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SOUTH WEST

AND

CENTRAL SCOTLAND

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COMMUNICATION

Printing costs are rising. Many periodicals and newspapers are giving up. The prices of books are soaring. Postage costs are doubling. Railways are being torn up. Bus routes are ceasing to operate. Our roads are choking with traffic. The movements of the county agricultural advisers are being restricted. And yet, from all sides of the industry, there is a cry for improved communication of the results of research and development. Something must be wrong with the present system of communication—what is wrong?

Some say that the fault lies at the 'sending' or transmitting end. The scientist is chasing the wrong problems. Some say that the line of communication is at fault and the scientist's message cannot be understood. Finally, there undoubtedly is trouble at the receiving end. The farmer is bombarded with good and bad advice, with genuine scientific advice and with nonsense disguised as science, and is unable to sift the genuine from the false.

Typical of the difficulty presented to the farmer are the many types of calcified seaweeds/coral, etc., offered to farmers at around £25/ton. No one can deny that they can be beneficial to crop growing or livestock production if the soil is deficient in lime. It is equally certain that these benefits can be obtained more cheaply by applying various forms of ground limestone. The long lists of trace elements present in these substances can be matched by trace elements present in our normal liming materials, in basic slag and in the soil itself. Although trace element deficiencies can lead to animal health troubles, excesses can be equally harmful. Colleges, research institutes, advisors have all expressed their opinion of these materials in no uncertain terms. Who then are the farmers who continue to use these materials?

A Society such as ours exists to remedy the situation. In spite of rising costs of publication, our journal continues to appear. But severe and unpopular measures are needed to keep it going. For instance, I have left out reports on many farm walks, on our annual general meetings and the number of research reviews included in this number have been reduced. Both Bob Miers (Drainage) and Tom Dodsworth (Beef) had included diagrams and charts with their talks but their inclusion in the journal would be costly. Pictures, diagrams, big print, fancy paper are all expensive. They help to make a journal readable, but it is hoped that our members do not need to be coaxed to read what is good for them.

We are fortunate in our printers who assist in every way possible to reduce the cost of publication. We could reduce costs of printing still further by using smaller print, cutting out spaces between paragraphs and between articles. Such savings are small and not likely to affect the main issue which is the value of this method of communication to the farmer members.

At the moment, the journal costs £5 per printed page to produce, 60% of which is met from the funds of the two Societies i.e. from members' subscriptions. The rest of the costs, mainly other than actual printing, are derived from other sources.

The possibility of maintaining, enlarging, improving and increasing frequency of publication by allowing advertisment is being considered. The views of members both farmer and merchant would be appreciated. Quite definitely, the pages of the journal should not be used to persuade members to buy unnecessary or harmful or costly machinery, systems, herbicides, seeds, additives, cattle feed, etc., etc. It is customary for journals with the same main purpose as ours to print somewhere a disclaimer that the editor/publisher and committee do not necessarily support the opinions of advertisers using their journal. We are very fortunate in that most merchants in our locality are highly reliable and trustworthy. By putting on the market low cost, high quality fertilisers, seeds, herbicides, machines and additives, they contribute in no small measure to the advancement of grassland husbandry in our region.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

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1. DRAINAGE OF GRASSLAND — DEMONSTRATION

A whole-day demonstration of field drainage systems and field drainage machinery took place at two sites in Ayrshire on 7th October, 1971.

At the first site, Fore Rogerton, Auchinleck, (Messrs Wardrop) several systems of under-drainage set up jointly by the West of Scotland Agricultural College and the Department of Agriculture and Fisheries for Scotland, were demonstrated by a team led by Alistair Campbell, the Senior Officer and Area Agricultural Adviser for the South-West region of the College. In summary the types of systems shown, together with their costs, were: —

	Type of System	Cost per acre*
1.	Traditional tile system at 5½-yard intervals	£170
2.	Tile system at 11-yard intervals with-sub-soiling** to a depth of 22 inches	£102
3.	Tile system at 22-yard intervals with turf infill and sub-soiling**	£64
4.	Tile system at 22-yard intervals with turf infill and mole draining at a depth of 20 inches	
5.	Plastic pipe system at 22-yard intervals with gravel infill and mole draining	£55
7.	Plastic pipe system at 88-yard intervals with gravel infill and mole draining	£41

* Each scheme allotted a share of the outlet cost, namely £11.
** Subsoiling to be carried out as soon as subsoil has dried out.

The experiments at Fore Rogerton are pilot trials intended to arouse the interest of the farming community and it is hoped to hold further demonstrations from time to time so that the results may be judged under various weather conditions. On upland farms with soils of the type demonstrated, it is doubtful whether returns on investment could justify high-cost traditional type drainage systems. Reducing the costs of drainage to economic levels is therefore a worth-while subject for experimentation along the lines of that shown at Fore Rogerton.

At the second site, Ladykirk Home Farm, Monkton (Lady Moore), various types of machinery for subsoiling and cultivating were on show and in action (when the atrocious weather conditions permitted). The equipment on show included: —

British Leyland 384 with Vicon Rota Harrow. Economic Forestry Group Dual Purpose Mole plough/Subsoiler with Fiat 100 C Crawler. Ford 5000 with Bamford Subsoiler. Ford 5000 with Sod-seeder. Ford 4000 with Rota-seeder. International 573 with Vicon Subsoiler. International 634 with Spring Tine Cultivator. International 434 and Howard Rotavator. International County Super 4 (four-wheel drive). Massey Ferguson 1080 with Spring Tine Cultivator (10′ 0, 15′ 0 and 18′ 0) and 4-Furrow Reversible Plough. Massey Ferguson 135 and 165 tractors with Double Furrow Reversible Plough. 3-point Linkage Mole Plough and set of Massey Ferguson semi-mounted discs.

Plant Protection Ltd. were responsible for organising "Gramoxone" treatments of grassland into which was then direct drilled winter wheat.— J. FRAME.

1a. PROBLEMS AND SYSTEMS OF GRASSLAND DRAINAGE

R. H. Miers
Chief Drainage Officer, M.A.F.F., Lincoln.
Talk to the West of Scotland Grassland Society
on 7th October, 1971, Ayr.

In a town where Robert Burns was born it is right that a talk should begin with a poem. Coming from Lincolnshire, it is even more appropriate that I should quote from Alfred (Lord) Tennyson's poem, "The Brook":—

> I come from haunts of coot and hern
> And make a sudden sally
> And sparkle forth amongst the fern
> To bicker down the valley.
> Till last by Philips farm I flow
> To join the brimming river
> For men may come and men may go
> But I go on for ever.

If Tennyson could return now he would perhaps not feel as confident as he was when he wrote that poem. The river has been embanked by the River Authority and doesn't run brimful; it is gauged for water and no doubt at sometime in the future the flow down the stream will be reduced. Due to the cutting out of the rock outcrops the stream no longer bickers down the valley and the haunts of the heron are now good arable land inside an internal drainage district. The object of quoting from Tennyson was to show that Lincolnshire is very different from the south-west of Scotland. There all is well organized with the rivers, major drains, and most streams, under the control of an appropriate drainage authority. So different is it that land above 25 ft OD is called highland, the rivers and drains may only have 3″ to the mile fall, the soil might have 80% clay fraction, but no rocks, and rainfall in a wet year may be 28″ and the evapotranspiration normally about 18″.

You may well ask why a person used to such drainage should be invited to talk in the west of Scotland. Appreciating your difficulties has however, allowed me to project myself into your conditions and I do run a Training Centre for drainage where the students are expected to learn not only about the arable east, but the drainage of the stock rearing west.

When I lived in Scotland I was frequently asked "Don,t you wish you had been born a Scot"? and I used to reply "Of course your education is so much better and people take more advantage of it." How strange that here, in one of the cradles of 18th century field drainage, little progress has been made for more than 100 years. Why have the Campbells, the Dunlops and the Howies not considered the changes in farming practices, the increased power made available by the tractor, the increased knowledge of land utilisation, and of the understanding of the soil profile?

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Scots have a reputation for being prudent and any prudent man considers the objective he wishes to achieve before he starts spending his money. What then should a farmer look for from field drainage ? Three things:—

The best possible soil conditions for plant growth.
The best topsoil conditions obtainable for farming.
The best value for money.

To ensure that we achieve these objectives, we must first understand the soil. Below the top layer it is composed of sand, silt and clay. In a moist soil, each particle is surrounded by a thin film of water. Between the particles of coarse or medium sand there is still enough void through which water can pass and air circulate, but between the particles of clay, silt and even fine sand, there is no such space for the passage of water as the voids are filled with these thin films of water held tenaciously by the particles. It can readily be seen that in most soils which are a mixture of sand, silt and clay, the spaces between the particles will be completely filled with these films of water and that there will be no room for water to pass or air to circulate.

How then does the water get through the soil? Fortunately soils containing some clay tend to aggregate, that is to form shapes called peds, which are easily recognisable in the soil. The first peds to form in the soil are usually prisms, these break up into angular blocks and these in turn become rounded off to become sub-angular blocks and in the topsoil crumbs may form. Between these peds are cracks, and through these cracks the water flows to the underdrainage.

It will be clear that the amount of cracking increases as the peds get smaller and the cracks widen as the structure moves towards subangular blocky and crumby. Mr Jarrett's subsoiling was successful because the subsoil in the fields concerned has a fine angular blocky soil with a good crack development. The operation of subsoiling probably broke a pan above these small peds and opened up the cracks which allowed the water in the topsoil to get away. I doubt whether the same operation would have been successful enough for arable farming. There are many cases where drainage can be improved by the act of subsoiling alone where the crack development at depth is sufficiently open to receive the water. It is a matter of inspecting the soil profile to ensure that a surface drainage problem is not to be transferred to a depth of 18″ where it cannot be dealt with effectively. The Soil Scientist will tell you that the formation of these peds and the cracks, which together are called soil structure, is imperfectly understood, but to the ignorant like you and myself there is no difficulty. We are not interested in the chemistry of these soil particles, nor in their minute physical relationship. The factors which improve the soil structure are well known — sunshine, grass, extensive root development, evapotranspiration, biological activity, a high pH, and drainage. The factors which tend to destroy the

peds and fill the cracks in between them are cultivations, fallows, heavy rains, acidity and waterlogging.

I have already stressed that the passage of water through the soil is dependent upon the quantity and width of the cracks and to a lesser extent upon the spaces between the coarser particles in the soil. From examining a large number of schemes in areas as diverse as Lincolnshire, Cumberland, Leicestershire, Gloucestershire and Essex, I have been able to find a relationship between the texture of the soil, the size and shape of the peds, and the quality of the crack development, to the design of successful thorough under-drainage. For example, if you have a massive compacted clay then the spacing required will be in the order of 2 yards. If you have a massive uncompacted clay then the spacing will be about 7 yards. If on the other hand, you have a coarse prismatic soil with a moderate crack development in a clay, then the spacing would be about 14 yards. It is important therefore, to be able to recognise these soil features. These solutions are of course, for a drainage problem arising from a soil structure, undamaged by farming, or unaltered by the downwash of fine particles. More often than not there is a more serious problem which will render underdrainage, even at 5 yards spacing, ineffective or only partially effective. Let us see what this problem might be:—

Impediments to the Downward Passage of Water

Arable Land	Grassland	Horizon in the Profile
Slaking	Poaching	Surface
Loss of crumb	Compaction	Topsoil
Anaerobic layer	———	Bottom of topsoil
Plough pan	———	Bottom of topsoil
Compacted layer	Compacted layer	Subsoil
Iron pan	Iron pan	Subsoil

If any of these features exist in the soil, under-drainage may not work effectively. These impediments to flow must be removed. In arable fields the problem is better understood than in grassland. Discing, subsoiling or moling, are all well-established remedies which are effective when used under the right conditions and for the right problem. Their use may not be effective in grass fields where poaching and compaction are the main problem. My colleague, Mr Bellhouse, when he came up here to see some of your problems, emphasised that most of them lay in th top 4″ and he likened your problems to those that he had experienced in Cumberland, where I think conditions are perhaps a little worse.

I found this problem existing at the drainage experiment at Fore Rogerton, Auchinleck. This had been created either by heavy poaching or by ploughing, which had turned a massive subsoil onto the surface. Later development created 2″ of soil structure at the top, leaving 2″ - 4″ in depth a compact layer and then 2″ or so of soil structure which had been originally at the surface.

Let us look at the problem more closely. Soil is weakest when it is wet, and therefore the danger of poaching or compaction in the topsoil is greatest with a soil which remains wet for a long time. A soil which dried out quickly will suffer the least. How can we ensure that the topsoil becomes dewatered as quickly as possible? Where the topsoil is not damaged it is much more permeable than the subsoil and normally the horizon immediately below the topsoil, is the least permeable. If therefore a spot of rain fails on the surface of a soil which is already at field capacity it will find its way through the topsoil in a short period, say half an hour. If there is no more rain, the drop of water will find its way slowly through the next layer which is only slowly permeable, say in 3 days, and then moving rapidly through a well-developed crack system will gravitate into the under-drainage system. Now let us consider not a little shower, but a heavy rainfall. What happens? The first drops find their way down to the compacted horizon and start to go through it but it is like a crowd trying to get through the small gates after a football match, a build-up occurs, saturating the topsoil. It is now vulnerable. Poaching and compaction will almost certainly take place, and it may be 3 days, it may be 28 days, it might even be longer, before that ground becomes capable of carrying cattle without damage to the soil structure.

Now, how can this problem be overcome? It is obvious that we have to treat the compacted layer to make it permeable so that the water can pass through it as quickly as possible. How can this be achieved? The methods used in arable farming must not be blindly adopted for permanent pasture. The soils, farming practices, rainfall and evapotranspiration are so different from those in Essex where mole drainage was developed. In that county, the soils are frequently stable, calcareous clays; the rainfall is low and a good soil moisture deficit occurs in most years. The spacing of the moles at 3 yards apart is said to originate from the ridge and furrow system developed in that part of the world, just as the 5 yd spacing in the intensive underdrainage of South-West Scotland has developed from the 5 yd ridge and furrow systems. There are three ways that I can see of solving the drainage problem in South-West Scotland for permanent pasture. The first is by piercing the impermeable layer and letting the water through to a good crack development below. I doubt whether this would be practicable about 200 ft OD because the structure of the soil will be poor in most cases. The second method which might be tried is shallow mole drainage. In New Zealand this method is used for draining pasture land and is reported to be very successful. When the moles are drawn a minimum soil moisture deficit of 2″ is needed and the temperature should not be below 60°F. In addition to this, the grading of the moles is very carefuly done so as to avoid erosion. (I have not found this of much significance in clay soils where the laterals or mains are not laid more that 44 yds apart). The third method is the one being tried out on the drainage trials organised

by the West of Scotland Agricultural College and the Department of Agriculture for Scotland whereby underdrainage is laid at wide spacing across the slope and the topsoil pushed into the trench, leaving an open slit above it. Mr Brownlee of the Scottish Department of Agriculture, considers that this will intercept the surface run-off which will occur in fields in the intensive rainfall areas and thereby improve the drainage to a standard sufficient for pasture. Drainage should be like tailoring and designed to suit the individual field, agricultural practices, climate, etc. All new methods should be tried out to see if satisfactory conditions can be achieved at reasonable cost. With these open slits left in the ground above the tile drainage it might be possible to mole straight through them, increasing the depth of soil through which the water can flow. If the soil is massive then the moling must be shallow at first and deepened gradually as soil structure develops. It has to be proved that this system is as effective as a skeleton underdrainage system with permeable fill on top, but even if it were not it might prove more acceptable because it is so much cheaper. It would not be practicable where arable crops might be introduced into the rotation in the areas where arable farming will not be practised.

In my investigations into the life of mole drainage it has been shown that the dominant factor is the amount of soil moisture present at the time of doing the work. I have already mentioned that in New Zealand they will not mole until they have 2″ soil moisture deficit, but in practice it is impossible to know the soil moisture deficit in a particular field and it is probable that different soils require different soil moisture deficits to make them suitable for mole drainage or subsoiling. No accurate field test has yet been developed to determine the suitability of a soil for mole drainage and subsoiling. For mole drainage, the nearest that I have got to this so far is to take a small piece of the subsoil at the depth where the moling is to take place, form it quickly into a ball and roll it with the palm of the hand onto a smooth, flat surface. If a thread $\frac{1}{8}$th inch diameter can be formed then the conditions are too wet. If the thread begins to crumble before it is $\frac{1}{4}$ inch diameter then it is likely that the soil is in a suitable condition. For the most successful moling the soil above the layer in which the mole is to be drawn should be dry enough to crack and the topsoil dry enough to avoid damage. In many cases, however, the soil has such a poor crack development that ideal conditions never occur until drainage begins to take effect. Moling has therefore to be done in a soil which is too wet but much benefit will be derived. Only after several molings or a dry season will the ideal conditions be experienced. The test described above may be quite suitable once the drainage system has been installed but the farmer wants to know whether satisfactory conditions are likely to arise frequently enough for him to rely upon moling, and I stress moling because I think that the conditions are likely to occur more frequently than for subsoiling.

To forecast the opportunities a farmer will have to do mole drainage, reliance has to be placed upon calculating the soil moisture deficit which is likely to occur. I have done this for an elevation of 100 ft in Ayrshire and you will see that 1 year in 10 moling conditions last for over 4 months, and for 3 years in 10 last about 2 months. Reliance upon traditional mole drainage is, therefore, a possibility. At 300 ft, however, there is not an opportunity for moling 3 years in 10 and because of this, mole drainage at traditional depths cannot be relied upon. Shallow mole drainage, however, would still be feasible. At 600 ft the opportunities for moling will only occur once in 10 years, possibly for 2 months. The farmer will have to exercise great skill and initiative in taking advantage of the right conditions for mole drainage. He must not wait until his field has become so wet it is poaching heavily or crops are being lost.

Shallow mole drainage has not been experimentally proven in the United Kingdom but it would seem that for the pastures of South-West Scotland it provides a cheap solution to the greatest drainage problem of dewatering the topsoil quickly. It also takes into account the climatic and farming problems which beset this part of the world. Below, I summarise the advantages and disadvantages of its use: —

Shallow Moles

Advantages	Disadvantages
Dewater topsoil quickly	Short life
Avoid most stone	Enterprise needed
Soil moisture conditions occur frequently	
Farm tractor power O.K.	
Avoid old underdrains	
Revive old underdrains	
Low cost	

I want to emphasise however, that such a system cannot be used for arable farming and up to about 200 ft OD, traditional mole drainage will probably be more satisfactory.

I want now to compare the traditional practices of thorough underdrainage with those incorporating mole drainage and/or subsoiling. Field drainage can only reduce the water content in the soil to field capacity. In this condition, most soils are damaged by the passage of tractors, cultivations, and by the traffic of beasts. After underdrainage has done its work, evapotranspiration has to reduce the soil moisture still further to remove the danger of damage to the topsoil. How much further this depletion of the soil moisture has to be I am not prepared to say but I do know that in Derbyshire where the climate is not dis-similar from the South-West of Scotland, the farmer has to wait 2 days in spring after the drains have ceased to run for the soil to become suitable for reasonable acts of husbandry. This additional drying out

period reduces the significance of drainage spacing. I have calculated that if 1″ of rain fell in 24 hours on to a certain soil already at field capacity that for different underdrainage designs the drains would cease to run vigorously in the times shown in column 2 of Table 1 but that the topsoil would not be fit for cultivations until the time shown in column 3.

Table 1. **Drainage Limitation.**

1	Times After Running Ceases 2	3
Underdrainage Spacing	*Drains Cease to Run*	*Soil Becomes Suitable for Cultivations*
5 yards	16 hours	60 hours
11 „	20 „	64 „
15 „	24 „	68 „
44 „ (plus mole drainage)	8 „	48 „

In some cases the soil will reform pans after underdrainage has been installed and subsoiling or moling will be required at intervals otherwise the thorough tile drainage will not work effectively. In other cases the soil structure impoves and underdrainage works well without subsoiling or moling, but such underdrainage systems would have to be at very close spacing at altitudes of say, 300 ft or more.

Nothing in this world is of value at any cost and certainly the economics of drainage must be taken into consideration. In Table 2, I have made a comparison of cost both as a capital investment and as an annual repayment with the probable effectiveness of different systems.

Table 2. Drainage economics.

1	2	3	4	5
5 yards	16 hours	60 hours	£190	£28
7.5 „	18 „	62 „	£140	£21
11 „	20 „	64 „	£96	£14
15 „	24 „	68 „	£64	£10
44 „ p.f. and moling	8 „	48 „	£50	£8
44 yards p.f. and shallow moling	8 „	48 „	£50	£8

1. Spacing of Underdrainage.
2. Time Required to Return to Field Capacity.
3. Time Required to Return to Plastic Limit.
4. Approximate Cost per Acre.
5. Approximate Annual Profit Needed to Clear the Expenditure.

To summarise, compare the advantages of a thorough tile drainage system at 15 yard spacing and 5 yard spacing and you gain 8 hours in just under 3 days before the soil becomes suitable for farming operations, and for this you pay an extra £120 an acre, and must make an extra £18 an acre profit to pay for it. If moling can be done successfully the land will return after a heavy rain, to a suitable condition for farming operations quicker than under a 5 yard spaced underdrainage, and only £8 per acre increase

in profit is required to pay for the work. Moreover, if one of the drainage problems I have mentioned, like the compaction in the topsoil or the subsoil recurs, you will have a scheme designed so that you can overcome it, but with ordinary thorough tile drainage there is always a risk that the water problems will be transferred to a lower horizon where it cannot be easily dealt with.

Most of Scotland's fields have been drained in the past at between 5 and 7 yard spacing with the laterals running down the slope. This is a perfect design. The furrows naturally collect the water from the ridges and the drains accept the water from the furrows. The system can scarcely fail except from poaching or compaction of the topsoil, and as the beasts are likely to concentrate on the drier ground the chance of the drainage problem is kept to a minimum. These systems however, were made in the last century and I have records showing that men got approximately 5p a chain for laying them; so there was no incentive to do anything else but to make absolutely sure, but the cost has risen 40 times or more, and when other systems can give you equal or better results, you cannot afford to waste the money.

Yet these old drainage systems may still be valuable. By being laid down the slope they are frequently free from silt or contain very little silt, or are easily cleansed. When they have failed it has normally been where the fields flatten out or where the laterals join the main laid across the slope. Intercepted at 2 chain spacing and moled about 1 yard on either side of the bottom of the furrow you can have a drain system for £55 an acre which is better than one which will cost you over £150 an acre.

Now I want to talk about the benefits of drainage. In the case of the arable farmer these are self-evident. Continuing any good practice the yield on drained land would be appreciably higher over 10 years than undrained land. In the case of grass however, the benefits are not so clear. They are bound up with farming practice, with the balance of stock and grass, the season, and so on. Now I am no expert on the use of grass but I put forward to you my ideas:—

1. If you are already supplying 2/3rd of your feed during the winter from grass products, to benefit from the increase in grass yield you will get from drainage, you will have to buy stock and probably erect buildings. You will therefore, have to take into consideration the cost of the buildings and stock, together with the cost of the drainage, in deciding whether the profit you will make justifies the expenditure. In other words, an all-farm approach is essential.
2. If however, your grass yields are falling due to poaching then underdrainage becomes necessary to maintain your grass yield. I have seen a field drop from what I estimate to have been 3,000 lb of dry matter/acre yield in one May to about 750 lb in the following May, due to poaching. Under these circumstances if underdrainage will prevent the poaching then the expenditure is obviously not only worthwhile, but absolutely essential.
3. The third case is if you are feeding cake at £35 per ton and you could replace with silage or barn dried hay you can benefit by increased yields of grass, and with first class management you might

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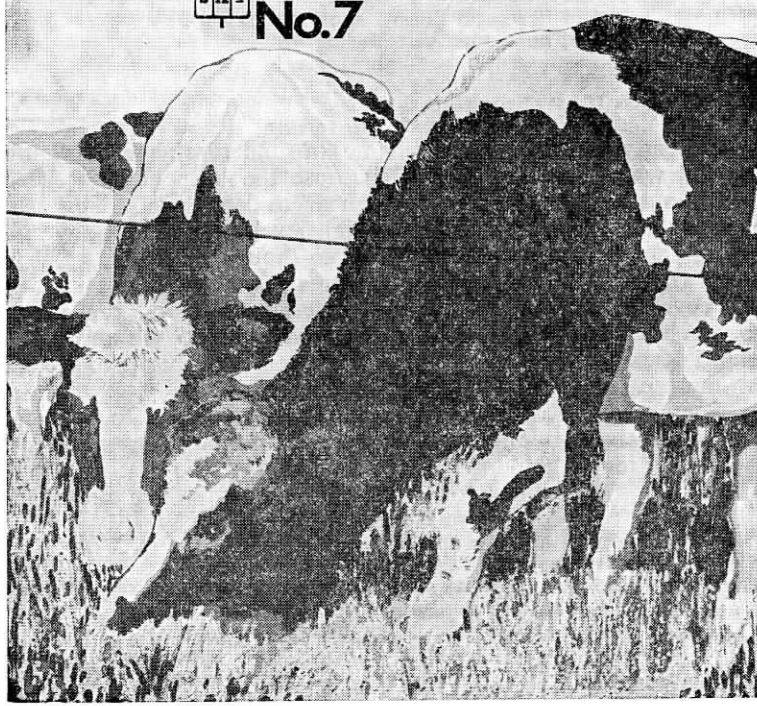


save 12p per day per cow, or something of the order of £18 a year. I should like to quote from the Boxworth Experimental Husbandry Farm Report for 1970 — "Normally hay provides a maintenance feed only but it hay of higher quality is made, 20llb will provide M+ 1 gallon. This will save about 6½ cwt of concentrates through the winter or about £23 per acre where concentrates cost £36 per ton." Traditional drainage in this area costs about £190 an acre and this means an annual payment of about £28. It is difficult to see how this can be recovered and it can scarcely be regarded as a prudent investment. Drainage in this area requires new thinking. Design should not slavishly follow the tradition of South-West Scotland, nor should the methods employed elsewhere be thoughtlessly adopted. Why not follow in the footsteps of the Wigtownshire drainer who pioneered ducts in underdrainage in the 18th century, or Mr Boyle of Ayr who made horseshoe tiles with soles, or Mr Calderwood who showed initiative in manfacturing field drains out of peat. These pioneers moved into an unknown field but the farmers in Wigtownshire, Ayrshire, Dumfriesshire and Lanarkshire can be pioneers, basing their designs for underdrainage on sound knowledge of agricultural practices, climate, and soil. Don't spend £150 an acre when £50 will give you better results provided you manage and maintain your underdrainage well.

At the beginning of my talk I quoted from Tennyson and said that if Tennyson returned to his birthplace he would find things very changed and I have written a poem which illustrates the need to take care of arterial drainage:—

The Burn

I tumble down the mountain side
And surge into the valley,
And here and there I spoil the hay
And here and there the barley.
So on to rolling plains I flow
To find potatoes growing,
If men won't keep my bed cleaned out
I'll flow where they are sowing.

Recently I inspected a scheme of underdrainage in South Scotland which had not worked because the burn had not been cleaned out and was running very near to land level. This had retained the water in the area at a high level and the clay soil had been unable to dry out and crack. Even though the underdrainage outfall which had been taken downstream was clear, the laterals were covered with a plasticine-like material which was preventing the water reaching them. Where the land does not lie above the natural stream level it is essential to deepen these burns to ensure that there is control of the watertable in the area.

Some people, however, think that by controlling the arterial drainage this will give us satisfactory field drainage. Drainage is a whole, starting at the topsoil and finishing at the sea, and it is right that I should finish off with a little poem which illustrates this need for considering drainage as a whole:—

Drainage and the soil you cannot divide,
Manage both well is a very good guide.
Avoid poaching the surface when e'er you can,
Don't plough in mud and create a pan.
Examine your profile is something you must,
Impediments to flow mole through and bust.

— R. H. MIERS.

1b SUBSOILING

George Jarrett, Somerset.

Farmer, Journalist, Contractor.

Enthusiasts for any subject are generally well worth listening to, and George Jarrett is no exception. In his rich Somerset accent, George put forward his reasons for being a keen advocate of subsoiling, always of course if it is done under the correct conditions. For over 20 years George has been subsoiling with either a D2 or a D4 Caterpillar tractor and he claims to have had no real failures. Originally his interest in subsoiling was aroused by reading the books of Newman Turner, but now he is an expert in the subject.

His subsoiling has been done mainly in Somerset and Devonshire, but he travels the country to give advice on his specialist topic. Briefly, his basic theory is that far too much money, e.g. £150 per acre is "wasted" on complex drainage schemes when subsoiling at only £6 per acre should be tried first and may be equally successful. Subsoiling conserves moisture and George feels that the minimum of drainage water should be released from the soil in the maximum of time. He considers a drainage scheme to be like a tin roof which quickly removes water, whereas subsoiling is more like a thatched roof which gently and slowly allows the water to trickle away. His suggestion is to subsoil first and observe the results and only then to consider drainage if the subsoiling is not a success.

Soil compaction is a present-day problem, and this can be remedied by sub-soiling carried out at the correct time of the year. This period is when the soil is dry, and the soil will shatter. The land may be left in ridges but later on these can be either rolled and harrowed flat or the land even ploughed. Subsoiling, claimed George, can lengthen the grazing season and give about 1 month earlier grazing. The plants can grow better because of an improvement in their rooting action, and the soil is warmer. Moisture is still retained after subsoiling and the plants will not dry out.

To support his argument for subsoiling, George gave two examples from fields he knows well. On one field the yield of wheat increased from 25 to 40 cwt/acre after subsoiling; on another field the yield of grass increased by 55-60% after treatment. Subsoiling is clearly an art, and not an exact science, and the direction of the slits and the timing of the job have to be decided on the spot after inspecting the soil. George insists on digging lots of inspection holes before he will accept a subsoiling job, and he may refuse to do the work if he is not satisfied that all the conditions are suitable.

George's arguments, and his coloured slides, were convincing, and without any doubt his views are well worth listening to. He makes it quite clear that he is not suggesting that all land be

subsoiled. His thesis is that subsoiling is a relatively cheap operation which can, in many places, replace expensive drainage schemes. The job must be done properly and at the correct time but it can have great benefits to the soil, the crops and the animals. Everyone may not agree with some of George's views but the value of his visit to our area will surely be to make us think. The scientific mind and the official mind can, after a time, become rigid and inflexible. George, we hope, has given us all a shake, and made us think again.— M. E. CASTLE.

1c — SOIL STRUCTURE AND DRAINAGE

Macaulay Institute for Soil Research, Aberdeen.

The term soil structure has a different meaning to different people. Basically soil is made up of soil particles, organic matter and moisture. The particles in order of increasing size consists of clay, silt and fine and coarse sand. These particles form aggregates which fall into 3 subdivisions. 1. Crumbs and granules, whose axis in both directions is fairly equal. 2. Plates, where the horizontal axis is longer than the vertical axis. 3. Blocks, prisms and columns which are the reverse of type 2. This structure involves shape and size which gives fine medium and coarse texture.

The formation of a soil structure is influenced by alternate wetting and drying, alternate freezing and thawing, the activity of roots and small animals and the decomposition of organic matter. The wetting and drying is the most important as this can effect size and shape of particles and aggregates. Soils which never dry out have no structure and so we get no crop off such soils. We want air in and water out.

In Ayrshire and S.W. Scotland there may be only 1 year in 3 at 100 ft or 1 year in 10 at 300 ft when conditions are suitable for subsoiling. Management is all important, choice of time for action is critical. This morning, Ladykirk illustrated this point with the very wet soil churned up and puddled. Great care must be exercised if operating in wet conditions for although it may appear that there is no damage, soil structure is being adversely affected and following crop yields may suffer.

DISCUSSION:

Q. Are there grants for subsoiling? A: Yes, for subsoil or moling either alone or along with a conventional drainage scheme.

Q: Is a consultant grant aided? A: In certain circumstances, Yes. But day to day management and assessment are not grant aided.

Q: Is pan due to traffic or breakdown soil? A: Some silty soils break down under heavy traffic. Natural pans form in clay by chemical action e.g. aluminium movement. Heavy sheep stocking too soon after refilling drain can bring pan about. Heavy machinery movements is very bad. Severe compaction can occur at low farming pressure. For example, foot traffic in tomato fields in Channel Islands has caused pan.

Q: At what depth does Mr Jarrett subsoil? What about turf as a backfill? A: At 20"-22" using a D2 tractor. Turf is cheaper than backfill but I do not know how long it will last. Cocksfoot/clover would help soil structure.

Q: Why such costly drainage at Fore Rogerton with no intention of ploughing? A: It is necessary to measure what drains alone will do. Lime is the next step; cropping may come in the future.

Q: Is the type of grass there going to pay for the drains? A: The grass is improving, better botanical composition already even after

1 year. Lime, slag and the appearance of white clover should set the improvement going. At Fore Rogerton only 2" of crumb structure on the surface. Ploughing would cover this up. Being in a wet area it would take ages to get this back. One should build on the structure already there.

Q: Would not the use of paraquat and direct reseeding lead to panning? A: Not in my opinion. Since the soil is not turned over structure remains unless damaged by heavy grazing.

Q: Why not basic slag at Fore Rogerton? The land desperately needs it? Would repeated ploughing down of turf not keep to build up soil structure? A: The area will get slag. It is possible that ploughing at 10"-12" deep would also bury weed seeds and repeated ploughing build up a structure.

Q: Can subsoiling be overdone? A: If done at correct time it shouldn't be necessary to come back quickly. A preliminary sub-soil to get water moving can be useful then return 2-3 years later to complete the job.

Q: What are the ideal conditions for sub-soiling? A: When soil is hard and not soft.

Q: On a sward, disturbance marks are a nuisance — can't cut hay or apply manure properly? A: Must treat gently to avoid large heave. May have to roll afterwards. If you keep the sub-soiling shallow, this heave can be avoided.

Q: On arable land, heave is no problem because it can be cultivated down? A: Best conditions for subsoiling lead to heave but if subsoiling in September, the frost can break it down. Roll it but not too much mechanical smoothing as it can lead to damage of soil structure.

Q: In Ayrshire, May/June is best time which can be awkward as far as 'sward use' is concerned? A: Take a good look at soil and especially what is below the surface. It can be O.K. at 24" despite a wet surface. Judge each field on its own. There could be years when sub-soiling is impossible.
You may have to sub-soil in sub-normal conditions to get the cycle going. If pan exists grass won't grow, and it is grass and transpiration that dries out the soil. — I. V. Hunt.

2. PROBLEMS OF BEEF PRODUCTION

T. L. Dodsworth, J.P., B.Sc. (Agr.), Ph.D.
North of Scotland Agricultural College, Aberdeen.
Guest speaker at Xth A.G.M. Newton Stewart.
25th November, 1971.

Over the last few decades consumption of beef in Britain has run at just over a million tons per year. By a tremendous effort the home produced proportion had increased from 40% to 74%.

The first requirement in such a tremendous change had been an increased supply of calves. These had come largely from the 1½ million baby calves formerly slaughtered at birth. These by-products of the dairy herd had entered various semi-intensive systems aimed at producing a 9 cwt animal for slaughter at 18 months.

The 'Barley Beef' explosion in 1961 had shown what could be done with the pure dairy Friesian. This was quantitively satisfactory even if its quality was a little doubtful. The problem now facing us was to take the proportion home produced to 100% and beyond with the prospect of export of quality beef to the European market.

Given the present rate of increase in beef production and population growth and consumption per head, this should arrive about the mid-1980s.

The major requirement for fulfilling this target was to improve financial return and make beef production competitive with other enterprises.

One way of achieving this was to turn money over more rapidly, i.e. to reach satisfactory weight in less than 12 months.

This leads to the following technical requirements:—

a. To get from birth at 80 lb to slaughter at 1,000 lb in 12 months, the animal would need to grow at an average of 2½ lb/day.
b. To achieve this requires a calf with the right potential and top quality feed.

Such a system provides no place for low quality feeds such as straw or hay except super barn dried hay. Top quality grass silage plus swedes and/or draff could be the basis.

The importance of equating food supplies with the nutrient requirements of the cow

The nutrient requirements of a spring calving beef cow over a calendar year are depicted in Table 1. A higher level of nutrient requirement is reached during the lactation period and it seems desirable that this should coincide with a period when liberal quantities of low cost high quality feed are available on the farm. On the other hand, the cow requires feeding for four or even five

months at around maintenance level and this period should clearly coincide with any period when only low quality feed is available.

The requirement for additional feeding during lactation is fully recognised but a point which is often overlooked concerns the need to feed generously during the breeding period in order to ensure that the cow is then rising in condition because this directly affects the duration of the breeding period and subsequently the length of the calving period.

The importance of condition of cow when served and length of breeding period

The liveweight at sale time of individual calves in a herd is directly related to age; the older the calf the greater the liveweight. The range in liveweight is therefore related to the length of calving period which in turn reflects the length of the breeding period. Ideally, therefore, the breeding period should be restricted to six or at the most nine weeks but at the same time it is necessary to ensure that all cows are settled in calf.

Table 1. Effect of calving date on nutrient requirements of beef cow.

Month	*Available Contribution from Grazed Grass*	*Spring Calving*	*December-January Calving*
September	M + 1	M + ½	M
October	M	M	M
November	—	M	M + 1½
December	—	M	M + 1 Calving
January	—	M	M + 1½
February	—	M + ½ Calving	M + 2
March	—	M + 1	M + 2½ Serving
April	M + 2	M + 1½	M + 2
May	M + 3	M + 2 Turn out	M + 1½ Turn out
June	M + 2½	M + 2 Serve	M + 1
July	M + 2	M + 1½	M + ½
August	M + 1½	M + 1	M
September	M + 1	M + ½	M
October	M	M	M
November	—	M	M + ½
December	—	M	M + 1

(This table is based on two charts prepared by Dr. Dodsworth—*I. V. Hunt*

There is now ample evidence which proves that the cow must be rising in condition if she is to settle to first service. The cow which is falling in condition either does not exhibit oestrus or does not conceive, she returns to service later and a protracted calving period must follow. In such a case the situation is often aggravated by an increased incidence of disease, especially scour, amongst late born calves. The disease builds up virulence during a protracted calving period and may considerably depress the growth rate achieved by late born calves, thus widening the range in liveweight at sale time. It is therefore necessary to ensure that the breeding season coincides with a period of adequate nutrition and that breeding season and hence calving date should be decided

according to limitations imposed by quality and quantity of feed conserved for use in winter. Poor results are inevitable if the breeding season coincides with a period of inadequate nutrition.

Spring calving is the obvious choice when hay of only average to poor quality is available for feeding in winter. The minimum supplementary feeding is required for six to eight weeks before calving and until turnout or the commencement of pasture growth. The breeding period coincides with maximum pasture growth which should result in an improvement in the condition of the cow, a satisfactory conception rate and subsequently a short calving period. A uniform batch of calves of satisfactory liveweight should be produced for sale.

When such successful results have not been achieved a common reaction is to advance the calving date into December and January although the poor results may more properly be attributed to the type of cow used. The calves produced are then some two months older and this should result in an increase in liveweight at sale time. Unfortunately in many cases it is found that a prolonged breeding period also becomes necessary, resulting in a protracted calving period and a wide range in calf liveweights at sale time. The reasons are illustrated in Table 1. Given calving in December and January, heavy supplementary feeding is essential for three or four months to support lactation and to ensure that the cow is rising in condition when served. Service is taking place during the traditional " hungry gap period " and if adequate supplementary feed is not given the cow does not hold to service and prolonged breeding and calving periods must follow. Furthermore, even if an even batch of calves is produced by giving proper supplementary feeding to cows, it will often be found that the cost of this additional feed simply equals the increased value of the heavier calves at sale time. Calving in December and January is therefore not a complete answer. In many cases it would appear to be more sound to revert to calving in February and March and effecting a change if necessary in the type of cow used and applying proper feeding and management methods.

Calving in early winter and preferably in autumn can only be recommended when higher quality roughage is conserved for feeding in winter. This would suit the upland farm which is either all grass or where there is an adequate acreage of " inbye " grass, where silage is made and adequate housing is available. Where silage of average quality is available, the quantity which must be fed to satisfy the cow's appetite will provide for maintenance plus 1 to 2 lb of liveweight gain or 1 to 2 gallons of milk. It is sensible to have the cow in milk at this time as there is little point in fattening suckler cows over winter. The herd can be calved in September, one immediate advantage being a reduction in incidence of disease amongst calves. The herd would graze on foggage until November or December according to conditions and then be on silage sufficient for 2 gallons of milk daily.

Calving from 24th August to 26th October implies a breeding period extending from 14th November to 14th January. The cows should still be in good condition, ensuring a satisfactory short breeding period. Up to 4 lb grain may be fed daily during the breeding period to ensure satisfactory conception but as soon as the herd is settled in calf, feeding should revert to silage alone at a level necessary to provide for the production of 2 gallons daily. Any additional milk may be taken " off the back " and silage of inferior quality should be kept for use during the late winter period. The additional requirements of the calf can be met by direct creep feeding of concentrates. The calves are 7-8 months of age in spring. According to circumstances on the farm they may be sold in the spring store market, return to the hill with the herd or weaned at or soon after being turned out. Weaned calves may be rotationally paddock grazed using eight paddocks, and if of the right type could be fit for slaughter at 13-14 months of age. On the upland farm with enclosed grassland, the cows may be grazed in tandem, i.e. following the calves on the same set of paddocks or they may be densely stocked on another pasture until mid-June. The cow stock could then be moved onto an aftermath or better pasture for six to eight weeks before calving commences again in late August. Under these circumstances of autumn calving, quality of available feed matches animal requirements.

Even when this results in satisfactory conception rates, the calves produced by this system are criticised as very early maturing and reaching slaughter condition at light weights when fed liberally and incapable of gaining 2 lb liveweight daily. Therefore there should be a change in the type of breeding animal used in suckler herds.

The importance of " type " of animal

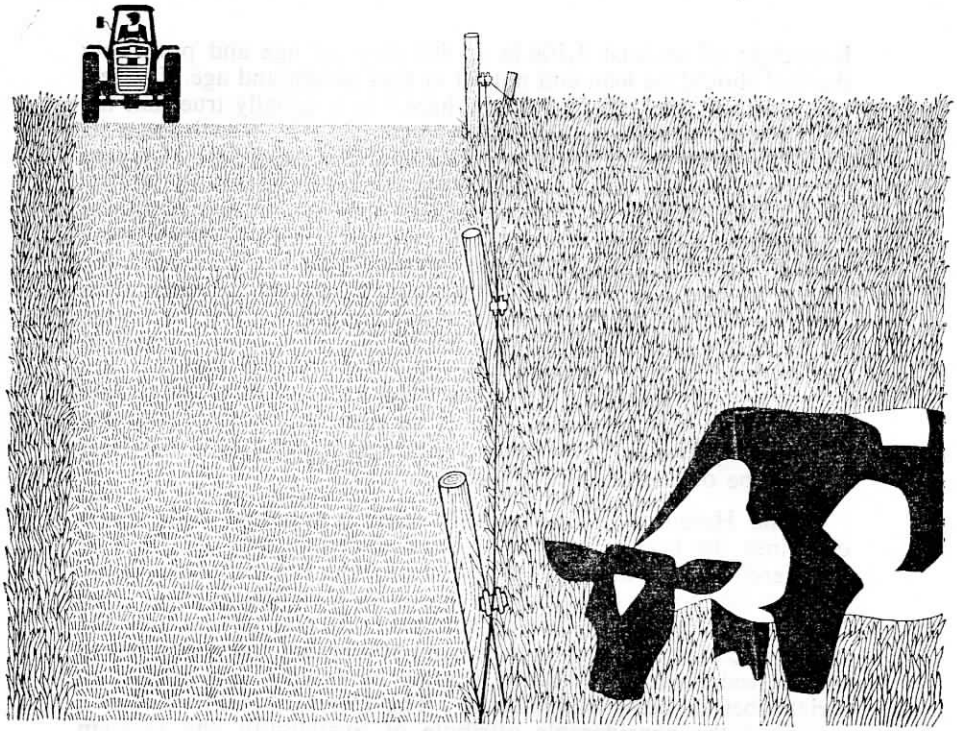
Survey findings emphasise the close relationship which exists between profitability and the genetic potential for liveweight gain possessed by the calves. To quote from a Beef Recording Association study of data from recorded suckler herds for the period 1966/68:—

" For every 0.1 lb increase in calf daily liveweight gain, the gross margin per cow increased by £1.90."

" The difference in the average weaning weight of calves between the top and bottom one-third herds, was 108 lb, the difference in net output was £6 per cow."

" Calves in the top one-third herds gained 0.3 lb more per day than calves in the bottom one-third."

These results confirm the need to use breeding stock which can contribute satisfactory genetic potential for liveweight gain to the calf. It implies the need to use a bull of proven merit for liveweight gain and that the sire used should have achieved a recorded



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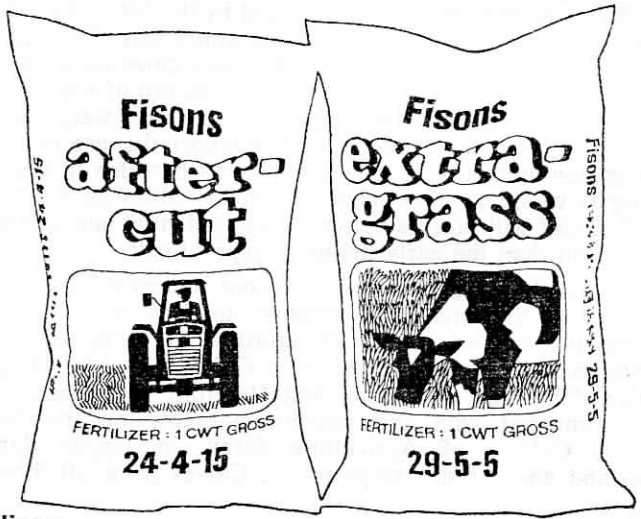

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FISONS

liveweight of at least 1,100 lb at 400 days of age and preferably the bull should be lean and not fat at that weight and age. Furthermore, while " the bull is half the herd " it is equally true that the individual calf receives 50% of its potential for growth from its dam. The dam's genetic potential for growth is therefore also very important but she must possess other qualities such as the ability to milk well, longevity, the ability for easy calving and hardiness appropriate to her environment. It is questionable whether many suckler cows possess all these qualities. In many cases, the commercial breeder has repeatedly retained home-bred heifer calves sired by a beef bull of unproven merit, for use as breeding cows. The cow thus bred may well be hardy and of good conformation but without records selection for milk yield and liveweight gain potential is impossible. It is for these reasons that calves now presented at sales are small and of an early maturing type which fatten at lightweights. We should return to the use of a first Beef Dairy type of cow in suckler herds.

The Hereford x Friesian cow offers a solution. This cross combines the beefing qualities, growth potential and hardiness of the Hereford with the milking qualities of the Friesian. Adequately fed, the Hereford x Friesian cow produces a vigorous calf of good birth weight, provides milk to match the growth potential of the calf. The calf achieves good liveweight at weaning and goes forward to the feeder with the ability to grow on rapidly to a good liveweight before being slaughtered. The Hereford x Friesian also possesses the considerable attribute of availability, the Friesian comprising some 65% of the national dairy herd in England and Wales.

The argument in favour of using a beef x dairy cow was supported by the results of the Beef Recording Association Suckler Cow Study quoted above and continued by the MLC. One pertinent finding emerging from this continuing study was that steer calves out of lowground herds of beef x Friesian cows were on average 32 lb heavier at 200 days of age than calves out of beef type cows. In upland and hill herds the difference in 200-day weight was 19 lb and 7 lb respectively. These results support the use of a beef x Friesian cow not only in lowground herds but also in upland and hill herds where the liveweight advantage although small is still real. The calf will possess better growth potential and will be more readily sold than the early maturing type of calf.

If the Hereford x Friesian is not successful in any given environment the challenge remains to find a suitable cross. Obvious possibilities are the Hereford x Ayrshire, the Galloway x Friesian and the South Devon x Galloway. The Hereford x Friesian, Galloway x Friesian and Hereford x Ayrshire are now being compared with the conventional cow on the North of Scotland College of Agriculture farms in Upper Banffshire, Sutherland and Orkney respectively. Calves from all three herds

are being fed to slaughter on our lowground farm at Craibstone, near Aberdeen, where their performance will be compared with that of calves out of the Craibstone Hereford x Friesian herd.

The need to produce calves with a better potential for liveweight gain during the finishing period is shown in Table 2 by performance at Craibstone of two lots of weaned calves over the fattening period. One lot of Hereford x Friesian dams were sired by a Lincoln Red Bull selected partly on the basis of a good 400-day liveweight. The second lot were sired by an Aberdeen Angus Bull selected on conventional standards and were out of crossbred beef cows. Both lots were housed after weaning the fattening ration consisting of swedes, and grass silage fed to appetite plus distillers wet grains and barley grain. The maximum daily food intake achieved per head was 5 lb barley, 7 lb wet grains, 25 lb swedes and 25 lb silage.

Table 2. Suckled Steer Calves. Performance over Fattening Period.

	Lincoln Red x Hereford/ Friesian	*Aberdeen Angus x Crossbred Beef Cow*
Liveweight at housing (lb.)	555	635
Liveweight at slaughter (lb.)	905	835
Age at slaughter (days)	384	423
Carcase weight (lb.)	526	491
Daily gain housing to sla,ghter (lb.)	1.87	1.71
Liveweight/day of age at slaughter (lb.)	2.36	1.98
Carcase weight/day of age (lb.)	1.37	1.16
Killing out %	58.1	58.8
Margin Selling-Buying price	£36.58	£13.05
Cost of Feed*	£23.38	£11.87
Margin over feed cost + purchase price	£13.20	£1.18

*Feeds charged to cattle at Barley £22,/Wet Grains £3.50, Silage £3.50 and Swedes £4.50 per ton.

The calves sired by the Aberdeen Angus bull and out of beef cows were of superb type by conventional standards but they had to be slaughtered after a 115-day fattening period. The later maturing Lincoln Red x Hereford/Friesian calves were fed for 188 days before it was necessary to slaughter them. The animals were less than 13 months of age at slaughter and the margin feed cost + purchase price was sufficient to leave direct profit which was not the case for the group of early maturing type calves.

The situation is aggravated by the high prices still paid by some lowground feeders for the conventional type of calf of traditional breeding and with outstanding conformation. This does not obscure the fact that there is a rapidly growing demand for animals possessing the genetic potential to gain over 2 lb daily while not achieving slaughter condition until they approach 1,000 lb liveweight.

The challenge to the suckler herd owner is plain; he must find a cow type which will suit his environment which when mated to

a bull of good 400-day weight will produce calves which can reach slaughter condition at 1,000 lb liveweight at twelve to thirteen months of age.— T. L. DODSWORTH.

DISCUSSION

Q1 — How can you continue paddock grazing through September without feeding and still maintain the required gain in weight? Grass in that period is over-rated. **A** — You must supplement the grass from August and house them from 1st October.

Q2 — Why 8 paddocks? Surely 4 are enough. **A** — 8 paddocks make it possible to provide 4 or 5 for rotational grazing through the flush period with 3 or 4 withdrawn for forage production. Later in the season, all 8 will provide a longer rotation. 6 paddocks is not enough to give this control in management.

Q3 — Assuming you calve in September and are geared to provide high quality fodder, what are you going to do with your cows in May/June? On such a farm, you are unlikely to find an area of rough grazing to turn them to. **A** — The ideal is to put them on a hill but where not available, they should be put thickly on the ground or one possible alternative is to graze cows and calves in a tandem system, that is with calves going ahead. 8 paddocks would allow this.

Q4 — What can you tell us about staggers? Can you get your stock to take magnesium and minerals without the use of expensive feed? How do you tackle the problem of staggers in the spring in the December/January born calf even where there is no staggers in the cow **A** — If you are liable to lose 2 or 3 cows through staggers then problem of the expense of the grain feed does not arise. You set the cost of the grain required to carry the Mg into the stock against the losses if you don't. Experience varies in the feeding of minerals. Maybe it is a question of the brand of mineral mixture or maybe the animal. I can only give our own experience, in which the stockman puts a mineral mix in the bottom of the troughs. By the time he returns with barley or draff, the troughs are empty. Where a mixture of minerals and urea is offered some hesitation is shown. The calf trouble is an example of true Mg deficiency in contrast to mature animal 'staggers' where symptoms of magnesium deficiency are shown despite plenty of Mg in its bones. The diet of the calf at this period is milk and this must be low in Mg. It is necessary to use Mg bullets, or to creep feed with a mineral mix, to make sure the Mg gets into the calf.

Q5 — Is the trouble regarding staggers not entirely a question of deficiency of energy in the diet? **A** — It will contribute to the trouble but the calf dies of Mg deficiency.

Q6 — You advocate housing stock in winter but here in Kirkcudbrightshire most single suckled herds are outwintered. We have no accommodation indoors. Do you not accept outwintering in this part of the country? **A** — The problem is the cost in terms of feed of providing body heat in a cold spell. Maybe you have shelter and a hardy breed in Galloway but is it really as hardy as you believe? Compare the cold of a brackeny hill with the bleakness of a Kentish down open to Siberia in winter. Outwintering can only be justified under favourable climatic conditions, where shelter or good cheap feed is available to provide the necessary body heat. Otherwise I believe roof and walls are cheaper than feed.

Q7 — There are other bonuses from outwintering. Admittedly it may only be reasonably economic and the calf has a slower growth rate but the concentration of stock improves the quality of the hill land. **A** — I am not decrying what has been done mainly from improved suckler herd management. But are we satisfied? I believe we must move on now to 100% self sufficiency in beef.

Q8 — What is the farmer to do with calves below the 400 lb wt which you think necessary? Should he feed the calf? **A** — There does seem to be some magic about this figure of 400 lb. Practical men have always aimed for this figure and MLC analyses of thousands of animals have shown that it has factual basis. Over 400 lb, the calf will gain 0.2 lb/day more on grass than under this weight.— I. V. HUNT.

3. GRASSLAND, MEAT AND MILK

P. MACLAREN, Esq.
Agricultural Consultant

Talk presented to 120 members at Embassy Hotel, Newbridge, 6th January, 1972.

The Road Ahead

The farmer has five options — Amalgamation, Co-operation, Integration, Intensification or Packing-up.

Amalgamations of small farmers and the building of bigger and bigger units is considered to be a satifactory method of eliminating competition and the much favoured advice of accountants.

Co-operation is a reasonable alternative, it is a method of sharing costs of machinery to reduce production costs. Despite grants of around 70% (including 30% of the consultants' fees and 25-30% of capital costs) the small farmers who stood to benefit mostly did not take advantage of the grants. They put high values on their independence. Some large farmers took it up and built milk and beef empires. The opportunity to take advantage of the grants has passed and if it was not successful when grant aided, it is unlikely to be taken up in the future.

Integration means generally 'selling one's' soul to a feed merchant. It has been taken up by the poultry farmer who has now become a henkeeper for his feed supplier. So far, the process once named horizontal integration but now called vertical integration has not touched dairy farms. I doubt that this alternative is a good one.

Intensification means more stock, more grass or more of any product from the same area of land using the same labour force and is the only alternative which I consider our farmers in the South West of Scotland should consider. The fifth alternative of 'do nothing' and pack up is unthinkable. If it is no use carrying on as in former days — we must make a move in some direction. Intensification is the direction which I favour and in the west, this means intensification of grassland.

The 'Oxford Farming Conference' has 'discovered that' grass is the safest bet. This is not new — we have always known it. In the west country we can't compete in arable cropping with the east so that we **must** improve our grass.

The Key to Intensification is Management

This 'word' is bandied about and used in many different ways. In industrial relations, it is concerned with the relations between the owners, directors, superintendents and the workers on the shop floor. Three systems of industrial management are:—

The **pyramid** with the boss at the top and the shop floor workers at the base.

The **wheel** with himself at the hub, the spokes were his subordinate managers and the rim the workers.

The **mushroom.** Everybody is kept in the dark and occasionally treated to an application of FYM to sweeten them up.

MILK

Who would have thought that we should today be short of cheese and butter. What has happened to the insurmountable mountains of butter and cheese which were used to batter the farmer to the ground last year. Somebody must have miscalculated. This is the product in which we in Britain, especially in the West have the edge on the 'Continentals.' The Dutch are our most serious competitors but we have been learning from each other in the last 20 years and they are saddled with small farms.

Bought Feed. No one can afford to produce milk from bought feed. Home grown hay, silage or haylage must provide the greater part of the feed. Where possible and especially where intensification of grassland produces spare acres — then home grown grain can be used for stock feed.

The target for intensification should be £200 gross/cow. This is not unrealistic. Feeding 30 cwt/cow/year of mostly home grown grain provides a margin of upwards of £100 per acre. This is better than peas or potatoes.

Stocking Rates. 1 cow/acre down to 1 cow per half acre will be necessary and this in large numbers. I have experience of 500 cows on 300 acres so that the target is not unreasonable. Calving dates become important. The system of rotational grazing is not important although I favour paddock grazing and especially the 2 sward system with silage making and grazing in separate areas. Set stocking represents a turning back of the clocks and I mistrust the advantages which are claimed for it.

Grass Seed Mixtures. Study the values of the different grasses. Don't let the seedsmen sell you any old thing. Choose the grasses which do best and use them sensibly. The N.I.A.B. in Cambridge and the Grassland Departments of the Scottish Colleges produce recommendations regarding variety and species to use. I find that it is unnecessary to go beyond a perennial ryegrass/timothy type of mixture.

SUCKLERS

I have 5000 suckler cows in my care. The basic problem is to decide how to feed them. If you are on an arable farm and close to a distillery you can't beat a basis of straw and draff but nowadays the price for draff is beginning to climb.

An important decision for sucklers on grass is whether to make silage or hay. The issue depends on the size of farm, amount of labour, whether it is hilly, etc., but I believe that silage making is most favourable because yields are high, and the grassland is ready for grazing in midsummer earlier than land which has been mown. This can be critically important in the control of parasites.

Suckler cows are best kept in paddocks, calving early in July/August so that they enter the winter strong enough to avoid hypomagnesaemia. In the following spring, the calves can be grazed rotationally at 4 or 5/acre on top quality swards, whilst the cows can be turned out to rougher grass.

The grass used for the calves must be clean. Parasites will build up by early July and it is essential to move them to fresh grass at that time. The cattle should be wormed in July before turning them to new fresh grass.

Peter Maclaren concluded his talk by suggesting that with fixed costs rising by 9% per year it was essential to intensify and that there was no shortage of bankers willing to finance intensification plans.

SHEEP

Outputs are too low. Too much hard work is needed to intensify.

Discussion

Q1 — Why is it that our uplands have not been tackled as in New Zealand where vast improvements have followed small dressings of phosphates. **A** — Most hill land owners haven't enough cash to invest and the productivity of hill land is too low to generate the amounts required. There are competing interests for development. Thus at present—grouse are better land usage than sheep.

Q2 — What is the secret of keeping free from hypomagnesaemia. **A** — When early calving (July - September) the trouble arises in October and cows should be put on old fibrous grass, make plenty of straw available or apply 2cwt/acre calcined magnesite to avoid it. A feeding cob can be bought at £30 per ton which ensures that cows get the 2 ounces Mg per day they need. Where the bull is out with the cows from October onwards you should make available Phosphorus + Calcium + Magnesium for 1 month and then cut out the magnesium until the spring. For spring calvers, cut out K from fertilisers and on no account harry them. Two periods are dangerous—Sept/Oct and Apr/May.

Q3 — Have you any thoughts on reseeding methods. **A** — The best time is April or July. Earlier than April is not reliable. July is usually warm and wet. I like Westerwolths as a cover in the eastern parts of the country but in the west it becomes too soft. Under-sowing is a gamble although sowing under a cereal silage crop is good for the grass but the silage is rather expensive. Drilling is far better than broadcasting.

Q4 — I am using Kale because I find it useful grazing between autumn and winter. Is it worthwhile. **A** — Yes, provided the right varieties are used—for example Maris Kestrel. At one time

grazing Kale produced dirty bags but the new technique of sod-seeding Kale has overcome that. All that is needed to justify it now is a profitable use for the land after Kale and I think re-seeding directly to another ley to provide fresh clean bite for beef in mid-summer a very good system. Kale feeding alone is not satisfactory.

Q5 — Are you interested in maize or silage. **A** — Shortly—no. It is too low in protein.

Q6 — Has zero-grazing a future. **A** — Only in exceptional circumstances.

Q/ — At current calf prices should we sell or hold. **A** — Both can be right. If cash flow is to be maintained then sell. If you receive cow subsidy, this may be lost by fattening your own stock. If you calve early enough it is good policy to sell the early ones and hold the smaller ones till the spring. They can be kept on a cheap ration of silage/draff/straw and a small amount of grain, say 2 lb./day.

Q8 — I read that set-stocking is giving better returns than paddocks. How do you account for this? **A** — I reckon it is misleading to judge the merits of grazing systems when levels of productivity are low.

Q9 — Can you define "clean" grass for cattle. **A** — Freshly sown grass which has carried sheep beforehand or has not carried any stock at all. Using "dirty grass" is a real menace. For example, turning calves out in the spring onto grass which has carried cows over winter is a sure way to getting lungworm and that may cost £1.50 - £1.75 per head. When stock have been dosed, it is essential to reap the benefit by putting them "where they can't be rapidly reinfested" — that is on clean grass.

Q10—What return do our Common Market competitors achieve on land worth £500 per acre. **A** — You must not confuse the profitability of working capital and land values. However, even in this country, with lower land values, the overall return is not much more than 2½ - 3%, whilst the return on working capital i.e., stock, etc., is 15-19%. The value of the land rises and will always rise so that it can be looked on as a nest egg against your old age.

Q11—Will we suffer from Continental competition for our land. **A** — No doubt of it. London agents already have lists of Continetal buyers awaiting the signing on the dotted Common Market line.

Q12—Do you think "muck" is the "mother of plenty" or must we use oxidation plants to appease the anti-pollution brigade. **A** — Muck is valuable as a manure but an intensive livestock farmer has more than he can cope with. Its proper place is on arable land. I consider we must expect to use the "oxidation plant" or any other magic formula which will make it vanish.

Q13—What is your opinion of "soil conditioners" which we are being urged to buy? **A** — I can farm extremely well without them.

Q14—With a 9% increase in fixed costs, where are our future farmers to come from? How can they own farms? **A** — In the south, lease-back systems have been favoured as ways of converting capital into working capital, but many farmers in these systems wish they were out of them. We have always had this problem. The young farmers of 30 years ago asked the same question, but they still managed to get hold of land. I think a talk with an accountant is the first step. — I. V. HUNT.

4. PROBLEMS OF THE DAIRY FARMER

Discussion Night
South West Scotland Grassland Society
24th February, 1972. Glenluce, Wigtownshire

Speakers
J. Brown, Esq., Farmer, Gaindykehead, Coatbridge, Lanarkshire.
I. A. MacMillan, Esq., Veterinary Surgeon, Mauchline.
Dr M. E. Castle, Hannah Research Iinstitute, Ayr.

Chairman
Allan Buchan, Esq., Ladykirk Estate Office, Monkton.

Jim Brown

He took over Gaindykehead in 1964. Although 150 acres on paper, it comprised just 135 acres of workable land, in poor condition with just one fence around it. All he had was 25 cows, a plough and a trailer, and he set about improving land and buildings. The first stage was to provide 44 cubicles. By now these have increased to 3 rows of 42 cubicles under one roof 160 x 111 ft. During the process, many problems have been faced of which the following are typical.

1. **Dairy Housing Regulations.** These are peculiar to Lanarkshire. The inspectors concerned in licensing buildings make no concessions to the loose housing system of keeping cows and insist on cementing up to 8 ft eaves with ventilators each side of each cow and the same area per cow as for the normal byre. They discount entirely the area provided for feeding. This adds tremendously to the costs of housing per cow.

2. **Silage Making.** To start with, the silage making team was Jim and his wife but now the business is mechanised and along with 2 or 3 neighbours they can shift 20-25 acres of grass per day. This creates a problem which no doubt will eventually be solved. Normally we are urged to speed up silage-making to prevent overheating. They have broken through the speed barrier and find difficulty in getting a good fermentation. Add-F has been tried but so far with no success and he will be going back to wilting.

3. **Feeding Silage.** For two or three years he fed through an electrified wire and a hanging pole but finds the tombstone barrier the most satisfactory.

4. **Feet.** Bad feet plagued his cattle until he put them through a footbath. The worst affected were the outwintered heifers and when he stopped outwintering the trouble passed. This year he outwintered his heifers and it is again ' troublesome.'

5. **Feeding in the Parlour.** The time available in the parlour to take in supplementary feed is too short. Consequently, he has arranged to provide barley in the feed passage before entering the parlour.

6. **The Grazing System.** Two blocks of grass-land are used, one for grazing in the 3-day paddock and the other for silage. At present, he is carrying 85 cows on 34 acres of grazing land given about 360 units N/acre. This year P and K were cut out with no harmful results. At first, he was worried about the amount of rejected grass under intensive grazing but believes that this is a feature of intensive management in the early years. It now seems to be no problem at all. The extra fertility from high stocking rates has speeded up the disappearance of dung. His best seed mixture is one based on S.23 and S.24 perennial ryegrass combining a good bottom grass and a high yielder.

7. **Silage Area.** Tetraploid ryegrasses become very open and the land poaches badly in the autumn and he is now back to the same mixture as is used for grazing.

8. **Staggers** (Magnesium deficiency). No trouble has been experienced for three years. Barley is provided all the year round to carry minerals. In winter the mineral mixture is 20 phosphate to 5 magnesium whilst in the summer it is the opposite, i.e. 5 phosphate to 20 magnesium.

9. **Milk Fever.** A calcium bottle is given to every cow at calving and there is no trouble.

10. **Winterkill.** For 5 or 6 years no winterkill has been seen in the pastures ever since the grassland has been grazed from autumn to February with sheep.

11. **Brucellosis.** The worst problem is left to the last. Blood tests began 3 years ago. 5 failed and 3 doubtful animals were discarded and the rest treated with 45/20. The following year 12 failed and 6 were doubtful. They were discarded and the rest treated with 45/20. At the 3rd test, 28 failed and 5 were doubtful. This could not continue. His opinion of 45/20 was very low. The whole herd of 161 animals was disposed of and he began afresh with 40 accredited cows and 26 heifers. During the interval between 29th September and 21st October, the whole place was steam sterilised. The new stock have settled in well, part from the heifers. More cows will be purchased to put numbers up to around 100 as quickly as possible.

Ian MacMillan

Veterinary problems of the dairy farmer have changed tremendously over the years. Disease is less of a problem than unbalanced feeding or the harmful results of mismanagement. The relationship between ' fertiliser use, herbage production and quality

and the animal' is responsible for more present day veterinary problems than any other and the talk was based on the major mineral elements.

P (Phosphate). Farmers have always been urged to use slag or superphosphate or mineral phosphate on grassland to keep up the fertility of the land and because P is an essential element for livestock. No harm comes from excess P in farm livestock but there are disease conditions in dogs and town horses attributed to excess phosphate. Similar conditions may arise in the future under the zero grazing system of grassland management.

Deficiencies of P lead to the condition — Aphosphorosis — prevalent in the Highlands and in Ireland but not often found on the better land. The subject is topical and many of our stock troubles, e.g. infertility, are being laid at the door of low phosphate in the diet. Extravagant remedies are offered such as a mineral mixture at £120 per ton, containing nearly 50% common salt. Most of the so-called phosphorus deficiency is a deficiency of food of the right kind.

K (Potash). This can bring about big yield responses in grass which takes in as much as it can find. Such luxury uptake of potash results in low magnesium (Mg) in the herbage and also low sodium (Na) in the herbage. This combination produces a deficiency of Mg in the herbage. The effect is carried through into the animal since low Na and high K lower the ability of the animal to use the reduced Mg provided in the grass. Grass staggers due to low blood magnesium is the result.

The animal must have readily available magnesium at all times. Other elements are stored and when a temporary deficiency occurs the element can be pulled out of the store but magnesium is different. The soft tissues contain no readily available reserves of magnesium. The animal can stand a deficiency for some time but is in a very sensitive state. A stress of any kind will bring immediate symptoms of Mg deficiency.

N (Nitrogen). When high levels of N are applied, there is a possibility of increasing the nitrate content of the herbage. Nitrate can be converted to 'nitrite' which is dangerous to livestock. Actual cases are rare but the danger must not be either overstressed or overlooked. The main effect of N on grass quality is that Sodium (Na) and Magnesium (Mg) are raised. Thus the effects are opposite to those when potash feriliser is applied to grass. This is the probable reason why one never sees grass staggers under the intensive 21-day paddock system.

Two other problems which are not directly related to fertiliser practice must be mentioned.

Acetonaemia. Is not the problem it was and can be blamed on bad feeding practice. It is typically a disease of tower silage

enthusiasts in their 3rd year, when great efforts have been made to improve the quality of the silage. The result is a silage with too much protein and conversely too little energy. The effect can be easily corrected by providing extra energy as straight barley.

Bloat. This is the result of too rich a pasture faced by hungry livestock and cured by ensuring ample fibre or energy in the diet.

Dr. M. E. Castle

His text or motto was taken from a calendar published by a leading fertiliser firm: 'The future is but the past over again.' Twenty years milk production figures, 1951-70 inclusive, at the Hannah Research Institute were examined to see if year-to-year changes could be associated with certain management factors. Some interesting relationships were revealed.

1. **Stocking rate.** During the 20-year period, stocking rate moved from 2.2 acres per cow up to 1.4 acres per cow and stocking rate proved to be the most important factor affecting total milk production.

2. **Milk yield per cow.** This was the second most important factor. Stocking rate plus milk yield per cow accounted for 85% of the changes in milk production found. The years with the highest milk production coincided with the years of high yield per cow. High yields per cow were obtained along with maximum stocking rate, not at the expense of it.

3. **Proportion of milking stock to other stock.** This was the next most important factor influencing total milk production, but some way behind the other two. The higher the proportion of milking stock the higher the output of milk from the farm.

4. **Concentrate feeding.** Concentrates have been cut to the minimum, an average of 2.3 lb/gal over the 20 years. There have been slight differences in the amount used in any one year and these have had no significant effect on milk production.

5. **Amount of fertiliser N used.** Average use has been about 140 units N/acre of grass for the 20-year period. No difference was found in the output of milk corresponding to differences in use of N even when the rate of application of N was 50% greater. The important message from this finding is not that fertiliser N is unimportant, nor that increasing fertiliser N will not increase your grass production, but that no extra milk production can possibly arise from just applying extra fertiliser. Extra milking cattle are required and stocking rate must be raised to keep pace with the extra grass produced.

Fertiliser nitrogen is only part of the grassland nitrogen story. Clover, dung and urine and the soil all supply N and have parts

to play. Increasing the stocking rate makes N work that much more quickly.

6. **Potash.** No positive relationship was found between the amount of potash fertiliser applied and total milk production. In some years the reverse occurred. Some potash is important to grass production but milk production was not pushed up by putting on more potash. This may be a special feature of a heavily stocked farm.

Discussion

Many members took part in the discussion, including: Sandy Ross, Fraser Evans, Allan Wright, John Watson (of the Hannah) and Hew Chalmers. Points of interest were as follows:—

1. Very little phosphorus goes off the land in milk and stock.
2. Stocking rates can be put up to very high levels without fear of overstocking.
3. Too much money has been wasted on excessive application of phosphates in the past.
4. Milk fever used to be bad, but now less so, but it appears now to be more prevalent in the east of the country.
5. Cold winds in sheds can result in low production. Ventilation without draughts is important. Low temperature as such is not important.
6. High temperatures are more troublesome. Virus pneumonia can be worse in warm sheds, of high humidity and poor ventilation.

No trouble is found in slatted-walled houses. — I. V. HUNT.

THE BRITISH GRASSLAND SOCIETY

5b. SUMMARY OF PAPERS READ AT THE SUMMER MEETING, 1971

By MALCOLM E. CASTLE

During the 1971 summer meeting held at Wye College, one of the mornings wes devoted to the presentation and discussion of fifteen short papers. This new venture of the society dealt with practical and research topics, and allowed members to give an early account of new findings and new methods. Short summaries of each paper were circulated before the meeting and these covered a wide range of topics from pesticides to the management of grass on a Nature Reserve.

The response of ryegrass varieties to an application of 990 units nitrogen per acre was described by **David Aldrich** from the National Institute of Agricultural Botany at Cambridge. Eleven varieties were tested, and in two years the same three varieties showed the greatest response to additional nitrogen and the least sward damage. These were the Dutch varieties — Gremie, Combi Pasture and Cropper. The high level of nitrogen application had no adverse effect on digestibility but increased the crude protein and the nitrate content of the grasses. Although the amount of nitrogen used in these trials was much higher than that used in farm practice, it is now a fact that on many grazed swards up to 400 lb. nitrogen per acre may be deposited on localised areas. Grasses which can withstand really high levels of nitrogen are well worth further testing under intensive grazing conditions.

Experiments at the Grassland Research Institute by **R. O. Clements** indicated that pesticide treatment of grass swards substantially increased the yields of herbage. The pesticides appeared to reduce the population of invertebrates in the sward and one object of the work was to determine which groups of invertebrates were altering the yield of herbage. At present the experiments have no economic objective in view, and an important part of discussion was how the treatments could upset "the balance."

A far more practical talk was given by **George Jarrett** of Somerset who is a keen exponent of subsoiling. From 20 years' experience on difficult soils in Devon and Somerset Mr Jarrett claimed that subsoiling can greatly improve the land by controlling drainage. Subsoiling should be a first step in drainage improvement and, at a cost of about £6 per acre, it may save up to £70-£80 per acre on a conventional drainage scheme. Water control as a result of subsoiling has allowed grazing to start 3-4 weeks earlier in the spring, and the plants can root much deeper. Trials on subsoiled and control areas in North Somerset showed an increase of 55-60% in the yield of fresh grass due to subsoiling (see also his paper to our own Society in this issue of Greensward).

The two experiments reported on dairy cow grazing were from counties covered by the S.W. Scotland Grassland Society. **Alec Hood** from the Leaths at Castle Douglas described set-stocking, paddock grazing and a three-field system for dairy cows, and another comparison between two grazing systems was reported from the Hannah Institute at Ayr by **Malcolm E. Castle** and **John Watson.** In the experiment at the Leaths, the output of milk per acre was higher under a set-stocking system than from either a paddock grazing system or a three field system. Set-stocking is an extremely simple system with many advantages which reduce costs, and it would seem that if an adequate amount of nitrogen is applied to the sward a high output of milk can be obtained. These results are to be tested again, but without any doubt they indicated that high yield of milk per acre is possible if there is a high rate of stocking on a productive sward.

The results from the Hannah Institute also showed that a simple, rigid-rotation system of grazing dairy cow could yield almost 1,000 gallons per acre with a low capital outlay on fencing and with few management decisions. The grazing system was devised and used originally at Wye College by Professor Holmes and his staff, but it has proved to be equally effective in S.W. Scotland. Clearly, simple systems of grazing can produce a high output of milk although, as the discussion showed, some farmers and advisors felt that simple systems were rather "tatty." The general feeling was that any system of grazing was better than no system, and, if 1,000 gallons per acre can be obtained without feeding concentrates, then the system deserves further study.

With high rates of stocking it is not surprising that dairy pastures become fouled with dung, and this topic was discussed by **C. C. Boswell** from Grassland Research Institute, and by **J. R. Garstang** and **Harry Mudd** from Great House Experimental Husbandry Farm, Lancashire. Intakes of herbage from "clean" swards were 30% higher than those from "dirty" swards at high stocking rates but there was no difference at low stocking rates. Fouled and rejected herbage died, and large areas without cover were colonised by weed species at the end of the season. Surprisingly, fouling was reported to have its greatest effect at moderate stocking densities.

The results from Great House showed that odour-masking materials and appetisers sprayed on areas of fouled pasture did not improve herbage consumption. Fouling can have long-term effects, and in one study, the area of grass rejected was 28% in the first year, 19% in the second year, and 10% in the third year. The rate of decomposition of droppings was thus fairly constant over a 3-year period but it was accelerated during periods of high rainfall. It was suggested that the better herbage utilisation on permanent pasture may result primarily from conditioning cows to eat close to their droppings.

A rather more palatable subject was outlined by **P. E. Flecchia** of I.C.I. Ltd., who described an intensive system of rearing Friesian heifers. A unit of 62 acres has been established to explore the possibilities of increasing the profitability of heifer rearing. Heifers were calved at 2 years of age in the autumn and 1 acre provided the total requirements of 1 animal from birth to the time of calving. The animals had thus two seasons at grass and one winter on self-feed silage at about 1 year of age. Figures for the year ending July, 1970, showed a gross margin of £56 per heifer and £55 per acre. All the heifers reared so far have settled well into the dairies and the average peak yields were 38 lb. per day. The long-term performance of the heifers is not known yet but the system has obvious potentialities.

Two further contributions from the Grassland Research Institute dealt with the herbage intake of grazing calves **(J. Hodgson** and **J. M. Rodriguez)** and the growth of beef cattle on maize silage **(J. M. Wilkinson, C. R. Lonsdale** and **J. C. Tayler).** These topics were discussed at a somewhat academic level but the work could have useful applications on the farm in due course. Another "high-brow" topic which was discussed by **I. R. Lane** and **Professor W. Holmes** dealt with the analysis of the structure of grass swards. These workers reported an interesting series of experiments in which pastures were sampled at different strata above ground level, and the yields of herbage determined. Dairy pastures normally had 80-90% of their area grazed, and from 81-85% of the herbage produced was harvested by the cattle. About 22% of the herbage removed came from below a height of 1.5 inches.

Dr. John Brockman from Fisons Ltd showed some interesting differences between the yields of cut and grazed swards. Where no fertiliser nitrogen was applied, the yields from cut and grazed swards were similar, but when nitrogen was given, the difference in yield were seen at once. For example, where the application of fertiliser nitrogen produced 10,000 lb. dry matter per acre on cut swards, the nitrogen recirculated by the grazing sheep increased yields to 12,000 lb. dry matter, per acre; an increase of 20% The recirculation of nitrogen through grazing animals is a major source of this nutrient where the applications of fertiliser nitrogen are high. If this occurs with cattle, then on heavily-stocked dairy farms it will be necessary to have distinct fertiliser policies for swards which are regularly cut and swards which are always grazed.

Sheep were used in two other experiments described by groups of workers from the Grassland Research Institute**(M. J. Gibb, T. T. Treacher, N. E. Young** and **J. G. W. Jones).** In the first experiment, weaned lambs were grazed at a range of different stocking-rates and the herbage intakes and the lamb growths were

measured. On the most lenient treatment, only 14% of the herbage was utilised and the lambs gained 2.7 lb. per week, whereas on the severest treatment about 62% of the herbage was utilised and the lamb lost weight. In the second experiment two crops of artificially reared lambs were fattened on a perennial ryegrass sward. The first crop of lambs born in March and the second crop born in June from different ewes were reared artificially and turned out to grass at the age of 6 weeks. The first-crop lambs grazed until August and were finished at grass, but the second-crop lambs were given a supplement of concentrates. A total live-weight gain of about 1,500 lb. per acre was recorded. Although this is a high output of meat it must be realised that two groups of ewes were required and that these ewes had to be grazed on land outside the true experiment area. The artificial rearing of large numbers of lambs is not normal farm practice although the developments from this work could be useful.

The fascinating topic of grassland management on a National nature reserve was presented by **P. A. Gay** and **B. H. Green** from the Nature Conservancy. Nature reserves form only a small proportion of the countryside but they have the important objective of perpetuating examples of the country's natural habitat and their wildlife. Such areas are the products of traditional agricultural practices and wherever possible the Nature Conservancy continues to use normal farming techniques. The conservation of populations of wild plants and animals is important as they are an integral part of natural amenities of the countryside. Management schemes are devised to take account of the maintenance of a rich grassland sward, the practical needs of grazing tenants, and free public access to parts of the reserves.

In general, the papers and the discussions provided an excellent opportunity to put forward new ideas, and it was agreed that this new venture of the British Grassland Society was a success. The wide range of interests of the members of the Society were well covered by the topics discussed and no doubt this new feature of the Summer Meeting will be repeated at future meetings.

M. E. CASTLE.

5b. THE FARM VISITS

CLYDE PHILLIPS

It was my pleasant duty to represent the South West Scotland Grassland Society on the summer tour which was centred on Wye College, Kent. Whilst it is my task to report on some of the farm visits much of the enjoyment and learning comes from the informal moments when you have the opportunity of meeting delegates from many parts of the world. I learned much of the farming of New Zealand and Australia, as well as something of the Agricultural problems of Nigeria.

The first day was devoted to visiting dairy farms on some of the heavy land of Kent. Much of Kent consists of this type of land with a high water table and soil which is slow to warm up in the spring. To get to it we passed through some of the loveliest parts of Kent. One of the lightest moments of the journey was when we arrived at the top of one of the highest point in Kent on the famous Downs, to hear a Scottish voice enquiring " when are we going to get to those hills you've been telling us about ? "

HORSESHOE GREEN FARM—The Hon. Mrs C. Talbot

This is a 370 acre farm 8 miles west of Tunbridge Wells. The countryside is hilly with grass the predominant crop, broken by areas of copse and woodland. The soil is a poorly drained unstable clay described by the Soil Scientists as Wadhurst Clay. Dairying and livestock rearing are the predominant enterprises in this part of Kent, with cereals having an important place on some farms.

Horseshoe Farm was part of a large estate and was taken over from an outgoing tenant in 1955. At that time, the farm was 150 acres of grass with a dairy herd. To understand the development towards a proposed herd of 300 cows, a short historical summary is necessary.

The policy adopted was for a gradual increase in the size of the dairy herd by the rearing of all heifers based on self feeding silage, with some hay, and 50 acres of cereals. These were housed in a covered yard and milked in an abreast parlour designed to milk two cows at a time ! !! In 1957, another farm was taken over bringing the acreage up to 240. By 1966, there were 90 mainly pedigree Friesian cows. The business was doing well and showing a good profit and a further 130 acres was added bringing the farm up to its present size. By now the buildings were hopelessly inadequate, a review of the farm policy was called for.

A completely new cubicle house with covered feeding passages for 300 cows was erected. The old buildings were converted to rearing facilities for growing stock.

Perennial ryegrass/timothy leys form the basis of most of the grassland, with some permanent pasture (valuable on the very heavy land). No attempt is made to grow the earlier ryegrasses, most of the leys being based on S.23 and S.321 perennial ryegrass

with S.48 timothy (very popular in grazing mixtures over much of Kent). Silage is made in an open clamp and fed by forage box.

Slurry is an enormous problem on the heavy clays. A lagoon has been excavated to take the slurry for the whole winter period as the land is too heavy to permit spreading during the winter months.

Herd performance suffered during the rapid expansion. The herd was divided into 3 parts to give the opportunity for a more individual type of management and at the same time improve individual performance. Nominated bulls are being used to increase the herd potential.

Progress in recent years is summarised in the following table.

Horseshoe Farm—Dairy Herd Expansion (1965-71)

	65/66	66/67	67/68	68/69	69/70	70/71
Average No. of Cows	83.0	93.5	110.6	163.2	220.7	242.2
Yield per cow	1017	1029	969	851	851	930.4
Concentrates/cow (cwts.)	19.6	24.7	19.6	23.6	23.6	25.0
Margin over cons./cow	134.9	137.4	128.6	113.9	107.6	122.0
Gross Margin/cow	112.6	111.1	104.7	94.3	72.2	101.4
Forage acres/cow	1.8	2.0	1.6	1.5	1.6	1.25
Units N/acre	106	169	130	202	251	232
Gross Margin/acre	62.6	55.5	65.4	64.3	44.6	81.1

WHITEHOUSE FARM—Mr S. E. Lane

This provides a complete contrast to the Horseshoe Green Farm, consisting of 113 acres carrying 57 Jersey cows and their followers, 8 Charollais x Jerseys sold as beef and 180 Romney ewes and run by the farmer and one girl.

Grass is based on perennial ryegrass/timothy mixtures with some leys in timothy/meadow fescue and in straight Italian ryegrass. The herd is grazed in one day paddocks with the extreme refinement of having a subdivision into morning and afternoon areas.

About 100 tons of barn dried hay were made annually. The capital cost of provision of the fan and all the ducting was £700. The equipment was in its fourth year of use. Starch equivalent for the hay made in 1970 varied from 40 to 46 per cent. The running cost of the drier is 65p per ton.

All the land on the farm received in regular rotation 130 units of phosphate in the form of basic slag every 3 to 4 years. 2-3 cwts of a 20:10:10 type fertiliser is applied to the whole acreage as well as straight nitrogen on the grazing and additional potash on the cut areas. Average fertiliser units applied over the whole farm are 155 N, 33 phosphate and 23 potash.

Heifers are calved down at 2 to 2½ years old. Cows are artificially inseminated, housed on loose straw and milked through an abreast parlour. A typical winter dairy ration consists of 16 lbs of barn dried hay fed behind a tombstone barrier and home mixed concentrates fed at 4 lbs for every gallon. The present herd average is 700 gallons milk sold per year.

COLD HARBOUR FARM — Mr J. Fraser

Mr Fraser, valuing utility more than appearance, expanded the buildings as the herd expanded by a low cost building development based on cheap materials.

The farm consisted of 220 acres of gently undulating grassland. Most of the soil was clay but there were areas of Greensand. 115 Friesians and 80 Jerseys were milked through a 16/8 herringbone parlour. Target cow numbers are 120 for each herd.

The labour force consists of the farmer, a tractor driver and the two dairymen. Casual labour is fairly easily available throughout Kent and use was made of this for silage making.

Over the decade the whole farm had been ploughed and reseeded. Seed mixtures are based on S.23, Melle and Kent Indigenous perennial ryegrass, along with our old friend S.48 timothy. Most fields are both grazed and cut during a season. A semi-paddock grazing system is used with an internal fence moved twice daily in the bigger paddocks. 50 units of N per acre is applied each time round. None of the land is topped after grazing, a fairly common practice in Kent. 900 tons of wilted silage is made, molasses being added by means of a homemade applicator on the forage harvester. The winter feed consists of self feed silage along with opportunity feeds such as brewers' grains, potatoes or carrots. Mineralised barley only is fed in the parlour.

THE ROMNEY MARSHES

The farming systems tended to be very much alike, especially in the grassland management. En route to the Romney Marsh farm visits we passed the famous Snave Corner field reputed to be the best fattening field on this Marsh. There was no evidence as to why this should be so. In common with much permanent grass on the Marshes the field was grazed extremely closely and this combined with a spell of very dry weather gave the field a very unprepossessing appearance.

Cropping is now very important in this part of Kent. Formerly, the Marshes were entirely pastoral. The countryside is flat and level, and liable to flooding from the sea if the coastal defences are not kept in good order. We saw something of the elaborate drainage system, including an Archimedes Screw pump used to raise water to a higher level to give it the necessary flow in the flat low-lying land.

Sussex cattle, which are dark red and rather like a South Devon were strongly represented. The Romney sheep, large and heavy fleeced, were a permanent feature of the landscape. Lambing percentage is not high, but they show a remarkable facility for surviving at very high stocking rates. One flock of Scottish Halfbreds was encountered; they seem to do well in the difficult climatic conditions of the Marshes.

Much of the grassland management is directed towards production of the famous Kent perennial ryegrass and white clover. Clover production particularly requires very hard grazing by sheep to enable the clover to develop adequately. A new variety of perennial ryegrass seed called Romney ryegrass, similar in habit to S.23 and distinct from 'Kent Approved,' is being developed.

STANDARD HILL FARM, CANTERBURY

The final visit was to a large dairy unit (227 Friesian cows) on a big arable farm of 1,120 acres. These were housed in cubicles and milked through a 10/20 herringbone parlour. There were two 24′ x 70′ towers for haylage and a 200 ton moist grain tower. A total of 1,300 tons of haylage was made. This farm had a most complicated aerohydraulic disposal plant for the slurry and washing down water.

Cows graze on permanent grass divided into paddocks of 4 or 5 acres, given a total of 300 units N, 30 P_2O_5 and 30 K_2O per acre each year. Two cuts of silage are taken each given 80 N + 40 P_2O_5 + 40 K_2O.

The visit to Kent offered much that was novel. The grass seed production was particularly impressive. In terms of livestock and grassland management there is no doubt that the farmers of our own area have the ability and climate to compete strongly with the 'Men of Kent.' — C. R. Phillips.

5c. "STRAWBERRIES AND CREAM"

ANNETTE PHILLIPS

I had never quite made Kent before. Sussex yes, and Surrey, many times, but not the Garden of England. The chance of accompanying my husband on the B.G.S.'s Summer Tour 1971 presented itself, and there I was, on my way.

July, 1971, was British high summer at its best, and it was with some reluctance that en route I left our two children to the joys of the Pembrokeshire beaches and the over-indulgence of Gran and Grandpa. Gran wanted strawberries for jam-making and Grandpa's parting shot was " A good in-calf Jersey heifer will do me nicely ! " Some hesitation, too, because throughout that hot, uncomfortable journey I wondered how many other " wives of agriculture " would turn up at Wye and whether they would be so dedicated as to put me to shame—after all, my motive was slightly ulterior.

The cool and calm of Withersdane welcomed us, and after a quiet stroll around the gardens—most impressive—the remainder of the evening was taken up with dinner and a film show on the Soils and Farming of Kent. Much fodder for thought was thrown at us and I remember chewing over bits of it later and thinking how tremendously difficult it must be to make parts of that proverbial garden flower so well! The drainage problems, the trace element deficiencies, and the weather too, but I guess the latter bugs us all.

Tuesday dawned clear and bright, and four coaches awaited—luxury which was to accompany us for the whole week ahead. By this time I had made the acquaintance of several of the other wives present—not at all shaggy maned or heavy hoofed, but charming company and, thank God, with slightly ulterior motives. The menfolk tramped enthusiastically, critically, admiringly, dedicatedly. Their eyes probed every nook and cranny, and saw more, much more, than they were meant to. Meanwhile, we ladies enjoyed the taxi service which had been laid on at almost every farm. A tractor and bale-filled trailer ferried us from one vantage point to the next, though many were the comments about age and infirmity! That day we received our first taste of Kentish farm hospitality — a hospitality which prevailed throughout the tour and impressed so many of us. With the appearance of the first of many, many dishes of strawberries and cream, some of us girls decided to throw away our built-in calorie charts, and to hell with the consequences. At lunch in a hotel just outside Tunbridge Wells, a local farmer at our table lost no time in advising his ' foreign ' neighbour that he should pepper his strawberries—no connoisseur would dream of eating unseasoned strawberries ! " Sacrilege," I breathed, reaching for the castor sugar, whilst the gullible stranger sneezed his way through the rest of the meal.

Our first day's outing had brought us into contact with many new faces and interesting points of view, and I looked forward to Wednesday's specially arranged trip to Canterbury with the ladies. Canterbury Cathedral is both beautiful and impressive. Our guide must have been born beneath the Blarney stone, for his constant commentary was a great source of amusement. He reminded me a little of the Darkie Sunday School, because his comments on Edward the Black Prince and Thomas à Beckett would most certainly *not* be found in any history books. Shopping afterwards, needless to say, and a cup of coffee before returning to Wye. That afternoon I swam in the open air pool at Wye College, before strolling around the village of Wye, Sadly, many of the shops were shut, especially the little pottery shop on the corner, which had such unusual pieces for sale. The notice in the little Post Office reminded me so much of the little village I was born and bred in, " Closed for a while — not feeling well."

Wednesday evening we rejoined the men-folk and were taken on a tour of the Isle of Thanet. I have never seen such impressive fields of ryegrass, or such vast acres of vegetables. We don't see much wheat in Kirkcudbrightshire either, come to that. The hedgeless, dykeless fields reminded me of Normandy, though harvesting could not have been further from those mediaeval methods we saw on our way through Northern France the previous year. At question time on the vegetable farm, I was bursting to ask the owner whether the heavily populated towns right on his marches presented any problem of theft, but in the midst of such eminent technical know-how, I sat dumb and instead enjoyed my n'th carton of strawberries and cream.

Pastures new on Thursday when we travelled south, coastwards to Dr Synn's country—the Romney Marshes. One reads, one envisages, but in truth there is an atmosphere about the Marshes. Still strange, still a little sinister, still within striking distance of the sea, the ancient tool of invasion and destruction. Far inland lie the rotting trunks of huge oaks, torn up and thrust ashore by timeless tides. Networks of canals interspersed a patchwork of fields whereon thrive the indigenous Romney sheep. I never saw so many and I never saw such short grass. Indeed, disaster almost struck that afternoon when we found ourselves miles away from any convenient place! The man had once more trekked off leaving the less-inclined of us in the coaches. Nature calling, we " borrowed " the back of an unlikely looking deep litter, and were so alarmed at the loud objections of the occupants that we expected our coach driver to appear round the corner any minute!

Our meals at Wye College had been more than adequate, institutionally speaking, throughout the week, but the canteen staff had excelled themselves for the dinner preceeding the A.G.M. on Thursday night. The speeches were very pleasantly washed down by kind donation of the commercial boys, and from a lady's point

of view, Jim Prior with port is far more palatable than without! I found myself smiling at the message, " We'll all hold hands, and we'll be alright!" During the meal, we had been chatting with Malcolm Castle, and during the course of the conversation, I mentioned casually that we had heard for the first time a nightingale singing. I looked up to find Malcolm almost under the table in a rare state of excitement! A nightingale! In Kirkcudbright! I really had no idea that he was so interested in birds! He said he would send us a card, so that we could record the information officially, but since we haven't heard from him, I reckon he must have got the bird!

My congratulations to our Galloway farmers for their superb pastures—I saw nothing to compare with them, but oh, the strawberries and cream of Kent . . . A. PHILLIPS.

6. FORAGE HARVESTER DEMONSTRATION

A demonstration of forage harvesters was held at Dechmont, Cambuslang (Messrs A & J. Hamilton), on 8th June, 1971. The object was to compare the results obtainable from the wide range of harvesters currently on the market. A wilted crop was chosen since most difficulties tend to arise when handling this type of material.

The machines were provided by local distributors and gave a complete cross section of foragers from simple flail types to the full or precision chop harvesters. Dealers also provided their own tractor power and assisted with the mowing operations. Details are shown in Table 1 below.

Table 1. Forage harvester under test.

Make and Type	*Cost*	*Working Position*	*Width ins.*	*Min. Power*	*Optional*
Flail with flail laceration					
Russell	£415	Trailed/in line	40	20	H.D. Flail
Taarup	£380	Side mounted	43	25	P.W. Hitch
Double chop with fly wheel chopper					
Kidd	£698	Trailed/offset	60	50	Auto-hitch*
New Holland	£698	Trailed offset	60	50	Auto-hitch*
New Holland 33	£717	Trailed/offset	60	35	Hyd. hitch*
Full chop with cylinder chopper					
New Holland 717	£1260	Trailed/offset	56	44*	
Claas Jaguar	£1400	Trailed/offset	65	50*	
John Deere 30	£892	Trailed/offset	62	60*	

*Extra knives could be fitted.

Delivery from Russell and Taarup at rear and from others at rear and side.

The crop was cut by a series of 4 drum rotary mowers on the previous day and allowed to wilt for 18 - 24 hours without any further swath treatment, except for rowing-up two swaths into one for some of the larger machines. Little trouble was experienced by any of the machines in picking up the swath, in blockage, or in completely filling trailers. The Claas machine had the unfortunate experience of breaking three knives when a piece of tramp metal was picked up, but this allowed the operator to demonstrate the ease and speed with which the machine could be brought back into work again.

Outputs from the different machines obviously varied, but comparison of such outputs under demonstration conditions, with demonstrators of varying skill, is not a reliable guide.

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Additional equipment operating during the demonstration included Lely and Hay-Bob swath turners and the Fahr self-loading forage wagon, which although rather expensive at £1200, is designed as a one-man system.

Transporting and ensiling the crop was ably carried out by the regular Dechmont staff who are well used to handling outputs of up to 25 acres per day. The use of large trailers and a front mounted, short-tined buckrake on a large tractor with twin rear wheels no doubt adds to the success of the team.—W. Davidson.

7. MORAY ESTATES DEVELOPMENT COMPANY, DOUNE

Central Scotland Grassland Society Visit,
18th November, 1971

Milton of Cambus, Doune, was the venue for the Central Scotland Grassland Society's afternoon meeting on 18th November, 1971, prior to the Annual General Meeting in the Safari Restaurant, Blairdrummond, in the evening. The company was welcomed by Mr John Forbes, Farms Director, and Mr Jack Torrens, the Doune manager.

Following the introductions, Mr Forbes explained the policy of simplification, intensification and specialisation. Mr Jack Torrens led the group over a number of re-seeds. Ryegrass mixtures are the basis of the cutting swards and 1700 tons of silage is made from the twice cut 155 acres. Cutting grass receives up to 250 units nitrogen, 60 units phosphate and 60 units potash. Silage making has been mechanised through the use of a "Dania" self-propelled forage harvester filling two lorries alternatively. This same equipment is also used on the Morayshire farms.

The grazing fields have mixed stocking of cattle and sheep in suitable batches of 40 to 60 cows with calves and 50 to 100 ewes with lambs. An on/off system of controlled grazing is practised on the 674 acres. Improved permanent pasture accounts for 515 acres of this. Twelve acres is rough grazing and the remainder is rotational grass based on perennial ryegrass, timothy and white clover. Rotational grass receives up to 200 units nitrogen and the permanent pasture 120 units. Lime and slag are applied in rotation on approximately 100 acres only. Rape has been the pioneer crop in the reclamation programme.

Hill cows are the main enterprise with 440 cows being carried. The main breeds are Blue-grey, Hereford/Friesian and Shorthorn/Highland crosses using Aberdeen Angus and Shorthorn bulls. Housing is provided for 360 hill cows and for 110 of the younger weaned calves. All are fed mechanically by forage box which is filled with silage and draff by a front loader. The housing and feeding arrangements are a unique feature of the farm. All the progeny from the cows are finished on the Morayshire farms, and although the farms are some hundred miles apart, the integrated policy works extremely well.

600 Blackface and 50 Greyface ewes are run as scavengers. All ewes are crossed, Blackface to the Border Leicester and the Greyface to the Suffolk. All lambs are fattened off grass aftermaths and rape. Approximately 1400 lambs are fattened each

year, a proportion of which come off hill farms. Four members of staff, one of whom is part-time, tend all the stock.

At the end of the visit, the Doune Car Museum with its excellent collection of vintage cars was visited, and following the Annual General Meeting, Mr James Walker-Love, Auchincruive, Mr Bertie Logan, Holehouse, Kilbirnie, Mr Ian S. Morton, The Royal Bank of Scotland, Perth, and Mr Jack Torrens discussed a wide range of questions. — I. W. Mitchell.

8. THE KIRKTON STORY

ALAN HIGGINSON

Report on talk given at Stirling, Thursday 20th January, 1972.

Most of the advances made in Grassland Husbandry in recent years depend for their success on being able to control the grazing. One of the reasons for the apparent slowness of hill farmers to abandon traditional methods of grazing is that control on a scale likely to bring about significant changes in productivity is both very difficult and very costly. Recent work by the Hill Farming Research Organisation indicates that controlled use of limited areas of improved hill pasture can bring about significant increases in productivity throughout the whole flock. This approach is being tried out on the part of the College farms at Kirkton, Crianlarich.

Kirkton and Auchtertyre

These farms, totalling 6,000 acres, were taken over by the West of Scotland Agricultural College in November, 1969. Rising to over 3,000 feet and with a rainfall in the region of 100 inches, and with only limited enclosed and improvable land, they are typical of much of the Highland area. To facilitate a wider range of developmental work, two separate farming units have been established. The first of these is approximately 1,000 acres within a ring fence, and including between 200 and 300 of fenced and improvable land. The stock of Blackface ewes has been built up over the two-year period to 500 and these are being managed in accordance with the basic nutritional principles established by the Hill Farming Research Organisation. The whole stock is tupped on the improved land and wintered as far as possible on the open hill. Supplementary nutrition is provided as routine and leaner ewes are drawn for preferential treatment periodically throughout the winter. After lambing, as many ewes and lambs as possible are drawn on to the improved land during the lactation period. Hoggs, yeld ewes and ewes with stock ewe lambs summer on the open hill. Lambs are sold, either fat or store, as early in the season as possible, leaving the improved pastures to freshen before tupping time. It is hoped by this system of management to improve the year round body condition of the ewe, thus increasing her productivity. It is also hoped to improve the individual weight and quality of the marketable lambs.

A cattle policy has been devised to make complementary use of the improved land and also to look at the possibilities of producing higher growth rate calves on this type of farm. A herd of cows, mainly cross Highland but including thirteen Hereford/Friesian heifers, has been established and will be calving in July/August to a North Devon bull. The herd will be housed when

competition with sheep in the autumn becomes too severe. Calves will be weaned sometime during the winter period and can be sold either in the spring or at some later date.

Auchtertyre Farm

The remainder of the holding, i.e. the original Auchtertyre Farm plus the Kirkton Glen hirsel, total about 5,000 acres but includes only a very limited amount of improvable land. Obviously the scale of operations and nature of the land precludes the direct adoption of the principles being followed on the Kirkton Face. Consequently, a much more traditional approach is being used. The stock of 37 cross Highland cows is served with a Luing bull to calve in the spring. Bullock calves are sold at the autumn suckler sales and heifer calves are retained as herd replacements. The sheep stock of 1,600 Blackface ewes runs in two hirsels, each consisting of three self-contained hefts. This hefting structure helps in the accurate handling of the sheep with a limited number of staff, as does the use of hill parks for all main gatherings. The hill parks are also used for wintering lean ewes and the most remote heft is brought into the parks for tupping.

This unit is being handled by two men and the emphasis throughout is on cost control since the benefits of controlled grazing and increased productivity are so difficult to operate. Consequently stress is laid on producing a type of sheep which requires the minimum of shepherding attention. Herding and mothering ability becomes even more significant and an attempt to incorporate these qualities is being made by using rams of the Newton Stewart type and of the Swaledale breed.

Summary

The two units represent the possible divergence of policy within the hill farming industry. In the first case where improvable land is available and where control is possible, significant productivity increases are being aimed for. This is especially important where unit size is small. In the second case where unit size is large where improvable land is limited and where the possibilities of control are less obvious, productivity becomes more associated with cost control—especially fixed costs—and this in turn leads to the development of types of livestock and systems of husbandry capable of acceptable levels of productivity without excessive labour requirements.

A. HIGGINSON.

9. QUALITY SILAGE FOR QUALITY COWS

Michael Milligan, Culvennan, Castle Douglas,
Central Scotland Grassland Society Meeting at
East Kilbride, 16/2/72

Every good grassland farmer must make silage: there is no alternative for ideal grassland management. Only from silage can we get a high quality winter feed that will keep down costs. To beat the Europeans as grassland farmers, we must base winter feed on silage because it is unlikely that costs can be trimmed on labour and machinery.

The Culvennan unit consists of 3 farms run together to give 500 acres. The cows are milked at the Culvennan Home Farm. Numbers are 185 with 130-140 in milk. Last year's milk sales totalled 195,000 gallons or 1,050 gallons per cow.

The dairy herd lives on 200 acres. The remaining acreage is utilised for barley (120 acres), followers and young stock (50 acres), silage for beef stock (50 acres) and rough ground (80 acres). Some of the rough area can be improved. About 10 acres are tile drained each year but it takes about 3 years to get this reclaimed land into good production. All water from the drains has to be pumped into the River Dee since the hydro-electric scheme caused an alteration in its level.

Last year some 3000 tons of silage were made which will be stepped up to 4000 tons in 1972. The aim is high quality silage to replace some concentrate feeding or to replace barley for the fattening cattle. Nationally, production from silage seems to be disappointing. Despite propaganda, farmers in general still accept ridiculous losses in the silo. Silage making at Culvennan started 13 years ago using a Lundell 40, and storing the silage in a sleeper walled silo. Silage was cut and carted to the cows in the byre (and the waste carted out again !!). Later the grass was wilted before ensiling but some difficulties with heating were encountered. The Lundell was changed for the Kidd double chop machine—this helped silage quality and self feeding was introduced. At the present time so much silage is required that harvesting techniques had to be replanned in order to harvest the grass during the few days whilst it was at the optimum feeding value. Fields are quickly refertilised for the second crop. Fast filling of the silo keeps down the temperature and so aids silage quality and reduces losses.

The present day system involves a contractor, using 2 New Holland 717 full chop machines, a rotary mower, 3 trailers and a Drott at the silo because the buckrake was too slow. Machinery hire charges amount to £15 per hour. The crop yields 8-10

tons/acre and the machinery clears about 3 acres/hour in a 10 hour day. This gives a contractor's charge of 50-60p per ton over 3000 tons. This may seem costly, but the Culvennan unit could not justify the capital cost of all the machinery or supply the necessary labour. The farm supplies a tractor for the rotary mower, 2 tractors to haul the grass and a tractor to roll silage or to operate a second rotary mower if the forage harvesters are catching up with the cut crop. With this set up, 150 acres are cut and ensiled in 5 days before the end of May. The second crop is taken at the beginning of July and a third before the grain harvest. It is important therefore to get going in the spring and have the first silage cleared before the end of May.

Cutting starts 24 hours before the full chop machine comes in. Wilting is of great value but is difficult, and cutting must not be delayed for the sake of wilting. The flail mower was actually better for wilting. The rotary mower is needed to help the full chop harvester but allows less wilting. This year a conditioner is to be used along with the rotary mower in an effort to speed up wilting.

The New Holland harvesters pull their own trailers and these plus 3 trailers and 2 tractors can cope with the hauling. Trailers may be run alongside the harvesters to cut out hitching time. At the silo, a quick turn round is vital and the Drott enables this—it pushes, spreads, levels and rolls all at one go. Also the Drott can tackle a steep face and thus maintains a good wedge shape whilst filling.

Formic acid (Add F) is used on all the grass. This has the effect of controlling fermentation and helps to keep the temperature around 65°F in the centre and 70°F at the outside. Temperatures above these levels leads to a burn up of carbohydrates and a breakdown of protein. Formic acid is easy to apply and gives a good distribution through the grass, two very important features. Cost is around 30p/ton, but good cold silage with a pH 3.8-4.0 is attained. This controlled fermentation has over the years improved the quality and intake of silage and improved milk production.

The silos are made from railway sleepers slotted into steel columns. The cubicles are arrayed on each side of the silos. The sleeper walls have been lined with sheets of hardboard to exclude air. These may have to be replaced annually but the cost is worth it. Plastic sheeting is used nightly during ensilage and finally sealed once the silo is full. Close contact between the sheet and the silage is essential to prevent waste and the sheets are weighted down with old tyres and Add F containers filled with water.

The first crop silage is fed to the cows behind tombstone barriers. Electric fencing has not been successful as a barrier as

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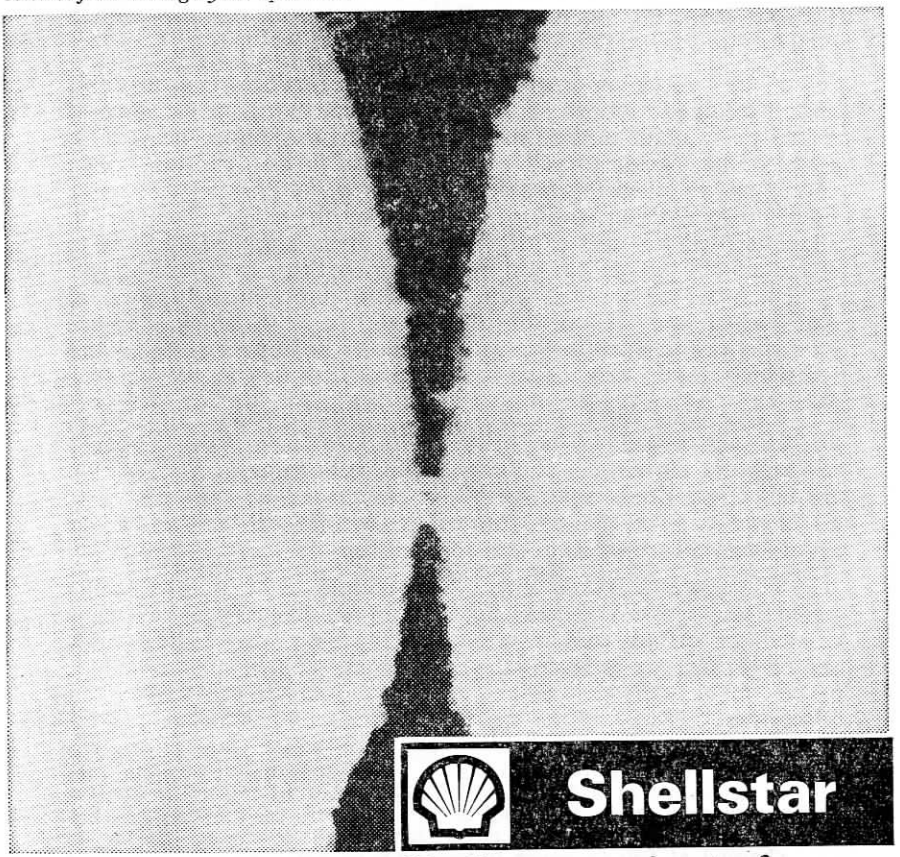

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it restricts the cows' intake. Silage does not accumulate behind the tombstone barriers. The cows prefer to graze the face. Everything must be done to encourage intake.

Silage is fed with 10 lb draff for maintenance plus 3 gallons. 4 lb barley is fed for the next gallon and 3½ lb concentrates per gallon thereafter. He is still not sure why concentrates are fed; perhaps they are only necessary a month before and 2 months after calving when the cow's intake is limited, but silage should do all the rest with barley and minerals.

Calving is an all-the-year-round job which keeps the plant working at an even pace throughout the year without high flushes and also leads to higher output per man. One man can milk the 130-140 cows. Output from milk is around £200 per cow with a concentrate bill of £17-£20 per cow.

A beef fattening enterprise is also run at Culvennan and this year it is hoped to finish 350 cattle. Last year the silage for the beef animals was made outside in a large mushroom-shaped heap. This enabled the tractor to run over the grass in all directions when rolling and avoided the problem of steep walls. Plastic sheets were used during making and for finally sealing the silage. Second crop silage is used for beef cattle which are given a ration of 50-60 lb silage plus 10 lb potatoes and 8-10 lb barley. Store cattle are bought in September to supplement the calves coming from the dairy herd and housed in a slatted floored shed (90′ x 32′ double); they are on slats to save straw which would have to be bought and they are fed with a forage box. Time is also saved.

Silage costs work out as follows:—50-60p contractor charge, 10-20p own machinery charges, 50p for fertilisers 4 cwt 23-11-11 for each cut plus winter slurry—this year changing to 27-7-7), 30p for additives. Seeds, rent, etc., bring this to a total overall cost of £2.70 per ton. The silage is charged at £4/ton to the cattle to cover an allowance for buildings and forage box.

The grass mixtures are fairly simple. S.24 plus Reveille perennial ryegrass was used but S.24 is not liked because it runs to stem too quickly and has a poor leaf to stem ratio. Late or mid-season grasses are replacing the early types.

Discussion

Q — Would you elaborate on your beef enterprise — what production do you get from your bullocks? **A** — 2½ lb/day liveweight gain is necessary at a feed cost of 21-22p/day to make the system worthwhile. At a killing out of 58% the return is 29p/day, so that leaves 7p/day/beast to cover labour ad buildings. Barley is charged at £30 to cover bruiser, labour and rent and the profit from the enterprise is the difference between the buying and selling price. If the selling price is £13.50 then we must buy at a maximum of £11.50. That is a bullock bought at 7½ cwt. and going away at 550-600 lb dead weight.

Q — I like the idea of the "Milligan Mushroom" — could you tell us more of the site, covering and emptying of the silo? **A** — A dry area is needed to provide a good base. The mushroom gets rid of the problem of sides and the silage is covered by sheets as filling progresses. A foreloader fills the silage into the forage box. The forage box is expensive (£900) however, one man can feed 180 cattle in 20 minutes.

Q — 3,000 tons of silage must justify some expense on machinery. What tonnage justifies a full chop? **A** — A full chop costs £1,200, but it depreciates very quickly and is not worked to its capacity—perhaps 15-20 days/year. It is the acreage to be cleared that matters. Fortunately we have a nearby contractor who spreads fertilisers, bales straw, applies lime, combines and ditches. Servicing costs are not terrific. Breakdowns and repairs are a problem, so we avoid all this by using the contractor.

Q — How relevant is speed of filling? What about machinery syndicates for this job — contractors are not always so convenient? **A** — Speed is essential — we probably have less than 10 days to secure the grass at the correct quality. Really it is the short time in which we must clear the field which necessitates the rapid filling. Reducing the area to be filled at any one time is fine for keeping air out by aiding consolidation, but one must cut the grass at the correct stage of growth. A machinery syndicate could be useful but choose your partners well to overcome the problem of everyone wanting the machine on the same day.

Q — What happens if your contractor goes out of business on the 19th May? **A** — Never thought of that!! **Remark** — You'd buy his business?

Q — Do you use the pasture types of grass because they hold their quality and grow a little later in the season. **A** — Yes. We have cutting areas and grazing areas. The pasture types allow more time to harvest. We find that productivity is just as good although dry matter content and fermentation is more of a problem with the leafier crop.

Q — What value do you place on slurry? **A** — Slurry is handled October to April so we justify owning one slurry tanker. I believe we do get a response to slurry but so far no build up of potash in the soil. **Remark** — You are not using enough potash on your cut swards and slurry is meeting the requirement and so a build-up is not to be expected. **A** — I should put some value on the slurry but I would be happier if it wasn't there at all!

Q — How do you feed your draff and barley? **A** — The draff is fed in a trough in the silage shed. **Note** — At this point the room was blacked out due to an electricity failure and the meeting continued by candlelight. **A** — Barley is fed in the parlour. We have installed a double system, one for the concentrates and one for the barley.

Q — Do you feed extra minerals? **A** — Yes. We have extra minerals in our concentrates. Magnesium cake did not answer our problems so magnesium and phosphate are included in the concentrates and hence all cows giving over 4 gallons receive these minerals. In spring, we mix minerals with the barley. In the silage shed, free access to minerals is available. Iodised salt seemed to be preferred to a complete mineral mix.

Q — Can you justify roofing silos? **A** — No. Today this can be avoided but 13 years ago easy feed wasn't easy. Today I doubt the value of expensive roofing. A good base and a plastic cover seem adequate for forage box feeding.

Q — Could you reach M + 4 if silage is made easier to eat? What about a roof to protect the cows? **A** — It is only the silage which doesn't need a roof. I still feed the cows under cover using an easy feed system. I don't think our cows will eat any more silage, the full chop silage is readily and easily eaten. What affects intake is quality or dry matter content.

Q — What quantity of silage do your cows eat? What is its dry matter? **A** — Intake is around 100 lb/day and we plan to make 10 tons/cow to last from mid-October to mid-April. The aim is to have a dry matter of 25-30%. We must not let quality or availability restrict intake — after all, during summer the cows' intake of grass is not restricted, so why restrict silage in winter.

Q — Your records are impressive — could you tell us something about your cows? **A** — I have Ayrshire cows and I don't intend to change, although I've thought about it in respect to producing calves for the beef unit. Ayrshires have an ease of handling, an adaptability and hardiness which is difficult to beat. We are now using AI virtually 100% for replacements which are a mixture of Ayrshire, Holstein and Friesian. We have tried several crosses for beef, e.g., Charollais, Simmental, Danish Red and Hereford have been used, all with their drawbacks. I think I was most disappointed with the Simmental. I am trying a Beef Shorthorn cross at present. Of course, our best Ayrshires are bred pure. So far, bull beef has not been tried, but everything looks to be in its favour.

R. Yuill, Walston Mansions, Dunsyre, proposed a vote of thanks to Michael Milligan for his most interesting talk.

R. D. HARKESS.

10. UPLAND LIVESTOCK MANAGEMENT

Joe Kaye, Esq., Weston, Dunsyre.
Central Scotland Grassland Society.

Farm visit followed by discussion — 15th March, 1971.

Weston Farm, lying between 750 and 1,000 ft, is composed of 900 acres arable and 2,100 acres of hill. The farm carries 174 inwintered autumn calving hill cows with 135 calves and 40 spring calving cows which are outwintered, 100 of the inwintered cows being housed in a cubicle/self-feed silage unit. 700 Blackface ewes with a Blackface tup graze the hill and 600 North Country Cheviots are maintained on low ground, 280 of which are crossed with a Suffolk tup, the remainder being bred pure.

Cattle Management

Winter feeding is started early to avoid grazing poor quality pasture. Enough silage is made for a six-month winter, and cattle are turned out before April. Only silage and ad lib minerals are fed through the winter. Steamed bone flour is mixed into the grass as the silage is being made, as well as calcined magnesite for 'Staggers' prevention. Magnesium rich cobs are fed when going out to grass and coming in—another 'Staggers' precaution. Mr Kaye maintains that 'Staggers' in a herd is often induced by poor management.

The cubicle/self feed unit has proved satisfactory but may be altered to split the 100 cows and calves into two groups, having access to both faces rather than the 100 feeding at one face.

Freeze-branding makes for easy identification and is of extreme value at bulling as the bulls run with the cows for a short time each morning, being kept out of cubicles to prevent accidents.

The 40 outwintered Galloway cows are crossed with a Friesian bull, of which the heifer progeny enter the commercial herd and are crossed again with either Aberdeen Angus or Lincoln Red. There are as yet no calves from the latter.

The Galloway-Friesian steers are a liability as they are slow growing and don't put flesh on easily. They are put to grass in the summer and sold store in January/February. The calves from the commercial herd are fed on silage and barley, with a small proportion sold at October suckle calf sales, the remainder being sold fat between November and January.

M.L.C. Recording 1970-71.

	60 *steers* (*lb.*)	36 *heifers* (*lb.*)
Av. birth weight	77	69
Av. lightweight gain/day	1.9	1.7
Av. weight at 26/7/71	673	623
Adjusted 300 day weight	628	574

30 Steer calves sold at the Lanark October sale averaged £90. Remaining steers and heifers sold fat from November to January averaged £96.

Sheep Management

700 Blackface ewes bred pure as brought off the hill to low ground to lamb. Singles are returned to the hill. Twins are kept on low ground and put back to the hill in June. Cheviot ewes which run on low ground are either crossed with Suffolk tups or bred pure.

Lambing date is 17th April. Before the 17th April, dry east winds and frosts are a hazard to earlier lambing. Mr Kaye is not prepared to invest in sheep winter housing. There is no point in lambing earlier, because of the smaller lamb crop.

From 1st February, hill sheep are fed whole maize as this has proved more successful than blocks or other types on concentrate feed. This winter has been exceptional and the sheep to date have received no supplementary feed.

Grass Management

Of 900 acres arable, 200 acres is barley, 200 acres is for silage and the rest for grazing. All grass swards were sown with perennial ryegrass/timothy mixtures.

The system is extensive and shortage of grass is rarely a problem, consequently only part of the grass receives artificial fertilisers. Grass for silage gets 80:40:40 units of $N:P_2O_5:K_2O$ to the acre and is cut only once. Machinery belongs to a silage group involving two other farmers. Grass is cut with a turbo-mower and picked up by two MH 717s and carted by four bogeys. Each farmer supplies two men and two tractors, pit work being carried out by other farm labour and machinery.

Early in the season sheep get the best grass with the cattle getting preference later. Cattle never graze the hill unless there is a shortage of grass.

Discussion in Silver Bell, Lanark, chaired by Lex Smith.

Panel:— Mr Joe Kaye, Weston, Dunsyre.
Mr R. Lennox, Shemore, Luss.
Mr I. Dickson, W.S.A.C., Auchincruive.
Mr A. Mathieson, M.L.C., Perth.

The initial part of the discussion was an expansion of points arising from the afternoon's visit.

The first point brought up was why Mr Kaye did not cross all his Cheviots and lambs earlier, to which Mr Kaye replied — "Replacement hill Cheviots are difficult to come by, therefore if regular ewe stock was crossed, in the long term the quality of stock would deteriorate."

Mr Mathieson was asked to elaborate on part of M.L.C.s work. He pointed out that the aim of the M.L.C. was to get the best bulls going into commercial herds and to see which breeds and crosses gave the best calves. Mr Kaye indicated that this information was not disseminated enough, and suggested that before Bull Sales, performance and records of bulls to be sold should be circulated to farmers.

The rest of the discussion resolved around intensification of the Unit. Mr Kaye emphasised that if Weston was split into 4 units, intensification would be more successful than intensifying the farm as a single unit, which he was not prepared to do, as the capital expense was too great.

Mr Dickson suggested holding back on cattle numbers as the land was suitable for Cheviots and for crossing, thereby with intensification giving high yields of liveweight gain per acre, higher returns could be obtained. Mr Kaye disagreed because he did not accept that Upland conditions and F.C.E. (Food Conservation Efficiency) of sheep were suitable for intensification, whereupon Mr Dickson illustrated the potential of sheep, by work currently running at Auchincruive where 1,100 lb liveweight gain/acre were being obtained under experimental conditions.

Mr Lennox stressed that sheep numbers per shepherd became an important consideration with the unavailability and high costs of good shephtrds. It was generally agreed after consideration of New Zealand and Falkland Islands conditions that high sheep numbers per shepherd induced lower output per shepherd to which Mr Kaye added that at the moment he has enough sheep for two shepherds, but doubted if the farm would carry enough sheep for three shepherds.

Mr Kaye concluded by saying that cattle were more easily intensified and integrated than sheep because intensive sheep systems could cause the land to become " sheep sick " and as a consequence high veterinary bills would rule out any extra profit over a predominantly cattle with sheep system.

DONALD M. HARRISON.

11. VISIT TO KIRKCUDBRIGHTSHIRE

(17/5/71)

The weather was altogether co-operative for the S.W.S.G.S. visit to the Stewartry of Kirkcudbright. Heavy showers meant frequent scampering for cover during the walk over the farm. During the morning the society were guests of Mr Ian Wilson, Drum Farm, Beeswing. Following lunch, Congeith, Kirkhouse and Summerhill farms, the property of Messrs F. J. and B. Young, were visited.

Drum Farm (I. Wilson)

Cropping. 320 acres in total. 100 acres Barley—15 of which might be cut for silage. 100 acres of Grass for cutting—all silage. 120 acres Grass—for grazing.

Leys are based on a four-year rotation sown to 24 lb Tetraploid Ryegrass, 4 lb timothy, 2 lb white clover, at 30 lb/acre. The permanent pasture was sown to a mixture containing the later flowering ryegrasses including cocksfoot.

Livestock. 130 cows with calves of which 100 are inwintered and calved September/October, 30 are outwintered and calve in March. In addition, there are 12 in-calf heifers.

The main breeds are 40 Galloways—which were on the farm when it carried a dairy, 40 Ayrshire x Shorthorn—bred from the original dairy cows, 40 bought-in heifers—Blue Greys and various other Shorthorn crosses. Hereford bulls are used—there were two on the farm at the time of the visit. The replacement policy is to buy in accredited heifers. In addition, 60 Friesian steers are bought in each year at three months old. 45 of the previous year's batch were still grazing on the farm. All animals are taken to finishing weight.

Buildings. An impressive feature of the farm is the adaptions to the buildings which Ian Wilson has carried out, largely using farm labour. These included cubicle and calf creep accommodation for 100 suckler cows with their calves, as well as a slatted floor fattening shed constructed over an existing silo.

Congeith, Kirkhouse and Summerhill (F. J. and B. Young)

These three farms are managed as an integrated unit. Calves produced at the suckler unit at Congeith are weaned in the spring, and moved to Summerhill for fattening. There are 550 acres at Congeith and Kirkhouse and 140 acres at Summerhill. In addition, there are 1,200 acres of hill ground at Plascow which was not visited.

Cropping. 140 acres hay and silage, 10 acres swedes, 120 acres cereals (half the acreage oats, half barley) of which 36 acres or so may be cut for silage. The remainder is available for grazing.

Grassland Management. The rotation at Congeith is based on a 7 years mixture based on mixed varieties of perennial ryegrass, timothy, meadow fescue and white clover plus a little Italian ryegrass to a total of 35 lb/acre. Direct reseeding following a pioneer crop of rape was being carried out at Summerhill which was designed to be an all grass farm. Some of these establishing leys were examined during the visit.

Livestock. 200 suckler cows consisting of 50 Galloways put to a Galloway bull; 50 Galloways put to a White Shorthorn to form the basis of herd replacement; 100 of Ayrshire origin either off a Beef Shorthorn or a Galloway bull, being both bred from the original dairy herd as well as some being bought in. These are put to a Galloway bull. 600 ewes of which 500 are blackface and 100 cross ewes.

Cows calve from July onwards. Calves are weaned in the spring and transferred to the lower farm for fattening. There were 220 of this years and last years calves at Summerhill at the time of visiting, all of which were being taken to finishing weight. 6 Simmental in-calf heifers were inspected by the party at Kirkhouse.

The day proved to be of immense interest to all Society members, with the various features demonstrated in exemplary manner by the three farmers concerned. All-in-all well up to the standard expected of a visit to the Stewartry. — C. R. PHILLIPS.

12. EUROPEAN GRASSLAND FEDERATION

Lausanne, Switzerland
Ronald D. Harkess

The fourth general meeting of the European Grassland Federation was held in Lausanne, Switzerland in June, 1971. The theme of the conference was "Comparison between natural and artificial grassland" and 154 delegates from 24 countries gathered to participate in the proceedings. Papers concerned a wide range of aspects — sward productivity, fertiliser usage, fodder quality, seed mixtures and establishment and the improvement of permanent pasture.

Mr Hunt read a paper on nitrogen response and another on behalf of Dr Frame on the role of timothy in conservation leys. The writer gave a paper on the quality of grass varieties of natural and artificial pastures and Dr Charlton presented his results with birdsfoot trefoil as a means to improve hill swards. The S.W. and C.S.G.S. were, therefore, well represented among the paper readers (4 out of 39 of papers).

It would be impossible to give a summary of each paper, but impressions gathered can be fairly briefly summarised. It was obvious that grassland plays a vital role in farming in all the European countries (87% of productive land in Switzerland is grass) and such a comment as 'the profitability of livestock husbandry depended on grassland husbandry' cropped up on numerous occasions. The emphasis was on the natural pastures which in European terms usually refers to Alpine or high altitude meadows in the range of 2,000 - 5,000 ft above sea level. I had not fully appreciated that many European farms start where we in Scotland finish—Ben Nevis is 4,406 ft ! Nonetheless, even at high altitudes, intensification was paying dividends, fencing and phosphates being two of the key factors and areas which were given up two decades ago as unimprovable were now carrying a reasonable number of cattle. These high alpine areas have a complex botanical make-up and contain many grasses, herbs and other plants which carry colourful flowers (just like some of our Ayrshire buttercup meadows !). Cattle graze these high meadows only during the summer months and return to the valleys for winter housing.

At lower altitudes, meadowland is ploughed and the farmers sow seed mixtures not unlike those sown in this country. In the colder areas, tall fescue, timothy and cocksfoot survive well and are important pasture species. The value of grassland improvement and intensification has already been shown in our country and one big advantage that at least the Swiss have is that their high lands are not very acidic—soil pHs of 5.0 - 6.5 are the usual order.

Following the paper reading sessions a four-day tour was arranged to visit the Plateau and central Switzerland—this was on

a route from Lausanne to Frisburg, Bern, Luzern and Zurich. We visited several farms and Government research institutes and usually the first task on arrival at each centre was to sample the local wine, with cheese of course ! The Swiss farming scene intrigued me. At 1,200 ft, which is almost their lowest altitude, vines, maize, rape seed crops and lucerne plus the usual root and cereal crops of this country grew profusely, the altitude being offset by the more southerly latitude. A reasonably sized farm would be 100 acres but we visited one farm at 2,550 ft with 17acres and 8 cows, 4 heifers, 3 calves, 10 pigs, 20 hens, 1 horse, plus a large area of forest. The equipment was a jeep, a motor mower (like an Allen Scythe, for cutting the hay) and a winch (or wench if married !) for pulling the hay up the hill slopes. Indeed a factor given for some farms was the areas at different land inclinations—imagine all your land on a 20° slope ! I wondered why this chap bothered to farm on—and so have many of the younger generation Swiss, who in fact are leaving these alpine farms. The Swiss Government is trying to persuade people to remain in the mountain regions by offering free public transport, special education for children and by paying higher farm gate prices for agricultural produce. There are three price zones based on the farm altitude.

There is more to it than that, however, Ungrazed or uncut mountain meadows become untidy and the tourists expect to see tidy mountain pastures and hear the tinkling of the cow bells that adorns each animal (actually they were a b----- nuisance, I couldn't get to sleep for them). Secondly, long grass is laid by heavy snow and acts like a roof thatch by shedding the snow and causing avalanches — and the winter sports enthusiasts don't like such happenings ! As a result many high altitude farmers have become wardens, entrusted with the care of the mountain environment and paid to be so by the Government. Will we see this on our hill farms ?

The following prices give an idea of the return for several products. They have been corrected from francs/1,000 kg, but will be accurate enough to illustrate the somewhat higher farm gate prices !

Wheat	—feeding £70/to — £90/ton	**Milk** 25p/gallon
Potatoes	—£50/ton	**Concentrates** (18%CP) £55/ton
	—eating £30	**Cow** 4–5 years old and yielding and 900 gals. £400
	—fodder £14	
	—chip/crisps £24	**Meat** £20/cwt.
Grass seed	—25–50p/lb.	**Pigs** £3.18/score (at 105 kg lwt)
Hay	—£20/ton	**Young pigs** 7–9 weeks £9

Fertiliser Costs

Nitrogen	4.5–6.5p/lb.
Phosphate slag	3.6p/lb.
Superphosphate	6.8p/lb.
Potash	2.18p/lb.

I asked about the EEC but the Swiss, as you know, are a neutral nation and they are particularly proud of this status. Several of our hosts hinted that whilst they like their independence, the Swiss industrialists like money even better and this might arouse more interest in possible entry into the Common Market. However, this was not the view of many of the farming community who predict a 30 - 50% drop in farm income if Switzerland entered the EEC. Judging from the table of farm prices quoted above, this would bring their income to around the current level of our product prices.

Switzerland has four languages, French, German, Italian and Romansch and has a population density about half of the U.K. She is a federation of 25 cantons or principalities which united over the years 1291 to 1815 to provide mutual protection and assistance. Leichtenstein remained independent but she is closely tied to Switzerland and is the haven for wealthy Swiss who wish to reduce personal taxation ! By the way, the Swiss banks have so much money that they only pay interest on accounts of those resident in Switzerland in order to discourage " elusive " bank accounts.

The visit to the Grassland Federation meeting and the following tour was most instructive and enjoyable and the writer is grateful to both Grassland Societies for their assistance to enable his attendance at this meeting.

RESEARCH REVIEWS

151. PRODUCTIVITY OF ITALIAN AND PERENNIAL RYEGRASS MIXTURES

I. V. Hunt, Auchincruive.

Journal of the British Grassland Society, Vol. 26, pp 41-49.

Italian ryegrass is our highest yielding grass, but it is also short-lived and susceptible to winterkill. Production in the second year is therefore not reliable. The inclusion of perennial ryegrass in short term mixtures in order to ensure production in the second year is worthwhile. The use of hybrid grasses, that is crosses between Italian and perennial ryegrasses has not outyielded the mixed sowing of Italian and perennial ryegrasses. The hybrid Manawa, whilst yielding well in the first year, suffered from winter damage and its productivity was reduced in the second year. The table summarises dry matter production (100 lb/ac) for two years.

Mixture	*IRG/PRG* (%)	1962	1963
1	100/0	110.2	79.6
2	75/25	115.4	87.5
3	50/50	110.6	84.4
4	25/75	111.4	77.8
5	0/100	100.3	70.8
6	Manawa	120.4	74.9

The best mixture was No. 2, consisting of 25 lb/acre of Italian and 10 lb/acre of perennial ryegrass. It can be seen from the table that this mixture has outyielded the swards sown with the straight varieties in both years, so apart from ensuring better survival of the sward into the second year, a yield bonus was obtained in both years.

The author stresses the need to combine varieties of a complementary nature when compiling seed mixtures. It is unlikely that multi-species mixtures (where more than three species are used) will show the advantages as obtained from the Italian/perennial ryegrass mixtures. — R. D. HARKESS.

152. STUDIES OF RESPONSE TO FERTILISER N

1. The effect of preharvest N on herbage production of S.24 perennial ryegrass.

I. V. Hunt, Auchincruive.

Journal of the British Grassland Society, Vol. 26, pp 133-141.

The objective of the experiment described in this paper was to determine whether or not N applied 4 or 18 days before taking a hay cut on June 16 would improve hay yield and quality and stimulate better herbage regrowth for a second crop in August.

Results indicate that preharvest N applied within 4 or 18 days before the hay harvest in 16th June did not significantly affect yield or quality as judged by organic matter digestibility although there was a small increase in the protein content of the hay. Harvesting the hay earlier and then applying N improved quality and yield of digestible feed since digestibility was falling at 0.55 digestibility unit per day for the week prior to June 16th.

Tht highest yield of the regrowths came from areas given N immediately after the hay cut. N applied 4 or 18 days before the hay harvest produced the lowest yields.

Preharvest N therefore fails to give quality and yield increases and is an inefficient way of using N. — R. D. HARKESS.

153. TOWER AND CLAMP SILOS. Cost comparison.

H. J. Wright and A. M. Robertson, Scottish Farm Buildings Unit Progress, Jan., 1972, pp 19-25.

The general considerations to be made when making the choice between tower and clamp silos must include factors other than cost. For example: What area is available for the erection of a silo ? What quality of silage is to be made ? What feeding system is to be adopted ? Is it important to minimise wastage, fermentation and effluent losses ? The authors give brief answers to these questions but then go on to discuss in detail the costs of towers and clamps. The tables summarise considerable data for five silos presented in the paper.

Cost (£) per tonne capacity

Silo Capacity (tonnes)	*Single*[1] *Tower* (A)	*Twin*[1] *Towers* (B)	*Concrete*[2] *clamp with roof* (C)	*Concrete*[2] *clamp without roof* (D)	*Sleeper*[2] *wall* (E)
200	30.61	—	11.33	6.74	4.74
500	18.49	22.60	9.19	5.22	3.50
1000	—	16.68	7.68	4.28	2.87

1. Includes base blower amd unloader.
2. Includes concrete base drainage and effluent tank.

Cost (£) per tonne of dry matter and starch equivalent

		A	B	C	D	E
100 tons stored at moisture content of	40%	69	58	—	—	—
	30%	80	68	—	—	—
	25%	—	—	39	24	17
	20%	—	—	46	28	19
	18%	—	—	51	36	20
Assuming an SE of 55	40%	84	—	—		
	30%	112	—	—		
	25%	—	—	69		
	20%	—	—	86		
	18%	—	—	95		

Examining the cost of dry matter or starch equivalent stored, rather than the cost of the silo capacity, reduces the difference between clamps and towers and the authors suggest that there may be circumstances which outweigh the initial capital cost disadvantage which tower silos incur. — R. D. HARKESS.

"Advertiser" Office, Ayr.