GREENSWARD

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FOREWORD

As forecast in the last issue of this journal, rising costs of printing have obliged us to use a less expensive method of reproducing the journal. This involves photography of prepared typescripts and offset litho instead of the more expensive typesetting and block making.

The result depends largely on the quality of the prepared typescript. A suitable typewriter had to be hired since the College is a little backward in acquiring some kinds of equipment.

It is hoped that the journal is as easily read in this form as it was when printed in the traditional form. The saving in cost by this method is substantial.

Most of the reduction in cost comes from saving manpower, which really means putting someone's job at risk.

Our journal's contribution to the national employment situation in the printing trade is small and our conscience clear. Our own alternative was not the choice of method of printing but whether to abandon the journal or print by the cheaper method.

But this trend away from labour intensive printing methods is becoming necessary at all publishing levels and is naturally being resisted strongly by the printing unions.

What do you think of the new format, as appearance of the journal is important. Can you read it or is the size of type too small.

Assuming you can read it, can you understand it? It contains an account of all the winter meetings of the two societies plus reports on the winter meetings of the British Grassland Society and some reviews of recent articles appearing in the journal of the British Grassland Society. Two original articles are included, one on the financial crisis at the BGS and the other on the significance of grass diseases.

I have left out reports on visits to farms made last summer including the summer meeting of the British Grassland Society. To my mind the most significant feature of the BGS Summer Tour was the visit to Jim Shores farm near Chester to see his system of silage making. His own account of the system was a highlight of our winter programme and is fully reported.

If you analyse the contents of the journal, a considerable amount of information will be found covering all aspects of grassland farming. The constantly recurring statement is that farmers are not making full use of the grass they grow and not growing as much grass as they could. Editor.

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UPLAND GRASS AND GRAZING MANAGEMENT

John Hodgson

Hill Farming Research Organisation (H.F.R.O.)

John Hodgson came to HFRO from the Grassland Research Institute, Hurley, Berkshire, where he had made a name for himself in studies of grass production and utilisation under grazing conditions. This is a very difficult area to work in because there is no simple method of measuring the amounts of grass grown and consumed under grazing conditions. The information is gathered with considerable physical discomfort and it is not surprising that few scientists work on this vital subject. Grassland scientists at Auchincruive, such as Dr. John Frame, have made a significant contribution to the subject. Dr. Hodgson spoke to SWSGS, 23rd October, 1975, at the Queen's Hotel, Lockerbie.

Introduction

John Hodgson introduced his talk by pointing out that the rapid increase in costs of concentrate feeds and fertilizer nitrogen emphasised the need for efficient systems of grassland management. The demand for greater efficiency, and the increased nutrient requirements of animals which are becoming more productive, resulted in smaller margins for error in making management decisions. These trends are common to most agricultural enterprises. Sensible management decisions depend upon a proper understanding of the processes involved in a particular system of production, and a major function of research is to provide that understanding as a basis for improvements in management. His object was to illustrate the way research people tackled the problems of increasing efficiency of grassland farming systems, rather than to talk about particular systems; he hoped that this would stimulate argument about the information farmers wanted from the research services and how these requirements were being met. This would be a personal view, illustrated with results from recent work at the GRI and HFRO.

Studies concerned with improvements in grassland management systems involving grazing have generally been associated with lowland grass, and have become more and more important as grass production has been raised by using improved varieties and higher levels of fertilizer nitrogen. Raising the yield of grass has been relatively easy but efficient conversion of the extra grass more difficult. Increased costs of production however make it imperative that the extra grass is put to good use.

The needs to maximise herbage production per acre and to achieve highly efficient conversion of herbage have not been accorded the same importance in upland grassland management, where traditionally inputs have been minimised even where this has meant waste of summer pasture growth because of low stocking rates. Although the current economic climate is not encouraging, the pressures on limited food production resources seem almost certain to result in a long-term demand for higher levels of output of animal products from the hills and uplands. The research effort that has been put into effective lowland grazing systems must be matched by similar work at higher altitude.

Animal production from grassland is affected by the amount of grass grown, the proportion which is actually eaten by farm livestock, and the efficiency of conversion of this into animal product:-

ANIMAL PRODUCTION = PASTURE PRODUCTION

X EFFICIENCY OF UTILISATION (CONSUMPTION)

X EFFICIENCY OF CONVERSION INTO PRODUCT.

Efficient grassland management must be based on an understanding of the factors influencing the variables on the right hand side of this equation, and on achieving an effective compromise between the demands of the pasture and the animal population. This sounds a simple proposition, but is in fact not at all easy; the most profitable research approach has been to try to take production systems to pieces, to study the individual pieces in detail, and then to use the knowledge acquired to fit the pieces together again in a more effective combination.

The three major areas of interest shown in the equation apply equally well to upland and lowland conditions. They are shown in logical sequence, but in fact more is known about conversion efficiency (i.e. the effective use by the animal of the herbage that has been eaten) and John Hodgson dealt with it first.

<u>Efficiency of conversion of food into animal product</u>

This is a reflection of the productive potential of the animals involved (growth rate and milk yield), and the reproductive efficiency of the population on the farm (relative proportions of young, growing animals and adult stock), but is also closely related to their level of feeding. It is a matter of some concern that emphasis has changed recently, particularly in the case of breeding cows and ewes, from studies on responses to better levels of feeding to studies on the minimal level of feeding necessary to sustain acceptable levels of performance - from "How much?" to "How little?". The latter approach is a sensible response to rapidly escalating feed costs, so long as it is adopted with adequate safeguards, but it can clearly increase quite sharply the risks inherent in an animal breeding enterprise.

The Blackface ewe is known to have a potential lambing percentage in excess of 150 when she is well fed, and under the same conditions she can sustain growth rates in her lambs of over $\frac{3}{4}$lb per day. It will be essential to make better use of this potential in future. At HFRO much effort has been devoted to defining the stages in the reproductive cycle when improvements in nutrition will have the greatest impact on prolificacy and lamb performance, with the object of getting the best possible response from limited feed resources. It is now well known that the number of lambs carried can be quite easily affected by the condition of the ewe and her level of feeding at tupping. Also, lamb growth rates can be improved by better nutrition of the ewe just before lambing and during lactation. At other times of the year, the ewe can live quite satisfactorily on a low plane of nutrition. However, this information is of little use by itself. We have to recognise that better feeding at tupping is of little use unless feeding in late pregnancy and lactation can also be improved, because an increase in the lambing percentage increases the nutrient demands of the flock later on. Also, of course, tupping and lambing occur at times of the year when natural hill vegetation and upland grass are of low quality, or in short supply.

Thus, it is quite clear that the level of production of a hill ewe flock is limited primarily by the nutritive value of her diet over quite short but critical periods of the year. This then becomes basically a problem of pasture management, which John Hodgson said he would return to later. Exactly the same principles appear to apply to the suckler cow, though the practical problems are different for cows calving at different times of the year.

Pasture production is not often a problem under hill conditions at present, because a lot of herbage is wasted on most hill farms, but it may become more important in the future as stocking rates increase. Grazing management has much greater impact on the efficiency of pasture utilisation - the proportion of what is grown which is actually eaten by livestock - than on pasture production, but management can have a major influence on the nutritive value of the pasture. The differences between the yield potentials of the alternative sown species of grass are relatively small, but the perennial ryegrasses dominate seed sales because they tend to maintain higher levels of digestibility, and to be eaten in greater quantity, than most other grasses. However, John Hodgson pointed out that very few measurements of pasture production and utilisation had been made under grazing conditions and this was a serious limitation of existing information.

Herbage consumption

The performance of grazing animals can be severely limited by an inadequate intake of nutrients from pasture. Thus it is important to maintain the herbage intake of productive animals at as high a level as possible. We do not yet have much information on the factors influencing pasture consumption, particularly for hill areas, but John Hodgson illustrated four ways in which intake could be affected.

First, intake continues to increase substantially as the digestibility of the grazed herbage increases up to at least 80% OMD (= 72D). It has often been suggested that there will be little improvement in animal performance once digestibility increases above 70% OMD (= 63D), but this is certainly not the case for grazing animals. For instance, in one experiment at the GRI an increase in the digestibility of grazed herbage from 70% to 75% OMD increased the herbage intake of young weaned calves enough to raise weight gain by $\frac{1}{2}$ lb per day.

Newly emerged grass leaves have a digestibility well in excess of 80%, and the digestibility of each leaf falls rapidly as it starts to senesce. Changes in a pasture are less extreme, because it contains leaves and shoots of different age. However, these values indicate that grazing animals can obtain a diet of very high digestibility if they are allowed to graze young leaves as they appear (as in set-stocking) or under a rapid rotational grazing system.

Second, intake tends to be depressed on particularly short swards. Intake does not necessarily reach maximum until the weight of crop reaches 2000-2500 lb dry matter per acre - roughly equivalent to a silage crop - so long as a high level of digestibility is maintained. In contrast to the usual belief, this appears to be true for both cattle and sheep. A major problem for the grazier is to achieve a reasonable compromise between the conflicting needs for high digestibility and adequate weight of crop. So long as the weight of herbage per animal (herbage allowance) is adequate, its digestibility is probably more important than the weight per unit area. Thus in most hill and upland situations, it will almost certainly pay to aim primarily for quality, but this will not always be true for intensively grazed lowland conditions.

Third, intake can be markedly affected by varying the allowance of herbage. Thus, under strip-grazing management animals have to be allowed access to three or four times as much herbage as they can eat before intake reaches a maximum. No farmer is likely to be interested in this wasteful use of grass if he can avoid it, and in fact herbage intake and animal performance are likely to be restricted very little if the allowance is reduced by half. The need to achieve a balance between high intake per animal and efficient utilisation of the herbage grown is a second major problem for the grazier, and to help to solve it we need a better definition of the relationship between herbage allowance and intake for different classes of animal.

Fourth, intake and animal performance are related to the botanical composition of the pasture. John Hodgson illustrated this point with some results from indoor feeding experiments at HFRO, in which housed lambs were offered different herbages to appetite:-

Sward type	Lamb growth 8-14 wks (gram/day)	
	No milk	Milk
Agrostis/fescue	60	150
Ryegrass/white clover	160	230
Clover	230	300

These results demonstrated the great value of clover in pasture for sheep, and also the importance of milk to lambs even when they are approaching weaning age. Clovers have also been shown to sustain higher levels of herbage intake, and higher lamb growth rates, under grazing conditions, and other results suggest that ryegrass is a superior feed even to high quality indigenous hill pasture. This kind of information illustrates the potential for the direct impact of clover in hill swards on animal performance, quite apart from its contribution to the nitrogen economy of the sward.

Grazing systems

John Hodgson went on to point out that, although each of these pieces of information was of value in helping us to understand the workings of current grazing systems, the farmer would only derive direct benefit when the pieces were put together so that coherent systems of management could be developed which made sense for individual farms. This integration of existing and new information is a major responsibility for the research and advisory services. He used the Two-Sward system of pasture management for hill sheep farms, which was developed at HFRO and is now being extensively tested on their research farms, to illustrate his argument.

The system is based on the provision of relatively small areas of improved pasture which are reserved for grazing in the critical periods around tupping and during lactation, when the productivity of the ewe can respond to a higher plane of nutrition (see section on efficiency of food conversion). Improvement can be effected relatively easily on areas of agrostis/fescue pasture, simply by hard grazing to remove surplus mature herbage, which would otherwise dilute the value of new growth (see section on pasture consumption). On other pasture communities more severe treatment may be necessary, but in all cases the areas must be fenced to ensure proper grazing control. Improved pasture cannot be used to meet the demands of ewes in late pregnancy, because growth does not start early enough in the year. It pays to feed concentrates at this time to ensure that lambs are vigorous at birth, and that lactation is established properly, particularly where lambing percentage has increased as a result of improved nutrition the previous autumn.

On one of the HFRO development units this system, based on fencing and a relatively simple grazing management, has resulted in an increase in the lambing percentage from 85% to 100% at the same time as increasing the number of ewes carried by over 50%. Gross margins based on constant prices have doubled, and have easily covered the initial costs of fencing and application of lime and slag.

John Hodgson concluded by pointing out that in one sense it was relatively easy to attempt improvement in the traditional hill sheep systems, given the right kind of background information, because they all depended upon a large area of natural pasture which could be used as a buffer. The problem could be more difficult on more intensively utilised, enclosed grassland farms, but the experiment approach should be similar. The need for a better understanding of the complex processes underlying any grazing system is a challenge facing the research scientist, the advisor and the farmer. It is a challenge which will have to be met in view of the increasing demands which are almost certain to be made on pasture and animals, and therefore on graziers.

Discussion

There was considerable discussion over the risk of increasing problems of mineral deficiency in a programme of pasture improvement and increasing stock numbers. John Hodgson said that animal health problems were carefully monitored in all the HFRO development projects, and that so far it had been possible to control problems of mineral deficiency and parasite infestation by appropriate preventative measures.

The difficulty of achieving a compromise between adequate quantity and quality of herbage on a grazed pasture was discussed at some length, but it was generally agreed that on hill pastures herbage quality was most likely to be limiting. It was felt that hill cattle could be used to maintain pasture quality for sheep without necessarily affecting calf production adversely, though this depends to some extent upon the time of calving; the use of burning or mowing as alternative methods of pasture control were also discussed.

References

Further details of the HFRO Two-Sward system can be found in the 6th Report of the HFRO, and in the proceedings of a colloquium on "Hill Pasture Improvement and its Economic Utilisation", published by The Potassium Institute Limited, Cedar Court, Fair Mile, Henley-on-Thames, Oxfordshire, RG9 2JT.

Nutrition of the Hill Ewe. Publication No. 1 issued by the Scottish Agricultural Colleges and available free from a College librarian or your College adviser is a useful reference.

4TH ANNUAL SILAGE COMPETITION 1976/77

Silage The committee have agreed to continue the silage competition for a further year. Slight changes are proposed in the marking schedules to allow for the inclusion of further indices of quality.

The top mark for 'D' value is reduced to 45 with a range from 0 at 55D to 45 at 70D.

Marks for pH are to be dropped and 15 marks to be given for ammonia content. This is a measure of the preservation of protein value.

1ST ANNUAL HAY COMPETITION

Hay For this first year, the entries will be judged entirely by chemical analysis and examination of the hay in the laboratory.

Provisionally, the marking schedule will include 60 for 'D' value, 20 for Crude Protein content, 10 for % dry matter and 10 for appearance including colour, dust and smell. 2 separate classes are proposed for:-
a) field cured, b) cold air blown, or warm air blown.

Schedules and entry forms will be sent to all members.

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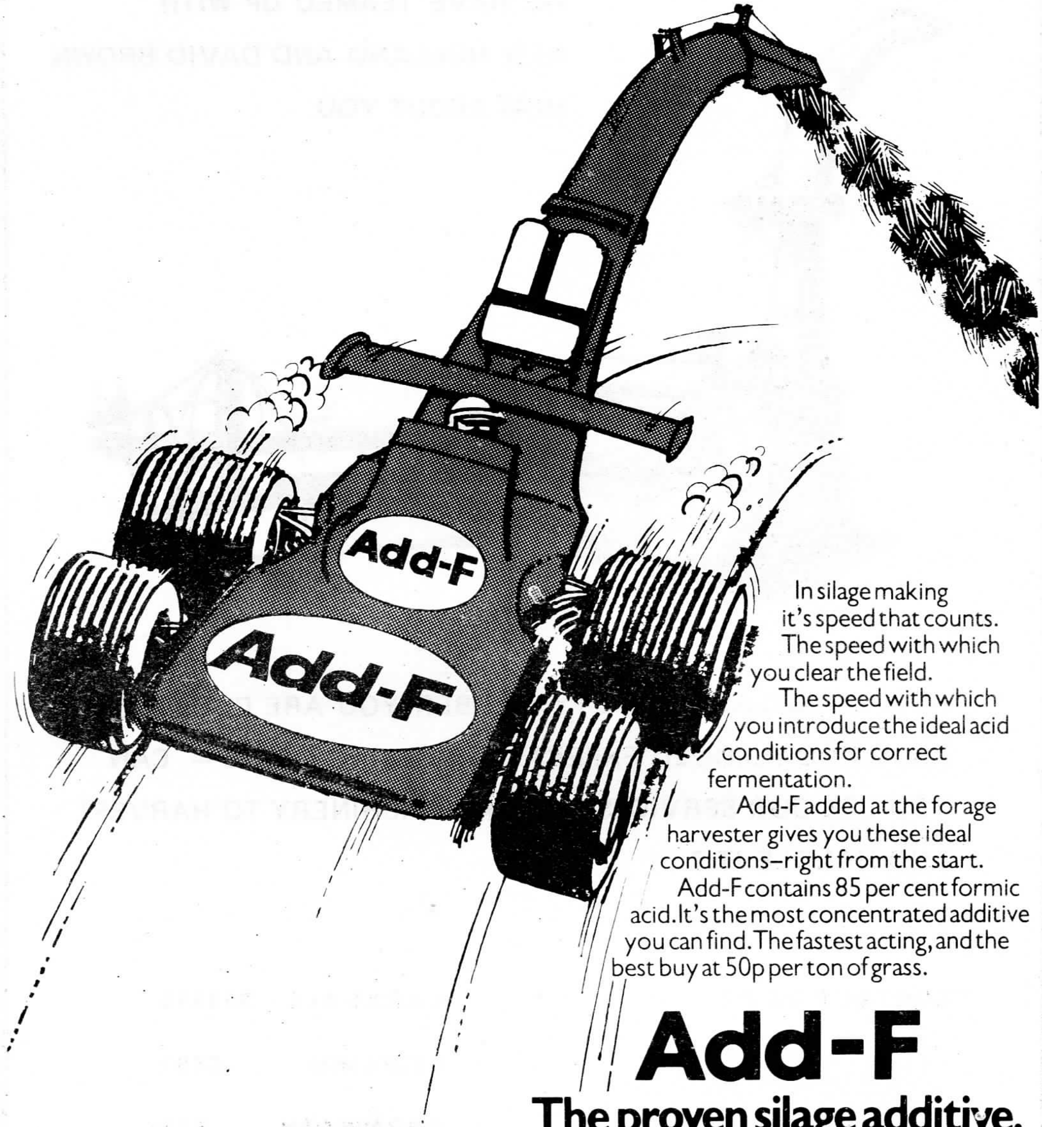

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RECENT DEVELOPMENTS IN HAYMAKING

A meeting held after the XIVth A.G.M. on 27th November, 1975, at the Galloway Arms Hotel, Newton Stewart.

Speakers:

1. Dr. R.D. Harkess, The West of Scotland Agricultural College, Auchincruive, Ayr.
2. Mr. J. Guthrie, Low Milton, Maybole, Ayrshire.
3. Mr. J.D. Metcalfe, S.A.I. Ltd., Ayr.

R.D. Harkess

Hay is as important as silage, judging by the number of farmers making hay or the quantity of hay made. This is especially true of the area covered by our South-West Scotland Grassland Society which makes 24% of the total Scottish hay.

Traditional hay is not the ideal winter feed for highly productive classes of livestock. Of the total cattle population, about half would come into less demanding classes, e.g. dry cows and beef cows. The other half would require high quality fodder to produce milk, meat or to grow. Only 20% get quality fodder, and for the remainder the deficiency in hay quality is met by concentrate supplementation and other feeds such as kale, turnips, swedes and draff.

Hay quality. Chemical analysis is a guide to feeding value and the following are the main indices. Average values quoted are for the last 8 years in the West of Scotland.

D value — As for silage, this is an important quality index of the digestibility of the hay. On average it is around 53D. Amongst farmers participating in the Milk Production Systems Investigation (M.P.S.I.) the best hay had 58D in 1973 and 64D in 1974. A target of 60D should be the aim. Higher values are looked for in silage but to obtain hay at over 60D involves loss of bulk and difficulties in curing. Hay of 55D is about maintenance feed for adult stock.

SE — The starch equivalent or energy value of the hay is important. On average it is 42, i.e. each 100 lb of hay dry matter contains 42 lb starch equivalent. A target would be 48 SE.

CP — Crude protein content is more important in hay than in silage. Hay is generally more mature. As grass matures, CP falls very rapidly and could drop well below the requirements of a growing or producing animal. Average CP is 7.9% which just satisfies maintenance. A target would be 10% CP.

DCP — Digestible crude protein averages 4%. A target would be 6%.

Target summary	D	SE in DM	CP in DM	DCP in DM
	60	10	10	6

The two major factors which must be considered when aiming for quality are as for silage: a) date of cutting and b) making and curing losses.

Date of cutting

D value falls as the grass matures. Early maturing grass will show this fall in D value early in the season. Late maturing grasses will hold their D value for 3 or 4 weeks longer.

Some species, e.g. perennial ryegrass, have inherently high 'D' values. Other species, e.g. cocksfoot, have low D values.

To make high quality hay, it is necessary to choose the grass varieties and species which match the requirements of the situation and purpose. Thus, if hay is to be made early in the year (e.g. end May/early June), choose early varieties of perennial ryegrass, e.g. Premo, Gremie, which will show high quality plus high yield at this time. To make hay in the second week of June, choose intermediate varieties of perennial ryegrass, e.g. Animo, Barlenna. If use is made of early varieties for harvesting in the 2nd week of June - yield will be high (3 tons/acre) but quality will be low.

If hay is to be made in the 3rd week of June, choose a late variety of perennial ryegrass as the main grass in the mixture, e.g. Perma, Lamora, S23.

One problem is that these late ryegrasses are very dense and were difficult to cut with the old reciprocating blade mower. Turbo-mowers make a good job of these swards.

For most parts of the south west of Scotland, hay should be cut by the date of the Highland Show! Unfortunately, most of the crop is harvested after the Show. Higher land will mean later ideal cutting dates.

The main steps to be taken in achieving more suitable harvesting dates are either to shift the date of the Highland Show! or to use later varieties and species or to defer growth by early grazing.

Losses

The basis of haymaking is to prevent the normal decay of cut grass by removing the moisture. Using sun, wind and the evaporative effect of the air to get rid of moisture is a slow process. The time taken to reach a safe moisture content depends on the type of herbage, and on the weather and can be speeded up by various mechanical processes. Machinery development is towards machines which are very abrasive for use at time of cutting but are more gentle for turning the crop as it reaches a drier more brittle stage.

A 1 in 40 chance of hitting 3 consecutive drying days is reduced to a 1 in 10 chance of finding 2 suitable days. Thus, there is every incentive to adopt some means of encouraging quick drying.

Total losses of DM can be as high as 100% and average losses are around 35% which still represents a tremendous amount of wasted effort in growing a crop. Improved machinery design, the use of additives and barn hay drying or hay conditioning all aim to reduce haymaking losses.

J. Guthrie

Mr. Guthrie is a hay maker because he has a traditional let farm with restrictions imposed by his landlords (Water Board) on the use of fertilizer N.

He and his father before him have always made hay as the only winter fodder. Hay from the first fields was made in ricks and provided the best hay for the dairy cows. Later fields were baled to provide for other classes of livestock.

The system works well providing a winter fodder suitable to the enterprise with an easy market for any surplus product. It was natural to take an interest in hay additives about 5 years ago.

In the first year, the results were disappointing but for 3 seasons now, use has been made of Add H, (product of B. P. Chemicals). The main problem was securing good distribution of the additive in the hay whilst still using a low quantity of the additive. The recommended rate of use is 1-2 gallons/ton (current price £1.35/gallon). Improvements have been made in the applicator and the present one applied Add H as a fine mist into the baler. Several changes have been made in hay handling which go to make it very attractive compared to silage making. Firstly the replacement of the mower by the Turbo-mower. Secondly, use of the Haybob to secure fast drying. Thirdly, the use of an 80 lb tight bale instead of the old loose 38 lb bale. This improves the effectiveness of the Add H, cuts down on the use of string and reduces the cost of storage.

Generally, 1 gallon/ton is used. The benefits are elimination of risks of loss through fermentation and respiration, reduction of field losses by early lifting, reduction of mould growth storage, reduction of hazard to health from Farmers Lung.

J.D. Metcalfe

Over the years silage has received more emphasis than hay, despite the fact that more hay is made than silage. My interest in "Sealed Hay" arose from a visit to Holland to look at their ideas on "High Dry Matter Silage". When silage reaches that state it becomes so near to hay that it was thought that the technique would appeal to the hay maker especially if the name was changed to "Sealed Hay." The system developed in Holland was so promising that funds were set aside to try it out on a number of farms in the West of Scotland. The experiences in the first year have justified the interest and the technique whilst still in the development stage can be of use to farmers making moderate quantities of hay and needing to make a high quality product. If the need is for bulk - this technique is the wrong one!

The process

1. Cut early, probably end of May/mid June.
2. Rapidly reduce moisture to 60-65% Dry Matter.
3. Bale, preferably into large 75/80 lb bales. This size of bale is not readily accepted by farm staff.
4. Use a bale collector suitable for handling these bales (e.g. Juggler). The best one is one that holds 8 bales in a single layer. A lifting tool such as an impaler bale loader can be used at many stages, making, stacking and feeding the hay.
5. Choose a level part of the field. Lay out a single polythene sheet. Set on this the bottom layer of bales leaving an outside edge of polythene sheet which can be turned up and over the edge of this first layer of bales. Plough out or cut out a furrow round the edge of the stack to provide a seal for the top cover. Build the stack up to about 1000 bales (35 tons hay). Cover the whole stack with an airtight top sheet of polythene - which should be drawn down tightly at the base and covered with soil or sand. This sheet is intended to seal the hay in.
6. Cover the whole stack with a second stronger sheet which may be held in place by a polypropylene net. This sheet is intended to hold the other sheets down and need not be airtight.
7. Check the stack occasionally to maintain airtight condition. Keep children and stock away from it since the product will remain fit for feeding only so long as it is kept airtight.

The technique is new and close touch is maintained with the originators of the methods in Holland. So far, the advice received has been found to be sound.

The method has similarities to moist barley, vacuum silage or high dry matter silage in that the product is stored in a moist state by keeping air out of it.

All the oxygen inside the sheet is used up in the first few days of storage and replaced by carbon dioxide by the respiration of the grass. If the seal is broken or the cover opened, the herbage will begin to rot down again.

So far the technique has not passed through a full years tests. Only one of the co-operating farmers has fed the "sealed hay." The result was favourable.

Whether or not the technique finds favour will depend on many factors. The advantages of the system are that the crop can be harvested early. There is a saving in time required to cure hay. Storage costs are low. The disadvantages are that bales are heavy and secondary fermentation could begin as soon as the seal is broken and especially if use of the bales is prolonged.

The problem is now to find how best to fit it into a farm system. As it stands, it is certainly not a technique for making vast quantities on each farm but it could well be used to make about 20% of winter fodder from early or late cut material which could not be made by traditional hay making methods.

Discussion John McIver, West of Scotland Agricultural College, joined the speakers to answer questions on machinery and the following summarises the discussion.

Much of the condensation in the Sealed Hay technique was part of the respiration process and it was important to build the stack in such a way that this condensed on the inside of the top cover, ran down the cover, between the base sheet and the top cover and thence away from the stack. It is hoped that the top sheet (£180) would have a 5 year life. The bottom sheet (£20) may require annual replacement.

All agreed that hay making, especially using combinations of approaches of J. Guthrie and J.D. Metcalfe, could be less expensive. In view of difficulties of forecasting future trends, hay had many advantages in that there was no vast investment in concrete or machinery. In general, the quality of hay was much lower than that of silage. In order to compare equivalent qualities, it was necessary to think of more sophisticated techniques such as barn dried or air conditioned hay and the additional cost of providing hot air etc. Even at that, some members maintained that hay making was more attractive than silage making.

The problem of deciding which additive was the best and whether additives were injurious to machinery was dealt with rather carefully. Very little comparative experimental work has been made. Officially, hay additives are regarded with disfavour because to be effective they must be well distributed. Mr. Guthrie's experience and opinions of Add H were promising and members were most interested.

Additives did not damage the baler apart from taking the paint off. Where damage did occur it was usually a matter of carelessness for example, storing the baler for the winter with additive dripping from the applicator!

There were suggestions that Add H and Sealed Hay might be combined. The problem of secondary fermentation could be solved at not much extra expense by sub-dividing the stack using, 2, 3 or more covering sheets which could be opened up for feeding in turn.

SCOTTISH AGRICULTURAL COLLEGES

Leaflets available from your area office or from the College Librarian.

1. Nutrition of the hill ewe - June 1974
2. Worms in sheep
3. Recommended varieties of grasses and clovers - October 1974
4. Recommended varieties of cereals 1975 - December 1974
5. Control of aphid borne virus disease areas of potatoes - January 1975
6. Classification of grass and clover varieties for Scotland
   2nd Edition May 1975
   3rd Edition May 1976
7. Charges for laboratory services - July 1975
8. Drainage of soils of low permeability - November 1975
9. The grain market - hedging grass sales - December 1975
10. The grain market - hedging feed grain requirements - December 1975
11. Recommended varieties of cereals 1976 - December 1975
12. Seed mixtures for Scotland - March 1976

HOLSTEINS ARE COMING INTO THEIR OWN

Jim Brown (Springwells Holstein)

Gaindykehead Farm, Airdrie

Jim Brown was chairman of the Central Scotland Grassland Society from 1973 to 1975.

Canadian Holsteins have been in this country for 25 years and for all that time they have been practically unnoticed. Now, almost over night, everybody is talking about them, thinking about them and wondering how they might obtain just one or two to compare with other dairy breeds.

There was one importation in 1939, and another in 1946, following the second World War. Then the dollar 'was tightened up', preventing live-purchase for a good number of years. Britain lagged behind the Canadians with semen-freezing techniques, and the use of superior bulls was hindered in this country. Happily, both problems have now been resolved, and the number of animals and ampules of semen coming to the U.K. has substantially increased.

Few people have realised that the Holstein as a breed has been topping the average milk yield per cow in Britain for many years. It is only recently that their production has been carefully noted.

The breed average is over 12, 300 lbs milk and 450 lbs fat. This is an impressive result coming at a time when cow numbers have been increasing and herds have become widely dispersed throughout the country, thus experiencing a great variety of climatic conditions and management methods. The Holstein is the next logical move to increase output per acre and per cow, to try to match our ever expanding costs. As a cow, she has a tremendous ability to utilise roughages and concentrates to maximum advantage, has a very quiet nature and simply, the will to milk.

I became interested in Holsteins after reading an article in the "Dairy Farmer" in 1969 and in 1970 visited a number of Cheshire farms that had restocked with Holsteins after the foot and mouth epidemic. The yields quoted by those farmers were, out of this world, and were difficult to believe. I returned home wondering how to attain similar production from my cows. I concluded that the only way was to breed them and I purchased a bull in 1971 to use on my herd of mixed Ayrshires and Friesians. Being an impatient person, 12 months later I decided a quicker way to find out if Holsteins gave more milk was to buy heifers, so I brought 2 heifers north of the border. The first peaked at 68 lbs per day and the second at 62 lbs per day. This was close to 20 lbs more than I could extract from either Ayrshire or Friesian first calvers. They went on to complete their first lactations at 17538 lbs @ 3.85% in 363 days, and 14071 lbs @ 4.07% in 362 days and calved back in 13 months. From that time on there was only one breed for me, namely HOLSTEIN. Since then I have purchased heifers both in the U.K. and Canada, and at this point in time have 84 pure animals of which 40 are milking age. To date I have sixteen completed 1st lactations averaging

12636 lbs at 3.65% in 305 days and 14468 lbs at 3.69% in 367 days, with a calving interval of 409 days.

Nine 2nd lactations reached 13680 lbs at 3.65% in 305 days and 14252 lbs in 333 days at 3.67%, and one 3rd lactation reached 15162 lbs at 3.66% in 296 days despite the cow being on three-quarters after summer mastitis.

These figures may not look impressive to the dairy farmer who has a long established herd carefully bred and culled over many years, but are remarkable considering the different environments from which these cattle come and the stress entailed in settling into a new home. As they were surplus to their previous owners requirements, I do not expect they were their best cattle. Given time to cull and carry out a breeding programme on the same lines as the Holstein farmers in Canada, i.e. without "Ministry Regulations", then who knows how high our average yield will be in the years to come.

MEET THE CHAIRMEN

ROBERT GRAHAM, J.P. - Vice Chairman 1970/72
Chairman 1972/74

One of four sons of a Naval Commander, Robert was educated in England at Wellington School, and joined the Royal Navy. He left the Navy in 1954 to run the family farm, Kirkland, Parkgate, where he still farms.

Kirkland extends to some 715 acres of which just under half is hill ground. Grassland farming predominates with dairy, suckler cows and sheep enterprises. Each year roughly 100 acres of the arable land is cropped with barley.

In addition to his farming interests he is actively involved in public life, an outlet for his other great interest - that of meeting people. He represents the Nithsdale District on the Dumfries and Galloway Regional Council and Ae on the Nithsdale District Council. He is on the Committee responsible for the Barony Agricultural College, Parkgate, and is an active member of the Board of Governors for the West of Scotland Agricultural College.

His farming and public commitments leave little time for hobbies, but he enjoys an occasional day's shooting in winter - M. J. Wrathall.

SILAGE NIGHT

The 1975/76 Third Annual Competition

A meeting was held at Belleisle Hotel, Ayr, on 22nd January, 1976, at which the guest judge, J. Neville Jones, Mains of Cairnbrogie, Aberdeen, presented his adjudication of the 1975/76 Competition. Dr. Malcolm Castle spoke about the lessons to be learnt from the competition and a panel comprising the judge, the speaker and the trophy winner was closely questioned by a large audience.

As a result of experience gained last year, slight alterations were made in the marking schedules for % Dry Matter (DM) and % Crude Protein (CP). The change in Crude Protein marking brought maximum points (20) for samples of 18%CP.

Maximum marks for Dry Matter (25) were spread over clamp samples showing 24% up to 28% and the penalties for higher DM were reduced. For tower silages, it became possible to reach top marks for samples with 35-44% DM and a small penalty was introduced for samples over 45% DM. We have not yet found the ideal system. Penalties for over-dry samples were introduced in the 2nd competition, 1974/75, because very high DM clamps showed considerable secondary fermentation. Now that we have methods of controlling this, we will need to cut out the penalties on analysis and allow the guest judge on his visit to decide whether secondary fermentation warrants a penalty.

Total number of entries were 54 for clamp silage and 5 for tower silage. The full results are shown in the accompanying Table 1. Comparison with previous years (see Greensward Nos. 17 and 18) show increased numbers of entries and vastly improved quality. Once more, Kirkcudbrightshire farmers are well in the lead. Out of 15 entries, they show 6 in the short list of 9. Again, Ayrshire clamp samples show low marks.

The reasons for this difference are:-

a) Kirkcudbrightshire farmers are competitive by nature and are keen to over-take each other. They know what is necessary to get high marks and they apply this knowledge.

b) Ayrshire farmers are traditionally more interested in bulk of winter fodder. They choose early flowering, poorer quality grasses in their mixtures which are difficult to cut early enough for high quality silage.

Instead of farm names, code numbers based on A, D, K and W for the four counties, Ayrshire, Dumfries, Kirkcudbrightshire and Wigtown, are followed by numbers 1 to 16 for the farmer in that county. Letters a, b, c, etc. are used when a farmer has submitted more than one entry.

Dr. Castle presented a table (Table 4) showing how digestibility has improved over the years. To supplement that, the changes in other qualities for clamp silages were as in Table 2.

Table 1 1975/76 Silage Competition: Analyses and Marks

Clamp Silages

Rank	Code	% DM	% CP	% DOM(=D)	pH	Marks/100
1	K/6	26.9	20.0	75.6	3.9	100
2	K/9a	24.5	18.8	70.9	3.8	99.5
3	K/4a	26.8	17.3	72.6	4.1	99.3
4=	D/4a	25.0	19.1	72.2	4.3	99.0
4=	K/10a	24.4	18.2	71.3	3.7	99.0
6	K/9b	26.7	17.4	70.3	3.8	98.9
7	W/15	28.5	17.0	72.5	4.0	98.5
8	K/1	24.1	16.6	70.4	3.8	98.1
9	D/2	29.2	17.2	75.0	4.0	98.0
10	W/9	24.6	15.6	71.0	3.9	97.6
11	K/3c	26.9	15.0	72.1	3.9	97.0
12=	W/6	25.5	14.9	71.4	3.9	96.9
12=	W/3	26.2	15.9	70.4	4.3	96.9
14	W/10	25.6	16.1	69.7	4.2	96.4
15	K/3b	24.4	15.3	71.1	3.7	96.3
16	A/5	30.4	17.1	72.3	4.3	95.7
17	W/1a	24.6	14.6	72.3	3.7	95.6
18	K/2	24.6	14.3	69.9	4.2	95.4
19	W/8	29.9	16.2	69.8	4.4	94.0
20	D/5a	24.3	18.0	68.4	4.2	93.1
21=	W/14	24.1	12.0	71.8	3.7	93.0
21=	K/8	22.8	14.5	70.6	3.8	93.0
23	A/4b	23.1	13.3	70.5	3.8	92.6
24	W/4a	28.1	16.9	68.3	4.0	92.0
25	K/5	23.4	15.7	69.0	3.8	91.7
26	W/16	29.0	14.4	70.2	4.7	91.4
27	A/10	23.0	21.9	68.4	3.9	91.1
28	A/4c	22.6	14.2	73.0	3.5	90.7
29	K/7	21.0	16.1	72.5	3.7	89.6
30	A/7a	22.8	19.8	67.9	4.0	88.6
31	K/4b	34.3	21.5	68.8	4.6	88.2
32	W/7a	25.2	13.9	68.0	3.9	87.9
33	A/8a	20.1	17.6	69.3	4.1	87.0
34	W/13	30.5	11.1	69.1	4.2	86.5
35	D/6	25.9	14.5	66.8	4.0	83.7
36	A/2b	24.3	15.0	66.4	3.7	81.6
37	W/5	20.7	13.2	68.2	3.7	78.8
38	W/4b	29.4	15.3	64.0	4.4	72.4
39	W/2a	37.8	11.6	65.5	4.2	71.4
40	A/2a	23.9	15.0	62.1	4.1	71.0
41=	A/8b	21.3	16.7	64.6	4.2	70.6
41=	W/12	22.1	16.7	63.6	4.2	70.6
43	W/1b	25.9	14.7	60.3	4.1	67.3
44	K/10b	22.3	15.3	61.9	3.8	66.4
45	K/3a	27.0	16.0	59.9	4.4	66.3
46	D//4b	27.6	20.4	62.9	5.2	65.8

Table 1 cont.

Clamp Silages

Rank	Code	% DM	% CP	% DOM(=D)	pH	Marks/100
47	W/2b	48.1	10.0	65.2	4.7	64.8
48	D/1	25.2	17.4	60.4	4.8	64.7
49	W/7b	22.1	21.8	62.0	4.8	63.8
50	D/4c	24.3	22.4	59.6	5.4	59.2
51	A/7b	20.0	20.5	60.0	4.8	54.5
52	A/4a	17.6	15.6	62.1	4.4	54.3
53	D/5b	21.2	18.7	59.1	5.0	52.7
54	A/1	17.4	14.2	55.0	4.0	39.7

Tower Silages

Rank	Code	% DM	% CP	% DOM(=D)	pH	Marks/100
1	A/9	39.0	18.5	69.9	-	99.6
2	A/3	41.6	20.0	68.8	-	94.7
3	A/11	46.1	14.1	74.7	-	93.4
4	W/11	27.2	16.7	63.2	-	61.0
5	A/6	40.6	13.9	53.5	-	47.7

In each year, there has been a wide range, but there has been a trend towards lower % DM, and lower pH, probably tied in with increased use of additive plus an increase in D value. The last has been achieved partly through improved weather but also earlier cutting and the use of later varieties of perennial ryegrass.

The difference between counties is interesting. The high % DM and low % CP of Wigtownshire may be due to the use of lower levels of N fertilizer for the silage crop or to a large proportion of Italian and Hybrid ryegrass varieties in the swards. The high pH in Dumfries may reflect less use of additives or more clover in the mixtures. Both Dumfries and Ayrshire have low D values but Ayrshire has also low % DM.

Table 2 Comparing silage qualities in 3 years

		% DM	% D	% CP	pH	Marks
Range	1973/74	19.2-42.2	53.3-70.8	10.6-21.8	3.9-5.1	39.0-92.5
	1974/75	17.4-40.1	48.5-72.6	10.4-20.3	3.6-5.1	32.3-97.3
	1975/76	17.4-48.1	55.0-75.6	10.0-22.4	3.7-5.4	39.7-100
Averages	1973/74	27.6	60.9	16.1	4.5	
	1974/75	25.5	63.4	15.1	4.2	
	1975/76	25.4	67.7	16.3	4.2	
Averages (1975)	Kirkcuds.	25.3	69.8	16.8	3.9	
	Wigtown	27.8	68.1	14.8	4.2	
	Dumfries	25.3	65.6	18.5	4.6	
	Ayrshire	22.2	66.0	16.7	4.1	
	Towers	38.9	66.0	16.6	-	

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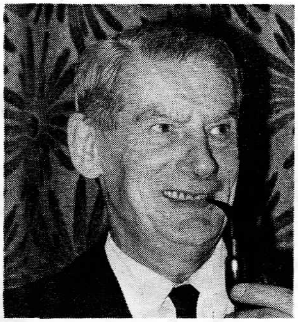

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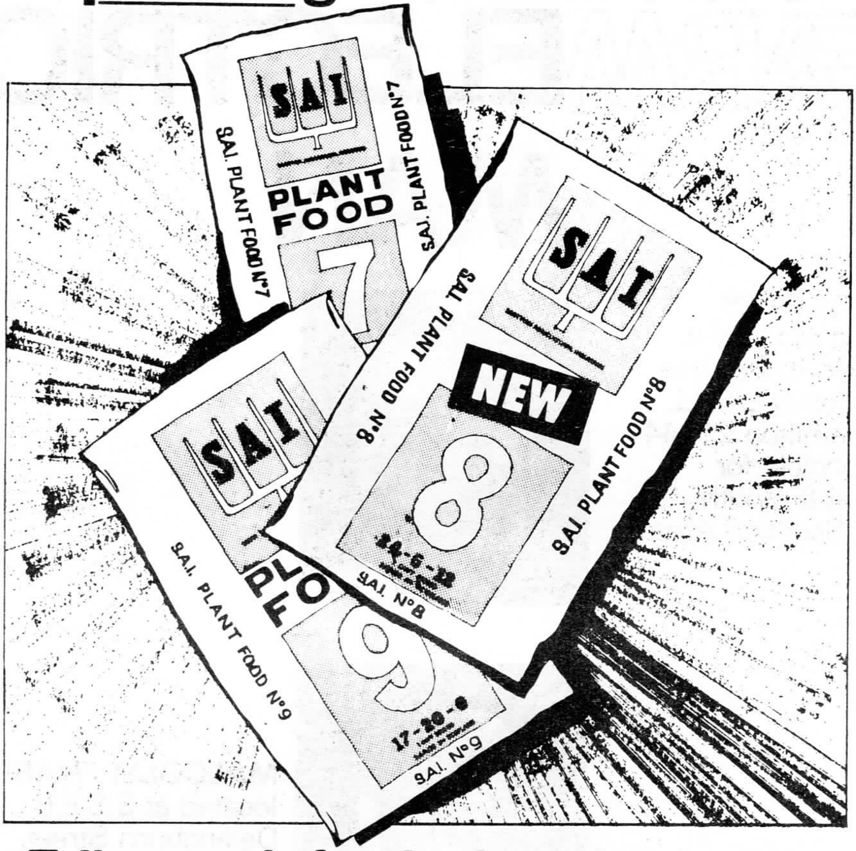

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SCOTTISH AGRICULTURAL INDUSTRIES

Table 3 The Short Leets (in order of analysis)

Clamp Silage Awards		Marks 100 + 40 = 140
4th	Michael Milligan, Culvennan, Castle Douglas (K)	100 + 32 = 132
	R. Irving, Meikleknox, Castle Douglas (K)	99.5 + 29 = 128.5
3rd	A. Irving Jnr., Largs, Twynholm, Castle Douglas (K)	99.3 + 33.5 = 132.8
1st & Trophy	D. I. Martindale, No. 1 Todholes, Annan (D)	99.0 + 36 = 135.0
2nd	W. R. Wilson, Billies, Castle Douglas (K)	99.0 + 34.5 = 133.5
	R. Irving, Meikleknox, (withdrawn) (K)	98.9
	T. Barr, Knocktim, Ervie, Wigtown (W)	98.5 + 24 = 122.5
	A.J.M. Brown, Borgue, Kirkcudbright (K)	98.1 + 28 = 126.1
	Prof. R. Paterson, Strenrieshill, Moffat (D)	98.0 + 23 = 121.0

Tower Silage Awards		
1st	G. Dunlop, Warnockland, Fenwick (A)	99.6 + 33 = 132.6
	I. Gilmour, Humeston, Maybole, (A)	94.7 + 31 = 125.7
2nd	J. Kerr, Camsiscan, Craigie (A)	93.4 + 35 = 128.4

Adjudication of the short leets was made by visiting the 9 best entries of clamp silage and 3 of the best tower silages during Wednesday and Thursday, 21st and 22nd January.

The organiser of the tour was Dr. Ron Harkess who accompanied Mr. Jones to every farm. At various stages, farmer members of the committee joined the team as stewards - namely John Marshall, Auchinleck, Auchencairn; Brian Stone, Crichton Royal, Dumfries; Jack Ross, Macmanniston, Dalrymple; Clyde Phillips, Stranraer.

Adjudicators remarks - J. Neville Jones

The adjudicator made three suggestions for modifying the rules.

1. It is difficult to devise a perfect marking schedule for % DM. Because over-high DM brought risk of secondary fermentation and encouraged undesirably high intakes the maximum should be set at 26% DM. High intakes were undesirable if they prevented cows of high potential taking in sufficient concentrate supplementary feed to bring out their full milk yield potential.

   In the case of towers, the maximum should depend on method of unloading. Top unloaders work best with DM low (25-30%) at the top and higher below, whilst the bottom unloaders work best with silage over 40%.

2. He thought there was over emphasis on high crude protein contents. The maximum should be brought down to 15%. Higher values are of no benefit to the cow and may merely mean that N fertilizer has been wastefully used.

3. The scale for D values between 65 and 70 is too steep. Silage of 70D is not 66% more valuable than silage at 65D. (Dr. Castle would question this. In any case the effort to produce 70D silage is worth the high bonus of marks).

The judges task was extremely difficult especially with such a high quality product. The 9 clamp entries showed marks on analysis from 98.5 to 100 and quite obviously the adjudicators' opinion had an overriding effect on determining the awards. There might, therefore, be an advantage in adding mineral analysis especially K% (Potash) since this can become excessively high in modern conserved grass crops where there has been lavish use of slurry or high K compound fertilizers.

Ideally, herbage for either grazing or conservation need contain no more than about 0.6%K but at this level the grass yield would suffer. At over 1.2%K, yields would be completely satisfactory. Over 1.2%K, means waste of resources plus high risk of hypomagnesaemia (= grass staggers).

It would be quite easy to add mineral analyses to the scheme. K% would generally be used to knock off marks for high %K. A more positive effect would be to give marks for high P (Phosphate) and suitable Calcium/Phosphorus ratios and possibly for Magnesium content. A worthwhile refinement would be to analyse the crude protein to look for evidence of breakdown - loss of ammonia etc. R. H. Alexander and Mary McGowan of the College Chemistry Division could include both these.

The emphasis on attaining the right DM content was, in the judges view, necessary to restrict the appetite for silage in the interest of securing 1500 gallons rather than 1200 gallons milk/cow. If silage is too palatable and high in Dry Matter intake is too high and there is no appetite for concentrate and yield of milk is pegged at the lower level. His favoured approach is to restrict appetite in the first 100 days of lactation and encourage the cow to reach its true peak production of milk (8-9 gallons/day). Thereafter, ad lib silage can be used and supplementary feed costs reduced.

The judge then awarded the points shown in the Table 2, making D. I. Martindale trophy winner for the 1975/76 competition.

Dr. Malcolm Castle

Dr. Castle congratulated the competitors on their efforts. The competition had achieved its purpose, farmers were moving towards better quality silage. We had much information on how to achieve this now with precise guide lines on when to cut, how to wilt, the value of additives and the need to seal the silo. The changes can be seen from the following table showing how competitors have moved up, firstly to the 65-70 bracket and now to the over 70 bracket.

Table 4 Improvement in D value 1973 to 1975

D	Percentage of entries reaching D values Year 1973/74	1974/75	1975/76
70 and over	3%	2%	41%
65 - 70	6%	34%	31%
57 - 65	74%	60%	20%
Below 57%	17%	4%	2%
Number of entries	34	50	54

Dry matters remained around 26 to 28% which means that most farms wilt for about a day.

Yields High D silage means that some yield is sacrificed.

At the Hannah Institute yields at point of ensilage have been between 7 to 9 t/acre. The Dumfries silage project shows average yields of 8 t/acre. These are yields all corrected to 25% DM. On this basis $\frac{1}{2}$ acre cut twice should provide 1 cow for a winter. Most of this will come from the 1st cut. Late cuts are generally of poorer quality.

The need for protein supplementation with silage

Mr. Neville Jones' remarks about the CP content of silage being too high are especially interesting in view of the current work at the Hannah Institute on the value of supplementing silage with a high protein feed.

Many experiments have been concluded and some are still in progress. Tables 5 and 6 will show this effect.

Table 5 High quality dried grass as a supplement

Silage (ad lib)	Feeding (lb DM/cow/day) Barley	Dried grass	Total intake	Production lb milk/head/day
25.6	-	-	25.6	32.0
21.4	10.1	-	31.5	36.6
23.2	-	10.1	33.3	44.5

Note: When barley was provided, there was a depression in intake of silage with an increase of 4.6 lb milk for 10.1 lb barley, that is 1 gallon milk for 27 lb barley. When high quality dried grass was given, there was no fall in intake of silage. Total intake was high and an increase of 12.5 lb milk for 10.1 lb dried grass was obtained, 1 gallon milk for 9 lb dried grass.

Table 6 Ground nut as a supplement

	Feeding (lb DM/cow/day)			Production
Silage (ad lib)	Barley	Ground nut	Total intake	lb milk/cow/day
23.8	-	-	23.8	32.2
19.0	10.4	-	29.4	35.5
24.5	-	3.3	27.8	38.8

There was again a depression in intake of silage with barley and a yield of 1 gallon milk for 32 lb barley. Ground nut behaved like dried grass - it stimulated silage uptake but the total intake of ground nut + silage was less than for barley + silage and 1 gallon of extra milk was produced by 5 lb ground nut cake.

There are many queries arising from these results and some surprises.

Firstly, it has been customary to think that silage - high in protein and low in energy - require balancing with a high energy food. Barley is the natural choice.

Secondly, the consistency of the results makes one wonder why the intake of silage falls with barley and rises with the protein supplement and what is wrong with the protein in the silage.

One point must be stressed and that is that we are dealing with a very special type of silage. This is all silage over 70D and as such demands more careful feeding to draw out of it the full benefit.

Producing 70D silage has involved some sacrifice in bulk and involved higher costs at various stages. What was satisfactory feeding policy with 55-60D silage is not necessarily so for the new high quality silage.

Further experiments are in progress. Information comes along very slowly - with each stage taking a year or so to complete. With more resources, the answers would come thick and fast.

D. I. Martindale

The trophy winner provided a thumbnail sketch of his enterprise and his methods of silage making and feeding.

The farm: This sea-level tenanted farm is situated on the edge of the Eastriggs moss and extends to 137 acres, 40 of which were reclaimed from peat during 1967-1972.

Seeds mixtures: These are mainly ryegrass seeds mixtures with a lasting life of seven to eight years.

Cows: There are 100 Friesian cows whose average yield is 1280 gallons with 12.32% average total solids. Calving is mainly between August and February.

Their feed: Silage produces M + 1 gallon. Concentrate usage 2 lbs/gallon in 1975; 2.6 lbs/gallon in 1976.

Silage: 140 acres are cut in two cuts. Add F is used for all cuts, but at a reduced level from that recommended. The 1st cut starts about 2nd June. Cows often have a grazing before the fields are shut up for silage.

Fertilizer: Total level is 300 units N.

1st cut - $1\frac{1}{2}$ cwts per acre of Nitram applied in March. Cows graze until mid-April, then $2\frac{1}{2}$ cwts per acre Nitram is applied.

2nd cut - Slurry is applied to cut stubble, then 2 cwts per acre Nitram.

Grazing: Strip grazing with a back fence. 70 units N applied each time round. Young stock follow cows then fertilized.

Panel Many questions were posed. The following were the most interesting.

Q1 The low yields of milk quoted by Dr. Castle at 3.2 and 3.22 gallons/head/day off pure silage with intakes of only $23\frac{1}{2}$ lb silage DM were a special target. Some wondered what the results would be if cows of higher potential (e.g. Canadian Holstein) were used. Mr. Neville Jones was especially pleased with the evidence that there was something fishy! about Crude Protein figures in silage.

A Dr. Castle pointed out that intake of $23\frac{1}{2}$ lb silage DM was far better than average and that the type of cow used in the experiment at the Hannah was fixed. The yield represented M + 3 from the silage in comparison with M + 1 or less from the majorityof farms in the country. Furthermore, this is not the peak yield but an average over the winter season.

The returns of milk for dried grass or ground nut were not necessarily profitable but that for barley was decidedly unprofitable. More work was being done in terms of raising the protein supplement to achieve a more profitable return and into the basic problem of the 'poor' value of protein silage.

Further questions suggested that the value of the supplementary feed could be not in their protein content but in their mineral contents.

Q2 Potash Possible dangers from use of slurry were stressed and the need to avoid using fertilizer K along with slurry.

Q3 Red Clover Mr. Neville Jones is an advocate of red clover silage. He used a mixture of red clover and timothy but now is moving to red clover + tetraploid perennial ryegrass. Red clover responds to K and is a useful soak for slurry, but care must be taken not to overdo winter traffic since the wheel pressure is harmful to the red clover crowns. No troubles had occurred from bloat, oestrogen or protein poisoning.

MILK FROM GRASS

Dr. F. J. Gordon

Agricultural Research Institute of Northern Ireland

A talk given to the South West Scotland Grassland Society at Stranraer on 19th February, 1976 and to the Central Scotland Grassland Society at East Kilbride on 18th February, 1976.

The target

Good grass and good grass farmers appear to be satisfied if they reach 7 cwt beef or 1000 gallons milk/acre. Every farmer can produce 5 tons herbage dry matter/acre and it is possible to push this up to 8 tons/acre. If this 5 tons of herbage dry matter is efficiently used it should be capable of producing either 15½ cwt beef or 1600 gallons milk/acre. This high theoretical output is not nonsense since for 3 years we have averaged 14 cwt beef/acre and for 5 years we have averaged 1420 gallons milk per acre at Hillsborough.

Thus, my first message to you is that you should raise your targets above 1000 gallons milk/acre. To reach 1000 plus, attention must be paid to 3 factors:-

A) Yield of grass
B) Percentage of grass grown which is actually eaten
C) Conversion efficiency within the animal

Given a high yield of grass per acre plus efficient harvesting of a high proportion of this grass by good dairy cows should provide a high output of milk from grass - the result is certainly a yield of milk near to 1600 gallons/ acre. This is 200 to 300% above present average experience and well worth aiming for.

A) Yield of grass Variety of grass, pattern of utilisation and many other factors will affect yield of grass but above all other factors, the most important is the level of N fertilizer applied. For a high output system of milk from grass 300 to 350 units N/acre must be used. N is a costly item and the aim must always be to make the best use of it. This implies that it is applied at the most effective time when it will produce the greatest benefit in terms of producing extra grass.

An experiment was carried out at Hillsborough in which grass was cut every 24 days and given N at 0, 20, 40, 60 or 80 units/acre for each period. This showed that the response to N i.e. the effect of N on grass yield was low for the first growth of the year and again for the later growths but high for early to mid summer.

Figure 1 shows the difference in value of N used at these two periods.

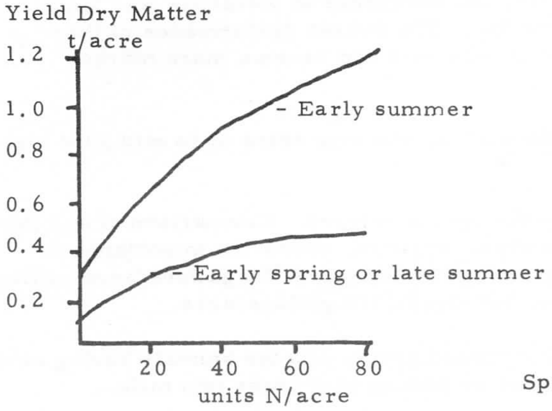


Fig 1. Response to N and season

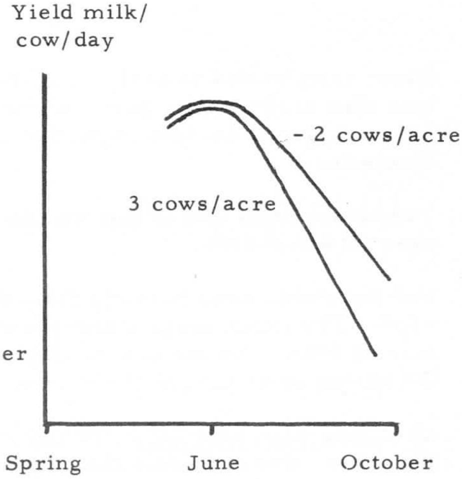


Fig 2. Milk yield/cow/day and stocking rate

In early or mid summer, yield of grass rises with up to 80 units N and only then shows the 'tailing' off suggesting that the maximum effective amount of N is only slightly above 80 units N/acre. For the first and late season growths, the yields all through are lower. Up to 40 units, there is a profitable increase in yield but thereafter little or none.

Thus, for grazing, we start with applying 40 units in early March, then follow with 60 units for the next 4 grazings, 40 units in July, 30 in August and none at all in September or later.

B) Achieving efficient harvesting by the animals Many factors affect this partly to do with the herbage and partly the stock but by far the most important is stocking rate per acre. Consider the following results which are the average effects over a 6 year period of raising stocking rate in terms of cows/acre.

Fixed rate of cows/acre over whole season	2	2.6	3.0
Yield of milk (gallon/acre)	1067	1301	1420
Milk sales (£/acre)	321	392	428
Yield milk gallons/cow over grazing season	534	501	473

Most good farmers have a target of 2 cows/acre of grass at the beginning of the grazing season and when grass begins to fade away, bring in extra grass acres or pump in supplementary feed.

In this experiment with our dairy herd, we show not only that over 1000 gallons of milk/acre without the use of supplementary feed is possible, but that this target can be raised by 40% producing an extra £100 worth of milk if one accepts a lowering of yield of milk/cow.

Study of the changing yields of individual cows gave the interesting picture shown in figure 2.

From early spring to early summer, the difference in yield/cow was small, less than 1/10th gallon per cow per day. The poorer performance of those at 3/acre began to become important in mid June and became more marked thereafter.

The lesson from this is that we can push up stocking rates up to mid June and ease off afterwards.

Our top yields were possible from the spring calvers. Comparison of our two herds, 50 autumn calvers and 100 spring calvers, shows the importance of calving date. The autumn calving herd of 50 averages 900 gallons/acre whilst the spring calving herd of 100 cows averages 1420 gallons/acre.

C) <u>Conversion efficiency</u> Having produced grass, and the animals having eaten the grass, there remains the question of turning that grass into milk.

A high yield of beef per acre is only possible if the animal is capable of putting on weight. A high yield of milk/acre is only possible if the animal yield is high. An obvious policy is to change from autumn to spring calving. The question is when is spring calving. We have come down in favour of January/ February calving. Fresh calved cows, put out to grass 3 weeks after calving tend to result in a low lactation yield because they do not reach a high peak at grass and the lactation is very short. For example, Southern Ireland has mainly a March calving policy and this is likely to be partly responsible for the low yield per cow of around 580 gallons per head which they obtain. Calving in January is not everyones choice. There are many arguments for and against but our experience favours it.

The January calver is fed indoors for 3 months and goes out to grass during the 2nd week in April. The critical points are how much is fed in this 3 months. What does it cost and what is the gain either per cow or per acre.

We tested out the effect of level of feeding during the indoor period by comparing feeding at 21 lb/day (i.e. our standard according to milk yield) against 16 lb/head/ day.

During the indoor period, yields were lower from the '16' group. When they went out to grass, the '16' group showed a marked jump in milk, the '21' group did not. Over the summer the '16' group showed higher yields from grass than the '21' group. I do not know the reason for this and we have not the experimental evidence to provide the answer. It may be that the '16' group ate more silage indoors and their stomachs were more able to handle grazed grass.

The summary of the results was as follows:-

	Group 1	Group 2
<u>Feed during indoor period January/April</u>		
lb/head/day	21	16
cwt/head	16½	12

		Group 1	Group 2
Milk/head (gallons)			
	Indoor	441	421
	At grass	625	644
	Total	1066	1065
lb feed/gallon		1.7	1.2
	Returns (less cost of feed)	£306	£324

The differences are not tremendous. Total milk yield is the same for two very different levels of indoor feeding.

The returns in milk yield from 16½ cwt of feed is only 1 gallon more than from 12 cwt which makes it an extremely expensive gallon. The results of this experiment posed the question that if 21 and 16 lb feed were so little different, what effect would less feed have?

1975 was the first season in which we went to lower levels and compared 16, 12 and 8 lb/head per day during this 3 month indoor period. The results are set out below:-

		Group 1	Group 2	Group 3
Feed during indoor period				
	lb/head/day	16	12	8
	cwt/head/3 months	11	8½	5½
	(Plus 62D silage ad lib)			
Milk yields (gallons/head)				
	Indoors	380	355	347
	At grass	708	665	673
	Total	1088	1020	1020
lb feed/gallon		1.1	0.9	0.6
	Milk value less meal cost	£336	£322	£334

Thus, although groups 2 and 3 are beginning to show an effect on animal performance, and feeding at 16 lb is giving better animal performance than feeding at 12 or 8 lb, the profitability of all 3 is much the same.

In all these experiments, the amounts of feed were kept steady through the 3 months indoor period. An experiment to compare increasing the ration in the first 4 weeks gave the following results.

		Group 1	Group 2
Type of rationing		High/low	Uniform
Total feed			
	cwt per 3 months	$8\frac{1}{2}$	$8\frac{1}{2}$
Feed rate			
	1st 4 weeks	20	12
	lb/day next 8 weeks	8	12
Milk yield			
	Indoors	361	360
	At grass	681	682
	Total	1042	1042

The result was an embarrassing no difference, but a tremendously interesting area for further experimentation and obviously not showing any benefit for 'lead feeding' or pushing these spring calvers directly after calving.

The outstanding message that comes out over and over again is that farmers are under-estimating the potential of grass. They are too ready to dip into the meal bag as an insurance against failure of grass. Like a lot of 'insurance', money can be wasted by being over-cautious.

A tremendous amount of work has been carried out at the Hannah Research Institute demonstrating that feeding meal during grazing is unprofitable. One of the criticisms made by the farmer is that the average level of yield of cows at grass in such experiments is only 4 gallons/head/day. Those who criticise overlook the fact that 4 gallons/head/day over 5-6 months is a very high yield. They talk glibly about the 6 gallon cow and forget about the 99 others. However, we have carried out an experiment to look at higher yielding cows. In this high yielding March calvers were used over a 4 month period and they gave the following figures:

		Group 1	Group 2	Group 3
Meal fed				
	lb/head/day	1	5	9
	cwt/head/4 months	1.1	5.0	9.6
Milk yield				
	gallons/head/summer	606	606	636
Value of milk less meal cost		£178	£162	£155

Thus, 9 lb meal/day or 9.6 cwt per 4 months produced 30 gallons of milk for an extra 8.5 cwt of feed. One gallon of milk worth 40p would require 30 lb extra feed costing well over £1.00.

The net effect of Group 3 was to lose £23/cow. Generally, we find that the more meal fed the less grass is eaten. This is demonstrated with zero grazed bullocks. An experiment in 1973 gave the following result:

	Group 1	Group 2
Feed/head (lb/day)		
Meal	0	9
Dry matter in meal	0	7.2
Grass dry matter intake	24.2	18.7
Total DM intake	24.2	25.9

Thus, using meal has increased total DM intake by only 1.7 lb/day and much of the effect of meal was to depress the amount of grass eaten.

National objectives

How one produces milk, whether from grass or from meal has been discussed so far purely in terms of production efficiency or profitability but there is another criterion which makes the case for production from grass extremely important.

If you have not read the document 'Food from our own resources' you should do. It shows that we must organise our industry to make maximum use of our own resources. Consider two methods of producing very much the same amount of milk per acre using our results from Hillsborough.

A) A January/February calved cow + 5½ cwt meal and 0.85 acres grass produces 1020 gallons milk. Allowing for the meal this means 1019 gallons milk/acre grass.

B) Autumn calved cow + 29 cwt meal and 0.85 acres grass gives 1035 gallons milk. Allowing for the meal, we have 223 gallons milk/acre grass.

There must be no doubt, the January/February calving herd meets the needs of the future. While it is accepted that there will be a requirement for milk produced throughout the year for liquid consumption it must be clearly known that any extra above this should be produced by spring calvers. Certainly an expansion in milk must be through this animal. It is the only efficient and logical conclusion.

There are of course many other factors which determine how much milk should be produced from the January/February calving herd. All our manufacturing industry has been geared to a continuing supply of milk and pricing policies have taken this into account. But, if we are to believe 'Food from our own resources' this will need to change. Maintaining a January/February calving herd has often been stated as being difficult but our experience suggests that the difficulty has been over exaggerated. It is much less difficult to maintain than a true autumn calving herd.

Discussion

Q1 What class of silage was used for your autumn calving herd using 29 cwt meal.

With a better class silage you might reduce meal comsumption?

A1 We used 60/62D which is the average farm silage in our country. This would be cut 1st week in June. I admit that with better silage, we would use less than 29 cwt meal but, the spring calvers would have shown improvement too. High D silage is useless unless it saves meal.

Q2 What grazing system to you operate?

A2 We use Flexible paddocks. We start the year with a 22/24 day interval. This is extended by bringing in extra paddocks from the cutting area.

Q3 Have you any experience of set stocking?

A3 None. There is some talk about it but few carrying it out on our smallish N.I. farms.

Q4 Do you take paddocks out of your system when surplus or do you top extra herbage?

A4 We do not top. Topping means we have understocked in the early part of the year.

Q5 What kind of grass do you have? What varieties do you sow?

A5 Most of our grass is permanent, the rest is 5 to 8 years old and contains varieties such as S24 perennial ryegrass, which were then favoured.

Q6 At present winter milk is more profitable than summer milk. Do you think such artificial pricing is extravagant?

A6 Personally I do. If we are to make the most of grass, the price structure must be altered.

Q7 With creameries dependent on a steady supply how would you justify increasing the proportion of January/February herds?

A7 I would maintain existing supply for creameries but for expansion concentrate on the more grass effective pattern.

Q8 How do you rear your January calves?

A8 This is a problem, especially as I hold to calving of 2 year old heifers. Some experimental results show the effects of our system which does not justify the use of meal at grass for calves.

	Group A	Group B	Group C	Group D
Age in weeks at grass	10	10	10	10
Weight in April (cwt)	1.5	1.6	1.5	1.6
Meal at grass (cwt)	0	$1\frac{1}{2}$	3	$4\frac{1}{2}$
Wt in October at housing (cwt)	4.2	4.3	4.4	4.5

This shows a gain of 1 lb liveweight per 16 lb meal fed. Our recommended system is therefore not to feed meal to these young calves at grass provided they are grazed under the leader/following grazing system.

During the second winter they are fed 4 lb meal plus silage which brings the weight by end of March to $6\frac{1}{2}$ cwt.

Through the second summer, they put on about $3\frac{1}{4}$ cwt to reach $9\frac{3}{4}$ cwt in October. Given silage and 4 lb barley/day they reach $10\frac{1}{2}$ cwt prior to calving. For grazing we use 21 acres during early season expanding to 27 acres for the total grazing requirements of a system producing 50 calving heifers/year. This grazes 50 calves and 50 in-calf heifers. This 27 acres are divided into 9 x 3 acre paddocks. The leader/follower grazing system is used. In this the calves are allowed to graze each paddock just followed by the in-calf heifers. They have used the same 27 acres since 1968. They are wormed in mid July and at the end of the grazing season.

Stocking young growing stock requires careful control. Because they grow as the grass vigour falls, it is necessary to bring extra paddocks in during season and again at the end of the season.

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE

Leaflets available from your area office of from the College Librarian.

1. Farm fertilizer recommendations
2. Silage - plan for quality
3. Making good silage
4. Cow cubicles
5. Silage for cattle
6. Mildew control in cereals
7. Biocontrol of whitefly
8. Silage handling - cutting to feeding
9. Silos - choice and construction

GRASS - KEY TO OUR FUTURE

Michael Joughin

Wester Manbeen, Elgin

Michael Joughin, chairman of the Scottish Agricultural Development Council and of the North of Scotland Milk Marketing Board, spoke to the Central Scotland Grassland Society at the King Robert Hotel, Stirling, 29th January, 1976.

The key to our future depends largely upon:-

a) Our ability to feed mankind, the world's population is likely to double in the next 17 years.

b) The means of expanding home food output.

c) Stating Agriculture's case as a priority industry and an import saver.

d) The individual farmer's ability to make profit.

In Scotland 90% of the land area is in grass of some sort, only 10% is cropped. Of the grass acreage, 73% is rough grazing though this varies from 45% rough in the North East to 95% in the Highlands. Four-fifths of the output from Scottish agriculture comes from livestock and therefore livestock performance on grass is crucial. Every effort must be made to improve output per head and per acre.

Since the little Neddy report of 1968 farmers have been called upon to save imports, which is even more important today as the £ falls. This means cutting imports of meat, milk and above all grain and therefore growing and feeding more at home.

Grain is already grown efficiently and we would be hard put to get more cwts from the same grain acres. Increased grain output can only come from acres presently in grass. Therefore, we have not only to improve output from existing grass acres but have to increase stocking rates more to free existing grass acres for grain production. That is the key to agricultural expansion.

Last year's white paper repeated the little Neddy message and the only thing missing is the political will to commit sufficient resources to agriculture to get an expansion going. The resources needed are Confidence and Capital. Capital in agriculture comes from retained profit - or the prospects of profits sufficient to convince a Bank Manager. Confidence comes from prices which allow profit - or at least hold out the prospect of profit.

The Scottish Agricultural Development Councils' Grass Working Party stated:

"We could double production from Scottish grassland if the more intensive methods and better management practices presently known and tested were adopted".

The knowledge already exists - if only we can get it into practice. The Grassland Societies have an important function here though to some extent this is preaching to the converted.

In Moray and Nairn, 90% of milk producers practice some form of intensive grazing whilst less than 50% do in Ayr, Dunbarton, West Lothian and Stirling. The main snag to further intensification is Capital and in particular the time lag in getting a return on the money spent.

None the less, we must continue to spread the gospel. You can always tell a farmer by his grass. If short dark green and lousy with stock, then he is a "goer" and the next decade will not worry him. If it is long, brown and stemmy, such that it almost hides the few stock that are exercising on it, then his Bank Manager has cause for concern.

There has always been a tendency to seek economic salvation in some new and exotic breed of cattle or some strange multiple cross of sheep. However, whilst there may be some marginal advantage in such searching it often diverts us from the real money spinners, that is the better use of the stock we have upon the grass we do not yet use to the full.

What is the grass gospel?

a) Keep it simple.
b) Feed it heavily and often.
c) Keep it short with a harvester - animal or mechanical.
d) Having grown it - use it - or keep it.
e) If keeping it, then conserve with as little waste as possible.

Regarding conservation, it is still surprising that overall twice the acreage is cut for hay as is for silage. Only 37% of milk producers in the S.M.M.B. area use silage as compared to 75% in the North of Scotland M.M.B. area.

Our rotation is 4 years barley, 2 years grass and we have one grass seeds mixture for undersowing which is then cut and grazed alternatively. This consists of:

15 lbs	Perennial ryegrass - S24 or Gremie
8 lbs	Italian ryegrass - EF486 or Combita
5 lbs	Cocksfoot
2 lbs	N.Z.M.W. Clover
30 lbs	

Should a direct reseed be necessary 12 lbs Westerwolds ryegrass, plus 2 bushels of barley are added and cut as arable silage.

Where barley crops are not undersown for the next year's grass, or where stubble cleaning is thought necessary, then catch crops are undersown comprising:

9 lbs	Perennial ryegrass
6 lbs	Italian ryegrass
15 lbs	

Catch crops receive 60-70 units N after harvest, this enables extra silage to be taken from the leys. The average rainfall is about 22 inches per year.

The grass is fed heavily and often. The first dose of fertilizer is applied in mid-February when 50 acres receive 3 cwts 13:13:20 and 2 cwts 33.5N. A second dose 2 x 33.5N is applied in late March with the same following every cut or grazing, i.e. upwards of 280 units of nitrogen. We try and avoid compound fertilizers on spring grazings - staggers is caused indirectly by potash, no nitrogen.

First cut silage is taken in the second week of May, this means a smaller crop but better quality.

The silage system employs a double chop machine and is deliberately low cost. Silos are outside and are not roofed as it is very doubtful if the wastage in a low rainfall area (22 inches) would pay for the necessary capital requirement. Cows are self fed and kept in straw courts, this system being particularly suited to light land.

MAMMOTH SILAGE CAMPAIGN

The Hannah Dairy Research Institute, the Imperial Chemical Industries Limited and the Agricultural Department of Messrs. Boots, are taking part in what is claimed to be one of the most intensive educational drives known in the history of agriculture, if not of industry in any form.

About 450 demonstrators are setting out on tours all over Britain to lecture on silage making. Information on type of herbage and silo, methods of filling and emptying, additions of molasses, salt, etc. and on feeding is supplied. Taken from Estates Magazine 1941 pages 304/6.

That was a long time ago. Very little has changed since then in the principles of silage making. The types of additive has changed. Air was to be excluded by a combination of rolling and a cover. The type of silo offered was either of sisalkraft paper within wire mesh or a concrete slab silo. Probably the biggest change has been in the amount of money invested by the farmer into harvesting, storage and feeding in order to cut down labour requirements.

Despite all the propaganda, the number of farmers making top quality silage in large quantities has not been commensurate with the effort of the propagandists.

JIM SHORE AND HIS SILAGE SYSTEM

D. C. Shore of Stryt Issa, Penyffordd, Nr. Chester spoke to a large gathering of members of the SWSGS at the Culgruff Hotel, Crossmichael, Castle Douglas, on 18th March, 1976.

In the last issue of Greensward (No. 18) John Watson of the Hannah Research Institute described his tour of farms in the "Silage news" and seemed to be quite excited about someone called "Shore" who broke all the rules but made some beautiful silage.

The BGS summer tour centred at Bangor, North Wales, spent one day visiting Mr. Shore's farm and also the farm of J. Wrench & Sons, The Beeches, Saltney Ferry, both of whom made what was called HDM Silage. Mike Dewhurst of Shellstar set up a club under the title of the Hi Dri Club especially to promote this system of silage making.

We were very fortunate to be able to bring Jim Shore so far north and to hear him speak about his system, and his farming generally.

Going back for a moment to the BGS summer meeting last July, visits were arranged to many parts of North Wales and the name of Jim Shore was widely known and highly respected, not so much for his silage system as for his Friesian cattle.

Some of those listening to him said - "There is nothing new here, all he does is break a few rules". True enough, it is not easy to put forward anything new in silage making, after all, silage has been with us for 3000 years.

The rules of the system

1. Cut grass at 3 week intervals. Most of us will cut grass for silage when the grass has about 6 weeks growth, when there are a few flowering stems showing, Jim Shore cuts whilst the crop is young, leafy and stemless.

2. Wilt to reduce moisture content and raise dry matter content.

3. Ensile quickly to minimise in-silo losses.

Rule 1

We all know by now that high quality grass is young grass. Go back to pre-war days and Woodman and his associates working in Cambridge showed that quality (measured by chemical analysis and by grazing livestock) fell markedly week by week as leaf gave way to stem.

This was the impetus which made the Welsh Plant Breeding Station direct its attention to creating leafier varieties of perennial ryegrass and other grasses.

Grass is grazed at 3 to 4 week intervals. How can you expect silage to be as good as grazed grass when it is 6-8 weeks old.

One of the best tests of age of grass is its crude protein content. Before the discovery of simple methods of measuring digestibility of herbage (Ron Alexander and Mary McGowan of the College Chemistry Department are widely acknowledged to have made a major contribution to the development of methods of measuring Herbage Digestibility) crude protein content was the main index of herbage quality - not because protein was a valuable part of livestock diet but because it fell rapidly by about ½ point per day as grass aged.

Regrowth of perennial ryegrass one week old could have a crude protein content of 30%. Six week old grass would be down to 15% crude protein. Its use as an index of quality was upset when farmers began to use heavy dressings of fertilizer nitrogen. "Crude Protein" is analysed very easily and rapidly by measuring the amount of "N" or nitrogen in the grass and assuming that all the N is part of the protein complex in the plant. Protein contains 16%N so that N x 6.25 = crude protein.

In fact all "N" in the plant is not all protein. N is taken up by the root as nitrate - changes to ammonia inside the plant and passes through various Non Protein Nitrogen stages before it becomes protein.

From a feeding value point of view the Non Protein Nitrogen is not as valuable as protein and furthermore if a high proportion remains as Nitrate in the plants the herbage can be poisonous.

Apply a heavy dressing of fertilizer nitrogen and the plant has difficulty in digesting it all and a high proportion of Non Protein Nitrogen is found in the plant. The quantity will be high in the first few days but eventually be reduced to the normal proportions.

When farmers use 80 to 150 units N per dressing, herbage will show high crude protein content and poor feeding value but often is risky to feed.

"Digestibility" became a much safer index of herbage quality. However, digestibility is not very sensitive to the feeding value of young grass. It is no use using "digestibility" to decide the grazing value of grass.

Quality or Yield That is the dilemma facing farmers. Quality whether crude protein or digestibility falls as yield rises.

Digestibility falls 0.5 units/day whilst the silage crop grows at 0.5 tons/acre/day. Mr. Shores 3 week old growths are low yielding. He may bring in just 1 big load per acre about 1½ to 4½ tons of silage per acre. All six cuts taken in a season total just 3½ tons dry matter/acre or 8 tons silage per acre. Most silage makers will expect to make 2 tons DM/acre or 8 tons silage per acre in their first cut.

The big question? "It pays to make high quality silage but does it pay enough to make up for the extra production costs of low yielding crops".

Rule 2

Mr. Shore wilts his silage and since it is very young and very leafy it very soon shrivels up. He speeds up the wilting by setting his 5 ft offset Kydd flail harvester to leave a 4" stubble. The cut leaves lie on top of this. By the following day, it is usually down to 40% Dry Matter. It is picked up by the forage harvester set to leave a 3" stubble, thus taking in a little fresh cut stubble with the wilted grass.

Why does he wilt? The short leafy stubble would be much easier to cart and pack into the silo if it was taken in when first cut. Wilting is an extra hazard, but is necessary because this young grass is wet and lush and would tend to settle into a sour slime rather than ferment into silage. Furthermore, it has a high crude protein content and low sugar content which would make it go "butyric" and evil smelling rather than "lactic" and tarty.

The finished product has a very high dry matter content. The average of all crops is as shown in Table 1.

Table 1 Shore Silage Quality

	Dry Matter % of silage	Crude Protein % of dry matter	MAD Fibre % of dry matter	D value of dry matter	Starch equivalent of dry matter
1969	38.7	18.5	23.2	76	60
1970	34.9	23.9	30.6	69	54
1971	33.6	27.6	28.9	71	57
1972	27.9	26.0	32.3	67	55
1973	37.8	19.3	31.6	68	57
1974	40.7	23.6	29.1	71	57
1975	45.5	23.5	28.5	71	59

pH was much higher than usual at 4.8 to 5.2.

Note that the average %DM in 1975, a fairly dry year, was 45.5%. Individual crops, especially October cut herbage, could be much lower whilst mid-summer crops which are often very light could be as high as 49% DM.

Most of our own top silage makers will wilt if it does not interfere with the flow of operations. Then again, wilted silage tends to be more palatable and ad lib fed cows go through the silo too soon. Finally, there is the risk of secondary fermentation or mould. In our silage competition, we penalise high DM in clamps because of the danger of moulds, etc. taking hold.

Those of our farmers who do wilt silage will tend to limit wilting to 1 or 2 days. If rain comes, the crop is picked up on the wet side rather than leave it.

Mr. Shore, on the other hand believes in the necessity for achieving wilting and will leave the crop out 6 days if required.

Rule 3

Prevention of in-silo losses by speedy filling, proper consolidation and effective sheeting is important in most systems and particularly important in this short dry stuff.

Although Mr. Shore uses no additives he has nothing against its use by farmers who prefer to cut out some of the risks of deterioration. Mr. Shore fills his silo on a Dorset Wedge principle. A polythene sheet (500 gauge) is rolled forward as the wedge moves forward and the edges of the sheet are kept firmly down with a load of grass trodden in.

Rolling is not excessive. After all the material is fairly short and the fresh cut stubble along with the wilted material acts as a cement to stick the layers together. Outdoor clamps are built with a back to front slope so that rain water will run off. Speed of completion is helped by his use of a narrow silo.

Why no secondary fermentation? The material is tight in the silo. Stock pick it out with some difficulty. The narrow feeding face and the tightness of the silage makes for slow intake. The narrow face allows the silage to be eaten away at about 6" depth per day. A 100 or so cows on a 20-25 ft face means just 3"-4" per cow. The silage face is about 9' high.

Feeding policy The silage has been produced at high cost and is fed as sole feed for low yielders, along with barley up to 6 gallons and along with dairy nuts over 6 gallons. When short of barley and obliged to use dairy nuts for lower yielders he found no advantage.

Cows receiving barley will eat 16-18 lbs silage DM plus about the same amount of barley. Those on silage alone will take double that amount of silage. Over the last few years, barley use has increased. Last year it was 27 cwt/cow with a lactation average yield of over 1100 gallons.

Fertilizer use on the cutting areas Keeping his grass growing through the year means using a lot of N. He starts with 40-60 units/acre on 50-54 acres in mid-February and turns out his dairy herd for early bite over the whole area in mid-March. The silage ground is completely bare by the end of April and then given 100 units N for the first cut taken 3rd week in May. Typical follow up programme would be 40 units for each of the next 2 crops. Then none for the 4th crop followed by 40 units for each of the last 2 crops.

The total N is about 280-320 units/acre. It used to be over 400 but this has been cut down.

Six cuts were made into silage in 1975. 3-5 have been made in previous years. The number of cuts will depend on progress in filling his silos. When they are full, he has all he needs for the winter and all the grass becomes grazed. High yielders come indoors 1st October but the rest under 4 gallons may stay out till Christmas.

The most controversial feature about his manuring policy was his statement "I have not used P or K for 8 years". He succumbed to persuasion to apply K-slag last year but has doubts of its value.

Grass must get P and K especially when it is grown with N and especially when it is cut frequently. The experience of farmers in grass drying has shown that eventually the available K in the soil falls and crop yields plummet as poorer grasses replace ryegrass.

Mr. Shores' answer is to put all his slurry, the product of silage feeding and bought in barley feed back into the cutting areas. This will undoubtedly maintain his first cut yields but he could see a decline in yields of later crops.

Machinery One of the disadvantages of the Shore system is that crops are so light that tractors, harvesters and trailers are whizzing around vast areas to pick up relatively small crops. One would expect a lot of wear and tear on machinery and tractor drivers. However, with light crops, it is possible to use low power cheaper machinery. As Mr. Shore put it wrily. "After 8 years, his forage harvester was no worse than new". Fuel use was no higher than for fewer but bigger crops.

Mr. Shore was closely grilled by members. Many of them would approve of parts of his system but not the whole package. His method appears to be a costly road to high quality but cost is relative. The justification lies in his feeding results. His statistics to December 1975 are shown in Table 2.

Table 2 Vital statistics - Jim Shores farm

Number of cows	103
Milk sold (average/cow and heifer)	1128 gallons
Milk sales/cow and heifer	£397
Total concentrates/cow (mainly barley)	27 cwt
Concentrate costs/cow	£93
Margin over concentrates and purchased roughages	£303/cow

DUTCH GO FOR HDM SILAGE IN A BIG WAY

Jim Shores High Dry Matter Silage and David Metcalfe's Sealed Hay both originate from Holland.

Recent figures quoted in "Silage in the Seventies" published by Shellstar show the increase in this form of conservation in Holland.

% Total mown area used for different conservation methods

	1964	1970	1973
Hay	72	65	50
Dried grass	5	5	3
High DM silage	7	20	33
Other silage	16	10	14

CAN WE DO WITHOUT THE BGS

I. V. Hunt

BGS = British Grassland Society.

The answer depends on what we mean by "we". "We", farmer members of local grassland societies can get along quite well without BGS. "We", the active scientific members of BGS would be seriously hampered in our work.

Broke!!

The question came up at the last summer meeting of the BGS held in Bangor, North Wales. The treasurers report was grim. The BGS was broke. The society was running at a deficit of about £2000/year. My own version of the 1974/75 Balance Sheet shows how the various costs and sources of income are made up. With much encouragement (some well aimed bricks) from the members present at the A. G. M. (Annual General Meeting) some painful decisions were taken which would remedy the situation.

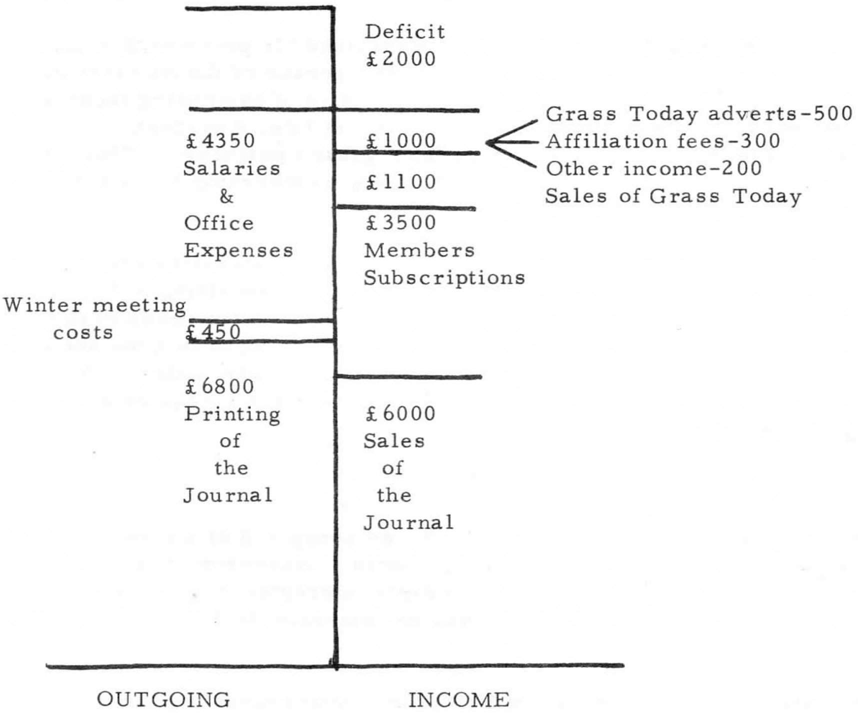
There are only 3 things which you can do: a) cut down services and expenses, b) raise income, c) both. The third was adopted. In addition, an appeal was made to Local Grassland Societies, individual members and the agricultural industry for donations to wipe out the current deficit. I expect the response was satisfactory. The immediate future of the journal of the British Grassland Society was assured by turning it over to a publishing company. The hardest decision of all was to cease publication of "Grass Today". Local society members were almost unanimous in urging the abandonment of the Journal of the British Grassland Society which was unintelligible to them and the retention of "Grass Today" which was virtually the only tangible contribution made by the BGS to the local societies.

There is no doubt that the 'Journal' is the biggest item of cost. Printing costs are rising and the 1975 volume is likely to cost £8000.

The scope of articles in the journal

The 1974 volume (Vol. 29) published in 4 parts totalled 320 pages including 44 scientific articles, 5 pages of reports of 10 papers given at BGS meetings, 8 pages of reviews and about 10 pages of other matters such as an index.

The 44 scientific papers summarise progress in plant breeding, grazing systems, red clover, seed mixtures, slurry, wilting, permanent pasture, beef cattle grazing systems, red clover silage, weeds of grassland, dried grass production, quality of grass, hill land productivity, calving pattern, maize, pesticides, grazing rotations, industrial land reclamation, effective use of phosphates and nitrogenous fertilizers, surface reseeding, winterkill in ryegrass, insect damage, supplementary feed for beef cattle, etc.



The BGS Balance Sheet 1974/75.

Scientific Gobbledegook

Each of the 44 articles will present in 6 or 7 pages probably the results of 2 to 3 years experimental work. No wonder it is not readily understood by the farmer. 30 to 40 years ago these articles would have been 30 pages long and whilst a little dreary to read, would tend to use a very descriptive kind of language. Volumes 1, 2 and 3 of the journal were in this older style of descriptive writing. The high cost of printing has led to a kind of scientific shorthand which aims to give the necessary facts and not one syllable more than is necessary.

Some of the findings in the 1975 volume are summarised under Research Reviews. Mathematical equations are the briefest method of presenting a result. These are understood by only the few scientists actively engaged in the same subjects. About 70% of the BGS membership are technical or scientifically trained, most of these will be interested in the main conclusions of each contribution, but even they find difficulty in understanding the details of experimental technique and become exasperated by the cautious approach to conclusions generally adopted by authors. They undoubtedly have the ability to understand these articles but not the time to consider the importance of findings. Probably the most widely appreciated article is the review where an author gathers together many reports on the same topic and produces a digest of the results.

For example, in Volume 30, Peter Newbould of the H.F.R.O. (Hill Farming

Research Organisation, Edinburgh) summarised "Improvement of hill pasture for agriculture", W. E. Klinner and G. Shepperson of the National Institute of Agricultural Engineering reviewed "The state of haymaking technology", whilst Dr. J. F. Greenhalgh of the Rowett Institute, Aberdeen, reviewed "Factors limiting animal production from grazed pastures". These are probably thoroughly read by about 50% of the membership but will still be tough going for the remaining 50%.

There has been for many years a body of members including some technical members who wanted greater emphasis on the incorporating of the results of research into farming practice and less emphasis on the needs of the research work itself. It was natural that this body was convinced that the society should abandon its costly journal and promote a better "Grass Today". It would be fine if both objectives could be sustained but this would require a considerable increase in income.

<u>Birth of BGS</u>

Consider the origins of the society. It was conceived at a meeting of the IVth International Grassland Congress (IGC) held at Aberystwyth in 1937. The I.G.C. itself was a gathering of scientists interested in grassland originated in Leipzig, Germany, in 1927 and due to celebrate its 50th birthday at Leipzig in 1977.

There were, at that date, a few British scientists directing their attention to the exploitation of the grassland potential. Professor Sir George Stapledon was director of the Welsh Plant Breeding Station where most of the experimental grassland work was undertaken. Some was conducted in University departments of Agriculture such as Cambridge, Bangor, Leeds, Newcastle and the Scottish Agricultural Colleges. I.C.I. Limited were busy at Jealotts Hill. Rothamsted was an ancient but active research station. The Hannah was coming into its stride with interest in grass drying and self sufficiency from grass.

The Grassland Research Institute (GRI) did not come into existence until 1940 when the Grassland Improvement Station was set up at Dodswell, on heavy Warwickshire clay as an offshoot of the Welsh Plant Breeding Station. The value of a research station devoted to grassland was recognised by all thinking farmers and scientists and the 'Aberystwyth Boys' were encouraged to spread their wings and establish other stations in Colesbourne, Gloucestershire, and at Mixen Hay, Staffordshire. These centres were vacated when the GRI transferred to its present headquarters in Hurley. It was these Aberystwyth grassland scientists who in 1945 set up the BGS. Sir George Stapledon, William Davies, T. J. Jenkins, Martin Jones, Iorwerth Jones, T. E. Williams, R. O. Whyte along with W. D. Hay then of Somerset Farm Institute, Professor Stephen J. Watson of Edinburgh and P. A. Linehan of Northern Ireland. Their prime objective was to provide a meeting point for discussion, demonstration and a journal for publication of the results of experimental work.

Membership at the foundation meeting was restricted to persons actively interested in the objects of the society which was defined as those who were members of research stations, Universities, Colleges and of War Agricultural Executive Committees (the forerunners of the Agricultural Advisory Services). Farmers, journalists, members of commercial firms were excluded from membership but able to subscribe to the journal. It is amongst the early subscribers that we find the names of many farmers who later became staunch members viz. Sam Gray (Hampshire), George Chrystal (Yorkshire), Colonel Pollitt (Shropshire) and John Rowsell (Hampshire).

Farmer members of the BGS

Membership was widened in the following year and we find the first farmer member, A. A. McGuckian, on the committee of 1947/50, a tribute to the help given to Linehan and his colleagues in their fundamental and classical researches into grazing trial techniques reported as the first article in Volume 1 of the journal.

There have been 4 editors of the journal. R. O. Whyte, who through F.A.O. has been responsible for taking grassland science to India and many under-exploited countries was the first. H. I. Moore, P. Mackintosh and A.G.G. Hill followed on. The journal opened its pages to scientists from all countries and has become widely used and referred to. Its style has always been slightly less scientifically formal than the Journal of Agricultural Science published from Cambridge reflecting its editorial policy of requiring authors to indicate the practical relevance of their contribution.

Cost of printing has enforced the careful use of words and resulted in reliance on statistical or mathematical expression of results but each article should be intelligible from a reading of the introduction and discussion, with the results as an appendix to justify conclusions.

Research must be published

Publication of the results of research is an essential part of research work. Without publication, including describing the objectives, the methods, the results and the experimental conclusions, the effort and cost of the experiment has been wasted. Experiments are written up so that other workers can be guided in further investigation and so that the conclusions can be incorporated in advisory programmes and thence become part of farm practice. Few experiments cost less than £5000 and many cost ten times that amount.

The task of writing up and preparing an article for publication in a reputable journal such as the Journal of Agricultural Science or Animal Production or the Journal of the British Grassland Society, is one which many experimenters shirk. They are always in the news pointing to experimental work in progress and speculating wildly as to the importance of unconfirmed results. At the conclusion of the field work they are away on another trip into the future.

The existence of a journal such as the BGS journal is an invitation to the experimenter to write his work up. He is a member and the journal is his own. Nonetheless, life is considerably easier when the task of "writing up" is deferred indefinitely. Some individual research workers are very guilty of this omission. Some whole organisations are very guilty. For example, the Grassland Research Institute, our largest grassland research organisation, was for years particularly lazy in publication. At the other extreme, the Hannah, on our own doorstep, is at the top of the list with publication following immediately on completion of an experiment.

Who should pay for Publishing Research Work?

As far as the BGS journal is concerned, it is paid for by the members and the non-member subscribers. The membership is 25% farmer and 75% technical including commercial firms. Probably about 100 of the members produce the articles which appear in the journals. They largely come from Government and commercial experimental stations. A simple solution would seem to be to make publication of results part of the cost of the experiment and a charge on the research organisation or commercial firm.

With printing costs at about £20-£30 per page, each contributor of an article could expect to pay £200 or so for the privilege of publication. This could not be paid by the individual writers but since they are the agent of the organisation responsible for paying the £5000 to £50000 already incurred in setting up the experiment, the additional charge for publication could easily be absorbed by those responsible. If publication is not worth £200, then the experimental programme should not be worth £5000.

Thinking along these lines leads to some rather peculiar conclusions. One assumes that the ultimate beneficiaries of a research programme will be the British community who will benefit by more, better or less expensive agricultural products. Intermediate beneficiaries will be the farmers or commercial firms who make use of the published conclusions.

The only benefit to the technical member is the satisfaction of achieving his vocation of contributing towards the betterment of his fellows.

Putting it across to the farmer

Ensuring that research work gets into practice is not easy. The increasing number of farmer members of BGS of the calibre of Fred Bates, Sam Gray, Rex Patterson, Edwin Bushby and John Rowsell was welcomed by the scientific members as providing a screen for checking out the kind of experimental work which was forthcoming.

The setting up of local Grassland Societies in 1955 (Surrey G.S. was No. 1) marked an attempt to take the scientist to the farmer.

Publication of Herbivaria and later Grass Today were embarked on to provide the farmer with a readable alternative to the "Journal". Unfortunately, our society was not financially able to carry all these self appointed tasks. It may be that the solution is for the BGS to concentrate on its basic role of scientific communication supported by the Government and commerce and leave the publication of 'Grass Today' or its equivalent to the farmer members of local Grassland Societies. We have a very suitable medium in our own journal "Greensward". It has changed its face once or twice in its history in order to balance the books but it will continue. "Grass Today" became too luxurious. It tried to compete with commercial publications.

A PROMISING NEW VARIETY OF GRASS

Some five years ago, I had the privilege of visiting the trial grounds of C.I.V. in the Netherlands. They lie close to the German border.

My special interest was in the early variety of perennial ryegrass Gremie which originated there. It had been tested at the N.I.A.B. (National Institute of Agricultural Botany) trial grounds in Cambridge and because it was unduly susceptible to Crown Rust, was considered of no interest in Britain.

The breeders threw the basic stock aside. Trials at the 3 Scottish Colleges showed it to be particularly high yielding. It formed a finer, closer turf than other early varieties (S24, Premo, etc). It also appeared to stand up well to higher levels of application of N fertilizer than other varieties.

It has figured on College recommended lists since then and has consistently given higher yields of herbage than S24.

At that visit, one variety still in the care of the breeder was particularly attractive. It was a tetraploid version of Gremie, developed primarily to improve its disease resistance.

It has been under test at Auchincruive for 3 years and is passing through the official tests prior to consideration for the UK National List. It is already available in some European countries.

Our own tests show it to be markedly more productive than any other variety of ryegrass, probably 10% better than any presently available variety.

Add to this the fact that it has the quality of tetraploids and it is worth looking out for. It could well be available for sowing in Autumn 1976 or Spring 1977.

Its name in this country is likely to be Grimalda. (It has also been called Gremietet).

THE POTENTIAL OF GRASSLAND AND FORAGE PRODUCTION FOR RUMINANTS IN BRITAIN

T. McCreath, Garlieston Home Farm

Tom McCreath reports on the 1975 Winter Meeting of the British Grassland Society held in London in early December.

The subject was covered exceedingly well by the speakers. One was aware of the very small representation of farmers and the equally high representation from trade and research. The papers were presented by speakers all engaged in some form of research.

There was very accomplished presentation but because of the lack of opportunity for discussion little headway was made in identifying the underlying factors in the commercial farming world that affect the potential. The meeting was therefore as academic as it could be despite an attempt by the opening speaker in the discussion to provoke the farming lobby. We left with the feeling that the potential was not likely to be tapped substantially as a result of any new information given during the meeting.

J. O. Green and T. E. Williams from Hurley (Grassland Research Institute) discussed grassland nationally and within the EEC. Mr. Green described a survey of 1300 farms in England and Wales completed in 1970-72. Four points were:-

1. The blurred area between old permanent pasture at 20% of total and long term leys sown down for over 9 years (26% of total). Sowing down for over 20 years was common.

2. Ryegrass tended to remain as 70% of the species in old sown leys but as 30% of 'old grass'.

3. Natural grasses were nearly as productive as leys grown without fertilizer N or conversely it is pointless sowing good grass swards if you are not going to use more N!

4. Nationally, the potential for more reseeding was limited due to lack of drainage and other ground conditions.

He suggested that more effort should be put into increasing the manuring and stocking rate on the better reseeded land, but three other speakers claimed that stocking rates were not increasing in proportion to manuring rates and that there was a greater use of grain and concentrates.

	1951/52	1973/74
Acres/livestock unit	2.11	1.49
Requirements for starch equivalent tons/acre	0.97	1.44
Source of SE		
Grain and corn	0.15	0.29

Source of SE	1951/52	1973/74
Bulk foods	0.12	0.07
Grass	0.70	1.08

The average derived from grass appears to be very low.

If that grass has an SE of 45, 1.08 tons SE is produced by 2.4 tons DM and 1.44 tons SE is produced by 3.2 tons DM.

Even the poorest grassfield yields more than 3.2 tons DM per acre. The significance of barley etc. as a material for supplementation or substitution depending on farmers' attitudes. The acreage of grassland had increased by 63%, but concentrates consumed were up by 90%.

John Morrison, also of Hurley, discussed grass production in relation to its environment. Response to N, now stated in kg/ha was given, and on average stood at 31 kg DM/1 kg N. Optimum ryegrass production could be three to four times the average grassland production while the average good dairy farmer usually doubled the average grassland production. Figures for S23 production on 6 cuts depending on date of first cut were given.

Date of 1st cut	Tonnes/DM ha	Average D value	DOM yield tons/ha
14 May	10.4	70	7.3
27 May	14.6	67	9.8
4 June	15.9	64	10.2
15 June	17.2	61	10.5

So we do drop our total DOM yield if we cut early! Should we revert to cutting about 65D value silage instead of 70D?

Soil texture had a dramatic effect on yield. The variation in grass yield from season to season could be 34% at Hurley and 11% in Wales or 42% on sandy soils to 19% on clay. Thank goodness we are in South West Scotland! Should all articles on production give rainfall and soil type as vital statistics?

Dr. Malcolm Castle gave the first paper of the afternoon session on the exploitation of the nutritive potential of grass and forage. I hope it is fully reported in the journal. We are familiar with some of the figures, but they bear looking at again. Briefly, the case for milk from grass and high quality forage was greater than ever. Very early bite had many limitations, but conserved grass at 70D was M + 3 gals. At grass, controlled grazing gave 100 galls extra per acre over set stocking, so control the grass and conserve all you can at 70D for winter and spring! Forage crops were for October/December, not July. Extra protein often gave a response despite sufficiently high protein silage. Should we follow Dr. Castle's suggestion to hold cattle in longer so that we can conserve more at 70D! With feed bills piling up in the spring and when most people look on spring grass as M + 5, I doubt it, but a brave man could be right!

The best paper, from Dr. Baker of M.L.C. came over very well, giving an outline of meat production here and in EEC related to grassland production. Higher grassland output related to higher N usage could increase meat production by 17%, milk by 20% and drop concentrates used by 18%. Sources of Home Produced beef were listed:-

Dairy cows			Sucklers		Irish stores
Calves		Cull cows	Calves	Cull cows	
Beef X	Dairy				
20%	21%	17%	25%	6%	11%

2 years grass beef from hill sucklers gave slightly better margins than barley beef and Charolais cross beef required twice as much concentrates as Aberdeen Angus X beef. But again, in general, stocking rate was not rising as extra N was applied.

Meat production from sheep came 63% from lowland ewes, 20% from hill ewes and 17% from upland ewes. 10% more lambs per acre would increase the gross margin by £1.16. One more ewe per acre would add £9.2. Can we replace New Zealand lamb if required? Should this potential be promoted by BGS? But there was no mention of the relative profits on the upland farm from beef as opposed to mutton, or to the management problem.

Mr. I. B. Howie, who opened the discussion. The relative ease of cereal feeding was mentioned to compare with the problem of grassland systems. Would our grass varieties persist with some intensive systems? We had our champions of heavy stocking, but would the capital investment today of £200 per bullock return an extra £30 per acre profit from intensification.

Unfortunately, the farming lobby did not press for details of the extra capital in equipment, stock, fertilizers and labour required today to go intensive and a detailed comparison with the profits from average stocking with its relative ease of management. I came away delighted with the information dispensed but worried that the research worker was so divorced from the pressures that make farmers unable to follow their leads.

GRASS DISEASES - A GROWING PROBLEM?

S. J. Holmes

The West of Scotland Agricultural College, Auchincruive

One of the consequences of the greatly increased cost of grass production has been the demand for information on ways in which efficiency can be improved. This in turn has called for a critical examination of the reasons for the failure of yields to reach maximum potential. An area of study which has been receiving considerable attention is that of the effects that fungi and viruses have on grass productivity. Although until recently grass was a crop little studied by plant pathologists there are now investigations in progress throughout the United Kingdom and evidence is rapidly accumulating to suggest that certain diseases may be limiting production.

Some problems

The fungal organisms which infect grass can be divided into two relatively distinct groups - those which attack the foliage and those which attack the roots and stem bases. The importance which each of these two groups assumes in the grass crop is largely dependent on the way in which the grass is utilised. Thus, where the grass is frequently cut or intensively grazed those fungi which attack the foliage have little opportunity to become serious as they are repeatedly removed before they can develop fully. In such circumstances soil-borne organisms, which can insidiously eat away the roots and stem are likely to be a more persistent problem.

Foliar diseases

The foliar pathogens usually have their greatest effect in seed crops but can be a problem where grass is grown for conservation, and in particular silage crops which, with their lush dense growth, offer an ideal substrate and environment for disease development. Investigations on the effects of foliar pathogens made at the Welsh Plant Breeding Station have clearly shown that relatively low levels of disease (less than 10% of the leaf area affected) can cause highly significant reductions in DM yield as a result of the utilisation by the fungus of the water-soluble carbohydrate contained in the plant cells.

The importance of foliar pathogens in the West of Scotland is uncertain. A small survey of perennial ryegrass swards made in 1974 showed only low levels of foliar diseases but as the crops examined were generally well grazed or recently cut the results were perhaps not surprising. An assessment of the disease situation in silage and hay crops over several years will be necessary before a clear statement can be made. That severe attacks by foliar pathogens occur in the West of Scotland is certain and these generally result from a combination of unusual management and/or climatic factors. For example, in 1975 fields of perennial ryegrass on a farm in Wigtownshire were found to be very heavily infected with crown rust. Indeed, the disease was so bad that the cattle refused to eat the grass. In this case the unusually dry summer promoted the disease.

Soil-borne diseases

Evidence that soil-borne fungi are capable of causing considerable yield losses is being accumulated at the College as the result of an intensive research programme. Investigations of perennial ryegrass swards affected by winterkill have shown that two fungi - Fusarium nivale and Fusarium culmorum - are regularly associated with the roots and stem bases of damaged plants. Furthermore, in glasshouse experiments Fusarium nivale has been found to react to the climatic conditions often associated with winterkill (i.e. mild winters with sharp cold spells) by causing greatly increased damage to the plants. Whilst it is not suggested that this fungus is alone responsible for winterkill the evidence strongly suggests that Fusarium nivale can, in correct combination with climatic and management factors make a considerable contribution to the damage of grass during the winter.

Attacks by Fusarium species are not restricted to winterkill situations and they may play an even more important role in reducing seedling establishment. Both Fusarium nivale and Fusarium culmorum have been found to cause losses in seedling numbers of up to 20% in field plots inoculated with relatively low levels of fungus and there have been consequent reductions in DM yield of over 20% in the first year of production. It is perhaps important to note that losses of this magnitude occurred in the absence of any obvious visual effects and were only detected when numerical assessments were made. Fusarium nivale and F. culmorum are of almost universal distribution and one or both of them can almost invariably be found in ryegrass swards, either on the lower plant parts on plant debris or in the soil.

Diseases caused by viruses

A group of organisms which must be considered when discussing grass diseases are the viruses. Although viruses often cause foliar symptoms they have an important advantage over the fungi which attack the leaves in that they are systemic. This means that the virus occurs throughout the plant so that even though the symptom-bearing leaves are removed the plants remain infected and the new leaves become diseased as they are produced. Thus viruses, like soil-borne fungi, are ideally adapted to the conditions found in intensively used grass crops. Two examples of the viruses which attack ryegrass will serve to illustrate the importance of these organisms. The first of these is Ryegrass Mosaic Virus (RMV), the main effects of which are to reduce tillering and to cause premature plant death. Experimental work at various research stations has clearly established the potential damage which can be caused by this virus. At the Welsh Plant Breeding Station RMV infection reduced yields of S321 perennial ryegrass by 19% over a 3 year period. Furthermore, it was found to restrict the increase in yield usually associated with heavy applications of nitrogenous fertilizer. Thus where no fertilizer was used the effect of RMV was insignificant but where 400 kg N/ha were applied virus infection reduced the total annual yield from 18.6 to 13.8 t DM/ha. An additional finding was that RMV infection renders plants more susceptible to winterkill.

Surveys of perennial ryegrass swards for RMV infection were made in the West of Scotland in 1972 and 1973 and it was established that the virus was widespread in the College area. As yet the economic significance of these findings is not known but it seems likely, in view of the levels of disease found and the geographical distribution of the virus, that if losses are occurring then they are likely to be localised in individual fields or groups of fields rather than generally throughout the whole of the West area.

The second noteworthy virus on ryegrass is Barley Yellow Dwarf Virus (BYDV). This disease, in contrast to RMV, often results in increased tillering but at the same time causes severe stunting. In RMV infected fields the loss from reduced tillering in infected plants may be compensated for by increased growth in adjacent healthy plants but this cannot occur in BYDV infected swards and there is a gradual alteration of the plant habit toward an extreme pasture type.

The future

If current trends in grassland husbandry continue then it seems likely that diseases will become more, rather than less, important, and there are two main reasons for making this somewhat pessimistic statement. Firstly, intensification of grass usage requires the application of higher nitrogen levels to compensate for increased stocking rates or increased frequency of cutting. High nitrogen levels result in soft lush growth and this has long been known on various crops to encourage attack by disease-causing organisms. In addition, the increased mechanical damage associated with more intensive management may create greater opportunities for entry of fungi and increase the spread of those viruses (e.g. RMV) which can be transferred mechanically in sap. Secondly, and perhaps of greatest significance, is the trend toward the growth of single-species swards. Most fungi and viruses are fairly specific and will only infect varieties of a single species. Thus, the growing of, say, pure ryegrass swards will offer a far greater opportunity for epidemic disease development than do swards of mixed grass species which effectively dilute the number of susceptible plants.

Conclusions

Although management and climatic factors markedly affect pasture growth, the brief discussion above illustrates that diseases can be responsible for the failure of grass swards to reach their maximum yield potential. The examples mentioned by no means comprise a complete list of the pathogenic organisms found in grassland. Indeed we know very little about the effects of most of the fungi which can be isolated from grass and as investigational work progresses it is quite possible that some of them may prove to be causing significant damage. It would, however, be wrong to give the impression that diseases are a major cause of loss to grassland. In certain instances they can be devastating, but generally they are probably taking a fairly modest, but nonetheless significant, bite out of profits.

A selection of papers appearing in Vol. 30, Journal of the British Grassland Society, 1975.

167 Further comparisons between a rigid rotational 'Wye College' system and other systems of grazing for milk production.

M. E. Castle and J. N. Watson, 'The Hannah'.

Four systems were under test:-

1. In the 'Wye College' system, fence moving is at a minimum and no effort is made to control surplus grass except by grazing it as the stock come round again. It has been operating in this and a previous experiment since 1970 and given an average output of 12700 kg/ha (1130 gal/acre).

2. Paddock grazing using 28 one day paddocks, was compared to the Wye College system in the previous experiment and resulted in negligible differences in milk putput, but was more difficult and more expensive to operate.

3. Strip grazing providing twice daily sequence of herbage using grazing fields of S24 and S23 ryegrass, aftermaths and a direct reseed. The milk output was practically the same.

4. Set stocking involved carrying the same stocking rate as above (5 cows per hectare = 2 cows/acre) for 20 weeks up to 30 September.. From week 11 onwards, milk yield declined as supply of grass became less.

Conclusion

Set stocking and the Wye College system are simpler systems to operate. Output of milk under the Wye College system at 5 cows/ha was no lower than from more sophisticated systems. Output was reduced under set stocking but only in the late weeks of the system.

Further study of the system may show how to retain the simplicity of the first 10 weeks and boost yields in the latter half of the season. For example, by extending the available grassland to silage aftermaths.

168 The effects on dairy cows of grazing pastures containing high levels of nitrate-nitrogen.

R. H. Phillips. National Institute for Research in Dairying, Reading.

It is generally known that it is risky to put cows to graze grass too soon after applying nitrogenous fertilizer, especially when large doses are repeatedly used. Cows may die or suffer reduction in milk yield or abortion. Trouble is associated with increases in methaehoemoglobin in the blood brought about by too much nitrogen in the form of nitrate in the diet.

Nitrate is a very common form of nitrogen, and a normal constituent of herbage. Indeed without nitrate in the grass, there would be no crop. The difficulty about the subject is the need for knowledge on 2 matters:-

a) The effects of management, timing and levels of application of fertilizer N and climate on the amount of N in the form of nitrate in the grazed herbage.

b) The effects of livestock management, i.e. date and rate of stocking, class or type of stock, amount of available herbage, amount and type of supplementary feed, age, etc.

Most of the nitrogen taken in by plant roots is in the form of nitrate. Inside the plant it is transported about from root to shoot as nitrate and changes through 6 or 7 stages including ammonium,amides, amino acids, etc. before becoming a protein in the growing substance of the plant.

The change from nitrate to protein is most rapid when the grass is growing rapidly, setting up new leaves and shoots to take up the protein and drawing in the large amounts of energy from the sun to achieve the transformation from nitrate to protein. If growth is slow, the sky cloudy, and the supply of N to the plant plentiful, more nitrate may be taken into the plant alright and it remains as nitrate for a longer period of time.

The trial reported in this article examines the relative safety of putting Friesian cows in early lactation on to graze for 4 days, 14 days or 21 days after applying 103 kg N/ha as nitram (35%N), (103 kg N/ha = 92 lb N/acre = 82 units N/acre). This was reported 4 times between April and July.

Table 1 Average N composition of herbage as percentage of dry matter.

Grazing		1 April	2 May	3 May/June	4 June/July
Accumulating application of Nkg/ha		103	206	309	412
	Days after Application				
Crude Protein %	14 days	27.4	32.1	27.2	21.4
	21 days	24.5	27.9	20.1	18.7
Total N %	14 days	4.38	5.17	4.29	3.42
	21 days	3.92	4.46	3.21	2.99
Non Protein N %	14 days	1.33	1.11	0.98	0.82
	21 days	1.08	0.96	0.84	0.64
Nitrate N %	14 days	0.26	0.55	0.76	0.37
	21 days	0.18	0.59	0.42	0.31
Water soluble carbohy. %	14 days	13.5	6.8	6.8	8.0
	21 days	12.5	9.2	12.0	9.0

As expected, the crude protein content of the herbage is high, more so 14 days after applying fertilizer than a week later (21 days).

Considering all experiments, dangerous levels of Nitrate-N have been reported as 0.14% up to 1.5% Nitrate-N in dry matter. The LD50 level when 50% mortality can be expected is quoted as 0.5 to 0.7%.

In three of the grazing periods there was a fall in % Nitrate N which would mean less risk of trouble. The most dangerous periods according to the analysis appear to be the 2nd and 3rd grazings with extremely high contents at the 3rd grazing.

Despite this, no evidence of danger from nitrate poison was shown in the cows. Blood samples showed higher urea content especially in the 2nd and 3rd grazings for the 14 day grazings than for the 21 day grazings simply because the cows were presented with surplus crude protein in their diet. Milk quality was different. 21 day grazing produced higher fat, SNF and total solids than 14 day grazing.

The result of this experiment will help to allay the fears of farmers considering set stocking with grazing following closely on N fertilizer application, or those considering Jim Shore's young grass for silage. However, one or two favourable experimental results should not reduce the need to proceed cautiously.

169 The effect of including dried grass in the supplement given to lactating cows at pasture.

F. J. Gordon. Agricultural Research Institute, Hillsborough, N. Ireland.

It is generally known that feeding cereal based supplements to cows on high quality grass is not a profitable exercise. The trouble is that the more the cows eat expensive supplements, the less they eat of the cheaper grass.

Dried grass has been shown to increase consumption when fed along with silage. The experiment was designed to find out whether there was a favourable effect on milk yield or quality and if the same increased intake of grazed grass would be found.

12 Friesians, 33 days after calving, were given free access to plenty of good quality grass and fed one of 3 supplements at 5 kilograms per head each day, (5 kgs = 11 lbs). They grazed 7-9 paddocks at a 21 to 27 day interval, spending 3 days in each paddock with a fresh area of herbage given each day using an electric fence.

Table 1 Composition of diet

	Type of supplement		
	1	2	3
% composition - barley	99	49.5	0
dried grass	0	49.5	99
calcined magnesite	1	1	1

	Type of supplement 1	2	3	Grass
Chemical composition				
% Dry Matter (DM)	83.8	87.2	90.0	16.5
% Crude Protein (in DM)	9.6	13.1	16.2	17.0
% Crude Fibre (in DM)	5.9	12.0	19.5	26.0
% Ash (in DM)	3.6	6.3	9.2	9.6

Table 2 Results from grass + supplement

	Type of supplement 1	2	3
Milk yield kg/day	23.9	24.5	23.9
gallons/day	5.1	5.2	5.1
Total solids % (TS)	12.03	12.23	12.24
Butterfat % (BF)	3.39	3.47	3.51
SNF %	8.63	8.80	8.71
Lactose %	4.50	4.80	4.80
Protein %	3.13	3.17	3.14

It was concluded that:-

The addition of dried grass did not raise milk yield but appeared to increase BF, SNF and TS content of the milk.

Measurement of effects on consumption were made by zero grazing the grass and feeding it along with the supplements to 8 BF steers weighing 484 kilograms (= 9½ cwt). Each day 4 kg/head of one of the 3 supplements was given along with ad lib cut herbage provided freshly twice a day.

Table 3 Result. Consumption per head per day.

	Grass + supplement (as above) 1	2	3	Grass only
Supplement DM intake				
kg/day	3.3	3.5	3.6	0
lb/day	7.3	7.7	7.9	0
Grass DM intake				
kg/day	8.5	9.2	8.7	11.0
lb/day	18.7	20.2	19.1	24.2
Total DM intake				
kg/day	11.8	12.7	12.3	
lb/day	26.0	27.9	27.0	24.2

Conclusion

All supplements reduced the consumption of cut fresh grass. The depression was slightly less with supplements containing dried grass than with pure barley. Total consumption of supplement plus grass was raised slightly by the inclusion of dried grass. The increase when barley alone was used was too small to be statistically significant.

General conclusion

From this experiment it is evident that neither dried grass nor any other supplementation is worthwhile when grazing herbage of good quality, even when the cows are high yielding.

170 Winter feeding for beef production (papers a to e)

This was the theme for the BGS Winter Meeting in December 1974. A report by A. D. Grant of the College Office, Dumfries, was held over from Greensward No. 18. A report was published in the Journal of the British Grassland Society. Five other papers presented at the meeting are also reviewed. The following notes are based on the published report and that of Sandy Grant.

a Winter feed and feed contributions

R. Smith. East of Scotland College of Agriculture.

A 25 ton/acre swede crop is equivalent in energy to a 50 cwt/acre barley crop but is more easily achieved. Good quality hay or silage could be £40/acre more valuable than poor quality conservation crops in saving concentrates. A plea was made for stock bred to make better use of such bulky feed.

b Root crops and brassicae

M. Kay. Rowett Research Institute, Aberdeen.

Recent developments have reduced costs of growing these crops. Root crops (swedes, fodder beet or mangolds) have high 'D' values and the crude protein content is similar to that of barley. The brassicae leaf crops (kales, rape, cabbage) have lower D values but energy and crude protein contents are similar to young grass.

Root crops can replace $\frac{1}{3}$ barley without loss of intake or liveweight gain. The leafy brassicae are useful for extending the grazing season when grass quality and quantity are low. To avoid troubles such as anaemia, no more than $\frac{1}{3}$ of the ration should be brassicae. Goitre can be avoided by feeding iodine.

c Forage maize

J. M. Wilkinson and T. E. Williams. G. R. I., Hurley.

Early maturing varieties now make it possible to harvest maize every year in South and East of England but yields are still unpredictable because the crop is sensitive to seasonal changes in temperature. The advantages of forage maize are the possibility of a high yield at high D value. This becomes possible because unlike most crops 'D' value remains high as the crop matures. Unfortunately, we lie in a zone where the high yield does not develop.

d The role of conserved grass

R. D. Baker. G.R.I., Hurley.

To sustain high growth rates and high livestock output per acre, grazing must be integrated with a good conservation system such as silage or barn dried hay which are independent of weather.

High quality is essential and this is achieved by cutting earlier than customarily practised. Every weeks delay in cutting loses 3 to 4 D units with little change in overall yield of digestible nutrients. Each weeks delay will result in a reduction in liveweight gain of 0.1 kg LWG (liveweight gain)/day.

Wilting reduces the amount of Water Soluble Carbohydrates wasted in fermentation. Additives will help in this matter.

e The economies of winter feeding for beef production.

R. A. Powell. I.C.I.

Feed accounts for 80% of variable costs of beef production and winter feed 75% of feed costs. Economies in winter feeding will have a considerable effect on margins.

Feeding more barley will reduce requirement for silage and increase rate of gain. This will itself reduce the time to slaughter weight and the quantity of silage needed.

Every extra 0.2 lb/day gain will reduce silage requirement by 1 ton/head. The most important measures are a) to increase yield and quality of silage, b) to increase substitution of low cost for high cost energy feed and c) careful choice of cattle suitable to the production system.

f Productivity of tetraploid red clover

Dr. John Frame. The West of Scotland Agricultural College.

The best tetraploid varieties - Hungaropoly, Norseman, Tetri, averaged 4-4½ tons DM/acre (= 10½ to 11½ tonnes/hectare), at average of 62D and 18% crude protein.

The main requirements for a good crop are a fine tilth of recently limed soil (pH 6 to 6.5), sowing between April and July at 12 lb/acre with medium late or late varieties of perennial ryegrass at 6 lb/acre. No advantage has been shown from using N fertilizer. It is very likely to reduce markedly the vigour of the clover. At least 60 units P_2O_5 and 180 units K_2O/acre will be used by the crop.

This could come partly from fertilizer and partly from slurry.

g The nutritive value of red clover and perennial ryegrass harvested in the autumn

D. J. Thomson. G.R.I., Hurley.

It is generally accepted that the feeding value of autumn grass is lower than material of similar digestibility harvested in spring.

An experiment compared dried, ground, pelletted ryegrass and red clover crops harvested in the autumn. They were fed to young growing lambs. Red clover was utilised more efficiently than ryegrass at all rates of uptake. Red clover produced 24% more carcase weight gain than ryegrass for similar intakes of DM.

h Improvement of bracken infested land

P. A. Dover. ADAS, Lancashire.

40% of rough grazing and 60% of common land in the Furness area of Lancashire is infested with bracken. Asulam at 3 lb and 4 lb (active ingredient) per acre achieved 98% reduction but 1 and 2 lb were less satisfactory in 1971 and 1972. Results were not so good in 1973. Follow up treatments are important, otherwise there is rapid regeneration.

Fertilizer, especially N, heavy stocking, application of lime and phosphate and winter foddering all help to establish a vigorous sward to replace the bracken. Difficulties experienced in such follow up treatment may be solved by the development of extra low volume sprayers.