	2.25	4.5
132	13	P	Nil	-	4.6
24	25	P	Nil	-	4.3
24	19	P	Sy	2.25	4.2
24	38	P	F	2.25	4.0
36	25	P	Nil	-	4.7
24	25	P	Nil	-	4.2
24	13	P	K	2.7 kg	4.6
24	13	P	F	2.25	4.4
24	*25*	-	-	-	*4.3*
41	*23*	-	-	-	*4.4*
24	13	P	Nil	-	4.1
48	13	P	Nil	-	4.1
36	33	P	Nil	-	4.3
72	20	P	Nil	-	4.1
36	17	P	Nil	-	4.9
48	25	P	Nil	-	4.0
36	32	P	Nil	-	4.5
48	*22*	-	-	-	*4.3*
30	*23*	-	-	-	*4.3*

Forage harvester: *P = Precision chop*
DC = Double chop
TC = Twin chop
FW = Forage wagon

Additive: *F = Add-F*
Sy = Sylade
K = Kylage Extra
Si = Silaphos

The main differences in silage quality (Table 3) between top and bottom groups at the first cut were in D value (71.6 compared with 60.8) and in the content of crude protein (17.8 compared with 13.8). Volatile N, pH and organic matter content were similar in all groups. Dry matter contents were high throughout. In most cases the analyses of silages in the middle group fell in between those of the top and bottom silages.

Table 3 Silage analyses 1977

Group	Cut	% DM	% CP	% OM	D Value	Volatile N	pH
Top (9)	1	27.9	17.8	91.1	71.6	11.2	4.2
	2				no entries		
Middle (27)	1	27.2	17.2	90.2	67.4	11.4	4.3
(12)	2	33.7	17.1	90.3	64.7	11.0	4.4
Bottom (2)	1	28.3	13.8	93.1	60.8	11.3	4.3
(7)	2	29.5	16.4	90.1	62.0	13.1	4.4
Towers (5)	1	37.6	16.9	90.5	65.9	11.6	4.3
(2)	2	37.2	18.6	90.0	65.5	11.7	4.3

First Cut versus Second Cut: It is significant to note that there were no second cut silages in the top 9 whereas seven of the 9 bottom silages were regrowths. The D value of second cuts in the middle group of samples was around two units poorer than the first cuts with the position reversed in the bottom group silages (Table 3).

Tower Silage: Of the tower silages, five were first cuts and two were regrowths. Their quality was very similar and matched reasonably well with the average values of second cut in the middle group of silages. This again illustrates the difficulties in making very high quality silage in a tower. Lower in-silo losses might be expected in the tower system so final yield of conserved forage in terms of digestible organic matter, would bring the tower and clamp situation closer although well sealed clamps would still retain the edge over towers.

Discussion

Last years survey (1976, a poor year) showed considerably greater differences between the top and bottom silages especially in D value, volatile N and pH. The more amenable silage time in 1977 has enabled better silage to be made and the differences in D value are explainable by the longer growing interval before cutting. The silage was also less contaminated by soil as seen in the improved organic matter contents (around 91% cfd 88%). Protein content and volatile N were both higher in the better year although the latter was still at an acceptable level. Silage dry matter contents were fairly high (27.9-33.7% Table 3) and this coupled with cleaner herbage would enable better fermentation and lower in-silo losses. In a good year, therefore, time of cut and efficiency of filling and sealing the silo are the keys to producing quality silage. Of the top 9 silages, two received no additive, 6 received Add F and one received Master Silage. There were no obvious trends associated with additive use. In both years of the survey one third of the silages received no additive.

It is intended to complete a third year of this survey for silage made during 1978. A summary of the three years will be reported in the next issue of Greensward.

RESEARCH REVIEW

175 Soil and dung contamination of silage.

Hayes J H, Training Project MAFF 1978, 24 pages.

The contamination of herbage for silage by soil or dung residues can lead to poor fermentation and preservation. This is due to the presence of excessive numbers of Clostridia bacteria which breakdown lactic acid and sugars into butyric acid. Also proteins and amino acids are broken down into simpler nitrogenous compounds and ammonia is given off. Hence there is an overall decrease in the feeding value of the silage. This report records the results of an on-farm survey into the contamination problem and lists the following conclusions:

1. Late spring dressing of organic manures will lead to contamination.
2. Mowers and harvesters using a flail action are likely to cause more contamination than other machines.
3. Mowers are frequently set too low and 'scalp' the sward.
4. Rowing and tedding can increase contamination due to the movement of cut herbage on the ground.
5. Buck-rake areas must be kept clean - sweep the area,especially if soil is being carried on vehicle wheels.
6. Wet conditions and sloping ground cause wheelslip and this increases herbage contamination.
7. Care is needed when applying organic manures for second cut silage especially in low rainfall areas.
8. Rolling and mole control will help reduce soil in the herbage as will attention to detail throughout the making and storage of the silage.

RENFREWSHIRE FARM VISITS

C C Watson

A meeting of the CSGS in Renfrewshire 29 November, 1978.

Stenhouse Estates Ltd, Langbank

This private company has holdings in Renfrewshire and Dumfriesshire with a total acreage of over 1,000 hectares, covering beef, dairy and sheep enterprises. The visit covered two of the Renfrewshire farms.

Knockmountain Farm - This is a farm of 148 hectares of which only 20 ha are cut for silage. This is cut once producing about 600 t of silage. The sole enterprise is a 200 inwintered beef cow herd (Irish blue-grey).

The cows calve down at grass in September/October and are gradually housed by mid-November into a "Mootel" building consisting of cubicles, creep feeding area for the calves and a central feed passage for "easy feed" silage, which is fed together with hay, draff and 1 kg of mineralised barley. Currently all cows are artificially inseminated with either Charolais or Simmental semen. Conception to 1st service is running at 78%-80% and all calvings next year will occur within a 7 week period. Previous breeding policies have involved the use of Lincoln Red and Hereford bulls.

Cows and calves are put to grass in batches of 40-50 in late April when the calves should weigh 200-250 kg. They graze existing fields on a rotational basis in 13-14 day periods. Up to 300 kg of N are used per ha. The calves are weaned at the end of July (10 months of age), the best weighing 320 kg, and are grazed separately until housing at Undercraig Farm in late September at around 350 kg liveweight. Last year 150 forward Charolais calves were sold as yearling autumn stores from grass. (Average overall £301 steers and heifers). The estimated cost of winter indoor feeding for a cow and calf is £90+. The calves are normally allowed access to creep from January onwards. This year the calves are currently being fed only hay and silage. Cereal-based creep feed may be offered in February. Careful nutritional management of the cow during late pregnancy and early lactation aids in controlling mastitis, calving and rebreeding problems. The excellent handling pens and facilities are particularly noteworthy.

Undercraig Farm - One large fattening shed (built 1961, modified 1971) has a potential throughput of 300 fatteners, including all calves from own beef cow and dairy herds.

The shed has high level slats allowing complete winter accumulation of dung. An automated feeding line is connected to a haylage tower supplying *ad lib* haylage (daily intake, 13-15 kg). 3 kg barley + minerals is mixed with the haylage on the automated feeder. Average gain is 0.9 kg/day. Finished steers are sold at about 400-430 kg liveweight and heifers sold at 380-400 kg. Usually about 50 cattle will have been sold by the end of April. Age at slaughter varies from 17-22 months.

Calves and cattle are weighed at birth, when housed at about 2 months of age, at turnout, weaning and at rehousing.

Drums Farms

Drums Farms is the collective name for six farms in one block amounting to some 480 hectares in all, of which 240 hectares are ploughable and the rest is rough and permanent pasture.

The main activity of the farming enterprise is the dairy herd which is situated at North Glen and has 48 hectares of cow grazing ground within access of the steading. This means that the cows are paddock grazed in summer and the silage is obtained from the other farms. The herd comprises now of 360 cows or thereby, and these are housed within two buildings at North Glen.

All milk is pasteurised, bottled, and sold off the farm on a semi-retail basis.

The staff consists of three dairymen who milk and feed the adult stock as well as all the young calves up to twelve weeks. The bottling operation is carried out by one man and two part-time female employees.

All the heifer calves are retained and the surplus are sold as in calf heifers at 30-33 months of age. The winter feeding regime is silage from a forage box along with homegrown barley, draff and protein fortified molasses.

The following table gives a statement of terminated 305 day lactations for 1978.

Qualifying lactations	Number of cows	Milk yield (kg)	Butter fat (%)	Protein (%)	Average no. days
1st	91	4663	3.78	3.36	294
2nd	39	5733	3.81	3.37	297
3rd-5th	98	5947	3.63	3.25	297
6th +	23	5238	3.66	3.23	287

The total herd average of 251 qualifying lactations was 5383 kg milk at 3.71% butter fat and 3.31% protein in 295 days.

Members of the CSGS express their sincere thanks to both estates for two most interesting visits.

DAY VISIT TO DUMFRIESSHIRE

A day outing of SWSGS to Kirkland and Dalswinton on 11 May 1978.

Kirkland and Rosehill, Closeburn, are farmed by Messrs Jamieson and extend to 180 hectares. Two dairy herds are run, Kirkland with 115 Ayrshires and Rosehill with 100 Friesian/cross cows. So this is how father and son settle their breed fancies?! Both herds are on cubicles and easy-feed systems. The main points of interest viewed by visitors were; high level slats for dairy followers and bullocks; rotational grazing at Kirkland (five fields) which receives 62 kg straight N per hectare for the first two grazings then 62 kg of a 2:1:1 compound at 28 day intervals thereafter; set stocked grazing at Rosehill with a day field and a night field; fertiliser as above but applied to quarter of the area each Monday morning; leader and follower grazing of heifers on 12 hectares, leaders 4-8 month old and followers 15-20 months old; new dairy unit at Rosehill.

Dalswinton Estate, Auldgirth extends to 2800 hectares and is the property of D W N Landale Esq. The estate is managed by Robin McLelland who conducted members round the dairy unit which covers 172 hectares and carries 170 Ayrshire cows and followers. The party visited the buildings which comprise self-feed silos, cubicles and parlour; high level slats for 280 cattle; paddock grazing with the electric fence within and moved twice per day; first fertiliser dressing is 125 kg N per hectare followed by 43 kg for the second grazing. Thereafter 125 kg of a 2:1:1 compound is alternated with 43 kg straight N; a large transporting trailer for hauling silage.

The Society is much indebted to Stewart Jamieson, senior and junior and to Robin McLelland for their trouble and effort on behalf of members.

BOOK REVIEW

MODERN MILK PRODUCTION

by

Malcolm E Castle and Paul Watkins

Published by Faber and Faber, London, 1979. 309 pages, 36 tables, 52 figures, 44 plates. Paperback £5.75, Hardback £9.95.

The book offers a complete resumé of milk production from growing the grass to housing the stock. Such a comprehensive volume is, as might be expected, full of useful information and is, therefore, not to be skimmed through lightly. Each page has some interesting fact or detail worthy of thought and indeed the authors are to be complemented in packing so much into 309 pages.

The text is subdivided into 18 main sections starting with a review of the UK 'Dairy Industry'. It then discusses 'Feeding Dairy Cows' which includes information on dietary needs, the digestion process and the utilisation of the products of rumen fermentation. The next five chapters discuss how to provide the dairy cow with the desired diet and include 'Grassland Production', 'Grazing Systems', 'Hay and Dried Grass' and 'Silage'. Foods other than grass and grass products are extensively fed to dairy cows. So 'Forage Crops and Concentrates' is a useful chapter which discusses the use of many other feeds, the season of year when these are available and the formulation and use of concentrates. Chapter 8 then covers how the feed is offered to the cows in 'Winter Feeding Systems'.

The emphasis of the book then changes to the end point of dairy cow feeding, the milk, Chapter 9 concerns 'Milk Composition' as affected by such factors as breed and age of cow, type of food and disease. 'Milking and Milking Machines' and 'Milking Parlours and Cowsheds' include such important topics as lactation physiology, correct milking techniques, layouts and work routines.

Chapters 12 and 13 discuss 'Buildings' and 'Slurry' respectively. Environment is clearly important despite the adaptability of the cow and an efficient layout of buildings is an important aid to good herd management.

One of the most significant aspects of dairy farming is the ability to get the cows back in calf. To this end Chapters 14 and 15 entitled 'Herd Management and Records' and 'Breeding and Fertility' stress the need for good record keeping - acute observation and a knowledge of reproductive physiology as aids towards a good calving index.

These chapters are followed by 'Herd Replacements', a guide to the feeding and rearing of heifers.

Cows are not machines and have their likes and dislikes just as have those of us involved in dairy farming. 'Cow Behaviour and Health' although coming late in the book stresses the importance of the well-being of dairy stock for good productive performance. The Chapter makes wise practical points to assist in keeping dairy cows healthy which no doubt in turn will aid the wealth, in the broadest sense of both stock and stockmen.

Farming is frequently described as a way of life and a hobby rolled into one. However, in todays world there is no doubt that dairy farming is a business with all the associated problems and worries of capital investment and cash flow. So perhaps appropriately enough the final chapter in the book is entitled 'Business Aspects' which summarises factors likely to influence the profitability of milk production although many of the previous chapters have this theme in the background.

Both authors are involved in the day to day management of dairy herds and despite the inclusion of up-to-date scientific knowledge they have kept the text of a very practical nature. The book includes references to other suitable literature at the end of each chapter but in itself 'Modern Milk Production' is a book well worthy of a place on the shelves of students and farmers as a general and comprehensive ready reckoner to modern dairy farming. - R D Harkess.

USEFUL LITERATURE

'Silage Making'. Booklet No 9 in 'Profitable Farm Enterprises' Series 1978 MAFF. 102 pages.

This is an enlarged and up-dated presentation of Booklet No 9. The text includes the principles of ensilage, producing the crop, factors affecting successful ensilage, silage additives, losses, silage effluent, silos, mechanisation and financial implications.

'Alkali treatment of straw'. Publication GFG 52 1978 MAFF, 8 pages.

An interesting leaflet describing the factors limiting the feeding value of straw and the improvement obtained by treatment with caustic soda. The value of treated straw is related to the price of other feeds and methods of feeding and example rations are given.

A single copy of these leaflets can be obtained free of charge from MAFF Publications, Tolcarne Drive, Pinner, Middlesex HA5 2DT

CHANGES IN SWARD COMPOSITION AND PRODUCTIVITY

Dr J Frame

The West of Scotland Agricultural College

A report on the British Grassland Society Occassional Symposium No 10 at University of York 20-22 September 1978.

The Symposium had five main sessions:

1. General review of available information
2. Selected examples of botanical change and its effect on output
3. Causes of sward change
4. Maintaining sward productivity
5. Reversing sward deterioration

The first session drew attention to the increasing costs of establishing a ley (now £120-£140 per hectare) and the 600,000 hectares sown annually in the UK. It posed the question of whether it was absolutely necessary to aim at a perennial ryegrass/white clover type of sward; there was great variability in the botanical make-up of British swards, even those sown to perennial ryegrass, due to differences in environment and management practices. These differences caused colonisation by meadow, bent, fescue and other grasses until a balance was obtained between sown and unsown species. One school of thought argued that many so-called 'weed' grasses gave production levels similar to perennial ryegrass under certain conditions and that environment and soil fertility had greater influence on grass production than type of sward. This argument was rebutted by plant breeders who produced trial results showing superior yield and quality from ryegrass populations relative to populations of meadow grass, bent grass and Yorkshire fog. At no time was the total yield of the best of the ryegrasses exceeded by a population of another species even when grown at a low level of fertiliser nitrogen. The rate of establishment was faster and the growing season longer for ryegrasses. It was agreed that suitable ryegrass varieties were likely to be superior for early spring growth and for early-cut high quality silage.

The scene was thus set for a debate which was to rage over the three days.

In the second session, it was shown that cut swards of perennial ryegrass underwent greater botanical change than grazed swards when other management factors such as level of fertiliser N were identical. One of the strengths of perennial ryegrass was its high 'tolerance' of grazing. One spokesman said it was wrong to speak of perennial ryegrass in general since variety trials had shown large differences in persistence between varieties. Sward yields could be reduced early in their lifetime when weed grass ingress above 25-30% occurred.

A paper from Wales highlighted the low yields and poor nutritive value of native hill vegetation. Yield response of natural vegetation to fertiliser N after the application of lime and phosphate showed poor potential for increased production when compared with resown perennial ryegrass swards on adjacent areas. Continuous studies of performance of 150 varieties of 19 grass species, under differing soil and climatic conditions at various sites in Wales since 1961, showed that only red fescue, timothy and perennial ryegrass were suitable for wet hill conditions; red fescue outyielded the other two at all levels of fertility.

Soil fertility as a key factor influencing sward production was discussed by a speaker from Eire. Ryegrass swards were soon invaded by 'weed' grasses which could become dominant in 5-6 years; however he claimed this had little influence on the animal output. Conversely he described how permanent pasture given good management developed a botanical composition similar to reseeded swards after 5-6 years; this again suggested that a sward eventually attained a balance according to the sum of the factors which can influence it.

One review paper showed that in the absence of a limitation to food supply, sheep fed or grazed on white clover grew on average 75% faster than animals offered grass. Similar results were obtained with lucerne. When white clover was included in a grass diet (proportion unspecified), sheep grew 25% faster than on grass alone. Sheep consumed more white clover and utilized the digested and metabolizable energy in white clover with a higher efficiency for liveweight gain than that in grass. Production results with cattle offered legumes were limited and less conclusive. With conserved red clover, there had been enhanced intake and individual animal performance. Unfortunately, information on the effect of legumes in the sward on animal output per unit area at high stocking rates was not available for UK conditions. The higher intake and nutritive value per unit of dry matter of legumes could undoubtedly be effectively exploited in important phases of milk and meat production such as early lactation, early stages of growth and the final stage of fattening. Currently the cost effectiveness of fertilisers and its ready availability limited farmer interest in legumes.

The third session on causes of sward change dealt with selected rather than all the causes. According to survey data the content of perennial ryegrass and other sown species declined more rapidly where drainage was impeded. Bent grass, Yorkshire fog and broad-leaved weeds were associated with poor drainage. As fertiliser N input was increased, perennial ryegrass and other sown grasses became more competitive but meadow grass and red fescue were also encouraged whilst white clover was suppressed. Bent grass, red fescue and broad-leaved weeds also seemed to be associated with soils low in phosphate. Potash was important in promoting white clover development and perennial ryegrass persistency. Yorkshire fog and broad-leaved weeds were apparently associated with low soil potash. The development and persistence of preferred species such as perennial ryegrass were encouraged by liming. Bent grass and Yorkshire fog were abundant in soils of low pH.

Grazing affected sward productivity and species composition but it was difficult to separate out the component effects of treading, selective grazing and return of dung and urine. If poached, soil structure could be lost and the consequent pan formation and perched water table lead to poor root development. This would be followed by sward pulling and aerial tillering of plants. Direct damage depressed plant growth and led to changes in sward composition. Species and varieties differed in the poachability league; perennial ryegrass was one of the most tolerant species while cocksfoot was one of the least tolerant. Sward damage could be minimized by improving drainage, establishing resistant species and varieties, increasing the length of ley and maintaining soil fertility.

Both dung and urine return plant nutrients, with urine being the more beneficial in influencing yield. The reluctance of stock to graze over or near dung pats could result in areas of rank herbage. The net effect of grazing was a balance between beneficial and damaging effects. At low sward productivity, stocking rates were so low that grazing was unlikely to effect major sward changes. At high productivity, the associated high stocking rates could be damaging and nullify the beneficial effect of nutrient return.

Climate obviously had a major influence on sward change, particularly 'stress' periods such as excessive cold, drought, wetness, wind and so on. Tolerance to various stresses was increasingly being incorporated into plant breeding programmes and one breeder pointed out that among grass species, the ryegrasses were exceptional not only in the genetic potential for improvement but in the opportunities for exploiting this through breeding and reseeding.

Control of insects by use of pesticides was shown to increase grass yield and to permit sown species to persist better. This was an area of work currently being expanded at research stations. Grass diseases were also discussed and losses of dry matter up to 30% were quoted and up to 60% in legumes due to certain viruses. Exploitation of newer, more resistant varieties now being produced was cited as the best means of control.

In the session on maintaining sward productivity (session 4) a plea was made to tailor seeds mixtures to the potential use of the sward, for example, sheep farming in hill land situations or intensively farmed grassland on lowland dairy farms and so on. Indeed one breeder reckoned that the ultimate aim for grassland improvement should be the 'package deal' of variety and management.

Since establishment was the starting point in the process the case was made that much more attention should be paid to establishing weed-free swards than in the past. This focused one's thoughts on the differing attitudes of 'arable' farmers and 'grassland' farmers. The arable farmer has long used sprays as a major weapon in establishing cereals for example, but the grassland farmer has traditionally been reluctant to use chemical spraying. Recent research has shown that grass weeds and chickweed which germinate at the same time as the sown seed mixture can have a damaging effect on the establishment of a new lay and its subsequent output. The chemical, ethofumesate, has shown considerable promise when applied pre-emergence on ryegrass or early post-emergence on most preferred sward species (except clover). It can also tackle certain weeds in established swards.

A controversial paper was given on the subject of selecting the most suitable species and varieties for sowing. The speaker made the point that the most important criterion for selection should be profitability under realistic farm conditions. However, the information required to link profitability was rarely available because so many other factors could also have an influence. Because of this, selection of seed mixtures was based, at best, on animal output results obtained under experimental conditions, which differed from farm conditions, but more often was based on herbage production. He alleged that there was little quantitative data on herbage production from many particular conditions of climate/soil/management in the UK; also that differences between varieties in production were often only 5% or less and that considerable variation could occur from site to site and year to year. Thus he claimed that more time, effort and money should be invested in defining the climate, soil and management factors which cause the differences in production.

The final session on reversing sward deterioration was disappointing, partly because it did not deal with the subject very fully and secondly, some of the techniques offered were definitely in the experimental phase. An historical account was given on the renewal of pastures by direct drilling following chemical suppression or destruction of the old sward. Certain guidelines now exist but two problems were highlighted: the invasion of newly established swards by meadow grasses and serious attacks by frit fly. (Our own work at the West College on direct drilling in an upland situation has given mixed results. An even depth of sowing was difficult to obtain due to surface undulations; also competition from the existing sward can be too strong if a total kill of the sward is not achieved by the chemical. If the 'mat' of sward is too thick, the seed does not get the necessary seed/soil contact and again failure can result). An avenue being explored at research institutes is the possibility that organic acids, produced from the decaying mat, inhibited seed germination.

In a 'slot-seeding' method, bands at 50 cm apart were chemically suppressed and seed of improved species 'stiched in' immediately along the band following removal of a narrow strip of turf 2-3 cm wide in the middle of the band. Again results to date have been mixed. If all the snags of direct drilling could be overcome, then clearly the method has tremendous potential for improving deteriorated swards. Some of the chemicals have a selective effect at certain doses, so that a degree of manipulation of the botanical composition could be possible in the future.

The Symposium was summed up by Professor Alec Lazenby of the Grassland Research Institute who spoke at our AGM - see page 5. In the perennial ryegrass versus 'secondary' species controversy, he came down on the side of ryegrass for sown swards particularly in eastern Britain. It had high annual yield, persistency, quality and adaptability, and was still capable of being improved further vis-a-vis drought resistance, cold resistance and improved digestibility. The real challenge to grassland workers came from the west side of the country where in many instances farmers were obtaining high animal output from species other than ryegrass. If that was the case, why should they be replaced? However, where a sward's output had deteriorated seriously with consequent effects on animal output, it should be ploughed up and reseeded with a ryegrass-type mixture. In a way his philosophy boiled down to leaving well alone but if things were not good enough, replace with ryegrass. He made a plea for better all-round grassland management and improved soil fertility in long-term pastures to avoid having to replace them, but noted that researchers still needed to investigate why sward production varied from site to site and even at the same site from year to year. Above all, he stressed that where possible, grassland workers should pay more heed to assessing animal output in their work.

To sum up, the Symposium covered a lot of ground and much information, albeit some of it conflicting, was purveyed. In retrospect, the scope was perhaps too wide and time too short to do justice to some of the topics covered in the sessions. The main lesson from the first session (review of available information) was that good grass production and animal production could be obtained from swards differing widely in botanical composition; however, soil fertility and climate were important factors also. Perennial ryegrass was presented as the species with the most potential but whether this potential was being widely achieved is another question.

If anything, the evidence in the second session (effect of botanical change on sward output) was particularly conflicting. There were pro-ryegrass and pro-other grass factions but certainly while certain advantages of perennial ryegrass were not denied, it did appear from limited experimental evidence that good animal output could also be achieved from the so-called weed grasses. However, one wonders if stocking rates were sufficiently high to allow sward differences to show up. Again, perhaps the animals' genetic potential and not sward potential was the limiting factor. Perhaps the experimental techniques used are not sufficiently sensitive.

The third session (causes of sward change) tended to be a litany of the various factors which could influence sward composition. Unfortunately some are not totally under the control of the farmer, for example, the weather!

The fourth session (maintaining sward productivity) became controversial rather than constructive. A lot of time was spend discussing which types of swards to sow rather than how to maintain them once sown; in effect the session became an extension of the second session. Everyone did agree on the principles of good establishment and certainly lip service was paid to 'good' subsequent management including fertilizer use, effective grazing and cutting techniques and avoiding abuse or misuse of swards whenever possible.

The final session on renovating deteriorated swards was rather disappointing because so many of the techniques covered are not always totally satisfactory and some require further investigation before a 'blueprint' can be given.

I came away thinking that at least grassland scientists would not be short of ideas for trials for some time! Also that while I accept certain grasses have perhaps unrealized potential, especially in certain situations, perennial ryegrass is still at the top of my list for good all-round performance. It is in the utilization of our grassland that the next wave of advances must come if we are to be really worthy of the name of grasslanders or grassland farmers.

SILAGE AND HAY COMPETITIONS 1978/79

A meeting of the SWSGS in the Galloway Arms Hotel, Newton Stewart on 15 February 1979.

SILAGE COMPETITION

Judge James G Altham Esq, Yanwath Hall, Yanwath, Penrith, Cumbria.

Yanwath Hall Farm

The judge used slides to illustrate his talk on the activities on his farm which extends to 123 hectares. There are two dairy herds each of 80 cows but which are undergoing an expansion to 100+ cows. Each herd has access to 16 ha of grazing which is alternated night and day. Some 2000 t of silage are made each year, 24 ha of barley are grown and 57 ha of the land is in the old ridge and furrow. Formerly calving was on an all-the-year-round basis but with the installation of a 20:20 milking parlour these two factors were not compatible since fresh and stale cows came through the parlour together. So a switch was made to batch calving and splitting the cows into two groups for autumn and spring calving. This keeps the calving period short albeit somewhat hectic. Calves are fed once per day.

Because stock are being bought in, a metabolic profile is carried out. The vet visits the farm once a month on a routine inspection and treatment with selenium and copper has been found to be necessary.

Calving is planned at 2-2½ years old and with the batch calving at Yanwath this has worked out at around 32 months. The heifers must be well catered for when calving around 2 years old and the bull selected for the heifers is one which throws a small calf. The heifers are served at the same time as their dams. Dry cows are fed for up to 30 kg milk prior to calving.

The grazing area receives 300-350 kg N per hectare applied in six dressings at one month intervals. Back-end calvers receive 0.5 kg concentrate in the parlour once they are turned out to grass. Spring calvers also receive 0.5 kg in the parlour and the rest of their concentrate is mixed with the silage. Spring calvers are turned out later than the back-end calvers as their higher yields make it more practical to feed them at this time.

The general approach to grassland fertilisation for silage is to assess what is in the soil then consider the slurry. The aim is for 100 kg nitrogen (N) to start with - last year 70 kg N from the bag was backed up with slurry N. 95 kg potash (K_2O) is used to balance that application of N. Soil K_2O status is good, so in future some reduction in its use may be necessary especially on grazing areas, where magnesium is fed in the drinking water to avoid the staggers problem. Phosphate status is also monitored and applied as necessary.

Whilst better use of the fertiliser value of slurry is obtained when held over-winter for spring application,it is costly to store. Slurry is not applied to grazing pastures after Christmas. Silage fields are then treated until such time as there is danger of it adhering to the grass and contaminating the silage. Indeed to avoid this problem, slurry has been applied to barley fields after they have been sown when disposing of the last of the slurry.

Regarding silage making, wilting is practised. Length of wilt is dependent on crop yield and weather but the target is 28-32% dry matter in the silage with a preference to err on the dry side for good smelling silage. Additives are not used. The speaker suggested that a silage additive may be an aid to bad management.

The hay bob type of machine which rolls two swaths into one was not too successful. This left a fluffed up swath and took more power when compared with the helipede type of machine which places one swath on top of the other. This latter swath gave a more even feed into the forage harvester so enabling faster harvesting and the production of a more even chop. Chop lengths have been varied from 10 mm to 75 mm. The shorter the chop the better, since it reduces the number of trailer loads of herbage hauled from the field (bigger loads) and most important the cows have shown preference for the shorter chopped material. Both self-feed and easy-feed are practised at Yanwath. Back-end calvers are on easy-feed till January and then move onto self-feed.

Silage competition

The judge then went onto comment on the current silage competition. He had found the two days spent visiting farms in South West Scotland very informative and stimulating. He stressed his belief in good dry matter percentages and reasonably short chopping as important requisits for good silage fermentation but retained an open mind on silage additives. He also stressed the importance of using the silage in a well balanced feeding programme. In self-feeding units, he did not particularly like the tombstone barriers with solid boards at the base since silage falling behind these boards tended to be ignored by the stock. The electric fence or tubular barrier without lower boards seemed to involve less wastage of silage.

Of the competition entries, the top twenty clamps were all good silages (see Table 1) and the judge suggested that the 'tail' would soon be chasing the leaders. He wondered if for the competition the place of sampling could be selected to coincide with the point at which feeding would be on the date of inspection but he realised there could be difficulties in achieving this.

The judge then announced his inspection marks (Table 2) and awarded the prizes. The winner of the clamp silage class was J M L Milligan of Culvennan and the winner of the tower silage class was D C Hogarth of Sorbie. Michael Milligan also won the Society's trophy for the best overall silage system.

Table 1 1978/79 Silage Competition: Analyses and Marks

Clamp silages

Rank	Code	% DM	% CP	D value	Ammonia N as % total N	Marks/100
1=	KS8	43.6	19.0	72.2	9.6	100.00
1=	KS9	56.8	18.5	71.1	7.2	100.00
3	DS2	26.9	16.9	71.3	10.4	98.60
4	KS11	29.8	17.7	72.6	12.2	98.05
5	AS8	24.1	14.8	70.1	6.7	96.80
6	WS1	30.8	18.2	68.6	10.8	95.20
7	KS12	28.3	22.4	69.3	13.8	95.05
8	AS2	27.0	12.9	70.2	9.3	94.90
9	KS6	27.0	14.1	69.9	11.8	94.45
10	KS4	36.1	19.0	67.9	10.3	93.48
11	AS9	27.0	13.6	69.2	8.2	93.20
12	DS1	22.7	15.7	70.0	12.8	92.35
13	KS7	26.5	15.0	68.3	9.1	91.90
14	KS13	28.6	17.6	67.5	11.2	91.20
15	KS5	25.1	14.9	68.1	10.2	91.05
16	WS6	28.0	15.9	68.1	12.0	90.70
17	WS4	38.1	13.7	67.4	9.6	87.90
18	KS2	25.3	16.8	66.2	10.8	86.80
19	DS7	26.4	15.1	66.2	10.0	85.70
20	KS1	23.8	15.4	66.2	12.5	83.63
21	WS2	25.5	17.4	64.7	10.4	83.20
22	AS12	36.4	14.3	64.7	9.6	80.40
23	WS3	35.5	12.1	65.5	10.7	80.08
24	KS10	23.3	13.3	64.7	9.1	77.65
25	AS6	34.1	18.7	62.9	11.6	77.50
26	KS15	22.9	13.8	64.9	10.7	77.23
27	KS14	21.8	17.0	64.0	10.7	74.98
28	DS6	20.5	15.1	65.9	13.5	73.43
29	DS5	25.6	18.7	62.7	17.8	72.25
30	AS3	29.5	14.4	61.3	10.7	69.78
31=	AS13	25.9	17.0	59.4	12.4	65.40
31=	WS5	34.8	11.0	60.8	8.2	65.40
33	WS7	18.6	15.4	61.5	14.6	54.95
34	AS4	19.9	16.6	56.4	24.6	36.60
35	DS8	19.3	16.9	55.7	25.6	32.55

Tower silages

Rank	Code	% DM	% CP	D value	Ammonia N as % total N	Marks/100
1	AS5	40.9	19.9	69.1	11.7	96.03
2	AS7	45.3	20.1	68.7	11.7	92.83
3	AS11	51.5	15.8	64.6	8.9	79.60
4	AS10	32.6	13.7	63.3	9.2	73.20
5	AS1	46.4	12.5	60.0	9.0	62.50

Table 2 Short list for judge's visit (in order of analyses)

Awards	Farm	Analysis	Marks Inspection	Total
Clamp silages				
2nd	A C Irving, Largs, Twynholm.	100	64	164
	A C Irving, Largs, Twynholm.	100	52	152
4th	Crichton Royal Farm (per B Stones).	98.60	58	156.60
1st and trophy	J M L Milligan, Culvennan, Castle Douglas.	98.05	67	165.05
3rd	Lady K P Moore, Raith, Monkton.	96.80	61	157.80
	J McColm, Garthland Mains.	95.20	49	144.20
	J & W Carson, Conchieton, Twynholm.	95.05	52	147.05
	J R Ross, Macmanniston, Dalrymple.	94.90	45	139.90
	J A Houston, Overlaw, Kirkcudbrightshire.	94.45	42	136.45
Tower silages				
1st	D C Hogarth, Sorbie, Ardrossan.	96.03	67.5	163.53
	I C Gilmore, Humeston, Maybole.	92.83	49.5	142.33
2nd	J Hodge, Bogwood, Mauchline.	79.60	73.5	153.10

Table 3 Silage qualities in six years.

CLAMP SILAGES

Quality	D-value	% of total in each group					
		1973-4	1974-5	1975-6	1976-7	1977-8	1978-9
Very good	>70	3	2	41	0	18	17
Good	65-70	6	34	31	18	48	57
Medium	57-64	74	60	26	64	34	20
Poor	<57	17	4	2	18	0	6
Mean DM %		28	26	26	22	29	28
Number of entries		34	50	54	43	57	35

Dr M E Castle: Silage qualities in six years.

A summary of the distribution of the D-values of the silages, and the mean dry matter content is given in Table 3. The proportion of silages of "very good" quality, i.e. over 70 D-value, was similar to that in last years competition although there was a slight increase in the number of poor-quality silages. Of particular interest is the fact that 74% of all entries were classed as "good" and "very good"; the highest proportion in the six years history of the competition. This indicates the increasing quality of the silages entered for the competition although weather conditions at silage-making time clearly affect silage quality. The low-quality silage in 1976-77 was, of course, a direct effect of the poor weather when the silage was being made.

The average dry-matter content of all the silages was 28%, and was similar to that in the previous year which was also at a highly satisfactory level. The value compares favourably with the low value of only 22% recorded in 1976-77. Mainly because of the satisfactory dry-matter values in 1978-79, the ammonia nitrogen levels were low with 88% of all entries having 14% or less ammonia in the total nitrogen. A standard of 10% ammonia is usually taken as indicating a satisfactory silage fermentation, and thus most silages in the competition were close to this value. Without doubt the quality of silage in the competition is high, and a credit to all entrants. The number of competitors however has fallen to almost that in the first year of the competition and it is hoped that more entries will be made in 1979-80.

HAY COMPETITION

Entries were disappointingly low for this years competition with a total of nine samples of hay. Interestingly the best hay was a field cured sample. Table 4 summarises the marks. The silage judge presented the prizes as follows:

Field cured hay - 1st T C McCreath, Garlieston Home Farm, Garlieston.
2nd R D Clark, Fineview, Glenluce.

Cold or warm blown hay - 1st I C Gilmore, Broomknowes, Maybole.
2nd Crichton Royal Farm (per B Stones).

The BP Nutrition Trophy was awarded for the best field cured hay to Mr McCreath of Garlieston.

Table 4 1978/79 Hay Competition: Analyses and Marks

Field cured hay

Rank	Code	% DM	% CP	D value	Analyses marks/90	Visual marks/10	Total marks/100
1	WH2	82.4	11.3	68.6	74.00	10	84.00
2	WH1	86.1	12.7	62.7	66.85	9	75.85
3	DH4	83.6	16.4	58.3	63.40	7	70.40
4	WH3	86.0	8.4	61.8	56.00	8	64.00
5	DH3	85.2	7.2	59.5	49.00	6	55.00
6	DH2	84.9	6.0	58.3	44.05	8	52.05
Cold or warm air blown hay							
1	AH2	84.4	18.7	61.7	70.60	7	77.60
2	DH1	86.9	10.2	60.3	57.45	8	65.45
3	AH1	83.8	8.9	57.3	47.30	8	55.30

7TH ANNUAL SILAGE COMPETITION 1979/80

The silage competition will continue for a further year with the scoring and judging procedure as for last year. In order to overcome the problem of silage being finished by the inspection date the following clause is to be added to the rules: 'the judge will be asked to assume that its (silage) efficiency of use etc. was the same as the silage being used on the day of the visit.'

4TH ANNUAL HAY COMPETITION 1979/80

As for previous years entries will be judged entirely by chemical analyses and examination of the hay in the laboratory.

Details of both competitions and entry forms will be sent to all members and we look forward to yet another lively competition for the silage and hay trophies and prizes.

EVENING WALKS

Evening walks organised by local committee members of SWSGS, summer 1978.

Ayrshire:	Raith Farm, Monkton by kind permission of Lady Moore and by courtesy of Alex McKay.
Wigtownshire:	Pinwinnock Farm, Port Patrick by courtesy of W McPherson Esq.
Kirkcudbrightshire:	Conchieton Farm, Twynholm by courtesy of Messrs J & W Carson.
Dumfriesshire:	Burnside of Baltersan, Holywood by courtesy of D W Crichton & Sons.

These informal evening walks are primarily intended to stimulate discussion and interest at local level.

The Society is indebted to each of these farms for extending hospitality to society members who thoroughly enjoyed the visits and greatly appreciated the trouble taken on their behalf.

CAN YOU HELP?

(Hay Additives)

The area of Scotland serviced by our two grassland societies produces around 550,000 tonnes of hay each year. This is 50 per cent of the total Scottish hay crop. There is a continuing interest in the development of chemical additives as a means of improving the feeding value of hay. Even and thorough application is a major problem in the use of additives and varied results are reported by farmers and scientists alike. The Editor would be pleased to receive any communications from farmer members who may care to offer comment on or experiences with hay additives, be they good or bad.

DEVELOPMENTS IN HILL & UPLAND GRASSLAND

J R Thomson

Farm Director, Redesdale Experimental Husbandry Farm,
Otterburn, Northumberland

A meeting of the CSGS in the Bruce Hotel, Stirling on 8 March, 1979.

In the course of his talk, Mr Thomson gave a brief description of the farm and some financial performance figures, but dealt in depth with certain aspects of the farm policy which he considered had been primarily responsible for the substantial increase in farm output over the past 10 years. He was referring, of course, to grassland improvement coupled with the judicious use of pioneer crops and the subsequent controlled utilisation of these crops by stock, both cattle and sheep.

The Farm

Redesdale Experimental Farm is situated in the Rede Valley in north-west Northumberland. It is a hill farm, taken over in 1967, and extends to 1569 ha with 132 ha of inbye ground. It formerly comprised three separate holdings.

The altitude is moderate, extending from 160 to 378 m with most of the hill being covered with peat of varying depth overlying clay. The surface is wet for most of the year, with rainfall averaging 750 mm per annum. Most of the farm faces to the north and east.

Capital expenditure has included the provision of new buildings and sheep and cattle handling facilities. A large scale fencing programme on the hill was necessary to confine sheep flocks to specific areas and provide greater control of grazing.

Sheep

At the take-over in 1967 the stock consisted of 1449 Blackface ewes and 368 hoggs which had increased to 2700 ewes (2180 Blackface, 200 Swaledale, 120 cross, 200 draft) and 600 hoggs by 1977.

Lamb disposal policy has always been to sell all lambs as finished animals to deadweight centres. This approach has been adopted to reduce the uncertainty of returns from the fluctuating store market, to increase total farm income and, in recent years, to help in land improvement. Although this development is contrary to the traditional role of hill areas and is beyond the resources of many farms, the speaker suggested that a partial move in this direction could be of value. The two main disadvantages are, firstly, the delay in selling means more working capital is required and, secondly, other stock may be penalised by this diversion of land resources.

Sales are made over a long season, starting in summer and finishing in the New Year. The aim is to control disposal so as to make the best use of the farm's resources and obtain maximum output. The system has proved to be flexible, with the number of lambs being sold each month varying according to prevailing conditions of price, feed supply and lamb progress.

The finishing systems used include grass alone, grass and concentrates, and turnips and concentrates. The objective is to produce a minimum carcase weight of 14 kg or say 34 kg liveweight.

The part that sheep have played in the overall improvement in total farm income is evident from the following. Total sheep income for 1969-70 was £9,411 and for 1977-78, £64,862 of which £4,999 and £43,941 was lamb income respectively. Subsidies in 1969-70 amounted to £2,303 and £9,629 in 1977-78.

Cattle

On entry in 1967 the suckler cows consisted of a spring calving herd of 64 Galloway cows which have been reduced to 22 cows. At the same time an autumn calving herd of 112 Blue-grey cows has been built up.

Hereford bulls were used on the Blue-grey cows during the first few years but latterly Charolais sires have been used. Target weaning weights are 200 kg. These calves are sold usually as yearlings, the target for September/October born Charolais calves being an average weight of 356 kg when sold in the following September.

The importance of grassland in general, but of hay quality in particular in suckled calf production at Redesdale has become increasingly evident over the years. At all stages of Blue-grey production at Redesdale, with the suckler cow, the suckled calf and the overwintered store, an increase of 4 points in the D value of the basic hay ration has been shown to have profound effects on performance. Improvement of hay quality from the usual 54/55D up to 58/59D has had a great influence on productivity and cash returns. With roughage of only average quality, early introduction of supplementary concentrates to the cow in early lactation is essential. Even then the cow does not usually maintain her post-calving weight.

The outwintered Galloway cows, which are crossed with a Cumberland Whitebred Shorthorn bull, are born in the March/April period and weaned into yards in the first week in November.

Land Improvement

The increased farm output has been achieved mainly by land improvement. Because of the soil type, surface improvement is preferred at Redesdale rather than using the plough or rotovator.

Three basic methods have been used:-

	Vegetation type	Treatment
I	Fescue/Rush/Nardus	Fence; lime and slag, heavy grazing and top if possible.
II	Molinia dominant	Fence; lime and slag, heavy grazing and top if possible; broadcast seeds mixture.
III	Nardus dominant	Fence; lime and slag; "Redesdale technique" of direct drilled turnips for 2 years; broadcast seeds mixutre.

Treatment I Only a slow rate of improvement can be expected from the first method. It is applicable to only a small proportion of true hill land and relies on livestock grazing down the existing vegetation, allowing the less competitive but more productive species, such as fescues, to dominate the sward.

Treatment II The surface seeding technique is particularly applicable to *Molinia caerulea* (Flying bent) dominant swards which are relatively "open" in the bottom. The method consists of:-

1. Fencing the area to be seeded.
2. Heavy grazing by cattle in dry conditions followed by topping and/or burning to get rid of excess vegetation.
3. Liming at 5 tonnes per hectare and application of 1.7 tonnes per hectare of basic slag.
4. Surface seeding with a perennial ryegrass/white clover mixture using a fertiliser spreading trailing a chain harrow.
5. Controlled grazing with sheep and cattle.

The two most important points to follow are, firstly, to remove as much as possible of the old vegetation before seeding and to control it sufficiently for the first year or two after seeding, to allow the sown species to become established and grow with reduced competition from the native grasses. This is best achieved by grazing with cattle when ground conditions are dry during July and August. However, because a balance has to be struck between the grazing down of the old sward and the stock themselves losing conditions, cattle grazing may have to be supplemented by mechanical defoliation. Secondly, white clover should be sown at 3-3.5 kg per hectare to create a vigorous sward with a high proportion of clover capable of fixing useful amounts of nitrogen.

In order to maintain a vigorous sward containing a high percentage of sown species it is important that the improved enclosures are well grazed down during the summer months when grass even on the open hill is plentiful. Cattle grazing in dry conditions can prevent grass growth becoming too rank for the sheep at this time of the year. Any regeneration of rushes should be kept in check by spraying and topping as necessary.

The improved areas at Redesdale are used in conjunction with the open hill in the traditional "raking" system of grazing. The swards are rested for a month or so before being used for flushing or lambing. The fresh growth is ideal for boosting the body condition of the ewe at these critical stages in her production cycle. This practice, together with a moderate level of winter feeding, allows the ewe to express her potential to a far greater degree than on unimproved hills. Under Redesdale conditions typical sheep production from an unimproved hill would be 27 kg of weaned lamb at a stocking rate of 0.8 ha per ewe and a weaning percentage of 95%, i.e. an overall output of 33.6 kg per hectare of weaned lamb. On the improved hill the target is 31 kg of weaned lamb at a stocking rate of 0.6 ha per ewe and a weaning percentage of 110% i.e. an overall output of 56 kg per hectare of weaned lamb.

Treatment III This technique of pioneer cropping with direct drilled, fast-growing Dutch turnips (100 day turnips) for 2 years and then reseeding with a ryegrass clover mixture is particularly applicable to rough grazings where *Nardus stricta* (Moor mat grass) is abundant. On those swards breakdown of the surface mat is necessary before more productive grass species can be successfully introduced. Pioneer cropping with turnips and utilisation of these with lambs allows this to be achieved. On Molinia dominant swards, which are more open in the bottom, and therefore more easily improved, this technique has also proved successful. The technique used to establish the turnip crop is as follows:-

1. Ground magnesium limestone is applied at 5 tonnes per hectare to areas coming into first year turnips at least nine months before drilling. This raises the pH in the top 2.5 cm of soil from around 4.0 up to at least 5.5.
2. The area is grazed heavily during the winter, preferably with cattle, or topped mechanically to get rid of surplus herbage and to open-up the sward.
3. A fence is erected to enclose the areas to be sown.
4. About 14 days before sowing is due the area is sprayed with 4.2 litres per hectare of "Gramoxone". This is followed some 10 days later by a second application of 4.2 litres per hectare.
5. At least 3-4 days after the second spray (6-7 days in dull weather to ensure the chemical is inactivated), 1.7 kg per hectare of dressed turnip seed is direct drilled with a triple disc drill. The aim is to drill between 15-20 June.
6. Mini-granular slug pellets at 7.8 kg per hectare are mixed and drilled with the turnip seed because the slits cut by the drill provide an ideal habitat for slugs.
7. At or near the time of drilling 500 kg per hectare of a 22:11:11 compound fertiliser plus 1.7 tonnes per hectare 10% Basic slag are broadcast on to the drilled areas.

The material cost of growing the first year turnip crop in 1977 was £140 per hectare.

Two consecutive years of pioneer cropping with turnips and grazing with fattening lambs is necessary to break down the surface mat and to adequately prepare the land for establishing a grass/clover ley. No lime or slag is applied to the second crop thereby reducing the cost to £90 per hectare.

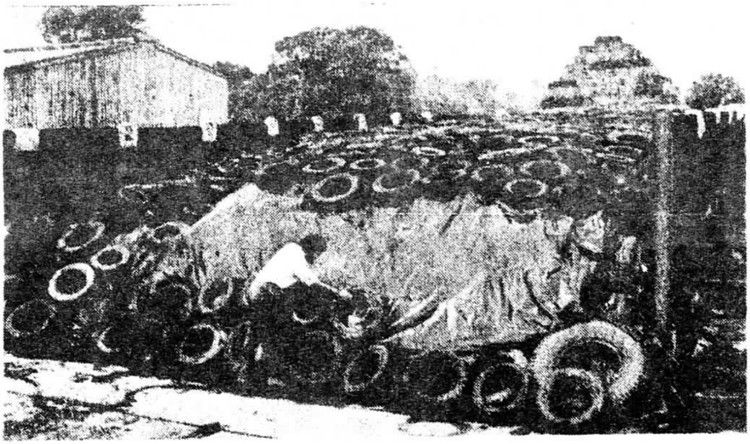
All that is required to establish a grass/clover ley after the turnip crop is a chain harrowing in May followed by broadcasting the seed with a fertiliser spreader trailing chain harrows. Rolling would be advantageous but often rock outcrops do not allow this.

These improved areas can be grazed on the two-pasture system and provide grazing for sheep in conjunction with the rough grazings. The enclosures are used at peak demand periods for flushing, tupping and lambing; grazing ewes with twin lambs; grazing lean pregnant ewes before lambing; overwintering hoggs and easing pressure of stock on inbye ground in May/June and so releasing more land for hay.

The technique outlined above of improving selected areas of hill grazings has made it possible to double production on some areas of Redesdale fairly quickly. This however, was only achieved by increasing stocking rates and/or lambing percentages to match the increased carrying capacity of the hill, whilst at the same time maintaining individual lamb performance.

Reported by C C Watson

ICI Black Polyethylene Agricultural Sheet for Lining and Sealing Silage Clamps



APPOINTED I.C.I. STOCKIST

300g (75mu)	8m x 72m	(26ft x 236ft)	Black only	@ £37.50
	11m x 50m	(36ft x 162ft)	Black only	@ £37.50
	12.8m x 50m	(42ft x 162ft)	Black only	@ £43.00
500g (125mu)	8m x 50m	(26ft x 162ft)	Black only	@ £41.00
	11m x 42m	(36ft x 136ft)	Black only	@ £45.00
	12.8m x 36m	(42ft x 118ft)	Black only	@ £45.00
1000g (250mu)	8m x 28m	(26ft x 91ft)	Black only	@ £45.00

(All above material is manufactured by I.C.I.)

Cut Sheets available from any of the above rolls, to your exact length

OTHER USEFUL SIZES

500g (125mu)	2m x 100m	(6ft 6in x 324ft)	Clear only	@ £18.50
	4m x 50m	(13ft x 162ft)	Black/Clear	@ £18.50
1000g (250mu)	2m x 50m	(6ft 6in x 162ft)	Clear only	@ £18.50
	4m x 25m	(13ft x 81ft)	Black/Clear	@ £18.50

Also in Stock: I.C.I. "POLITARP" SHEETING (eyeletted to your own requirements), SEALING TAPE/JOINTING TAPE

Above prices do not include delivery and are subject to 15% V.A.T.

Terms: Net cash with order or C.O.D. by our own transport where possible

PLASTI-COVERS LIMITED

16 Kyle Road, Burgh Industrial Estate, Irvine, Ayrshire Telephone: Irvine 78696/7

GRASSLAND UTILISATION

Dr J D Leaver

The West of Scotland Agricultural College

A meeting of the SWSGS in the Marine Court Hotel, Ayr, 8 March, 1979.

The current trends in dairying emphasise the increasing importance of efficiency on the farm, and the asset in the west of Scotland with the greatest scope for increased efficiency is our grassland. Under controlled experimental conditions, plots of grass have produced dry matter yields up to 20 t/ha. Under ideal field conditions, yields of up to 15 tonnes have been recorded. However, if we examine recorded dairy herds on lowland swards the amount of grass utilised only ranges from 2 to 7 t dry matter/ha. Data from the West Colleges Milk Production Systems Investigations indicate that the top 25% of farms, on a gross margin per hectare basis, utilised 8.2 t dry matter/ha compared with 7.1 t and 6.0 t/ha on the middle 50% and bottom 25% farms respectively. These figures serve to highlight the potential which is still to be tapped by improved grassland farming.

Unfortunately research workers, advisers and farmers with an enthusiasm for grassland, have often not seen the objectives clearly enough. There has been a tendency to have herbage quality as a main objective at the expense of quantity, and many have too readily fallen into the grass versus concentrates conflict, when in fact the two feeds are complementary.

The only way to increase the contribution of grassland to animal production is to increase the quantity of digestible or metabolisable nutrients *utilised* per hectare. This is particularly so in the grazing situation which tends to be less well planned than the conservation management.

Grazing management

In general the amount of herbage utilised per hectare by grazing cattle is less than when the sward is cut. For example, in 1977 at Crichton Royal Farm up to 12 t dry matter/ha was utilised from silage fields, whereas on set-stocking only 8 t were utilised. The reason for the difference lies mainly in the reduced production of herbage due to the greater frequency of defoliation in the grazing fields, rather than in-efficiency of use. Indeed 95% of all the herbage grown on the set-stocking area was utilised. So cows can be very efficient in utilising grass.

The objectives in grazing management are therefore to optimise herbage growth, herbage utilisation and cow performance (for milk and growth). Optimum herbage growth is achieved by following normal recommendations on drainage, liming and fertilising. For optimum utilisation, cow requirements must be matched to herbage growth. This can be approximately planned before the season starts as illustrated in Table 1.

Table 1 Stocking rates required to match herbage production and utilisation

Period	Herbage DM production (kg DM/ha/day)	Autumn calvers Requirement (kg DM/day)	Stocking rate (cows/ha)
April-June	80	13.1	5.5
June-Aug	50	11.7	3.9
Aug-Oct	30	9.2	2.9

The production and availability of grass in the period August to October is frequently overestimated and reduced animal performance, particularly in growth rate is often the result. It is important that stocking rates in autumn be reduced to about half of those in spring and early summer.

Decreases in herbage availability at any season of the year due to climatic conditions have to be offset by supplementary feeding, or by a reduction in stocking rate, in order to sustain milk yields. The main problem is in identifying shortages, particularly with set-stocking systems but this can normally be detected from milk yields and body condition. Attempts are now being made to use grass height, as measured by the grass meter, to give a rapid guide to herbage availability. Routine feeding when there is ample grass is extravagant and wasteful since 1 kg of concentrates is likely to produce less than 1 kg of extra milk. The tactical use of concentrates at grass is, however, a different matter.

Although concentrates often do not give an economic response in the short term when fed at grass, they are essential if milk yields are declining and body condition is not increasing due to shortages of herbage. Also as a rule of thumb guide ample grazing is only worth M+ 25 kg in spring, and M+ 0 in autumn. Supplementary feeding should be offered for yields above these levels.

Grazing system

Most studies have shown little difference in performance between rotational systems and set-stocking systems where N levels and stocking rates are similar. The choice of system should therefore mainly depend on the individual farm situation. Where high yielding cattle are being grazed they are likely to do better on a strip or paddock grazing option because it is easier for them to quickly 'harvest' sufficient grass. With set-stocking it takes longer for the cow to satiate her appetite.

Future systems of grazing will undoubtedly be aimed at feeding higher yielding cows, and at utilising larger quantities of herbage per hectare. Such systems as the leader/follower technique with paddocks or partial grazing, say at night, with daily set-stocking are possible methods of improving grass utilisation. Storage feeding on silage or good quality hay at night with day time grazing is another possibility. Yet another technique may be to offer ad lib concentrates throughout the grazing season on the premise that if there is ample grass the cows will only top up on concentrates if grass supplies become inadequate.

Silage systems

Recent work at Crichton Royal Farm has been examining the implication to the farmer of changing from a conventional 2 cut system of silage making to a high quality 3 cut system. This study has been carried out on 16-20 ha each year. The final cuts of the two systems coincided and the first cut of the 3 cut system was taken 2-3 weeks before that of the 2 cut.

The 3 cut system gave silage of 5 units higher D value (66 cf 61D) but 17% less dry matter yield (9.7 cf 11.6 t/ha) and 11% less digestible organic matter (6.4 cf 7.1 t/ha) were produced. Higher quality silage therefore led to a reduction in grassland utilisation. High quality (70D) was obtained only at the first cut of the 3 cut system.

The cows ate 12% more dry matter of the high quality 3 cut silage. This led to a marginal response in milk yield and a larger response in liveweight gain (Table 2).

Table 2 Crichton Royal Farm: silage trial 1977/78

	3 cut system	2 cut system
Milk yield (kg/day)	20.0	19.3
Total solids (%)	13.0	12.8
Liveweight gain (kg/day)	± 0.34	± 0.19
Silage area required for 6 month winter (ha per cow)	0.23	0.17

The reduced DM yield and greater intake of the 3 cut silage led to a 35% increase in the area of silage ground required per cow for the winter period.

This trial emphasises the importance of not neglecting the quantity of silage produced when pursuing higher D values. It is important to produce enough silage to fill the silo from the area of available land and then to seek an improvement in quality by better conservation techniques.

The method of feeding silage depends very much on the farm situation. Self-feeding, easy feed or complete diets can all be ideal in the correct situation. Self-feeding involves a minimum of effort by farm staff whilst easy feed enables the cows to eat more quickly. The use of complete diets in the arable situation or where there is a source of other feed products can be particularly useful.

Management in response to increased grassland utilisation

Where improved management increases grass production on the farm, what are the alternative uses of this grass and which options will give the best return? Increased production can be utilised to produce:

(a) Higher milk yields at the same stocking rate and concentrate input (increase individual cow intakes).

(b) Same milk yields at the same stocking rate but at a lower concentrate level (substitute grass for concentrates).

(c) Same milk yields at the same concentrate input but at higher stocking rates (keep more cows or release hectares for another enterprise).

The following example can be used to show the effects of these options on profitability resulting from an increase in utilisation from 7000 to 8000 kg dry matter/ha.

	Example Farm	Option (a)	Option (b)	Option (c)
Grass utilisation (kg DM/ha)	7000	8000	8000	8000
Concentrate use (t/cow)	1.2	1.2	0.8	1.2
Stocking rate (ha/cow)	0.5	0.5	0.5	0.44
Milk yield (kg/cow)	5000	6000	5000	5000
Margin over concentrates/ha (£)	820	1040	900	920
Margin over concentrates/cow (£)	410	520	450	410

The most profitable option is (a), going for higher yields, and this still holds true if the concentrate price increases by 20% and the milk price remains static.

An improvement in grassland utilisation is therefore likely to show its main benefit for most farmers in allowing cow intakes and milk yields to increase. If however political moves result in heavy penalties for extra milk production performance, the next best option particularly for smaller farms is (c). In this case stocking rates are increased to utilise the extra grass and hectares can be released from the dairy enterprise to other enterprises.

Conclusions

There is considerable scope for increasing the utilisation of our grassland. This will only be brought about by measuring grassland utilisation on farms and publicising the results. The utilised metabolisable energy (UME) system is a simple system of measuring grassland output which can be applied to any farm where the milk output, stocking rate and concentrate input are known.

The optimum quality (D value) of grazed or conserved herbage will vary according to the enterprise, the animal potential, and the amount and type of supplementary feeding offered. There is no single optimum 'D' value for all situations.

The main objective should therefore be to optimise the utilisation of DOM per hectare at the D value necessary for the particular system of animal production. It is against this background that the development work at Crichton Royal Farm is being conducted.

It is important for our R & D work to have the quantity of utilised DM or energy per hectare as an objective and to forget the conflict which has never existed between grass and concentrates. It is quite possible to have highly efficient grassland utilisation at both low and high concentrate inputs. The choice of concentrate input should be dictated only by the economic condition prevailing on a particular farm at a particular time.

DISCUSSION

25 kg is the maximum milk yield obtainable from spring grass. This is because the cow cannot eat sufficient herbage to sustain a higher yield. The time a cow grazes per day is limited. Indoors, cows can eat faster so can consume sufficient nutrients. Outdoors both feed intake and grazing time fall with advancing season. So if a cow can yield more than 25 kg she will need to be fed even when grazing spring grass.

The falling intake as grazing season progresses has been linked to a build up of fouled herbage on the grazing areas. Alternating the use of the sward for grazing/cutting may help but experiments have failed to show any large difference in production from this technique. As herd sizes become bigger there is more likelihood of separate grazing and cutting blocks being established although, as happens on many farms, silage areas are brought into the grazing rotation in autumn.

At Crichton Royal, the autumn calvers receive concentrates for the first 2 to 3 weeks after turnout. Thereafter concentrates are not normally fed but last year because of the drought, feeding was resumed during the summer. Usually it is advisable to stock for the average year but be prepared to feed in the difficult years.

The optimum height of grass in a set-stocked system in trials at Crichton Royal in 1978 was about 8 cm. In the spring on a dense pasture ryegrass sward, stocking rates to achieve 5½-7 cm are suitable as this keeps the grass dense and vigorous as well as releasing more grass area for conservation. If stock are forced to graze below these optimum grass heights, milk yields are likely to suffer. Where utilisation is matching grass growth rate the sward can be kept at these suggested heights and the use of the grass meter is a useful tool for monitoring what is happening.

The fertiliser use on grazing land at Crichton Royal is about 100 kg N of straight 34% N fertiliser per hectare in mid March. After the first grazing, one quarter of the set-stocked area receives N each week. In a season the total N application is 375 kg per hectare backed up with 30 kg of phosphate and of potash. Fertiliser for silage swards is applied in the second week of March. 150 kg N per hectare is applied and a total of around 300 kg is applied over the season. Phosphate and potash are used as necessary.

In the two cut versus three cut silage systems most of the difference in yield was recorded at the first cut viz. 4½ t compared with over 7 t dry matter per hectare. Certainly dry summers had been experienced in both years of the trial and wetter conditions may marginally reduce the yield difference between the systems. No single D value for silage will suit all occasions and the level required will depend on the production potential of the stock and can also vary depending on other feeds, e.g. concentrates, being offered. Certainly 61D may prove to be too low for high yielding cows.

Formic acid additive is used to ensure uniformity of product. With adequate wilting and chopping there may be a case for reducing additive use. Chopping aids silage fermentation and makes the silage more easily extracted on a self-feeding system. These are important factors where low concentrate diets are on offer.

Autumn calvers at Crichton Royal are on easy-feed and winter calvers are self-fed. Cows spend about 3 hours per day at the silage face or 2 to 2½ hours at the feed trough on easy-feed, where normal levels of concentrates are being fed. Cows that are milking well should not get fat and so they cannot really be over-fed. The benefit of good intakes may not appear until the next lactation. The message today is not to 'ration' the cows. This suggests a restriction in intake and the objective must be to entice them to eat plenty if high levels of milk production are wanted. Present lactation yields at Crichton are around 5500 litres with 40 per cent of the herd as heifers. No culling has yet taken place since all cattle have been bought in over the last two years. Home bred calves will be coming into the herd soon. The lactation yield has increased by 600 litres since the introduction of the new cattle in 1976.

There is an interest in the use of partial zero grazing in order to increase stocking rates early in the season, say April and May and then again in the autumn. Set-stocking during the day and zero grazing at night could be a useful approach. Although the selective grazing possible at pasture grass is removed and cows must eat what is presented to them, a depression in milk yield is less likely since zero grazing is only offering a part of the diet. Zero grazing is just another system and the best system for the individual farmer is the one he can make work. Any change from a successful system must be very carefully thought out.

CONSTITUTION AND RULES

of the

THE SOUTH WEST SCOTLAND GRASSLAND SOCIETY

Founded 14th June 1962

1. NAME

The Society shall be known as the South West Scotland Grassland Society.

2. ADDRESS

Auchincruive, Ayr, KA6 5HW.

3. OBJECTS

The advancement of methods of production and utilisation of grass and forage crops for the promotion of agriculture and the public benefit.

4. MEMBERSHIP

(i) Membership of the Society shall (subject to paragraph (iv) of this section) be open to those wishing to further the objects of the Society.

(ii) Applications for membership shall be sponsored by not less than two members of the Society. Election to membership shall be made by the Executive Committee or a Sub-Committee appointed for this purpose.

(iii) Those persons who were present at the Inaugural Meeting shall be *ipso facto* Foundation members.

(iv) The membership of the Society shall be farmers, farm managers, full time workers, or the factors of agricultural land working in the former Counties of Ayr, Dumfries, Kirkcudbright or Wigtown i.e. former to regionalization in May, 1975.

Membership of the Society will also be open to persons who are not farmers, farm managers, farm workers or estate factors irrespective of domicile.

5. SUBSCRIPTION

There shall be an annual subscription of £2 payable on application for membership and thereafter by bankers order on 1st June each year. Any member who cancels his bankers order is deemed to have cancelled his membership.

6. MANAGEMENT

The affiars of the Society shall be managed by an Executive Committee (five of whom shall constitute a quorum) consisting of/or a Sub-Committee appointed from the following persons:-

(i) /

(i) The Chairman of the Society, who will be elected annually at the Annual General Meeting and will normally serve as Chairman for not more than two consecutive years.

(ii) The Vice-Chairman of the Society, who will be elected annually at the Annual General Meeting and will normally serve as Vice-Chairman for not more than two consecutive years.

(iii) Eight members (two of whom shall represent each of the aforesaid former counties) who will serve for a period of two years. Four of these members (one representing each former county aforesaid) will retire annually and will not be eligible for re-election for a period of twelve months. Four members (one representing each former county aforesaid) will be elected at each Annual General Meeting.

(iv) An agricultural adviser of the West of Scotland Agricultural College for each of the aforesaid former counties.

(v) The Ex-Chairman of the Society shall automatically be a member of the Committee in the period following his term of office.

(vi) The Honorary Secretary and Honorary Treasurer who will be elected annually at the Annual General Meeting will be members by virtue of office. They will be reimbursed for all expenditure in the service of the Society.

(vii) The Committee has the power to co-opt additional members who will serve until the following Annual General Meeting.

7. ELECTION OF COMMITTEE MEMBERS

(i) Nominations supported by two members should be submitted in writing to the Secretary not later than 1st October.

(ii) For voting purposes, members will be classified according to former county. Candidates will be nominated to represent one of the former counties whilst members will vote only for their former-county representative.

8. FINANCE

Accounts shall be kept by the Treasurer of all money received and expended by the Society.

An Auditor, who shall not be a member of the Committee and who need not be a member of the Society, shall be appointed annually at the Annual General Meeting. A statement showing the financial position of the Society, examined and certified by the Auditor, shall be circulated to all members and laid before the Annual General Meeting.

All cheques on the Society's account shall be signed by the Treasurer and the Chairman or Secretary.

9./

9. ANNUAL GENERAL MEETING

The Society's Annual General Meeting shall be held in November each year, after not less than fourteen days' notice has been given to members.

10. AMENDMENTS TO THE CONSTITUTION

This Constitution may be amended only by a general meeting at which at least two-thirds of those present are in favour. Notice of any proposed amendment, supported by the signatures of not less than five members must be given to the Secretary in time for inclusion in the convening notice, which will be sent out to members not less than fourteen days before the date of the meeting.

The Constitution Rules were revised in 1978 in order to allow for nomenclature changes following Regionalization

ADVERTISERS

The continued support from Advertisers is gratefully acknowledged and members are asked to mention Greensward when replying to or seeking information on the products advertised.

Printed by W J Ross, Repro Service, 90 West Nile Street, Glasgow G1 2QU