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SOUTH WEST SCOTLAND GRASSLAND SOCIETY

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GREENSWARD

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EDITORIAL

Cutting our coat according to our cloth . . .

Printing costs have risen so steeply this last year that it has been necessary to reduce the number of pages in the journal by 16, leaving out the section on Research Reviews, and deferring publication of a report of one of our winter meetings and three articles submitted for publication by members.

I am grateful for the help given by our advertisers in the last few years but we have reached the stage when a drastic operation is necessary.

The next number will need to be substantially smaller and revert to printing by offset litho as were Nos. 1-7 and include no adverts or it can continue as a printed journal of fewer pages with the help of advertisers prepared to pay substantially higher fees than the current £20 per page.

This same problem is striking every aspect of our existence and certainly creating havoc with hitherto acceptable techniques of livestock husbandry.

Grass and grass products have assumed great importance as replacements for more expensive feeds. Throughout this issue there is emphasis on the extreme importance of high quality silage as a means of replacing grain and concentrates. Although grass and grass products are relatively less expensive, their cost is also rising and cannot be ignored. To keep smiling, we must cut the costs of grass growing by paying more attention to the kind of grass mixture used, bring in the clovers into our grazing and conservation plans and by limiting the use of N, P and K to the amounts which can be met by increased livestock output. — I. V. HUNT.

1. DAY TOUR TO KIRKCUDBRIGHTSHIRE

Visit by the Central Scotland Grassland Society
Tuesday, 14th May, 1974.

The programme was arranged so that intensive beef production and dairying could be looked at together with unusual systems of housing.

Beef production was the theme of the morning visit and our members were most fortunate in being able to hear Mr J. Kingan and see his system at West Preston, Kirkbean, Dumfries. The cattle for fattening are from a commercial herd at Lochill and are basically (Ayrshire x Beef Shorthorn) x Angus Bull. Approximately 400 are reared on high level slats having 7′ 9″ clearance below for slurry accumulation. Once empty, a vacuum tanker is used to draw off the liquid slurry and a tractor loader then copes with the solid material. Three Howard Rotaspreaders with one man loading can clear the building within four days. The grass is chain harrowed following spreading within 3 days and grazing can commence about 14 days later.

Cattle come into the shed at approximately 7 cwts and are fed to appetite on silage and barley supplementation at the rate of 1 lb per head per day for each live cwt.

The silage is made with a precision chop machine, on the wilted crop, which makes silage loading and buckrake filling of the silo very much easier. No additives are used.

Mr Kingan expressed the view that conditions for cattle on slats never seemed quite right due to unseen air currents. Over the previous three years, only two animals had been taken out for health reasons. Black and white cattle do not do as well under this system as the Cross Angus.

Turning to the land, this ranged from fairly stiff to gravel then to running sand. Drainage and land improvement have been a very important aspect in the development of the farm. Fertility has been difficult to build up, particularly on the sandy soil, and to this end cocksfoot has been widely used. A most interesting aspect of land improvement was the technique in draining running sand.

Drains once laid, had the top half covered with polythene which was in turn covered with straw prior to back filling. Silt boxes had to be positioned every 50 yards and these have to be cleared twice a year.

Fertilizers used generally contained relatively high levels of P and K for the sand soils e.g. Fisons extra P.K. 15-15-22, though for the heavier land 20-10-10 compounds are used.

Direct nitrogen was tried during the spring of 1974 on some of the lighter land though probably due to dry conditions fairly severe scorch was observed.

Dairying took over the afternoon and we were most fortunate to visit the farms of Capt. J. B. Blackett at Arbigland, Kirkbean, Dumfries. Messrs R. Carver and W. Cameron were our hosts.

The cows, pedigree Ayrshire, were cubicle housed in modified Masstock buildings. Each unit consisted of approximately 160 cows with the cubicles placed in series at right angles to the feeding passage. This particular layout gave the maximum number of cow placings per building. Some concern was expressed over cow comfort particularly regarding draughts.

Anhydrous ammonia was extensively used over the seven farms on the estate. Much of the grassland received 280 units of N this way, around the middle of March. Much of the P and K was applied as slurry and all fields were analysed every four years. Deficiencies showing then were corrected with either basic slag or muriate of potash. A special 0-20-20 compound was also bought to complement the anhydrous ammonia.

Silage making was of particular interest to our members.

Stress was laid on the importance of rolling all silage ground, a 4 ton Kidd roller being used. Much of the silage acreage was cut three times a year, the aim being to achieve in excess of 14 tons of made silage per acre. Precision chop forage harvesters were used to deal with the wilted crop and Add F was applied. Grass swards were not of the single species type and in fact contained a range of ryegrasses including Premo, Barlenna, and S23 and others together with Scots and Canadian timothy plus white clover.

Much of the grass acreage was sown out under an arable silage crop which was grown for beef cattle and consisted of oats, barley and peas cut at the end of June.

Following a walk round part of the estate, the cow handling and milking installations were inspected. Prior to taking our leave a beef unit on another part of the estate was inspected. Here again the cattle were housed in Masstock units, silage fed from an incredibly large open silo.

2. KIRKTON

Visit by the Central Scotland Grassland Society
Tuesday, 6th August, 1974.

This was a most enjoyable afternoon visit to the Hill Farms of the West of Scotland Agricultural College.

Alan Higginson, who was at that time the College's Hill Farming Adviser, welcomed our members. He described the aims of present and future policy in the development of the farms during a farm walk (Harry McClelland has since been appointed Hill Farming Adviser).

The farms were taken over in November, 1969, in order to

examine the practicality and financial implications of farming systems based on new ideas and knowledge in hill farming. Most developments capable of improving the financial position of hill farming depend upon the controlled use of improved land to bring about significant nutritional changes in the sheep stock. It is realised that, especially in the Highlands, problems of scale and access make application of these principles difficult and often impossible. Consequently, the greater part of these holdings (Auchtertyre — Kirkton Glen) is being farmed on the assumption that improvement must be sought within the relatively uncontrolled environment of the typical Highland farm. However, one complete hirsel, together with a portion of the lower ground, has been enclosed to give a holding (Kirkton Face) capable of stricter grazing control.

KIRKTON FACE

The Kirkton Face comprises approximately 1,000 acres within a ring fence rising from 600 ft. to 2,200 ft. above sea level, and with an average annual rainfall in the region of 100 inches. This area includes 200 acres of fenced and improvable rough grazing, and 50 acres of arable land which is unfortunately liable to flooding. The farm traditionally carried 380 breeding ewes, lambing about 70%, and 20 outwintered spring calving cows. The holding is too small to benefit from the advantages of a low cost, extensification programme, and therefore intensification offers the most likely method of improving profitability.

Land Improvement. Since 1970 most of the 200 acres of enclosed marginal land has been improved by the use of lime and slag, by spraying rushes and docks, and by the continued maintenance of existing drainage systems. Some of the better land is receiving annual dressings of low nitrogen, high phosphorus compound fertilizers. The hill itself is not accessible to normal improvement methods, but in February 1973 two blocks of 50 acres were top dressed with 4½ cwt. of 29½% Gafsa phosphate per acre, by helicopter.

Sheep. Since 1970, ewe numbers have been increased to 570, lambing at 100%. In building up ewe numbers, use has been made of the nutritional principles researched by the H.F.R.O. The improved land is retained for the ewe stock during tupping time and again for as many as possible of the producing ewes during the lactation period. Hoggs, eild ewes and ewes with ewe lambs summer on the hill, and the entire ewe stock runs on the hill between weaning and tupping. Self-help feed blocks are offered on the hill during winter, and leaner ewes are progressively drawn on to lower ground for more intensive feeding. By this combination of grazing changes and supplementary feeding, the body condition — and therefore the performance — of the ewe stock is kept at a

fairly high level, in spite of the considerable increase in stocking rate.

Early success selling Blackface wether lambs fat off the ewe after lactating on improved land has led to a policy of tupping approximately one third of the stock — mainly the less desirable types of ewe — with North Country Cheviot rams. All these ewes lactate on the improved land, together with Blackface twins, and a proportion of the ewes with single Blackface wether lambs. Most of these lambs continue to go fat off the ewe in August. Although the flock replacement potential is being reduced by this crossing programme, quality is being maintained by breeding replacements from the better type of ewe only — and also by retaining all the best older ewes for pure breeding beyond the traditional casting age (i.e. 5 shear).

Cattle. An increase in cow numbers to 45 has been mainly accomplished by the purchase of 22 Hereford cross Friesian heifers. This choice of cow, together with the use of a North Devon bull, is an attempt to investigate the economic practicability of producing faster growing calves within the Kirkton environment. Since spring calving would be directly competitive with the sheep policy in its requirement for early summer grazing — and since autumn calving would be very demanding of expensive purchased winter feed — a policy of July/August calving has been chosen. Cows calve on the hill and are brought on to the improved land for September-October-November grazing. The herd is housed from late November until late May in existing buildings which have been converted to cubicle housing. Supplementary feeding of the cows can be cheapened from early January, with concentrates going directly to the calves. Calves are weaned in February-March and can be sold during spring or early summer, with smaller types being retained on improved grazing until the autumn. Cows are turned out to the hill at the end of May where they remain until after they have calved. Although fairly demanding of winter feed, this is proving to be a very flexible system — fitting well with the sheep policy and offering valuable alternatives to autumn marketing.

Labour and Mechanisation. The farm supports two men, and 'neighbouring' takes place with the Auchtertyre unit. Mechanisation is kept to a minimum and all winter feed, both concentrates and roughages, is purchased. This not only avoids over-capitalisation, but allows stock numbers to be kept at a higher level than would be possible with a policy of self-sufficiency.

AUCHTERTYRE — KIRKTON GLEN

Auchtertyre — Kirkton Glen comprises 5,000 acres of unfenced hills, rising to 2,900 ft. on Ben Odhar, 2,600 ft. on Ben Chaorach, 2,900 ft. on Cam-a-creag and 3,350 ft. on Ben Challum. This area

includes a series of unimproved hill parks totalling 400 acres, approximately 40 acres of enclosed improvable land above Tyndrum village, and 50 acres of arable land at 600 ft. above sea level at Auchtertyre farm. The unit is typical of many Highland farms where economic trends in the 1960's encouraged increasing cost control and extensification. Although this trend is probably inevitable, it can have an adverse effect on standards of management and social conditions if it is taken to extremes. The Auchtertyre—Kirkton Glen unit is being farmed extensively but it is hoped to achieve sufficiently high standards of management and performance to justify being well staffed.

Sheep. A total sheep stock of 1,800 ewes run in 6 hefts, each of which can be gathered and worked separately — mostly within a day. All except two hefts are tupped on the hill. However, the Cam-a-creag heft is tupped in parks because of its remoteness. The Corrie heft is tupped in improved parks in an attempt to promote heavier lamb crops, since these same improved parks (Tigh-an-Eas) are convenient for summering twins, and also for providing improved wintering facilities. Leaner ewes from all hefts are drawn on to enclosed land for supplementary feeding during winter — but no other ewes are fed. All ewes, except those being fed on enclosed ground, are lambed on the hill. All ewe hoggs are wintered away. All wether lambs are sold store. Ewes are mainly cast at 5 shear.

Early experience indicated that more compact ewes with shorter fleeces suited the farm best, and consequently rams of the Newton Stewart type are being used throughout. In an attempt to further increase foraging and mothering ability, limited use of Swaledale rams is being made on both the Corrie and Ben Challum hefts. Newton Stewart rams are being used on the first cross ewes. The ewe stock is culled for eildness, difficulty at lambing, and undue need for winter supplementation. This breeding policy is aimed at producing a well adapted stock, capable of acceptable levels of performance without unnecessary attention, so that skilled shepherding can be put to best use.

Cattle. The original herd of cross Highland cows was increased to 40 cows by purchase. A Luing bull — " Luing Cardinal " was used, and his first cross heifers are calving to " Luing Carpenter " this year (1974). The herd is outwintered, calves mainly in March, and summers on the hill. Stott calves are sold in September-October. All suitable heifer calves are retained for breeding, with any surplus being sold at the bulling age.

Land Improvement. The arable land at Auchtertyre has been improved by slagging, and by spraying rushes. Approximately 40 acres of marginal land at Tigh-an-Eas have also been improved by

slagging, and are used mainly by the Corrie heft, and by breeding heifers during summer.

Labour and Mechanisation. The unit supports two men, with neighbouring help from Kirkton. Again, mechanisation is kept to a minimum and all winter feed is purchased.

3. CONSERVATION MACHINERY

Principal Speaker : R. McD. Graham,
School of Farm Mechanisation, Massey-Ferguson (U.K.) Ltd., Stoneleigh, Warwickshire.

Panel : Bob Graham (B.G.), Bill Davidson, College Office, Paisley (B.D.), Alistair Kerr (A.K.), John McIver, College Office, Dumfries (J.McI.), Alistair Campbell, College Office, Ayr (Chairman).

A meeting arranged by the South-West Scotland Grassland Society at the Belleisle House Hotel, Ayr, on 14th November, 1974.

Bob Graham, a speaker with wide experience in Scotland, England and overseas stressed the importance of self sufficiency in meeting the present difficulties in livestock feeding. The key to self sufficiency is efficient conservation of grass.

The world's supply of grain for human and animal feed is in short supply. North America, which can be termed the world's granary and accounts for the production of 23% of world grain including rice, had hoped that 1974 would have been a bountiful one to top up the empty warehouses. Instead, a shortfall of 10-15% is forecast. Soya bean, the principle form of vegetable protein is in a worse situation. North America produces 75% of the world's supply of soya and forecasts a 15% drop in yield. In view of this, we must be more self-sufficient and more efficient with it.

Grass conservation must form part of a farming system. It is not a system in itself but must be properly integrated to suit local conditions.

Of all farm enterprises, grass conservation is the most wasteful. Maybe the attitude still exists that grass does not really matter because it's more or less a free gift, but far from it. It is estimated that in hay making, 30% of the feed value of the original grass is lost before feeding to the animal and this in the United Kingdom is equivalent to 1.8 million acres per year. Silage making also has its losses but these are probably half those of average haymaking.

Much, however, can be done to improve this situation by grassland management. Of supreme importance in conservation is the timing of harvesting to get maximum quality combined with careful handling of the product in order to minimise physical loss and losses through primary or secondary fermentation.

Let us consider in turn the machinery involved.

1. **Mowing.**

The ideal mower for hay or silage is often a different machine, for the best swath in haymaking should be wide and open while for silage making it should be easy to pick up. Almost always, the same machine has to be used for both operations and the choice lies between the older cutterbar type with its modern developments and the rotary mower whether drum or disc type with its developments. Each has disadvantages as well as advantages. At present, many farmers are turning towards the rotary mower.

Various forms of rotary mowers are available including top and bottom drive types, but all are fast, reliable and will cut a swath close to the ground. They do, however, require higher power (6 horse-power per 1 ft. width of cut).

The cutterbar type has the basic advantage of low cost and low tractor requirement (0.7 horse-power per 1 ft. width), but they have the disadvantage of slow forward speed. In dense closely mown swaths, blockages can be frequent. Stones on the surface can also be a problem.

The cutterbar mower is not disappearing from the scene. Developments are taking place to overcome its disadvantages. It still has a commercial future. Nearly 2,000 are required in the United Kingdom each year for farms too small to carry a high powered tractor and where cost is a limiting factor. The rotary mower is about three times the cost of the cutterbar version.

2. **Conditioners.**

These are basically required to increase the speed of drying for hay or wilting for silage. Many machines and methods have come and gone, tedders, flail mowers, roller crushers, crimpers, and even flail forage harvesters. All had advantages and disadvantages and after a period of being fashionable they were discarded.

The importance of conditioners is illustrated by the results of tests to measure rates of drying with different combinations of mower and conditioner. A flail mower followed by tedding had the best drying rate. A crop of hay was satisfactorily baled on the third day after cutting. The other treatments consisting of various mowers and conditioners would have taken another 24 hours to reach the same state. As it rained on the evening of the third day, baling was delayed until the fifth day. Good though the flail mower undoubtedly is, it has the severe disadvantages of high power requirement (up to 10 horse-power per 1 ft.), slow rate of work, problems in laid crops and the danger of very short chopping or double chopping which can be undesirable in haymaking.

3. **Forage Harvesters.**

There are four main categories of these — flail, double chop, precision chop and the self-propelled type which is also precision chop. They represent the change in design and demand over the last twenty years from simple to complex and from relatively low to undoubtedly high price. All do a good job where they are used for the purpose for which they were intended but the right machine depends on type of storage silo or bunker, the method of feeding and the dry matter content to be achieved.

The flail forager. This is more robust than the others, tends to pick up soil and stones and to scalp the ground and thereby delay regrowth of grass. It produces long material (6-12 ins.) which is rather difficult to feed out, unsuitable for mechanical feeding and not ideally suited for self-feeding.

The double chop machine. It produces a much more uniform material (3-6 ins.) which is quite satisfactory for self feeding, is easier to handle but the machine picks up soil and stones where the grass has been wilted. At present, double chop machines are being replaced by precision chops.

Precision chop machines. The length is further reduced to $\frac{3}{4}$-2 ins. with very even length. They are machines with very high potential output especially where they are of the 'cut and blow' type in which the chopped material is passed to a fan to blow into the trailer. The cheaper 'cut and throw' type depends on the inertia of the cutting cylinder to throw the grass up the chute.

The material from the precision chop machine is ideal for mechanical handling and is essential if stored in a tower silo. Stones are easily picked up and the cutting mechanism can suffer severe damage. The shorter crop increases the capacity of trailer and raises the efficiency of transport between field and silo.

For example — a 500 cu. ft. trailer (a 5 tonner) would carry the following amounts of herbage to the silo. Flail mower — 42 cwt. wet = 13 cwt. dry. Double chop (3-6 ins.) — 63 cwt. wet = 19 cwt. dry. Precision chop (1 in.) — 70 cwt. wet = 21 cwt. dry.

4. **Work Organisation.**

The big problem with silage making is to deal with a large bulk of material in the short time during which quality remains high. The only way to organise satisfactory combination of field plus transport plus silo equipment is to study each phase closely to isolate the weakest point and to make modifications accordingly.

A good illustration was on a Berkshire farm with 1,200

tons of silage to be made in 12 days, i.e. a hundred tons per day. The equipment included one 75 horse-power tractor, a precision chop harvester and two 4½ ton trailers. This could not reach a hundred tons per day and it was proposed to increase the power of the tractor. Certainly this would speed up the field work, but after some careful work study the weakest link was shown to be the transport over 1½ miles from field to silo.

The result was that the problem was solved by spending £600 on one extra trailer rather than several thousand pounds on a new high horse-power tractor.

Bob Graham concluded his talk by making brief comments on other methods of conserving grass, namely barn hay drying, the heat treatment or chemical treatment of standing crops prior to harvesting and the pelleting, cubing and wafering of dry material.

The Panel

Q.1: Machines are getting more and more expensive. What can be done to reduce breakdowns which can be disastrous to the machine and to the conservation programme ?

B.G.: Breakdowns are inherent in present design, alternative chopping systems are being sought. Massey Ferguson are very near to marketing a very robust harvester but there is a limit beyond which one cannot expect to avoid breakdowns. It is not merely a question of stones but bedsteads.

A.K.: So far we have been lucky. Avoiding action is important and a specially heavy roller is used. What are the possibilities of mine detectors to pick out hazards in the path of the FH.

J.McI: The mine detector would only be a part solution. It would not protect a harvester if the tractor pulling it dropped its exhaust pipe.

B.D.: There is no easy answer. The Clyde region is particularly prone to dumped rubbish, both metal and glass. An enterprising solution is to take out insurance and make use of a standby service such as is provided by some dealers.

J.McI.: I believe more could be done by safety hitches and also by deliberately putting in weak points to protect vulnerable machinery just as you would use fuse wire in an electrical system.

B.D.: I believe John Deere have a machine developing in France that is tested by feeding chain to it. Before being too enamoured of the weak link idea, I have noted tremendous secondary damage due to broken off pieces of metal flying through the rest of the machine.

Chairman: In Kilmarnock, the biggest hazards are not bedsteads or washing machines but courting couples !

Q.2: Heavy rolling is recommended for all who use a P/C machine. Does this not damage the sward ?

B.G.: No. For it is not necessary to buy especially heavy rollers. They must be used at the right time. I know of the successful use of a section of steel chimney with an axle and filled with concrete.

A.K.: We use an ordinary roll but choose our time for rolling. The ground should be just wet enough to allow stones to be pressed in, but not too wet.

Q.3: Why the interest in cutter bar mowers. Surely these are right out. Although at 2000/year they represent 20% of the market they are a much smaller proportion of the total value of sales, and of the total value of the product finished silage. Why encourage basically inefficient farmers ?

B.G.: The market is the demand and if 2,000 farmers want a cutter bar system, then we must develop it to eliminate some of its faults. One of the main reasons why it is still needed is because that size of farmer does not have the tractor power for a rotary mower. Nothing would be more irresponsible than persuading such farmers to hitch a rotary mower onto a low power tractor. To cope, they would have to drop down a gear and lose the advantage of speed and lose some of their herbage.

Comment: Rotary mowers are not favoured in Canada because they cause too much leaf shattering.

Q.4: Scalping of swards was mentioned, especially by the older type Flail mower, but the newer machines can also scalp a sward when set to cut closely. What can be done to level our swards at sowing time ?

Replies came from all corners. Moving soil about could be expensive but the Cumberland scrubber could be used with advantage (half a dozen sleepers set on their corners clamped across the top and drawn across the soil). Use of reversible worst dips.

Q.5: Must we pay out vast sums of money to make good silage ? I recall excellent silage made long before we had forage harvesters.

J.McI.: Good silage can be made with the most primitive equipment provided the herbage is cut at the right date, consolidated in the silo and covered with a polythene sheet.

B.G.: The expensive machinery comes into its own for the man with a large quantity to be made and fed. The choice is machinery or men. At present, 40% of harvesters sold are PC and the proportion is increasing.

A.K.: We have made good quality silage with green crop loaders, then the Taarup and now the Precision chop. We do not make bad silage, but it could be mediocre. In contrast, we used to make some fairly bad hay.

Q.6: Why a Precision chopper ?

J.McI.: It is not essential. The usual reason given is to secure a bigger throughput, but this has not been proved. In our Dumfriesshire Survey, the top throughput rate was obtained with a Ford 4000 plus a Flail harvester.

B.D.: In our tests, a small tractor and a JF registered a very high throughput. It is very easily and cheaply maintained and furthermore one could keep a second outfit in reserve.

B.G.: The decision must be made on the basis of the type of finished product required. The tower man **must** use a PC to facilitate unloading.

A.K.: The PC is a must for the tower set-up. We must get our silage in within the time allocated. The value of the PC will be seen from our past experience.

The green crop loader dealt with silage for 50 cows in 10 days
The Taarup FH .... 80 cows in 14 days
The PC ... ... 200 cows in 21 days

This is a measure of increased productivity — per acre and per unit of labour.

Comment: My own choice was between changing to a PC or using an additive.With a Double chop, I found I was losing a lot of feed value by secondary fermentation at the face. This could be cured either by using an additive or changing my machine to the PC. I chose the additive, but with the high cost of the additive, I am beginning to doubt my choice.

Q.7: Pick-up forage wagons appear to be popular in Germany. What is the panel's experience ;

B.G.: In Germany, they are to be found even on the 50 acre farm. Capital cost is too high for the British farm. They are essentially single purpose machines whereas a British farmer likes a muli-purpose machine.

Q.8: What is the panel's experience of " Big Balers " for hay making ?

B.D.: There are many types producing round or square bales. Some of the square bales are built-up of several bundles. In general, they are less dense than normal bales so that they do not suffer so much if baled too soon. The problems are not so much at the baling-end as at the unloading and feeding end. To feed indoors, there must be access for tractor and off-loader.

Full development awaits a really good hay additive. There is an outfit working in Bute. You don't just buy a big baler, you must re-design your system to accommodate the big baler.

Q.9-20: The discussion moved rapidly among the number of recent and not so recent innovations — the silage sausage of Germany — dried grass after the juice had been expressed — the hay tower — deep freeze grass, etc.

4. LARGE SCALE DAIRYING OF RECLAIMED LAND

Robin Baker

Givendale Head, Snainton, Scarborough, Yorkshire.

A talk given after the SWSGS Annual General Meeting at the Embassy Hotel, Hewbridge, Dumfries, 28th November, 1974. Mr Baker's farm was visited by the British Grassland Society last summer.

Mr Baker presented his talk as comments to a series of slides which illustrated the type of land on which he farmed, his methods of improvement and management and some of his experiences, good and bad. His talk is summarised below:—

Total acreage. 1500 acres at 700 to 900 ft. in an isolated part of Yorkshire, partly owned and partly rented from the National Trust. The farm began as a piece of cold bleak unwanted heather-covered peat on impervious clay bought for £23 per acre. It has been improved and added to until there are now 1,100 acres of tolerable grass, partly improved moorland used for grazing and partly improved inbye land used for producing winter fodder. 400 acres of heather moor remain untouched by agreement with the National Trust.

Stock. 460 dairy cows are kept in two herds of 230 calving autumn to February plus followers. They have developed from an initial stock of Ayrshire but are now Friesians.

Reclamation. The soil is extremely acid with a pH of 3.5 to 4. It has a skin of 3-4″ peat with some gulleys with up to 10′ peat. Below the peat there is 2-3″ gravel and then tough yellowish clay plus stones.

Deep ploughing to about 22″ turns down the peat and gravel and breaks through and exposes some of the clay. A crawler tractor is essential at this stage but the seed bed can be worked down with a wheeled tractor.

With a pH of 3.5, heavy liming is essential. 6 tons/lime per acre given for the sow-out is followed up with 2 tons in each of the next 2 years. Slag, superphosphate or GMP is applied to the seed bed. Thereafter, a 20:10:10 compound is used to keep up growth.

Most of the reclaimed land has been sown to modified Cockle Park mixtures using the most persistent varieties, e.g. S143 Cocksfoot and S23 or Melle perennial ryegrass, No Italian ryegrass is sown and no pioneer crop is used because it is considered essential to reach the long term status of the ley as rapidly as possible.

Grazing Management. These improved areas carry the 2 dairy herds plus followers on a loose rotational system at just over ½ acre per cow through the summer which starts in mid-April and continues as long as possible into November. No grass is wasted.

The cows are kept on a grass field until it is eaten down and not shifted regularly whether or not they bellow or the yield drops.

The grass was formerly topped after grazing but latterly it has been topped before grazing. This follows on a tip picked up on travels. Normally cows will graze a field unevenly — over-grazing patches and leaving ungrazed roughage which is ripe for topping. Topping after grazing tidies the field up but does nothing to compensate for the overgrazing suffered by some patches. Topping before grazing wilts the toppings, takes away dung taint which prevent clean grazing and results in more uniform utilisation of the sward.

Seed bed preparation and consolidation before and after sowing are essential.

Latterly, a Roto-caster has been purchased, which makes this job particularly easy. It has proved a very sturdy machine and is now used for all sowing on hill and inbye land.

Why dairy cows? Reclamation of hill land would normally be associated with sheep or hill cattle. The land is eligible for the hill cow subsidy. However, only dairy cows could produce the rapid return on capital which was essential. For the same reason, namely the need for a speedy return, no pioneer crops were used because they mean having to wait a year for the firm-standing improved grazing required for all-summer grazing.

Conservation. All the conservation swards are on former inbye land. The main winter feed is silage. At one time, bulky peas and oats were grown as a cover crop; latterly, barley or even oats have been sown at fairly low seed rates as cover crops to early, intermediate or late seed mixtures sown with the rotocaster.

Seed mixtures.

Early. S24 or Cropper perennial ryegrass plus some tetraploid perennial ryegrass; S37 cocksfoot; Blanca white clover.

Intermediate. Hora perennial ryegrass; S143 cocksfoot; Omnia timothy; Blanca white clover.

Late. Melle perennial ryegrass; Pecora timothy; Blanca white clover.

Nitrogen is applied generously for the first crop. Formerly 100 units/acre was used but as part of an economy measure this is now cut back to 80. Late dressings will be less and total about 150 to 200 units/acre for 2-3 cuts of silage.

Blanca white clover is reputed to stand up to these high dressings of fertilizer nitrogen. P and K are applied at 80 units/acre over the year.

As part of his philosophy of seeking the most economical policy, a flail forage harvester is used and makes very good silage. 4,500 tons of silage must be made in about 3 operating weeks which means handling 200 tons of wilted silage from about 40 acres per working day.

Four seasons ago, trouble arrived. The silage had a pH of 3.6 This was unusually acid, reduced intake and caused the cows to regurgitate and spit out wads of silage. Eventually, they became very emaciated — because they could not take in enough food. The answer was to correct the acidity of the silage with sodium bicarbonate. For two seasons, no trouble was experienced, but this year silage analyses was again at 3.6 pH and bicarbonate feeding will commence right away. There are many curious aspects to this including what factors or managements are responsible for such a low pH being reached.

Buildings and machinery. For the summer, there are Hosier bales for milking. A portable herring bone milk bale set on a 36′ trailer was moved from herd to herd. In the winter, the cows were in kennels with access to clamp silage.

Mr Baker was fortunate to have the co-operation of local engineers in designing and making up his own parlours to meet problems as they arose. He was very critical of current farm machinery which would not last a season on his type of land. Trailers shook themselves to bits and he was obliged to strengthen them with steel in weak places. Tractors were completely unsuitable to carting the large loads of silage required to handle 200 tons per day. He had found one answer, namely to turn to industrial machinery and found a Weatherall tractor extremely useful. Although it was double the price of an agricultural tractor, it was capable of handling large bulks.

Mr Baker spent 2 years as a herd recorder in New Zealand in his youth and was extremely fortunate to return there with a Nuffield Scholarship. Much of his philosophy derives from the New Zealanders love of improvisation and suspicion of so-called simple rigid systems.

5. FERTILIZER CRISIS

Merchant: Finlay Stalker, SAI Ltd., Scotland.

Farmer: Henry Christie, Monreith Home Farm, Port William, Wigtownshire.

Scientist: I. V. Hunt, The College.

Talk Presented to SWSGS at Culgruff Hotel, Crossmichael 9th January, 1975.

F. Stalker

Potash is in reasonable supply and costs £1 per unit. The new mine in Yorkshire should guarantee UK supplies for many years. Phosphate supplies are tight and a large proportion of trade is controlled by the Arabs. Cost is £3.25 per unit. Nitrogen is in short supply on the world market. Cost is £1.50 per unit in the UK but world price is £3, so the UK farmers are fortunate (These units are not the same as units of fertilizer used for advisory work).

Two situations interact to cause problems in the industry, namely scarcity and price. Five years ago, there was a world surplus of fertilizer and no incentive to invest in new manufacturing plant.

To manufacture nitrogenous fertilizer, nitrogen and hydrogen are combined to give ammonia, this process uses oil for energy and hence the price rise. At present, ICI have a cheap contract with North Sea Gas but no doubt the price of this fuel will rise on renewal of the contract. A new plant costs £50-60 million to construct and can produce 300,000 tons per annum. One new plant in Scotland would adequately supply needs (50-60,000 tons per year) but it takes three years for a new production plant to come into operation. Plants are being built throughout the world and there could be a fall in the world price in the next 3 to 5 years. There is likely to be a rise in the home price until the two balance.

For a number of years, fertilizers commanded a good price in the UK and other countries sold here, but not now that prices are better elsewhere. The mobilisation of the United States land bank has created a home demand for fertilizer that was formerly exported from the U.S.A. The unavailability of imported fertilizers aggravates the short fall here at a time of rising demand.

What can we do about the situation on the farm. Certainly we can cut back but we cannot cut out; around 250-350 units N is probably as far as anyone should go. By and large, the intensively farmed areas still produce the best financial results despite rising costs. The little and often approach to application is the best way. Be careful with unsoluble phosphate — it is alright for hill or wet ground but certainly needs a year in the soil before anything is available. Slurry contains 30 units N, 10 units P_2O_5 and 60 units K_2O per 1,000 galls. in an available form and is clearly a valuable source of plant nutrients. These figures are the nutrients as they leave the cow, but there are several sources of loss before they reach the plant root area.

For the stock farmer, the use of organic manures is well worthwhile and if steps are taken to improve grass utilisation and reduce conservation losses the enterprise should remain viable.

Henry Christie

I would like to present my remarks on fertilizers under three headings (1) Do we use too much fertilizer ? (2) Can we replace purchased fertilizer by dung and slurry (3) Are we buying at competitive prices ?

(1) Are we extravagant ? In many instances this could well be the case. Make use of soil analyses but be careful when cutting back P & K. In intensive grassland, I am sure that we overuse N and economies can be made.

My programme starts with 50 units N/ac at the end of February or early March in order to provide grazing by the 1st April. Nitrogen is applied to all grazing and conservation fields. I am looking for early grass rather than early bite, because once the cows are out on grass. I want them to stay out. Grazing in April is the most profitable part of a winter feeding programme. The cows graze till mid-November and N is applied as late as mid October. This is a long season and 7 or 8 applications of N at 50 units gives around 350-400 per acre. I think I could cut the applications to 40 units each (280-320 units N/season) without seriously upsetting the yield. One thing for sure is that grass from fertilizer is a better bet than buying in concentrates.

(2) Can we replace fertilizer ? Our pigs produce around 30,000 gals. of slurry each day, so we have rather a lot of it ! An irrigation system is used to handle this and cow slurry is handled on conventional lines. Slurry is applied to 500 acres of grass. Fertiliser N and slurry both produce early grass equally well. Where slurry is applied the application of purchased P & K is not necessary and hence for silage after early grazing each field receives slurry plus 100 units N. The ' lumpy ' application of slurry leads to uneven growth but the bag N tends to offset this effect. The second cut receives only N, 100 units/acre, but the third cut receives this level of N plus some compound to supply P & K. Full use is therefore made of the organic manures on the farm and this makes a considerable saving in the purchased fertilizer bill.

(3) How can we buy fertilizers competitively ? There are ways in which this can be done, but with the strong representation from the trade in the audience I would rather not say lest I tip off the fertilizer moguls !

I. V. Hunt

Maybe it was wrong of me to use the word ' crisis ' to describe the present situation regarding fertilizers, but over the past year we have had fantastic price rises and shortages. These price rises coming with rises on other components of farm production and the relatively slow movements of prices obtained for farm products mean that the profitability of farm enterprises has been seriously eroded.

Indeed, some farmers claim that livestock production is running at a loss.

Livestock production is, or should be, a system of converting animal feedstuffs such as grain, oil cake residues, grass into human feed.

Fertilizer cost is part of animal feed costs and has for some time been a particularly important part. Because of economic pressures since the war, livestock feeding has switched from the relatively easily controlled grain/cake feeding to cheaper grass feed. The margin of difference has been so great that relatively expensive fertilizing programmes have been justified to produce higher yields of grass.

If the costs of grass feed creep up and up until they match those of the alternative feeds then we will need to consider ways of reducing the costs of **grass feed.**

There are two ways of doing this in terms of fertilizer.

(a) Use it more effectively; (b) Use legumes. For years the answer to demands for greater intensification of grass production has been to raise levels of fertilizer use.

Generally, this has meant raising levels of N whilst holding P and K constant. The result has been that N use had increased year by year by about 10%. On average, in England and Wales 80 units N, 34 units P_2O_5 and 20 units K_2O is applied to grassland. The figure for Scotland is about 10% less, i.e. we are a year behind the rest of the UK.

During that period, I, and my colleagues at Auchincruive and a few other people such as Malcolm Castle and David Reid of the Hannah and Prof. Wm. Holmes, formerly of the Hannah, have been determining the maximum amounts of fertilizer that can be used (a) to produce grass at any cost.

(b) to produce grass at an acceptable or optimum cost.

To a large extent, present day recommendations regarding fertilizer use are based on the early work of Holmes who demonstrated at the Hannah that the response of grass yield to N was linear up to quite high levels. The phrase used at the time his findings were made popular was " within the ranges of use which could be reasonably anticipated."

Linear response to N is something we will hear much of during the coming year and we should be clear what it is ! What you expect to find is the **law of diminishing returns.**

The law of diminishing returns is that for every additional amount of input or effort you get a reduction in the return or in the effect or in the response.

Apply **100** units N and you increase yield from **2,000 to 5,000** lb/acre.

Apply a second 100 units, i.e. 200 altogether and yield will increase to 6,500 lb/acre at 15 lb/unit of N if the law of diminishing returns operates **or** to 8,000 lb/acre at 30 lb/unit of N if the linear response prevails.

This linear response has been demonstrated to continue up to 300 or 400 units N and then the normally expected law of diminishing returns takes over with a rapid fall off in the effectiveness of N fertilizer.

Compare this with the average use of N in Britain of being 70 or 80 units/acre and you have the reason why emphasis is laid on the gap between 80 and 300 and farmers are urged to push up N levels on grass. I have not time to go into why I think this argument is wrong and must get down to the scientific possibilities of beating the fertilizer crisis.

1. First you must forget about the simple rules which you have been plied with in the past.
2. It would be possible to fully satisfy Britain's needs for livestock products without using any fertilizer N at all merely by applying present scientific knowledge to the use of the legumes such as white clover, red clover, lucerne, birdsfoot trefoil, etc.
3. Some of the practical difficulties associated with legumes could be met by the use of minimal amounts of fertilizer N. That is, we would step back 20 years when rarely more than 50 units N/acre were applied to grass.
4. An important part of the system would be to take advantage of the different growth curves of grass varieties. Instead of using N fertilizer to get early grazing or an early silage cut, use an early ryegrass and immediately save 50 units/acre of N.
5. One of the difficulties would be the change from a current system of high N application to a new situation of minimum N. It cannot be operated suddenly. Deprive a grass ley of N after having applied 100-400 per year and you will get miserable crops. It would be like switching off a kidney machine.

   It is necessary to move into the system by using new sown clovery leys which have not been subjected to N fertilizer.
6. Some grass fields should be set aside for " heavy " use of N. No more than 100 units/acre should be applied in a single dose. If the field has been grazed or slurried, the limit would be 50 units N/acre.
7. After applying the maximum dose of fertilizer N to a crop, the next growth should be taken without a fertilizer dressing. Thus, instead of giving 6 dressings of fertilizer give just 3 and certainly none in September.
8. Total N applied to a grazed field should be kept down to 200 units/acre. The grazing rotation should include clover based fields given no fertilizer N at all and the overall use of N for the grazing herd average 100-150 units.

Discussion

The United States need as much fertilizer for their newly cultivated land bank areas as is produced in one year in the UK.

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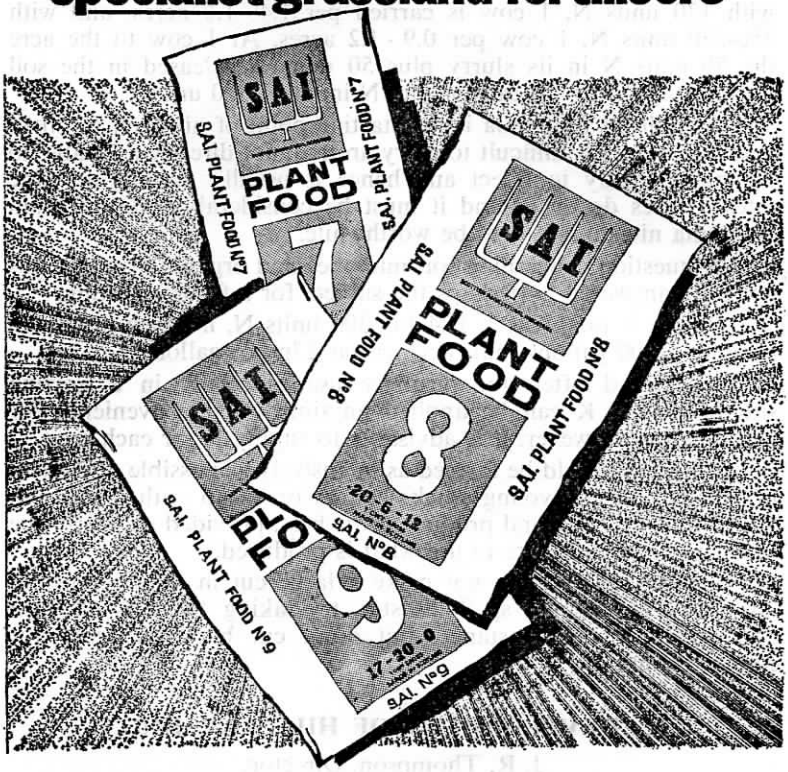

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For Grazing
SAI PLANT FOOD N°7 27:7:5½

For Cutting
SAI PLANT FOOD N°8 20:6:12

For Upland Grazing
SAI PLANT FOOD N°9 17:20:0

For a more profitable grassland programme

Scottish Agricultural Industries

Perfect conditions and clover on its own can fix 300 units N/acre, but with a grass companion this falls to 130 units N. So, with no N a grass/clover sward can carry 1 cow per 1.7 - 2.0 acres: with 120 units N, 1 cow is carried per 1.4 - 1.6 acres, and with 250-350 units N, 1 cow per 0.9 - 1.2 acres. At 1 cow to the acre the 50 units N in its slurry plus 50 units N released in the soil plus 270 applied N, means a total N input of 370 units.

Anhydrous ammonia is the starting point of nitrogen fertilizer manufacture. It is difficult to carry around, not directly available to the plant, costly to inject and hence is usually applied at large rates. Losses do occur and it must be considerably cheaper than ammonia nitrate if it is to be worthwhile.

A question concerning soil microbes and organic manures was not fully answered — perhaps the subject for a future meeting.

Where is the crisis ?; £24 for 300 units N, if wisely used can produce 1,000 gallons milk per acre at 27p per gallon.

Little and often for fertilizer use especially in a grazing situation. P & K can be applied anytime when convenient. For conservation, however, it is advisable to supply K for each crop.

All grass should be farmed as intensively as possible regardless of whether its for young stock, heifers or sheep — the land and sward must be used and produce of its best, provided of course the stock numbers are there to use what is produced.

Final warning — do not make a large cut in fertilizer use in one year. This would spell disaster, try taking 10 units off each grazing in the first instance, but don't cut back on crops for conservation.

6. DEVELOPMENT OF HILL FARMING

J. R. Thompson, Director,
Redesdale Experimental Husbandry Farm,
Otterburn, Northumberland.

A talk given to SWSGS at Newton Stewart, 23rd January, 1975.

Mr Thompson described the achievements at this Experimental Farm since it was leased in 1967.

It totals 3,800 acres of which 220 acres are inbye land. The whole lies in a ring fence. On entry in 1967, it was a traditional Northumberland hill carrying Scottish Blackface sheep and producing Galloway x Cumberland Shorthorn stores sold in the autumn. Stock were of good class but kept at the low numbers which the area could maintain over winter.

During the last few years grass production has been increased and quality improved. Matching this there has been a remarkable increase in stock numbers, stock performance and income.

Table 1. Sheep income. Redesdale E.H.F.

	Total income (£)	Distribution of Income (%) Fat lamb	Hill Sheep Subsidy	Wool	Draft ewes
1969/70	9,411	53	25	14	8
1970/71	14,133	63	23	11	3
1971/72	19,589	65	18	11	6
1972/73	24,514	68	15	9	8
1973/74	30,328	72	13	8	7

This is a remarkable achievement. Some of the increase is due to inflation. The lamb income has been the major source and this has developed so strongly that reliance on the subsidy is small and the unit is now not so vulnerable to changes in Government policy on subsidies.

A major investigation has been into the factors affecting income from lambs, in particular those affecting number of lambs per ewe, number of weaned lambs and weight of lamb.

Most of the increase in income from sheep has come from the achieving of targets set for each of these.

Land potential

This is an important factor easily shown by the results attained from different parts of the Redesdale Estate.

Effect of land potential

Area	acres per lamb	lamb %	Lamb weaning weight (lb)	output lb lamb/acre
a. (Top windburn)	2.0	101	57.5	27.8
b. (Top edge)	1.8	118	63.1	37.7
c. (Front)	1.4	119	58.8	48.9
d. (Ash trees)	1.2	110	69.0	56.9
e. (Dipper)	1.25	103	65.8	53.8
f. (Pastures)	1.1	140	62.7	73.2

Area (a) is not improved; (b) has had some drainage; (c) and (e) include a winter housing experiment; (f) area with some 60 acres of improved grassland.

Dargue Hope on the Dipper (e) above, is typical. The vegetation is of Molinia (Blow grass) and on entry carried 450 ewes at 1 ewe/2 acres. The target set was 1000 ewes with 100% lambing and weaning weights of 68 lb. Land improvement was essential.

90 acres were fenced and grazed over with 97 cattle. They picked off the rough grass. The area was limed and slagged and topped with an old forage harvester. Ryegrass and white clover cleanings were sown after no cultivations at all. Because the surface was fairly open and wet, there was an excellent establishment. This was threatened by a catastrophic attack from 4 million

leather jackets/acre but the sward recovered and is now as good as any sward anywhere, although it is still rather wet.

At entry, lambing percentage was restricted by avoiding twins. With land improvement, the ewes can be allowed to develop their full potential. In 1968/69, stock carry consisted of 155 ewes, 44 hoggs with 73% lambing. The weaning weight was 60 lb./head with a total lamb output of 6789 lb. By 1974, numbers were 285 ewes, 80 hoggs, 107% lambing with weaning weights of 77 lb. and a total output of 24900 lb. lamb. Over the whole of this area of 1521 acres, the output of lamb has gone up from 24403 lb. to 65470 lb. This is equivalent to a total increase in income of £4000 per year for an initial investment on fences, lime, slag, seeds of £4600 less subsidy of £2000. The extra income incurs additional costs for ewe feed, maintenance fertilizer etc. totalling £1500 leaving increased net income of £2500 per year.

The whole work involved simple tools — tractor — fertilizer spreader and a box of matches. Sheep dip and veterinary expenses amounted to 60p per ewe. 5000 sheep are treated three times per year against head fly attack. One of the factors affecting lambing is ewe condition. Data show that the heavier ewes are capable of 200% lambing, 160 lb ewes are capable of an average 100% lambing. The birth weight of the lamb is directly related to ewe condition and leads to good or bad weaning weights. Condition scoring at tupping over a scale of 1-5 showed that 2 to 3 is needed for 100% lambing.

Lamb fattening methods involving improved grass, grass plus concentrate feed, rape and indoor housing fattening have all been successful but the costs are high. A most successful introduction was stubble turnips. The seed is drilled thinly in June after the sward has been killed off with 2 successive paraquat treatments. The turnips are ready for feeding in October and because of low dry matter content, a supplementary feed is needed and a grass run back is provided for this purpose. Crops of 70 tons/acre fresh weight have been grown. Wastage is in the order of 20-30%.

The crop cannot be grown on acid soil. Even when normal lime dressings of 2-3 tons/acre are applied, the crop may still be small because the lime does not penetrate deeply enough under such surface treatments. A hill site with an original pH of 3.9 was limed in April. The pH of the top soil was 5 but 1 inch below the surface it was still below 4.0 with the result that the turnips were stunted. Acreage of this crop is being extended for fattening lambs, wintering hoggs and draft ewes. Following the turnip crop, the soil is in an ideal state for overseeding and the technique is a useful tool in land improvement.

Indoor housing. This has been taken up by some farmers. There is much to commend it, especially the thought of 1 man per 10000 ewes, but with the increase in costs of both feed and labour, the system may become non-viable. Technically it is fine. Ewe losses are reduced (only 2 lost in 3 years). Lambs are saved.

Comparison between 1968 and 1973 shows improved income from lambs from £5,500 to £21,800 partly due to increasing the price of lamb from 17½ to 33p/lb, but numbers of lambs doubled and even at a standard price of 30p/lb, this represents a gross return rising from £9,000 to £18,000.

With both labour and feed costs trebling, the return is not keeping pace with costs (£3 per ewe per winter when late housed in February).

Over the years, we have regarded cattle as a means of keeping the grass in fit condition for sheep. We have reached a phase when we can no longer justify the costs of feeding cattle in order to graze down grass for sheep.

Discussion

Stubble turnips. Paraquat was applied twice at an interval of 10 days. 1 lb/acre of seed was sown 2 days after the last dose of paraquat. Lime and phosphate (150 units P_2O_5 as basic slag) were applied plus 4 cwts/acre of 22-11-11 compound at sowing time and a top dressing of N fertilizer at 60 units/acre. It is always necessary to be generous with N fertilizer after spraying because whilst bacteria are busy rotting down the old grass they use a lot of the available N in the soil. We mix slug pellets with the seed. So far the crop has withstood frosts. The tops die back but the roots remain in good order.

Total cost of the crop comes to just over £30 per acre which may well be £40 this next year. In some years, this is eligible for a 50% grant. Lime should be applied 2 years ahead of the crop.

Rape was formerly used for much the same purpose — but sown as an arable catch crop on inbye land. This year we have none. We obtain more grazing and better lamb output from the turnips.

Ditch cleaning. An Italian machine (Molletti) has given satisfaction on peaty soil which has no rock or stone in it. The machine is fitted to the 3 point linkage and it lifts and throws the spoil clear of the edge so leaving no high bank.

Breed of sheep. Over the years, interest has moved from one breed to another. Many of these have had a short life. We have continued with the Blackface and find it very responsive to improved management. They adapt to all systems even in winter housing. Indoors they produce less wool of a poorer quality but these small changes are acceptable.

Last year we had 23 triplets. If necessary, we could reach 180% lambing but the gain might not match the extra costs. The basic advantage of the Blackface is its ability to ride out a severe winter, take a drop in body weight and still produce a lamb.

Land Improvement. It was suggested that some land is wasted by ploughing. In wet areas, peat is ploughed in and drainage upset whereas surface treatment would have been much more successful as is being accomplished using stubble turnips or rape as pioneer crops. S24 and S23 perennial ryegrass and white clover are the main herbage plants sown. Fencing is the first step towards

improvement as it permits control of stock. Heather and high stocking do not go together. Blanket peat areas are difficult to drain. So far only surface water has been removed by cutting open drains across the spring lines.

Mob stocking of cattle in summer is ideal preparation for reseeding. Otherwise it is difficult to justify cattle at the unit since they demand a lot of labour and winter fodder.

Grass conservation. Hay is needed where feed is to be carried to the sheep. Silage is too difficult to cart around. Last years hay lasted until 7th April and had a D value of 58. Silage for sheep must be high in dry matter and in D value so silage made on the unit with 58D is not suitable for sheep.

Labour. At present this is no problem, but it is easier to cut back labour on a sheep enterprise than on a cattle enterprise.

Hogg wintering. Several wintering methods have been tried including stubble turnips, heather areas and hay plus 1/3 lb concentrates. Of more recent interest is in-wintering of hoggs in forest areas after the trees are tall enough to avoid having their terminal buds grazed off. Whatever system is used, a dry lying area is important.

7. SILAGE NIGHT 1974/75

The 1974/75 SWSGS Silage Competition reached its climax on Thursday, 27th February, at Glenluce Public Hall. David Charlesworth, Bridge Farm, Baddington, Nantwich, Cheshire, presented his adjudication of those reaching the short leet and John Watson of the Hannah Research Institute reported impressions gained when touring farms and research institutes looking for clues to better silage making.

The Competition

As last year, entries were marked on analyses and the short leet on inspection by the guest judge. Slight alterations were made in the marks allocated for % Dry matter in clamp silos. Experience last year suggested that excessively dry clamp silages were liable to deteriorate. Top marks were given for 24-26% with slight reductions above and below. Summarised marking schedules were as follows:—

CLAMPS

%Dry matter (%DM)	14	16	18	20	22	24	26	28	30	32
Mark	0	5	10	15	20	25	25	23	21	19
%Crude protein (CP)	8	10	12	14	16	18	20+			
Mark	0	3	6	9	11	13	15			
%Digestible organic matter (D)		50		55		60		65		70+
Mark		0		10		20		30		50
pH	3.5	3.7	3.9	4.1	4.3	4.5	4.7	4.9	5.1	
Mark	8	9	10	10	9	8	6	3	0	

TOWERS

%Dry matter (DM)	20	22½	25	30	35	40
Mark	0	5	10	15	20	25

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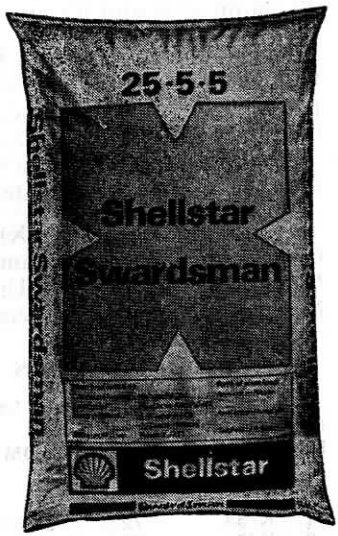

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% Digestible organic matter and % Crude protein were as for clamps. pH is not regarded as important in tower silage and no marks were allocated.

Marks for analysis were totalled out of 100. The guest judge was allowed 40 marks.

Summary of total marks

Analysis	Clamps	Towers
%DM	25	25
%CP	15	15
% DOM (=D)	50	50
pH	10	–
Total	100	90 x 100/90
Short list	40	40
	140	140

Entries

Despite the reluctant introduction of analytical charges by the College which brought entry fees up to £4 per sample, a total of 49 clamp silos and 8 tower silos were put forward.

The analytical results for all these are shown below together with the total marks awarded out of 100. Code numbers take the place of the entrants name. The letters A, D, K and W stand for the four counties, Ayrshire, Dumfries, Kirkcudbright and Wigtown. The number represents the farmer, and if a farmer submitted more than one sample, small letters a, b, c, etc., were added.

The entry marked (X) was submitted by a member of the Central Scotland Grassland Society (J. H. Ballantyne & Son, Netherfield, Strathaven). Unfortunately, it could not be included in the guest judges tour because of the time and distance involved.

SWSGS Silage Competition

Chemical Analyses and Marks/100

Coded Entry No.	%DOM (=D)	%OM	%DM	%CP	pH	Mark 100
Clamps						
1. K/5a	72.6	91.6	24.8	17.3	4.0	97.3
2. K/6a	69.9	91.4	26.8	14.2	4.1	93.0
3. K/3b	68.2	92.0	22.4	18.4	3.9	87.2
4. W/5b	68.6	92.0	22.9	14.5	4.1	86.1
5. K/2b	67.2	89.0	23.1	20.2	4.6	83.6
6. D/3a	67.8	89.9	21.5	18.5	4.2	83.0
7. D/2a	65.8	89.8	25.5	17.3	4.1	80.5
(X)	65.0	87.3	24.0	19.8	4.3	78.8
8. K/10a	66.4	88.8	22.2	16.6	4.2	77.2

Coded Entry No.	%DOM (=D)	%OM	%DM	%CP	pH	Mark 100
Clamps						
9. A/11a	67.7	90.6	21.1	13.6	3.9	77.0
10. D/4a	66.9	89.7	38.1	17.1	4.5	76.7
11. K/9a	65.4	89.6	26.9	15.9	4.0	76.6
12. W/11a	64.9	87.6	26.4	17.4	4.3	75.8
13. W/3b	66.0	90.1	28.2	14.1	4.4	74.4
14. K/4a	65.9	90.3	20.2	18.5	4.3	71.6
15. W/3a	62.8	87.9	26.4	17.2	4.3	71.4
16. K/8a	63.1	88.5	24.7	15.0	4.1	71.2
17. A/6a	64.8	91.3	24.0	12.6	3.8	71.0
18. D/6a	63.6	89.9	27.5	16.3	3.7	71.0
19. A/9a	63.2	93.0	25.7	14.9	4.2	70.8
20. A/8b	65.1	89.3	22.6	14.0	3.7	69.9
21. W/9a	63.8	87.2	27.8	13.8	3.9	69.5
22. W/4a	64.6	90.6	28.0	12.5	4.1	69.0
23. D/4c	66.3	88.4	41.9	13.7	4.7	68.8
24. W/8a	64.7	89.6	30.8	15.2	4.5	67.8
25. A/3a	64.4	90.8	25.0	10.4	4.0	67.4
26. A/6b	63.1	90.6	24.4	12.4	3.8	67.3
27. K/11b	62.4	88.5	23.2	14.1	4.0	66.9
28. W/7b	61.2	88.1	26.2	14.8	3.8	66.5
29. W/5a	65.3	90.3	20.9	12.4	4.0	65.0
30. A/1a	61.8	89.1	30.4	14.5	4.2	63.2
31. W/4b	59.8	88.9	25.2	15.5	4.5	63.1
32. W/7a	63.3	89.5	32.6	12.9	4.1	63.0
33. K/4b	64.9	90.8	18.9	15.6	3.9	62.6
34. W/6a	60.6	89.2	22.0	18.1	4.5	62.3
35. K/1a	65.8	89.5	17.4	15.6	4.0	62.3
36. W/9b	61.9	89.9	34.1	12.9	4.1	60.2
37. A/5a	61.9	89.4	21.1	14.4	3.6	59.5
38. A/5b	61.5	91.6	33.5	11.8	3.6	56.2
39. A/2a	58.8	89.3	28.3	11.9	4.4	54.6
40. A/4a	59.6	90.7	30.0	11.5	4.3	54.5
41. K/3a	59.2	89.8	19.5	20.3	4.6	54.2
42. A/8a	57.3	88.0	22.1	14.7	4.4	53.0
43. K/2a	60.1	88.6	18.5	16.4	4.3	51.8
44. K/1b	59.5	91.9	20.0	12.7	3.8	50.5
45. W/8b	58.6	86.2	19.6	17.2	4.6	50.4
46. D/4b	56.9	88.7	40.1	13.9	4.4	50.1
47. W/2a	59.8	90.1	19.3	12.7	4.2	49.3
48. K/9b	48.5	86.1	22.9	15.1	5.1	32.3
Towers						
1. W/10b	66.8	88.9	32.6	14.6	3.9	71.6
2. W/10a	61.4	90.8	41.0	16.8	4.6	59.6
3. A/7a	59.7	88.1	45.9	12.4	4.6	56.7
4. A/10a	58.8	88.5	41.5	13.6	4.6	56.7
5. D/5a	61.7	89.5	31.5	13.5	3.8	53.4
6. D/1a	61.7	90.3	31.1	13.0	4.1	52.1
7. W/1a	55.9	87.7	37.4	16.0	4.9	47.6
8. W/1b	56.1	87.1	24.7	14.3	3.9	35.0

Comment on Analytical Results — I. V. Hunt

Digestibility of the dry matter of the silage is the most important factor determining its value. This decides how much of the

food eaten goes to nourish the body, to produce growth, energy and milk (the digestible food) and how much goes in the dung. The more indigestible a feed is, the longer will it take to pass through the stomach, and a full stomach makes the beast lose its appetite. To achieve high production, you must have high intake (a good appetite) and this comes from high digestibility.

Research has shown that feed begins to affect rate of intake when it has a % digestibility of the organic matter (%OMD) of 70 or less. Farmers and advisers alike are often confused by the use of 3 entirely different figures for digestibility — viz.:—

%OMD digestibility of the organic matter of a feed.

%DOM digestible organic matter in the dry matter of a feed.

'D' or big 'D' digestibility of the dry matter of a feed.

%OMD. The first of these figures is calculated by getting rid of soil, sand, minerals etc. from the feed which are almost wholely indigestible anyway and then measuring the digestibility of the remainder which is the total living matter, protein plus sugars plus fibres etc. in the feed.

%DOM. In calculating % OMD, the amount of organic matter is automatically calculated and it is a simple matter to produce an estimate of how much digestible organic matter is present in the dry matter of the feed $\frac{(\%OMD \times \%OM}{100} = \%DOM)$

%DOM is so close to 'D' that it can be used as an alternative to 'D.

'D' is a direct measure of the digestibility of the dry matter as fed. It differs from %DOM only by the small digestibility of minerals.

The College standard analysis of silage gives % organic matter (%OM), % digestibility of organic matter (%OMD) and % digestible organic matter (%DOM).

On average, clean forage, silage, hay or grazed grass will have an organic matter content of 90%.

Consequently, the important target for forage would be 70% OMD or $\frac{(70 \times 90)}{100}$ 63% DOM or 63D. There is no great accuracy to either of these figures and some people refuse to talk about 63% DOM because it sounds as if 63½% would be safe and 62½% rotten. Such people round off the target to 65D.

On a basis of 63% DOM, 30 out of 48 clamp silages and 1 out of 8 tower silages were good. If you take 65D as the target, then the number of good silages comes down to 18 clamps and 1 tower.

Silages with 'D' or % DOM figures higher than 63 (%OMD above 70) are extremely valuable, and are likely to have a tremendous effect on raising the production capacity of the silage. Intake will be at maximum and every ounce of feed taken will be

more valuable to the beast. Recently the value of 70D (78.8%OMD) has been advocated and the top silage in the competition hit **72.6D.**

How valuable is a silage of 72.6D compared to one of 63D or a poor one of 56D.

D value	Total intake/day	Relative Feed value
72.6	30 lb DM = 21.8 lb DOM	216%
63	28 lb DM = 17.6 lb DOM	174%
56	18 lb DM = 10.1 lb DOM	100%

63D is 74% better than 56D. 72.6D is more than twice as good as 56D and this merely as a source of digestible food per day. There are still qualities such as high energy value, better palatability, better digestibility of protein etc. to be reckoned with.

How can you get silage of high D value ?

1. Cut early — the younger the grass the higher the D value. Do you realise that D value drops rapidly in the growing grass crop at silage making time i.e. through May/June by nearly ½ a point per day — 3 points per week. Grass which is 70D on a Monday will be 67D the following Monday. This loss takes place before you start to cut and cure.
2. Speed up the silage making process — growing crop to silo — check fermentation and loss of effluent. Under the best conditions you will lose 3 points and under the worst 10. One of the enemies is **dirt** picked up or sucked up by the harvester.

Most of the tower silages were disappointing — digestibilities were low — possibly because the crops were over mature. It is so important to secure a high dry matter, that it is tempting to leave the crop to bulk up to make for easier wilting — and to secure maximum yield per acre but the inevitable result is that quality falls.

Organic matter %. This did not enter into the marking system but is shown for all entries. High %OM of over 90% means that the herbage was clean — free from dirt. Good quality herbage made at the correct time could have a considerably lower D value because of the presence of soil.

Dry matter %. On the whole, the entries were good. A few clamp silages had high DM content.

Crude protein %. This shows a very wide variation. High crude protein % comes from (a) the presence of clover; (b) the use of fertilizer N or (c) cutting a young crop. The entries from Wigtown and Kirkcudbright have markedly high % CP. Ayrshire entries were generally low, possible because of all three reasons.

pH. The acidity of silage is a measure of the success or otherwise of the fermentation process. Low values are associated with

the use of additives such as concentrated solutions of formic acid (Add F). High pH values indicate poor fermentation and is generally associated with evil smelling silage. Formaldehyde based additives (Sylade) can preserve silages without depression of pH. Silage preserved in air-tight towers can also be satisfactorily preserved irrespective of pH.

The Short Leet

The top nine clamp silage entries and the top three tower silage entries were visited by the guest judge, David Charlesworth of Cheshire on Wednesday and Thursday 26th and 27th February. Dr. R. D. Harkess of the College Agronomy Department organised the tour and accompanied Mr Charlesworth on the trip. Ian Mitchell (Commonside), John Marshall (Auchinleck), Andrew Brown (Chairman), and John Watson (The Hannah Research Institute) were marshals or stewards. All the competitors were extremely co-operative making it possible for this task to be completed speedily.

Adjudication — David Charlesworth

Short Leet

Clamp Silages

1. **J. M. L. Milligan, Culvennan, Castle Douglas, Kirkcudbrightshire**

   Marks 97.3/100 + 33/40 = 130.3/140. Awarded the Society's trophy for the second year running. Made in an indoor clamp from a late variety of perennial ryegrass. Cutting began 25th May. The herbage was all given Add F at the recommended dose. Well consolidated and covered with 2 plastic sheets. Utilisation of the silage was excellent and based on the analysis.

2. **Alex Irving, Jnr., Largs Farm, Twynholm, Kirkcudbrightshire**

   Marks 93/100 + 35/40 = 128/140. This was also an indoor clamp. Additive was used as necessary — for early cut grass — under wet conditions etc. — No waste at all was evident. It was the most perefect clamp silage in the adjudicators long experience. The crop had been rapidly got in, built 12 ft high — covered with 2 plastic sheets. Additional weight was provided by 'sausages' of sand slung along the edges of the silo.

   Mr Irving was congratulated on his high mark on inspection. Most marks lost were on crude protein content. He is obviously a serious future challenger to Michael Milligan.

3. **Robert Irving, Meikleknox, Castle Douglas, Kirkcudbrightshire**

   Marks 87.2/100 + 30/40 = 117.2/140. This also was covered with plastic sheets and weighted with straw and sandbags. A little waste was evident. It had been well rolled — almost solid.

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4. **J. Robertson, Meiklewood, Ringford, Kirkcudbrightshire**
Marks 83.6/100 + 32/40 = 115.6/140. This silage gains top marks for Crude Protein content. This was an outside clamp covered with a plastic sheet and weighted with 4" manure. This is not a very convenient seal to remove but it was very effective in keeping waste to a minimum. In contrast to the others it was used for beef cattle and sheep.

The total marks of the remaining short leet was as follows:—

5. J. McColm, Garthland Mains, Stranraer, Wigtownshire, 86.1 + 29 = 115.1
6. Prof. R. Paterson, Stenrieshill, Moffat, Dumfries, 83.0 + 23 = 107.0
7. J. B. Ross, Macmanniston Farm, Dalrymple, Ayrshire, 77.0 + 29 = 106.0
8. R. Graham, Kirklands, Courance, Lockerbie, Dumfries, 77.0 + 24 = 104.5
9. J. Marshall, Auchenleck, Auchencairn, Kirkcudbrightshire, 77.2 + 26 = 103.2

Tower Silage

1. **Wm. Lammie, Laigh Glenstockadale, Leswalt, Wigtownshire**
Marks 71.6/100 + 34/40 = 105.6/140. This was a neat set up — The Silage looked good — leafy. It smelt good. Cattle were cleaning it up and doing well on it. Last year's results were an average milk yield of 916 gallons/head with 1.73 lb other feed per gallon. Mr Lammie was one of the more experienced tower men in the country.

2. **R. Cunningham, West Mossgiel, Mauchline, Ayrshire**
Marks 56.7/100 + 30/40 = 86.7/140. Mr Cunningham was a newcomer to tower silage and because of late deliveries was unable to take his cut before 1st June, consequently it had a lowish D value as well as a low crude protein content. The main grass used was timothy which might account for both the low crude protein and low 'D' value. The silage showed no evidence of waste although again possibly because of the late season and type of grass it appeared to be rather stemmy.
It was being fed on analysis to give maintenance only for energy and maintenance + 2 gallons for protein.

3. **W. Wilson, Barlaugh Farm, Maybole, Ayrshire**
Marks 56.7 + 29 = 85.7.

General Comment

In addition to waste and efficiency of handling, some weight was given to efficiency of utilisation. There is no point in making high quality silage and feeding it as if it provided M or M + 1.

Making high quality silage involved added expenditure and sacrifice of some weight of silage per acre. It must be used accordingly.

Consolidation and sealing are top priority for clamp silage. A loose flapping plastic sheet was useless — it must be weighted down. Old tyres were convenient, but it was necessary to use plenty of them — they should touch 4 or 5 other tyres in all directions.

High D value is essential — Date of cut must be matched to variety or species of grass and was generally earlier than would be expected. Although some bulk was lost by early cutting the regrowth was so much more vigorous that the harvests together would produce the same total quantity per acre plus high quality.

High Dry Matter could be important but not easily achieved in some years. A 24 hour wilt and then lift was the best policy. Energy was lost as the crop lay around on the field.

The Panel of Experts :

Chair — Alistair Campbell
Judge — David Charlesworth (DC)
Trophy winner — Michael Milligan (MM)
Expert — John Watson (JW)

Q.1: What is the panel's view of harvester type—Precision chop, Double chop or Flail ?

MM: I now use precision chop.

JW: We have been through the lot — Buck rake — Hurricane — Kidd and now precision or meter chop. This is the machine which ensures repeatability.

Q.2: What kinds of seed mixture are favoured ?

DC: For years I have relied on S23 and S24 perennial ryegrass which have given tremendous yields. The last mixture sown was of Gremie Early perennial ryegrass and Melle late perennial ryegrass.

MM: I have turned away from S24 to mixtures including 80% Tetraploid ryegrass. The last sowings were based on Barpastra late perennial ryegrass. Where no slurry is applied — it gets 100 units N/acre in early spring — later dressings are of compound. My main cut is taken 25/26th May. My 'D' target is considerably higher than the 65D set by many advisers.

JW: Latterly, our silage has come from S23 perennial ryegrass. Yield is low but cut twice we make up the bulk and ensure high D. 80-100 units N is applied mid April.

Q.3: What feeding arrangements suit the panel ?

MM: Self feed system. The important thing is to keep a good face on the silage — Precision chop material is easily self fed.

JW: Byres and stalls are used at the Research Institute because of the requirements of experiment. They are certainly not suited to practical farming conditions.

DC: Self feeding is the easiest to operate but easy feed gives higher output per ton of silage. The difference must meet the extra cost of machinery.

Q.4: What type of harvesting machinery is used ?

MM: A Krone mower and conditioners and Pottinger pick-up. The mower works well — leaves the crop in 2 rows for 12 hours wilting.

8. SILAGE — WHAT'S NEW ?

by John N. Watson

The Hannah Research Institute, Ayr

Thanks to the generosity of the South-West Scotland Grassland Society, I visited four Experimental Husbandry Farms (EHF), ICI Dairy House Farm, and two commercial farms in June to see if there were any trends and new developments in the silage ' scene.' All the farms were in the West of the country in grassland areas.

Grass Silage

My first call was at Great House Experimental Husbandry Farm, 1,000 ft above sea level in Lancashire. This was the only Ministry farm using dairy cows to evaluate their silage (is it too much work ? !). Two 200 ton clamp silos were self fed last winter; one had been filled with direct cut (19% DM) grass and one with ' wilted,' full chop grass (also 19% DM due to humid weather in August 1973). The direct cut silage had been treated with formic acid at $\frac{1}{2}$ gal/ton. In other trials, this had been found to increase the D value by 10%. The dairy cows spent less time self feeding off the ' wilted ' silage face than on the direct cut silage. This was presumably due to the greater compaction of the meter chopped silage: it took 5 days to fill the direct-cut silo compared with only $1\frac{1}{2}$ days for the ' wilted ' one, which received much less rolling. There was no significant difference in the milk yields of the two groups of cows on the two silage faces, although the direct cut silage was judged to be slightly superior to the wilted material. This experiment was repeated this winter and an additive used on both the silages.

Drayton EHF in Warwickshire were feeding silage to bullocks and Add F silage gave lightweight gain (LWG) of 2.2 lb/day against 1.8 lb/day from grass silage without additive.

The EHF at Rosemaund in Herefordshire was more involved in hops than silage — perhaps they had the right idea ! Here the workers were looking at a clamp silo with flexible walls of weldmesh lined with butyl rubber, which allowed grass to be loaded to a depth of 18 feet. These sides give under the load and by dissipating the pressure cut down on expensive construction

methods. A Kidd Ultimo drum mower was used to cut and ted the herbage in one pass, and then the swath was lifted by a Class Jaguar fullchop forager.

Machinery

The final EHF visited was Liscombe in Somerset on the eastern edge of Exmoor. On this farm, there were four 140 ton clamps under a shed which could be self-fed with bullocks. Again additive work was being carried out. In this high rainfall area the use of an additive appeared to pay off, with Add F leading the field. Most additives had been tested.

The farm seemed to be covered with different types of mowers, tedders and silage machinery all being tested and tried out for efficiency. A German machine for packing grass into a large plastic ' sausage ' in the field had been tried. The grass had to be chopped short and wilted to make this machine work and if the grass was wet it formed ' pea soup ' and blocked the filling mechanism. At £5,000 each I can't see them sprouting up all over S.W. Scotland — although they are cheaper than towers ! !

A Class two-drum mower with flail conditioner behind the cutter bar has been tested, and found to give a swath which dried at twice the speed of an unconditioned drum mower.

The Taarup BS 1500 at £1,340 is a double chop. There is a heavy bank of secondary flails which beat wet grass against a smooth concave screen to give a pulp. For wilted grass, there is a rougher concave with ribs.. The result is lacerated rather than chopped herbage with something of the appearance of cotton wool. The cows like it. Output is lower and power required higher than for the 717 but it will direct cut and it is cheaper.

Forage wagons like the Fahr and Sellars Melotte are cheap one man outfits but they are built for hay and can only be used for wilted silage. The outfits look flimsy. There is a slight chopping action but lots of rolling are required to achieve satisfactory consolidation. There is no provision for applying additives. ' Add Sec,' a dessicant which is sprayed on the growing grass with a crop sprayer was also being evaluated. Trials were at an early stage, but in difficult wilting areas this product may prove of value, although cost may kill it.

Cheshire

My fifth visit was to the ICI Dairy House Farm in Cheshire which some members of the Society have already visited. This intensive grassland farm has a large zero grazed dairy herd in summer and clamp silage is easy fed in winter. The grass for this silage was wilted to 23-25% DM, lifted with a Class Jaguar and treated with 1 gal Sylade/ton of grass. Sylade was being used at the top rate of 1 gal/ton as the manager had seen the great difference between the use of $\frac{1}{2}$ and 1 gal. This high rate of application was justified, he claimed, when all other silage making techniques were

correct and when a high quality grass was being ensiled. The farm was about to invest in a Crone mower (£2,000 approx.) and a Pottinger side rake, which, it was claimed did not have the annoying habit of losing tines to be picked up by a forage harvester.

Most people accepted the use of full-chop harvesters, but everyone said that a major worry was picking up metal into the drum. It seems strange that our engineers cannot prevent this problem. Another interesting point was that the chop length of the grass was in many instances longer than expected. The explanation was that the harvester throughout was holding up the whole team — so lengthen the chop — and this speeds up the job. This is excellent so long as the change does not become self defeating; i.e. some of the longer chop lengths could have been obtained with much cheaper machines, e.g. the Wilder seen on the next farm.

High-quality Silage

Two farms visited in the Mold area of N. Wales were making high-quality silage from ' lawn mowings.' Firstly a beef fattener on self-fed silage **only** was producing a daily liveweight gain of 1½ lb — a fair measure of the high silage quality ! The grass for the silage was mown with a Wilder 8′ Turbochop flail mower leaving a 2″-3″ stubble. After 23 hr wilting to 30-40% DM, it was lifted with a Wilder double chop and ensiled in deep clamp silos of 200 tons capacity. This process allowed quick filling of each clamp and the depth gave consolidation. The grass was cut every 4 to 5 weeks and gave a high quality, low fibre material.

The second Welsh farm was making silage for a pedigree dairy Friesian herd with a 1,200 gal. average. Here again the grass was flail mown leaving a 4″ stubble to give quick regrowth — a controversial point !

The swath was turned to speed wilting to around 30-35% DM and then lifted with a Wilder double chop. The clamps were narrow, air tight and filled fast. No additive was used, and indeed with such dry material with a high sugar content it is doubtful whether any benefit would be seen. As the clamps were so narrow, with only 3″ feed face/cow, the silage face was being eaten back at about 1′ per day and this was said to prevent heating or secondary fermentation in winter. It is claimed that maintenance + 2 gallons of milk was obtained from the silage, after which 4 lb barley/gall. was fed for the next 4 galls., and then dairy nuts for yields of 6 gallons. Both these farms were achieving as short a chop as meter machines but more cheaply and with less power.

Conclusions

The most important conclusions which came from my trip were: —

1. If we could cut our silage fields three times instead of twice per year, this would be a big step towards increasing silage quality.

2. When a silage stubble stands out like a field of snow, the field has been cut too late and probably has had too much nitrogen in a single dose.
3. If the grass is wet and contains less than 2.4 to 3% soluble sugars, use an additive.
4. Wilt the herbage to cut out effluent and to improve fermentation.
5. Aim for high ' D ' value of around 68%.
6. We must constantly strive to reduce silage making losses. With the cost of land, fertilizer and feed all rising, we can no longer accept 25-30% losses in the silo. **These silage losses can be halved, and silage quality improved if we make use of our present knowledge.**

9. GRASS MANAGEMENT FOR 1975

Malcolm Castle — Growing and Grazing
John Watson — Ensiling and Feeding
Hannah Research Institute, Ayr

Talk given to Central Scotland Grassland Society on 29th January, 1975, at King Robert Hotel, Stirling.

Malcolm Castle: Grass-only swards in the absence of fertilizer nitrogen yield in the region of 4,000 lb of dry matter per acre, whilst the same grass species sown in association with Blanca white clover can yield 12,000 lb of dry matter per acre—a 3-fold increase with no fertilizer N. Pure clover stands have yielded 10,000 lb of dry matter without fertilizer nitrogen. It was indicated that 300 lb of fertilizer N would be worthwhile on pure grass swards, even at the present high price of fertilizer.

One third of all summer milk production can be attributed to concentrate feeding. How can this be reduced and more obtained from grass ?

The Wye college system offers a useful grazing system, but it takes no account of conservation requirements. Half an acre per cow is allowed, and the total area (100 cows = 50 acres) is divided into 4 main blocks of equal size. These blocks are grazed in rotation for 7 days each which gives a 28 day grazing cycle. A fixed and rigid rotational grazing system is adopted, one new strip being fed each day with no back fence. As each main block is grazed fertilizer is applied thus allowing a 21 day regrowth period. With a fixed system the grass may at times be undergrazed, but this has had to be accepted and no topping is done.

Milk yields obtained with the Wye system have equalled those obtained using a Paddock System of grazing management over a 3-year period.

Milk Yield

lb/cow/day		gallons/acre	
Wye	**Paddocks**	**Wye**	**Paddocks**
37.9	37.6	1140	1130

Yields of almost 4 gallons per day were achieved over a period of 20 weeks using no concentrates at all. 1,000 gallons per acre is a must for milk production and in fact it is possible to achieve 1,600 gallons per acre.

Set Stocking has also been studied in detail. Under this system two cows per acre were grazed from early May to early October. Comparisons were made with Strip Grazing and the Wye College system.

	Milk Yield — lb/cow/day				
	May/June	**June/July**	**July/Aug.**	**Aug./Sept.**	**Mean**
Strip Grazing	49	42	38	28	39
Wye College	52	44	36	26	40
Set Stocking	52	43	32	18	36

During the early part of the season there was little to choose between any of the systems. However, following the July period, the set stocking system falls away and overall this system yielded 10% less milk.

High stocking rates are necessary for optimum milk yield per acre and for this nitrogen fertilizers are essential.

Unfortunately much of the grass in the West of Scotland receives insufficient fertilizer N, yet it must be pointed out that it is 6 times more expensive to buy Starch Equivalent as concentrates as it is to grow it as grass.

John Watson: Why is it that more grass is still conserved as hay and not silage ? Maybe farmers have tried silage and made a mess of things.

To make silage:—

1. Cut at the right stage of growth, i.e. plenty of leaf and no flowerheads.
2. Wilt for 24 hours — little effluent.
3. Chop the grass to $\frac{1}{2}$ inch lengths.
4. Use an effective additive.
5. Fill fast, consolidate and make airtight by covering efficiently each day.

It is most important to keep out rain as well as air and for the final sheeting, 3 sheets of polythene are used, weighted down with tyres, which must cover the whole surface of the silo.

In assessing silage quality, the ' D ' value given by analysis is all important, representing the amount of digestible organic matter in the silage dry matter. In terms of milk yield this can be well illustrated; on a 60 D value silage plus concentrates, an average yield would be 35 lb of milk per day, whilst a 70 D value silage would provide for 40 lb of milk per day with the same weight of concentrates. Unfortunately, there are very many low D silages still being made.

The use of formic acid can benefit silage making by creating better fermentation conditions at a lower temperature. Losses are also reduced leading to a higher D value product with increased animal intake and consequently higher milk yields.

An experiment was described on the feeding of dairy cows on high-digestibility grass silage with and without supplements:—

Feed Silage	Barley	Dried Grass	Total	Milk Yield lb/day
25.6	—	—	25.6	32.0
21.4	7.3	—	28.7	34.6
17.9	13.2	—	31.1	37.5
22.3	—	7.5	29.8	39.2
20.7	—	13.9	34.6	43.6

It is well worth noting that 3 gallons of milk were produced from this silage which had a D value of 70, and of further interest that feeding dried grass cubes of high D value has more effect than barley on milk yield.

Many other points were covered both in the talks and during the very active discussions which in all contributed to a most successful and entertaining meeting.

10. TACKLING THE PROBLEMS OF 1975

J. Clark, West of Scotland Agricultural College

Talk to Central Scotland Grassland Society in Strathaven Hotel, Strathaven, 4th March, 1975.

Many farmers in the West have the opportunity to grow a limited amount of cereals for animal feed. This in the long term is probably the right thing to do, despite fluctuating prices. However, the high cost of barley as a source of energy has recently been pinpointed in the 'Little Neddy' report. At today's prices the report estimates the cost of starch equivalent from various sources is as follows:—

Barley	3.50p per lb SE	Grass Silage	1.30p per lb SE
Swedes	1.50p „ „ „	Maize Silage	1.20p „ „ „
Turnips	1.50p „ „ „	Hay	0.80p „ „ „
		Grass grazed	0.45p „ „ „

The value of good grass is obvious. Our climate provides such conditions for growth that there can be no argument about the vital role of grass as the main source of food for grazing livestock.

Maximum performance must be obtained from grass grazed *insitu*. Perhaps the time is again ripe to stress the need to stretch the grazing season at both ends. A drive through the countryside in spring shows the amount of untapped potential we have for improving performance. Conservation of grass must always lead to some loss of nutrients. This loss tends to be greater in hay making than in silage, and while no one would argue about the value of well made

hay and the ease of feeding and handling hay, it is not easy to produce in our weather. Even though barn drying reduces the risk somewhat it is expensive in terms of fuel costs and there can still be higher field losses than with silage.

Grass drying periodically returns to fashion but the high cost of fuel, the problems of scheduling drying programmes and the high capital cost of driers, ancillary equipment and buildings make it a non-starter for the majority of commercial farmers.

Wastage in silage need not be high provided the crop is adequately fertilized, cut at the right time using proper equipment and stored properly. The value of wilting and additives is a subject for debate but there is now sufficient know-how to guarantee the production of a commodity of satisfactory quality and quantity.

Good grass is not cheap to grow. With the doubling in the price of rock phosphate consequent on the formation of a cartel of phosphate producing countries (learned from the Arabs), it will become more expensive but there will be no change in the **relative** cost per unit of feeding value of the feeds quoted earlier.

A big advantage silage possesses over hay is its higher feeding value in terms of protein. This could become very much more important in the future — particularly if the high protein by-products of the oil seed crushing industries rise in price. Since oil seed crushing is now centred in those underdeveloped countries which produce the seeds and nuts from which oil is extracted, they too may well jump on the bandwagon of holding the consuming countries to ransom for higher prices. Home produced protein will therefore assume a more critical status than has been recognised hitherto — despite the stress given to it already in the past by those with a ' grass philosophy.'

Having considered pastoral production in general, let me turn now to looking at individual sectors:

Dairying : If we look at the dairy industry we see the following strengths: —

1. We have an efficient dairy industry with a favourable size structure compared to the EEC; not only in terms of farm size but of herd size. (In the West of Scotland our average herd size is 65 cows; in England and Wales it is 37 cows compared to under 20 for most EEC countries).
2. We have a relatively high consumption per head of liquid milk — the highest price market and a rapidly growing expertise in the manufacture of sophisticated dairy products — particularly high value products like cheese, yogurt and milk-based desserts.
3. We have the capacity to improve farming efficiency further. If only current knowledge were applied we could be self sufficient and it is up to farmers to seek the knowledge from advisory services (college or commercial).

4. We have Milk Marketing Boards which have done an outstandingly successful job since 1933 and which must in future be supported and encouraged by producers.

Indications are that in future there will be strong Government support for dairying. It is a sector with less cash flow timing problems than other enterprises and is therefore less susceptible to short term economic pressures. It is an industry which can produce large amounts of beef — and a more stable supply of that commodity.

Beef : In the long-term it must be a good prospect. Our present problems stem partly from fatteners paying prices ' over the odds ' for suckled calves and then finding that inflation in the price of feeding stuffs plus the buying price made the final product uneconomic. Industry should concentrate on informing the consumer of the ' value for money ' which beef represents — even with steak at £1 + per pound, wages averaging £50 a week make it a good buy. (The pensioners know this — they use their tokens to buy the best cuts !).

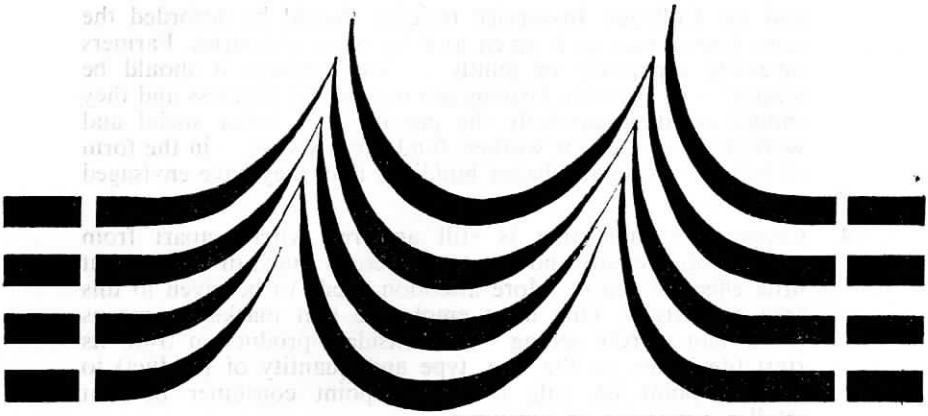
Sheep : In the long-term it should be a steady market — particularly if continued access to our market for New Zealand becomes, as is likely, more expensive to them. Sheep have been much maligned on the score of relatively low Gross Margins to other enterprises but the fixed costs of sheep production are unlikely to escalate at the same rate as for dairying and beef. Labour is a problem — but it is well worth a look at this enterprise.

Arable Crops : The essentially pastoral areas in the West are not particularly promising for cropping. The situation for glasshouse producers in the Clyde Valley is likely to worsen particularly in view of the cost of energy.

Pigs and Poultry : They will continue to be the preserve of big business.

Each sector has to be assessed independently but some general rules apply : —

1. Invest carefully. Make sure that money is not wasted on expensive ' luxury ' items in buildings, machinery or plant but at the same time don't waste a lot of high calibre resources by using poor quality labour. Try to ensure flexibility in the use of buildings and machinery.
2. Plans for intensifying production must take account of the likelihood that specialisation, despite being advocated in the fifties and sixties, may not be the best policy today even if, in the short term, it appears to be the most efficient. Montgomery's success at El Alamein hinged on his ability to switch his attack. Farmers should poise themselves to switch production if need be — and to do it as cheaply as possible.
3. Labour will remain a problem but farmers should look at labour training programmes such as are offered by the ATB



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Scottish Agricultural College Technical INFORMATION LEAFLET — OCT. 1974

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and the Colleges. In-service training should be accorded the same importance as is given to it by other industries. Farmers investing separately or jointly — and perhaps it should be jointly — in intensive farming are now in big business and they should consider carefully the provision of better social and working amenities for workers (and their wives) — in the form of better housing and better buildings than they have envisaged in the past.

4. Cooperative marketing is still an area where, apart from horticulture, cereals and potatoes, there is much discussion but little effective action. More attention needs to be given to this area of activity. One must emphasise that marketing means more than merely selling — it considers production from its start (decisions on the size, type and quantity of product) to the end-point i.e. sale to the endpoint consumer be that retailer, processor or consumer.

5. Farmers are bad record keepers — of past performance or of using them for management control purposes during the year where actual performance is compared to planned performance. Despite uncertainty, it is important to set targets and to know during the course of the year whether these are being achieved.

One final point: —

Despite in some quarters, a degree of euphoria over the Price Review, in a land of inflationary pressures, farmers (like many other business men), may have to accept the fact that living standards are likely to be lower than in the past **relative to the 'workers' of this nation** since that is the present order of the political scene. It is unfortunate, not to say heartbreaking; but the inevitable must be faced in a situation where the majority of voters dictate Government policy from a 'workers' point of view. In this 'levelling' situation, leaders and managers may well have to accept a lesser reward than they have been used to until such time as the laws of Supply and Demand dictates some realignment, not perhaps to the same degree as in the past, toward extra payment for responsibility and merit.

11. GETTING THE BEST OUT OF YOUR GRASSLAND

J. M. H. Dewhurst, Shellstar Ltd.

The Scottish farmer is well aware of increasing costs which are hitting all aspects of his farming business including fuel, feeding stuffs, rents, rates, fertilizers and wages.

Looking at fertilizer costs we can see that the rising prices of the last 12 months are of the order of 30% for nitrogen and 55% for high nitrogen compounds. The rise in prices has been due to several reasons. Firstly, there was the increase in raw material costs

over the last 12 months. For example, the swingeing upturn in rock phosphate prices which occurred a few months ago has clearly affected the prices of compound fertilizers, since we import 70% of our rock phosphate from Morocco. Potash prices have increased by about 100% and ammonia prices by 400%, the latter due to the upsurge in crude oil prices. The lack of investment in new plant has also limited world supplies which has led to the price increase. Increase in freight charges and the withdrawal of fertilizer subsidies has also had an effect on the farm price. Fertilizers are fetching much higher prices abroad than in the United Kingdom and many imports that were previously available are now attracted to other markets.

The question is, then, how can the farmer make the best of a a situation as it prevails at present ? How can the livestock farmer minimise these increases in fertilizer costs and get reasonable returns from his fertilizer investment as livestock and livestock products. The following course of action is suggested. Firstly, to increase the efficiency of fertilizer. Secondly, to avoid uneconomic applications of fertilizer and finally to employ new techniques in order to maximise the utilisation of grassland by livestock.

Over the last few years, Shellstar have conducted surveys on the efficiency of fertilizer spreaders and it is clear that machinery maintenance and calibration leaves a lot to be desired. Damaged spreaders and incorrect settings are wasteful of fertilizer and result in loss of yield and thus loss of profit.

We are all familiar with the striping that occurs in many fields. To avoid this, the tractor driver should check the bout width of his machine and whether or not it is in good working order and correctly set. The advice in the maker's handbook should be closely followed in order to avoid uneven application of fertilizer. Recent trials by Shellstar have shown that cereal yields can be affected when relatively small overlaps and underlaps occur and this loss amounts to something like £6 per acre.

In trials last year, uneven distribution resulted in 10% yield losses in potatoes and 16% loss of grass dry matter. Digestibility also appears to be affected.

The second method of combating higher fertilizer costs is by making more economic use of plant nutrients. This is perfectly feasible under many circumstances; for instance, where soil analyses show high levels of phosphate and potash. The high soil reserves can be cashed in as a short term policy but should not be embarked upon for the long or medium term period, otherwise yields may be limited. Furthermore, there should be efficient use of farmyard manure and slurry.

Conservation of farm wastes not only avoids pollution but will also help to supplement the fertilizer requirement. If there is a

reduction in livestock numbers, then it may be possible to reduce fertilizer usage, but it should be remembered that fertilizer applications to grass are still a good economic proposition if the grass that is grown is utilised fully by the livestock on the farm. On no account should adjustments to fertilizer consumption be made at the expense of livestock, either in terms of grazing or in terms of the amount of hay and silage grown.

Livestock farmers can help to fight increased costs by using advanced techniques when they become available. Silage is now universally made and was a major breakthrough in this wet region. A number of Welsh farmers now make what is called " super silage," a material very high in dry matter and protein. The grass is cut every 19 to 23 days in the growing season. The so-called " lawn cuttings " are wilted and a dry matter of 38% is aimed at. On a number farms in Wales, silage like this with 20 lbs of barley is producing maintenance and 4 gallons of milk. Clearly the techniques have to be carefully examined and it may be that they don't fit into everyone's system but it does seem relevant in these days of very high cost protein to be able to grow a lot of that protein at home.

Keeping abreast of the new techniques means getting about to demonstrations and meetings and this can be very difficult for the working dairy farmer. However, some events are more than worth the effort, the National Grassland Demonstration is one such event. The eighth NGD will be held at the National Agricultural Centre, Kenilworth, Warwickshire, on 28th and 29th May, 1975. NGD '75 sponsored by UKF Shellstar will show many technical advances in grassland research from the Grassland Research Institute, the NIAB, from the Netherlands and from ADAS, the Milk Marketing Board and the Meat and Livestock Commission. In addition, there will be a tightly packed action demonstration covering 180 acres and over 100 machines for processing grass. The super-silage technique and permanent pasture improvements will be demonstrated together with many other interesting aspects of animal production from grassland.

12. COCKSFOOT REVIVAL ?

A. W. Peden

The International Plant Breeders Mommersteeg who are well represented in the Scottish colleges list of recommended varieties have yet another first. After an extensive breeding programme they offer a new concept in cocksfoot.

In the past, it was acknowledged to have clear benefits over many other species but also some features unacceptable to the grassland farmer.

The main benefits associated with cocksfoot have been:—

1. Deep roots — which means the variety improves organic matter status of the soil.
2. Drought resistance.
3. Rapid recovery from cutting or grazing.
4. Persistence.

The disadvantages all appear to stem from one problem, that of low palatability causing rejection by the grazing animal.

After exhaustive trial work, the poor palatability appears to derive from the invert silica teeth present in the leaf of cocksfoot which become worse as the plant matures. Having discovered the cause of the problem associated with cocksfoot the breeders set about solving the problem.

After many years of selective breeding, Mommersteegs have bred a variety of cocksfoot without the silica teeth. This new variety was aptly named TENDERBITE. It is being referred to as the cocksfoot with the ryegrass quality.

Information on the variety and its uses can be obtained from Messrs R. & A. Hannay Ltd., Stranraer, a branch of A.A.M. (Scotland) Ltd., and A.A.M. (Scotland) Ltd., Churchill House, Dumfries.

13. THE WELSH MARCHES

Summer Tour — 1974

Good weather, good company and good farms all contributed to the success of the May visit to that beautiful and fertile area of Herefordshire and Shropshire near the Welsh border.

Sylade and Zero-grazing. As an " appetiser," the I.C.I. Dairy House Farm, near Middlewich, stimulated discussion on just how much fertilizer should be used on grass. Silage making was in spate. The wilted grass was being cleared at 20 acres/day with a Speiser precision-chop harvester. One silo was being filled without an additive and another with herbage treated with Sylade at 1 gal/ton. The silages will be fed to matched groups of dairy cows next winter and the milk production compared.

In the summer the 256 cows are zero-grazed. Each cow was eating about 240 lb. of grass per day with an average production of 5 gallons milk per day from the grass. Fertilizer use was over 300 lb N/acre plus P & K but there was clearly no shortage of grass.

Poor man's tower silo. The Experimental Husbandry Farm at Rosemaund, Hereford, was testing a silo described by our Vice-Chairman as a trampoline on its side. This " poor man's tower silo " was a 60 ft. x 30 ft. Dutch barn complete with roof and strong uprights plus flexible walls made of weldmesh, polythene sheets and lots of springs. In theory, the 450 tons of grass silage will be 15-18 ft. deep and yet exert little pressure on the sides of

the silo. The herbage has to be blown into the silo. The idea should be followed closely since many buildings could possibly be adapted for silos if the construction could be made lighter.

Messrs F. & J. Simcock at Felton showed their two "Harvestores" which were part of their system for keeping 220 cows and 120 followers on 218 acres. Concentrate usage has been cut from 18 to 11 cwt/cow due to high quality silage, and yields are at the 1,000 gal. level. Maize silage was still being fed in May to some fattening bulls but in general, this crop was not being grown on a wide scale.

Balanced farming. Balanced farming could well describe the activities of Mr Powell. Amberley Court, Marden, who grew blackcurrants, potatoes, wheat, grass and clover for seed production plus a herd of 73 cows averaging 1,100 gals at a stocking rate of 0.8 acres/cow. The seeds mixture for seed production was 3 lb ryegrass and 3 lb white clover per acre, and the sward was thick and highly productive.

The grazing swards were being strip grazed, and in mid-May providing nutrients for over 4 gals milk/cow daily.

White faces and blackcurrants. Blackcurrants and pedigree Hereford cattle were the profitable interests of Mr C. Harris, Orleton, Ludlow, in the North of the county. These extremely civilised activities tended to avoid ulcers and the usual hectic farming life, and yet make full use of the latest scientific findings. The 100 acre farm had 25 acres of currants and the remaining grass was stocked with 30 Hereford cows plus about 50 followers. The bulls were bred for good weight gains plus commercial characteristics.

Profitable organic farming. Probably the highlight of our tour was the 580 acre farm of Mr Mayall, nr. Shrewsbury, who recently spoke to our Society (Greensward No. 17, page 39). The two herds of Ayrshire cattle numbered 250 + followers with a couple of Pant bulls as herd sires. The farm rotation was 4 years ley and 2 years cereals with some roots, carrots and fodder-beet. Cereals were milled on the farm and sold direct to customers who prefer compost-grown foods.

Milk yields were 1,197 gal/cow and 992 gal/heifer at 4.00% butterfat and a calving index of 387 days. Stocking rate at 1.1 acres/cow may not be as high as on many "intensive" farms but no money was spent on bag fertilizer since 1948.

Correction to Greensward No. 17

Ron Harkess adds the following correction to his article, "The truth about additives," No. 17, pp. 34.

Lines 6-9 should read:—

This loss occurs in four main ways: (a) field losses, (b) oxidation/respiration losses, (c) fermentation losses, (d) feeding losses. Additives can help in reducing all of these. Wilting the crop .....

CENTRAL SCOTLAND GRASSLAND SOCIETY

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