GRASSLAND

JOURNAL OF THE SOUTH-WEST AND CENTRAL SCOTLAND GRASSLAND SOCIETIES

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GREENSWARD

JOURNAL OF THE SOUTH-WEST SCOTLAND AND CENTRAL SCOTLAND GRASSLAND SOCIETIES

No. 4, March 1964.

Contents

Editorial Note

This fourth number of the journal appears under a new title to mark its change of status, since it now serves both the Central and South West Scotland Grassland Societies.

It will continue to take the same general form of news of the activities of the two Societies including complete records of the various meetings organised, original articles by members and reviews of research on grass and grassland farming taking place at various colleges and research institutes.

I have wondered sometimes whether such a full report of our meetings is necessary but the following typical conversation with an intelligent member indicates the need:-

Me "What do you think of last night's meeting"?

Him "Great! the best we have had yet".

Me "Write me a short report of it".

Him "I don't think I can remember a single thing about it".

The contributors to this number are to be thanked, especially our new farmer member, Mr. Hall, for his account of Iceland farming. Iceland should be topical nowadays with its practical experience of both sheep housing and barn drying.

Dr. Reid of the Hannah Institute threw a large spanner into current theories about grass growth a few years ago when he demonstrated quite conclusively that close cutting a sward did not reduce growth but actually stimulated extra growth. His account of the practical implications of his work are much appreciated. Dr. Hemingway represents the Central Scotland Grassland Society's contribution to this number, and more than makes up in quality for a disappointing response to my request for contributions.

Members of my own Department, of the Animal Husbandry Department, Auchincruive and of Dr. Castle's Department at the Hannah prepared the research reviews which are being read quite keenly by members to judge from the vast number of letters (2) received requesting further information about the last series of reviews.

Miss Rena Blain of the Grassland Husbandry Department typed this journal for printing by xerography and offset-litho in the University of Glasgow.

I.V. Hunt.
Editor.

CENTRAL SCOTLAND GRASSLAND SOCIETY

Officials 1963-1964

CHAIRMAN - George M. Gilmour, West Crosshill, East Kilbride, Renfrewshire (Auldhouse Cross 232).

VICE CHAIRMAN - Minto Argo, Newton Farm, Cambuslang, Lanarkshire (Cambuslang 3023).

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SECRETARY - Graham M. Berrie, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow C.2. (Glasgow City 5211).

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Robt. M. Yuill Jr., The Burn Farm, Quarter, Hamilton, Lanarkshire.
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Robt. M. Howie, Drumfork, Helensburgh, Dumbartonshire.

College Advisers

Campbell C. Watson, College Office, 8 St. Mirren Street, Paisley.
A.G. Malcolm Esq., College Office, Beechwood, Stirling.

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SOUTH WEST SCOTLAND GRASSLAND SOCIETY

Officials 1963-1964

CHAIRMAN - D. Bruce Jamieson, West Glenstockadale, Stranraer, Wigtownshire (Leswalt 252).

VICE CHAIRMAN - R.W. Montgomerie, Lessnessock, Ochiltree, Ayrshire (Ochiltree 226).

TREASURER - Dr. M.E. Castle, Hannah Dairy Research Institute, Kirkhill, Ayr (Prestwick 77292).

SECRETARY/ JOURNAL EDITOR - I.V. Hunt, Grassland Husbandry Department, West of Scotland Agricultural College, Auchincruive, Ayr (Office - Annbank 234 Home - Prestwick 78288).

MEMBERS OF COMMITTEE

Ayrshire

R.W. Montgomerie, Lessnessock, Ochiltree. 1963-1964.
W. Gray, Park Farm, Kirkoswald. 1963-1965.

Kirkcudbrightshire

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J.D. Ballantyne, Tinwald House, Dumfries. 1963-1964.
A. Smith, Gotterbie, Lockerbie. 1963-1965.

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F.R. Evans, Penkiln, Garlieston. 1963-1964.
S.A. McColm, Cairngarroch, Drummore. 1963-1965.

Advisory Officers of the West of Scotland Agricultural College

Dr. Robert Laird, College Office, 20 Miller Road, Ayr.
Ian W. Mitchell, College Office, 82 King Street, Castle Douglas.
Alistair Campbell, College Office, 41a Castle Street, Dumfries.
John Thorburn, College Office, National Commercial Bank Buildings, Bridge Street, Stranraer.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

Report of Proceedings at the 2nd Annual General Meeting

At New Building, Auchincruive, Ayr.

Date 18th November, 1963.

Time 5 p.m. after an address by Mr. A.R. Wannop, Edinburgh.

The Chairman, Mr. Ian Jennings, opened the 2nd Annual General Meeting of the Society.

1. Minutes

The minutes, as published in Journal No. 2, were approved and signed by Mr. Jennings.

2. Matters Arising from Minutes

Mr. Jennings reported that the Committee had carried out the recommendations of last year's Annual General Meeting and used their discretion as to the interpretation of the wishes of the members to the best of their ability. As no members wished to bring up matters arising from the minutes Mr. Jennings gave an outline of the four major events throughout the year.

The first event was the Annual General Meeting last year with Mr. Cray.

In March that was followed by a talk in Dumfries by Mr. Morrey.

This was followed in April with a tour of Wigtownshire farms - this was an outstandingly successful day, well attended and of great interest to all members.

The Yorkshire tour was arranged and fairly well patronised. The Committee came to the conclusion on looking back that possibly it was too lengthy. It did not attract as many members as were expected. It was worth going on but at that time of the year it proved difficult for a lot of farmers to leave home for three or four days at a time. This problem always cropped up, especially when members of a Society were drawn from all kinds of farming. No matter what time of the year is chosen

for a special effort there will be somebody who wished it was some other time. The Committee had taken those difficulties into consideration when considering this year's tour.

3. Chairman's Report and Outline of Programme

Mr. Jennings went on to say that during the time under review a sister Society, the Central Scotland Grassland Society, which served Lanark, Renfrew and the adjacent counties, had been formed. Mr. Hunt, Secretary, was closely connected with them in their formation and the Committee decided that in the best interests of the Society as a whole there should be a good bit of reciprocity between the two Societies. Not that we wanted to lose our identity nor did they but it was inevitable that there should be a certain amount of contact and that contact should, the Committee thought, benefit members of both Societies. We had a member of their Society on our Committee and vice versa and our members were welcome at their functions and their members welcome at ours.

Out of this arose the question of the Journal and Mr. Jennings hoped that all members were enjoying reading this. It was giving the Secretary and all concerned with the production a great deal of work and the work was done through the help of the College of which the Secretary, Mr. Hunt, was a prominent member of staff. Mr. Hunt wanted to be able to perform the same service for the sister Society. That being so it was going to be quite impossible, with the extra work that would be entailed, that the Journal could go on in quite the same form for both Societies. The Committee was giving quite a lot of thought to this and as a final recommendation they had agreed that instead of Mr. Hunt producing a Journal for the Central Scotland Grassland Society independently the Committee suggested that we should produce a Journal with a title, a name to be decided, which would serve for both Societies. We should have to change the title to give a shorter title and a subtitle of 'Journal of the South West Scotland and Central Scotland Grassland Societies'. It would continue in the same form and might even be improved, even justifying proper printing. Mr. Jennings suggested that, if there were no valid objections to the principle, this be left in the hands of the Executive Committee for another year.

The next item in the review was membership. The membership had risen to 253 made up of 196 farming members and 68 technical members. This represented an increase over the original number of between 50 and 60.

The Committee had gone into the question of the programme for next year - there had just been a talk by Mr. Wannop on "More From Hill Pastures". On December 10th there would be a discussion night at Kilmarnock and the topic would be "Manuring of Grassland". The openers were to be A.D. Drysdale, I.V. Hunt, R.W. Montgomerie and S. McColm. In February in Wigtownshire we would have a discussion night on "Winter Feeding". One of the openers would be Dr. Castle, the others were still to be decided. On March 5th at Castle Douglas the guest speaker would be D. Smith Esq. from Buckingham. In early May there would be a tour of Dumfriesshire farms with the theme "sheep". Trying to follow up what had been said earlier, the summer tour was being planned for approximately the same date to take the form of a tour of Aberdeenshire, consisting of possibly one or two nights away from home and two days on farms.

Our sister Society also had a programme and all members were to be welcome to attend their meetings. In February Principal Hendrie would talk on "Grassland" at Stirling, in May there would be a day on Perthshire farms and in June a day at the Hannah Dairy Research Institute.

Mr. Jennings then asked the Treasurer, Dr. Castle, to give a report on the state of the finances.

4. Treasurer's Report

Dr. Castle reported on finances and presented a balance sheet. The Committee had decided that the 31st May should be the end of the financial year as subscriptions were payable on the 1st June. The statement therefore dealt with the period 31st October, 1962 to the 31st May, 1963, just part of the year. This new year did cut into the middle of the summer tour. Thus the operative word was "part" in this connection. It looked as if the Society had made a little margin on the tour but actually it had lost £13. The year had ended with £91 in the bank, the present position was that there was £266 in the bank. There had been an income since 31st May of approximately £245, had spent £70 and at the moment the Society had £266:3:2d. No questions were forthcoming about the accounts.

5. Elections

Mr. Jennings intimated that he was retiring and thanked all members of the Committee, especially Mr. Hunt and Dr. Castle. Mr. Jennings thanked the hosts throughout the year and the Principal and the College for the facilities granted.

The Society had run for half a year and then for a full year. The retiring members of the Committee, determined by ballot, were therefore:-

Ayrshire	- W. Young, Skerrington Mains, Hurlford.
Kirkcudbrightshire	- J. Biggar, Chapelton, Castle Douglas.
Dumfriesshire	- J.G. Marshall, Hardgrove, Carruthers-town.
Wigtownshire	- T. McFadzean, Brightside, Ardwell, Stranraer.

There were no nominations for new members before the appointed time. The Executive Committee therefore proposed the following:-

Ayrshire	- W. Gray, Park Farm, Kirkoswald.
Kirkcudbrightshire	- I.L. Howie, Cubbox, Balmaclellan, Castle Douglas.
Dumfriesshire	- A. Smith, Gotterbie, Lockerbie.
Wigtownshire	- S.A. McColm, Cairngarroch, Drummore, Stranraer.

The proposal was accepted by the meeting and the gentlemen accepted their tasks.

Mr. Jennings proposed Mr. D.B. Jamieson, Vice Chairman as the new Chairman. This was agreed and accepted by Mr. Jamieson. Mr. Jamieson thanked the Society for the privilege and asked Mr. Jennings to occupy the Chair till the conclusion of the meeting. This was agreed.

Mr. R.W. Montgomerie was elected Vice Chairman of the Society.

The Secretary and Treasurer were re-elected.

6. Any Other Business

Mr. Hunt read three notices to the Society.

(a). A letter from the British Grassland Society in connection with sheep farms. They wished to know of any farmer members of the Society who had a sheep-only grassland enterprise with no cattle. Contacts should be made through the local County Agricultural Adviser.

(b). The second item was the programme of the Hill Sheep Management Conference to take place on Thursday 21st

November. Mr. Alistair Campbell intimated that he had a number of copies of the programme.

(c). The Winter Meeting of the B.G.S. would take place on December 5th and 6th. As usual the Society could nominate two members to attend this function. It would probably be most convenient for farmers who were already going down to London. For the first time the programme was marked "Members Only" but this did not exclude the Society's two delegates. Mr. Hunt requested that anyone interested should let him know. Mr. Wardrop had acted as delegate last year and his report was included in Journal No. 2.

Mr. Jennings then asked if any members wished to raise any points under this heading. No suggestions were forthcoming.

Mr. Jennings wished every success to the new Chairman and thanked members for attending. The 2nd Annual General Meeting then concluded.

MORE FROM HILL PASTURES

A.R. Wannop, O.B.E., B.Eng., B.Sc., F.R.S.E.

A talk given by Mr. Wannop, Director of the Hill Farming Research Organisation at the 2nd Annual General Meeting of the South West Scotland Grassland Society, New Building, West of Scotland Agricultural College, Auchincruive, Ayr, 3 p.m., 18th November, 1963.

Mr. Ian Jennings, Chairman.

Last year we had a very prominent speaker from the low countries and this year, much to my joy as a hill farmer, Mr. A.R. Wannop, who is outstanding from the hill farm point of view. He combines, in a unique way, a great deal of practical knowledge of hill farming with a scientific approach. When, some 10 years ago, the Hill Farming Research Organisation was formed to try and help solve some of the problems of management, disease and the manifest different outlooks on hill farming, Mr. Wannop was its first Director. As an industry, we owe a tremendous lot to such Organisations. The impact of these discoveries and experiences will be even more felt in the future for it is a very slow business sorting out the rights and wrongs of anything to do with farming and especially with hill farming. We are extremely lucky to have the privilege of listening to Mr. Wannop this afternoon whom I now introduce to you.

More From Hill Pastures

The Beneficent Grazing Animal

Most Grassland Societies consist of members who are primarily concerned with maximum production from grass at a low altitude and with cow grazing days or lbs. of starch equivalent per acre, neither of which can be applied to hill pastures.

One might ask the question, why, in the present agricultural climate, 'more from hill pastures'? It has been quite obvious from the price reviews for the last few years that the Government are not looking for more production in respect of sheep. Certainly in regard to beef there has been no encouragement. In fact, it has been made rather plain that they do not want any greater output of mutton and lamb in this country. The hill farmer, if he is going to make ends meet in the next few years, has to try and step up his production.

Traditional hill farming is suffering severely from the wind of change at present buffeting farming in general. Unfortunately

its nature makes it much less resilient than other forms of farming and it cannot be adapted either so quickly or so positively to changed conditions. Lowland farms can be highly mechanised to increase output per man, a step that has only limited application for a hill shepherd. As a result costs have in recent years been rising steadily on hill farms without any relative increase in income, so that profit margins have been falling and are, in fact, today too low to satisfy anyone.

The hill farming accounts analysed by the North and the West Colleges over the last few years, show a declining margin regarding output and expenditure. When you examine the figures the most striking thing is the much higher proportion in the hill farm of the costs of labour. The latest reports of your College here (the last one which I have is for the 1961 lamb crop) shows that the total labour costs are roughly $\frac{1}{3}$rd of the total costs.

This is from a half more to twice the proportion on a lowland farm. No-one would suggest that shepherds' wages are too high, but when the output of a hill farm only gives a return of about £300 for each £100 spent on labour whilst on a lowland farm it may be fully £400, then the situation needs careful thought. What we require are methods of increasing the output per man. Normal sales from a hill farm are lambs, wool and cast ewes with possibly some weaned calves, and of these it is from more lambs and better lambs that we are most likely to step up production on most hills.

Talk of increased production from a hill implies that it can be done without breaking the rules of good husbandry, that is without depleting fertility. My colleagues and I are satisfied that our rainfall brings in more than enough calcium etc. to replace that going off as flesh. Recently at the British Association meeting in Aberdeen there was a discussion on land use in hill areas. No-one repeated the old accusation that hill sheep are turning the Highlands into a desert, a strange charge to make against Scottish farmers, whose history has been to convert waste and neglected land into productive farm land rather than the reverse. But there were implications that hill sheep farming leads to declining fertility. I think that these critics confuse declining fertility and changed vegetation. Most of our hill lands have been suffering from very severe climatic conditions and any loss of fertility has been primarily due to a leaching of minerals run off due to excessive rainfall and so on. My colleagues have gone into this question and we are quite satisfied now that in the ordinary rainfall that occurs in Scotland you are getting an input of calcium etc. in the rain which is much higher than any drain in the flesh of the sheep from the hill farm. There may be a negative balance despite that. We can't

deny that the traditional all the year round low density set stocking with sheep and no fertiliser application has, in the absence of cattle, led to changes in hill herbage involving a decline in the early and more palatable grasses and an increase in coarser grasses and plants. This means fewer sheep can be carried, but it is wrong to blame the hill ewe for what is the result of the system or the absence of grazing control. Last century we had many more shepherds, who with the help of dogs determined where sheep should graze at different seasons. This was a form of grazing control of which there is a lot less today and tomorrow there will be less still, unless we give the shepherd new tools to help him. If we do, the hill ewe together with the hill cow can be a positive means of building fertility rather than reducing it.

Like the proverbial pint pot, one can't take more out of a hill flock than one puts in. Its prolificacy and productivity is largely determined by the nutritional level the hill herbage provides, especially in winter and spring, but also in summer and autumn. This is not beyond our control, but can be influenced by management, and if we are to increase production we must do something about it. Production cannot, however, be increased without relation to cost, and needs separate consideration for almost every farm.

If the object is to have more and better lambs we must improve the hill by one or more of several methods. Ewes have more lambs and lambs which are more vigorous at birth and with a better survival chance if they are in good condition at mating. They also nurse their lambs better. This requires a hill pasture good enough to let the ewes recover condition after weaning. There are various methods of improvement. One can plough and reseed, but to recover the cost of this means fencing and creating hill parks. This may be well worth doing, but on the real hill, improvement is most likely to be more economically done by surface topdressing though only a few hills are good enough for wholesale applications. On most it must be done selectively. Improvement of part of a hill can lead to an improvement of the whole hill, if the improved portion is not all in one block but consists of a series of improved pockets causing the stock to rake the hill and so benefit the whole. Some hills improved in this way now provide lambs for grading instead of store lambs.

In getting improvement it is difficult to exaggerate the benefit of cattle. We have registered an increase of over 30% in sheep production from one hirsel on one of our research farms merely by introducing cattle. There was no increase in ewe numbers, only

more and better lambs. The cows pull off the coarse herbage and leave the sward shorter and more nutritious to the advantage of ewes and lambs.

In managing a hill pasture the same rules apply as for any permanent pasture. A hill grass is no different in its needs than any other grass except that it operates in a much poorer environment. We have plenty of evidence of what happens to a lowground old pasture if it is stocked with sheep all the year round and gets no fertiliser. It gradually becomes overrun with Fog and Bent, develops a shorter and shorter grazing season and produces less and less lamb. On many hills the same process has already gone a long way, but it can be arrested and the process reversed. The main need is to avoid continuous grazing and to give the herbage periodic rests.

To do this means fencing. The fence of today partially replaces the shepherd and his dog of last century. Whether it be fences to allow some rotational grazing of the whole hill or to create enclosures into which the flock can be brought for say tupping and lambing or a cross fence to ensure summer grazing above and winter grazing below, the benefits must cover the costs but they can be substantial in regard to extra lambs and better lambs to sell.

Before hill sheep farming became general in the Highlands the small flocks then existing were always housed at night in winter and sometimes all day as well. For seven or eight years we have been housing hill ewes in winter and lambing them indoors on our research farms without any apparent ill effects, but we have not been able to house a whole heft or hirsel. Winter housing is, of course, regular practice in Iceland and Norway. It has the great merit of resting the pasture, so that in spring ewes and lambs go to clean ground with ample fresh growth. The ewes would milk their lambs better and might even do twins well enough on the hill. We must try and get more evidence of the advantages to the herbage and the sheep of a four months' rest from grazing in winter and spring and of the possible increase in lamb numbers and lamb growth that might result. What is clear is that this would mean an increase in capital investment per ewe and in winter feeding costs, possibly half a lamb per ewe more available to sell. But this may be possible. At any rate it deserves serious thought.

Mr. Wannop illustrated his talk from this point with a number of colour transparencies showing how cattle had improved herbage even without any liming or slagging and the great changes possible by surface reseeding techniques.

The more usual techniques of ploughing and reseeding have proved successful on big enterprises like the Great Glen Ranch, on small crofts on a co-operative basis and at all heights. Half of a field at Glensaugh had been surface reseeded and the other ploughed and reseeded many years ago. Now they were both improved and indistinguishable. On one of the hirsels at Lephinmore an area of 80-90 acres at 1600-1700 ft. had been fenced. Many small patches totalling 15 acres were improved by lime, phosphate and seed. There was a big change in herbage matched by an increased lambing percentage at marking time from 64% to near 100%. When first fenced it carried 220 ewes, which were brought in for tupping and later for lambing. They were back on the hill with week old lambs. Concentrates at $\frac{3}{4}$ lb/ewe were fed from 4-6 weeks before grazing. Land improvement brought the lambing up to 90% and the feeding up to the 100%.

The 15 acres improved helped to improve the remainder. The late Sir George Stapledon used the phrase "the more you improve what you improve, the more you improve what you don't improve".

On Sourhope, grazing control by fencing has been proved very valuable. A 500 acre hirsel was divided down the centre into two 250 acre areas. Both areas carried 130 ewes plus 30 hoggs. In 1951, cattle were introduced to one area. A picture taken in 1955/56 showed that the cattle had produced a far better sheep pasture, even though it was still mainly the poor mountain grasses, Nardus and Molinia, since no lime, slag or seed had been introduced. By the 5th year, the difference was remarkable, resulting in 20% more weight of lamb from sheep grazing with cattle. Over 10 years, the difference was 36%. In 1955, a dry year, the cattle were keeping the hill rather bare but even then, the sheep did better with cattle.

Another slide showed a low part of a hill fenced off from the upper part in 1954. The lower enclosure was used for tupping and lambing and gradually improved. Cattle introduced to the area carried the improvement further. Finally after slagging, improvement resulted in a 40% bigger ewe stock.

From some experiments with seed sowing on hill land it was concluded that Creeping Red Fescues were useful on the poorest ground. Some experiences of reseeding were, however, disappointing in that none of the sown seed could be found and yet there was an improvement in carrying capacity.

Mr. Wannop's final slides dealt with grazing control and the use of New Zealand fencing either electrified from the mains, or from a wind generator. The last named could be erected for 2/- to

2/6d. per yard and provide the farmer with the equivalent control of grazing formerly exercised by shepherding.

Mr. Wannop concluded by stressing the need to provide shepherds with the means of achieving the high output per man essential if hill farming were to progress.

Discussion

Dr. Kellie Brooke, Newton Stewart. What is the ideal time for sowing seed for surface reseeding? I gather that crofters in Lewis sow as late as early July. I myself have sown at the end of February or early March.

A.R. Wannop. There is no ideal time. Both Newton Stewart and Lewis are favourably situated. February or March would be too early in my experience because of possible frost damage. The time must be chosen to avoid both frost and drought. Rain falls on Lewis throughout the summer. In our own farms May or June would be the most favourable.

J.J. Hannah, Girvan Mains. It must be a matter of great satisfaction to Mr. Wannop as it is to us to see the results that he is getting on these hill pastures. I want to put it to Mr. Wannop quite bluntly, is it worthwhile? The Government has said that there is to be no further increase in production. He states that hill farmers must try and maintain and improve their financial position by increased production. Farmers have had some success in improving their position and meeting extra costs through increased production but we are told officially that we cannot improve our financial position and meet increasing costs by increasing production. The more you increase production the more the price comes down. Nothing is achieved by increased production in the state of affairs which has been arranged by the Government. We must ask the research worker to change his approach to this problem altogether. We must reduce our costs without increasing production to accord with Government policy. Mr. Wannop, can you help us in that direction?

A.R. Wannop. I cannot look ahead. The only way we can cheapen production on the hill farm is to produce more and better lambs. If we get 100 lambs were we had only 60 before they will be produced more cheaply. Instead of putting all the lambs on the store market we get more and more graded. At Lephinmore, we fatten half of them and get a better return from these. It is not anything like so easy to do on Sourhope. I do not see what alternative the individual farmer has but to try and take steps such as this. If we have this increased output at lower cost I do not see anything wrong in that.

J.J. Hannah. Increased production puts a larger amount of product on a limited market and reduces the price. Although you are producing more cheaply you have to take a lower price.

A.R. Wannop. You are right. I am disappointed that we have not developed already what the National Sheep Breeders' Association suggested, a Sheep Development Authority, whose function would be to encourage greater consumption of lamb. The consumption of lamb is falling at the moment. The egg and the bacon producers have campaigned successfully; a similar body could do this for lamb producers.

A.B. Wright, Fisons Ltd., Ayr. I was interested to hear Mr. Wannop describe his methods of improving and reseeding hill land but I would like to hear his opinion on the use of medium or high grades of basic slag rather than the low grade. With low grade at £3:7s. and high grade at £5:10s/ton, is the hill farmer not better to use the medium or higher grades of slag in reseeding or improvement of grassland since it would have handling time as well as money?

A.R. Wannop. I was speaking generally. The bigger quantity involved in low grade slag is easier to spread. Low grade slag may have elements in it other than phosphorus which may be beneficial. You should consult the College Advisory Service. When we have applied phosphate in almost inaccessible conditions we have used the most concentrated form.

John Watson, Hannah Dairy Research Institute. You did not mention whether you thought there was any future in building slatted floor houses?

A.R. Wannop. This is a question of economics. There are two purposes, (a) for wintering hoggs or (b) fattening store lambs.

(a). Wintering hoggs. We have wintered quite a lot of hoggs inside. We have not found an adverse effect on them, their daughters or grand-daughters. It is not any cheaper than away-wintering but it is difficult to get away-wintering. Given a run-out during the day and only a feed of hay at night the cost of in-wintering is considerably less but you would need to carry less ewes. We may be obliged to turn more to wintering at home because satisfactory away-grazing is more and more difficult to get.

(b). Fattening store lambs. We have not found that we can fatten store lambs any better inside than outside except in areas of heavy rainfall. For example, at Lephinmore we cannot get

condition on to lambs with the same speed because of high rainfall conditions and there may be a case for fattening some of them inside. Another possibility for a house is to take the flock off the hill from the end of January until after lambing, that is from January to May. This is the bottleneck which determines the number of stock which can be kept on a hill. If there were no sheep on the hill from January to May possibly when you put lambs back on the hill the ewes could nurse the lambs better and might even carry twins on the better herbage. As far as I can calculate you would need to have on average another half lamb per ewe to pay for this. In some areas ewes can be removed from the hill altogether and wintered on low ground and then they go back to the hill without the need for the house at all and achieve the same results.

Slatted floors are not absolutely essential but are a great advantage. If you are going to be feeding silage, kale or turnips or anything of that kind you do need slatted floors. We have kept sheep inside on dry peat moss litter quite satisfactorily.

D.H. Wylie, West of Scotland Agricultural College. Could Mr. Wannop give us any idea as to what proportion of the hill land of Scotland which is at present carrying sheep could be economically used for the techniques which he has shown us this afternoon? I am trying to link this with the point Mr. Hannah made earlier.

A.R. Wannop. Some years ago I said 10% or 1,000,000 acres could be improved by ploughing or reseeding, especially in the east of the country. The rest of it could be done by surface treatment and grazing control. That leaves a possible 9 million acres.

I. Jennings, Chairman. When you showed us slides of two areas of hill land, one with cattle and one with sheep, would the improvement that took place be merely a matter of grazing bare or did other types of grass develop?

A.R. Wannop. There were surprisingly few. We have not seen a big change in this respect in that grassy type of sward. Careful botanical counts made every year have not shown any infiltration. If the swards had been heather or rushes the result would have been different.

Dr. Kellie Brooke proposed a vote of thanks.

It is reassuring to hear about fertility being returned to the soil in rainfall. You have shown us hill reclamation on different parts of Scotland, some in the South West where we have a mild

climate but also in areas such as Bennieglow, Perthshire where conditions are not so favourable.

I believe you are coming near the end of your term of office - I would like on behalf of the farming community to thank you for the work which you and your Organisation have carried out and the help you have been able to give us in the last few years.

I would not be too put out by the general arguments against increased production referred to by Mr. Hannah. If you come from Newton Stewart as I have done today and see the hundreds of acres which have been planted by the Forestry Commission, it will be obvious that our basic sheep stock is being confined to a smaller area. We must raise the productivity of the land left to hill farming today.

I.V. Hunt.

PORTRAIT OF OUR CHAIRMAN

D. BRUCE JAMIESON

A young man with a wealth of travel and experience to back his judgment describes Bruce Jamieson. Born in Egypt, where his father was a Chartered Accountant, he returned to Scotland to be educated at Merchiston and George Watson's, later graduating Bachelor of Science in Agriculture at Edinburgh University.

Post graduate studies were continued for a year at the Imperial College of Tropical Agriculture in Trinidad, and from there he went on to spend seven years in Nigeria. The appointment which Bruce took up was Agricultural Officer for the Nigerian Government, and, in the course of his seven years in that country, he ran a Department farm and was responsible for extension work over a wide area.

After returning to Scotland, Bruce managed a farm in Wigtownshire for about four and a half years, before becoming tenant of West Glenstockadale in 1953. The farm was in a poor state when he took over tenancy, but, by hard and careful work, it has been turned into a productive farm. Early in his tenancy, Bruce grew the traditional crops, but it was obvious that the farm was not suited to cereals and greencrop, and now he has gone over completely to grassland farming. The dairy herd of 60 cows, a pig fattening unit and a small beef unit make up the stock. A large quantity of silage is made during the summer time, and, to ease the fertilizer bill, slurry is collected and distributed by a tanker. Very recently, West Glenstockadale was among a number of farms offered for sale, and Bruce took advantage of this to become the owner.

Apart from his farming life, Bruce has had an outstanding record in the field of sport, and among his treasured awards are Cricket and Rugby Blues gained at University. His favourite position on the rugby field was at full-back, where he played a trial for Scotland. No longer playing rugby, he keeps in touch by refereeing and regularly manages to fit in a game of squash at a local court. A list of his accomplishments would not be complete without mention of his contribution to a local choir, where he sings bass.

All in all, Bruce Jamieson is a very personable young man, quite unassuming, and a most excellent Chairman for our Society.

J. Thorburn.

THE FORMATION OF CENTRAL SCOTLAND GRASSLAND SOCIETY

A brief reference to the formation of the Society was made in No. 2 of our Journal. Now that they are co-sponsors of this Journal the following additional remarks may be of interest to members of both Societies.

Following the successful establishment of the North of Scotland Grassland Society (1961) and the South West Scotland Grassland Society (1962) several farmers, particularly in Lanarkshire, expressed interest and desire for having such a Society in Central Scotland. As a result preliminary discussions were held during May and June 1963 among the following people - George M. Gilmour, Minto Argo, James A. Minto, Robert Yuill Jr., A.D. Macfarlane, R.I. Sandilands of Lanark N.F.U. and John Waddell, I.V. Hunt and Graham M. Berrie, West of Scotland Agricultural College, and it was agreed that -

1) The Grassland Society should be formed only if the farmers in the area expressed an interest in such a venture.

2) Such a Society should be for farmers and run by farmers although The West of Scotland Agricultural College would give all the necessary technical assistance.

3) The extent of farming support should be gauged by, and the decision to form a Society should be taken at, a Meeting to be held at the Burn Farm, Chapelton (Mr. Robert Yuill) on 29th July, 1963. Accordingly a letter was sent to grassland farmers in the area. The result of this letter indicated that 350 farmers and others were in fact interested in having a Grassland Society in the area of Central Scotland.

The Meeting on 29th July was held on a fine warm evening - ideal haymaking weather - and because of this many farmers who would have been present were engaged in a more active form of grassland husbandry. Nevertheless over 100 people from Argyll, Clackmannan, Dunbarton, Lanark, Perth, Renfrew and Stirling, were present and were welcomed to the meeting on behalf of Mr. Robert Yuill and the West of Scotland Agricultural College by Mr. Graham M. Berrie. Thereafter the party was conducted round the farm and various aspects of the unit were explained by Mr. Yuill, Mr. Watson, Mr. Waddell, Mr. Hunt and Mr. Macpherson. At the conclusion of the farm walk a Meeting was held at which Professor D.S. Hendrie gave an

explanation of the purpose and objectives of a Grassland Society and on the proposal of Mr. Bankier seconded by Mr. Laing it was agreed unanimously to constitute a Society in the area. A draft constitution had been circulated previously and each clause of this draft was considered and discussed. The officials listed on page 2 were elected. Thereafter a record was taken of those present and 110 founder names were obtained. The meeting concluded with votes of thanks given by the new Chairman - Mr. George M. Gilmour - to all who had assisted in the organisation.

The constitution finally adopted was very similar to that for the South West Scotland Grassland Society and is printed below.

THE CENTRAL SCOTLAND GRASSLAND SOCIETY

Founded 29th July, 1963.

CONSTITUTION AND RULES

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1. NAME

The Society shall be known as the Central Scotland Grassland Society.

2. OBJECTS

To further the knowledge of the management and utilisation of grassland in all its aspects and to provide members with opportunities for the interchange of ideas and experiences relating to the art of grassland husbandry.

3. MEMBERSHIP

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

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

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

(iv) Not less than 75% of the membership of the Society shall be farmers, farm managers, full time farm workers, or factors of agricultural land working in the Counties of Argyll, Bute, Clackmannan, Dunbarton, Lanark, Perth, Renfrew and Stirling. The remainder may consist (irrespective of domicile) of persons who are not farmers, farm managers, farm workers or rural factors.

4. SUBSCRIPTION

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

5. MANAGEMENT

The affairs of the Society shall be managed by an Executive Committee (five of whom shall constitute a quorum) consisting of the following persons:-

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

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

(iii) Eight members representative of the area who will serve for a period of two years. Four of these members will retire annually and will not be eligible for re-election for a period of twelve months. Four members will be elected at each Annual General Meeting.

(iv) The County Agricultural Adviser for Lanarkshire and two other County Agricultural Advisers nominated by the West of Scotland Agricultural College.

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

(vi) The Honorary Secretary and Honorary Treasurer who will be elected annually at the Annual General Meeting will

be members by virtue of office. They will be reimbursed for all expenditure in the service of the Society.

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

6. ELECTION OF COMMITTEE MEMBERS

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

7. FINANCE

The financial year shall end on 30th September and an account in the name of the Society shall be kept by the Treasurer of all money received and expended by the Society.

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

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

8. ANNUAL GENERAL MEETING

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

9. AMENDMENTS TO THE CONSTITUTION

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

10. DISBANDMENT OF THE SOCIETY

In the event of the Society being disbanded the Committee shall have the power to dispose of such assets as the Society may have to a recognised charitable Institution.

Central Scotland Grassland Society

INAUGURAL DAY AT THE BURN

About 100 farmers attended an evening meeting at The Burn. The achievements on this small farm are well worth recording and studying:-

General. The farm, lying at 758 ft., with a 45" rainfall, extends to 45 acres of grass, 10 acres of which is renovated mossland over deep quaking peat.

Grassland policy. The 35 acres of ley are divided into 5 paddocks and worked in a rotation of 1 years Italian ryegrass followed by four years of either a Timothy/Meadow fescue or a Timothy/Perennial ryegrass mixture. The one year Italian ryegrass ley is being changed to a 2 year mixture by including some Perennial ryegrass. Grass reseeding takes place in late summer on ground given a liberal dressing of farmyard manure. A year ago the 10 acres of moss was given 3 tons/acre Magnesium Limestone, 1 ton/acre Basic Slag, sown with grass seed and divided into 4 x $2\frac{1}{2}$ acre paddocks. The paddocks are subdivided for strip grazing with electric fencing and any surplus grass is made into silage.

During the last three years, this has resulted in the following:-

	1960	1961	1962
Silage made	90	200	262
Acres cut	21	42	45
Cost per ton	£2.8	£2.4	£1.7

During 1961, a loose housing self-fed silage unit was erected with the objective of carrying 300 tons silage. All the construction work except bricklaying was carried out by Robert Yuill.

Fertilizer. High production is essential in order to produce a satisfactory income from such a small acreage. During the last three years each acre has been given the following fertilizer in units/acre.

	1960	1961	1962
Nitrogen	86	98	123
Phosphate	57	81	120
Potash	154	82	85

The manure from a small broiler unit is spread over all the grass.

Livestock. 30 cows rising to 36 cows was the target. Young stock are reared by arrangement on a neighbour's farm. On average, hitherto 1.5 acres has provided summer grazing and winter silage for 1 cow equivalent for the whole year.

Concentrate usage is kept to the minimum and has been reduced from 3.7 lb/gallon in 1960 to 2.2 lb. in 1962.

PROF. M. McG. COOPER
Nov. 6th, 1964, Bearsden.

Three features marked this meeting as especially noteworthy. It was the first public meeting of the new Society; it was held during the densest fog so far experienced; over 100 members, from all parts of the West of Scotland turned up braving fog, ice and rough seas to get to the Veterinary School of the University of Glasgow to hear Professor Cooper. The meeting was thoroughly enjoyed, especially the compliment paid by Professor Cooper to the work of the Glasgow Veterinary School. Its discovery of Dictol as a Husk preventive laid the foundations for the freer use of young stock for grazing along with mature stock and for better control of grass growth.

Professor Cooper's main point was to stress the importance of stock density in achieving grazing efficiency. To do this he traced the change of emphasis in the story of rotational grazing from the days when Woodman of Cambridge pointed out the effects of rest interval between cutting swards on grass quality and the value of strip grazing was emphasized by, among others, Bruce Levy of New Zealand.

The bomb which exploded these theories was fired at the 1956 meeting of the International Grassland Congress. McMeekan of New Zealand showed by a series of experiments that high stock outputs could be achieved by set stocking (i.e. continuous grazing of grassland) and that rotational grazing or strip grazing had been falsely credited with superior production. McMeekan concluded that stock number, not controlled grazing, was responsible for the increases generally credited to rotational and strip grazing.

After much work in New Zealand and in this country, the difference of opinion had been resolved. Stock number was important, probably the most important factor in increasing output from a farm. Low rates of stocking giving high individual yields could not compensate for the extra production possible from adding extra beasts.

By now, opinion was swinging back to a justification of controlled, strip or paddock grazing, not because it increased output of livestock or grass but because it allowed the conservation for hay or silage of seasonal surpluses.

He dwelt at length on his policy of ensuring a clean field for livestock production. Control of nematodirus eelworms based on a knowledge of the life cycle of these parasites had led to remarkable increases in the output of 'fat lamb'. The merits of sideways and forward creep were discussed.

GRASSLAND

Principal D.S. Hendrie,
West of Scotland Agricultural College.

Principal Hendrie addressed a large gathering of members of the Central Scotland Grassland Society at the Golden Lion Hotel, Stirling on 17th February, 1964.

The Principal opened his address by pointing out that British agriculture spends £900 million annually on goods from other industries in the U.K. and so stressed the vital role that our industry plays in the national economy. In most industries higher profits without increased productivity were almost impossible. So in farming, output should be improved and the Principal looked optimistically to the future. Every day in Britain, farming land is being lost to building and road making projects. By the end of this century the U.K. will have a population of 74 million and along with the 'NEDDY' prediction of a 4 per cent income increase per annum will result in more people with more money to spend on farming products to be produced from less land. It would therefore be in the interests of all if our industry increases its efficiency and productivity in anticipation of the future demand.

Turning his attention to grassland farming, Principal Hendrie discussed the need for improved techniques on a world scale. The present average number of cattle per 20 acres was just not good enough to cope with the explosive growth in population. On the home front, the speaker believed that by more efficient grassland farming up to 3d. per gallon could be knocked off the food costs of milk production. A target for many farmers to aim at is 1½ acres per cow plus 1 ton of concentrated feed to produce maintenance and 850 gallons of milk. Allowing full value to bagged feeds this would mean that grass and grass products would provide maintenance

plus 300 gallons milk or a Starch Equivalent output of 20 cwt. per acre. This figure is 33 per cent above the national average and of course is frequently exceeded by efficient dairy farms.

The speaker then went on to discuss methods whereby this improvement in efficiency and productivity could be brought about. The efficient grazing of herbage while at a correct nutritive status was vital. When the fertilizer programme was intensified to increase grass production the management must also be adjusted to utilise the increased herbage. Keeping pastures trimmed after grazing will aid in encouraging a palatable leafy regrowth without contamination from old leaves or rejected flowering stems. Too much emphasis is placed on early bite. The effort should go into making more good silage in order that beasts can be carried on winter feeding a few weeks longer and prevent the losses from discontented cows trampling wet fields to the detriment of milk yield and future pasture productivity.

An economic response can be obtained from nitrogen in certain instances up to 20 cwt. of a 20 per cent nitrogenous fertilizer. However, he encouraged farmers who do not normally use such nitrogen to try a small area using up to 10 cwt. (200 units N.) and to see for themselves what this fertilizer could do.

During question time the value of ammonium and nitrate forms of nitrogen were discussed. No experimental evidence exists to show that either one of these is superior for grassland. As far as gas liquor is concerned, cost and time of application must be closely watched. The characteristics and qualities of tetraploid ryegrasses were discussed. Research work indicates that no increase in dry matter yield was obtained from tetraploid when compared with diploid varieties although the former do contain more valuable carbohydrate and are slightly more digestible. This may well account for the observations made by farmers that tetraploids are very palatable and have had particularly good lamb production from tetraploid swards this year.

R.D. Harkess.

GRASSLAND MANURING

Meeting of South West Scotland Grassland Society in Ossington Hotel, Kilmarnock, 10th December, 1963, at 7 p.m.

Whether the farmer should rely on nitrogen from the bag or from the clover plant was one of the major topics discussed at a crowded meeting of the Society in Kilmarnock in early December.

Garden of Eden

An advocate of high nitrogen applications was Mr. S.A. McColm from Drummore, Wigtownshire, who regularly applies 250-300 units of nitrogen per acre to his grassland. This speaker admitted that he farmed in a "Garden of Eden" but in addition he relied on nitrogen backed up with adequate dressings of phosphate and potash to produce high yields of grass. On his 150-acre farm, 35 acres of early potatoes and 3 to 6 acres of roots are grown each year and on the remainder which is grassland about 125 cattle including a milking herd of 82 cows are kept. Mr. McColm applies his first dressing of nitrogen in late January or early February and can often graze his cows in February. At this time the dairy herd is strip grazed but as the year progresses a system of paddock grazing with 16 cows per acre is used. A problem due to the fouling of pastures with dung was admitted but as yields of 4 and 5 gallons per day are readily obtained without supplementary concentrates it was clear that the grass was of a high quality.

Mr. McColm has cows in the 150,000 lb. Club and has not had any outbreaks of tetany in his herd. On his small but highly productive farm an intensive fertilizer policy is without doubt profitable and a turnover of about £100 per acre was mentioned.

Clover preferred

Mr. R.W. Montgomerie from Lessnessock, our Vice-Chairman, in describing his farming system stated that he relied mainly on nitrogen from clover, and rarely if ever used nitrogenous fertilizer on his grassland. On his 265 acre farm he has to contend with heavy wet land and a high rainfall but with productive grassland he keeps a herd of 80 cows, numerous young stock and a flock of sheep. Reseeding is usually done in April, and the seeds mixtures contain $2\frac{1}{2}$ lb. of white clover per acre.

Fertilizer applications are $2\frac{1}{2}$ cwt. per acre of potassic supers per year but much of the success of the grassland is due to the use of the Gang-Mo-Loader. This machine cuts the grass

when it is at the 4" - 5" stage, and two men can collect 30 tons per day from 10-15 acres. The grass is cut every 10-15 days and as a result silage of high quality is made. Mr. Montgomerie stated that in 7 years of silage-making, the lowest protein content in his silage had been 19% and that he did not use molasses. The silage was fed with straw and roots in winter and usually provided sufficient nutrients for maintenance and 3 gallons of milk.

No concentrates

The cows are turned out to grass about 20 April and no concentrates at all are fed between 1 May and 1 September. Yields of up to 7 gallons per day are obtained from grazing and to avoid bloat, 6 lb. of straw are fed to each cow daily. This system of grassland management has worked exceedingly well for 12 years and with an average output of 23 cwt. per acre of utilized starch equivalent from grassland compared with the national figure of 15 cwt. per acre, it can be truly claimed that vigorous clover has a large part to play in grassland farming.

Slurry and grassland

The value of slurry as a fertilizer for grassland was the interesting and highly topical subject discussed by Mr. A.D. Drysdale of the Hannah Dairy Research Institute. This speaker, also a member of the Grassland Society, estimated that in 1 week a cow can produce urine containing 2 lb. of nitrogen and 2 lb. of potash and he described how this valuable material substantially increased the yield of pasture. Trials have clearly shown that 1 lb. of nitrogen in urine is just about equal to 1 lb. of nitrogen in commercial fertilizers but that in addition the urine contains a useful amount of potash. Because of this potash, it has been possible to apply dilute urine, equivalent to 400 lb. of nitrogen per acre, for 3 years and still retain a useful proportion of clover in the sward. As Mr. Drysdale remarked, organic fertilizers may be a compromise solution to the question of bag nitrogen or clover.

Other trials at the Hannah Institute showed that the value of slurry was in direct proportion to the ratio of urine to dung in the mixture. The higher the proportion of urine, the bigger the response in terms of extra herbage from the grassland.

In discussion it was stated by two farmers who use slurry regularly on their pastures, that cattle will find the pasture palatable about 7-10 days after an application.

Summing up the subject, the speaker thought that probably "Effluents gave Affluence".

Fertilizer problems

The final speaker was our Secretary, Mr. I.V. Hunt from Auchincruive who explained the results of his own manurial trials and indicated how these helped him in giving an answer to the farmer who asks the question "Shall I use clover or bag nitrogen"? In his experience the answer depended on what the farmer wanted from his grassland and the size of the farm. This indeed was the kernel of the whole evening's meeting and meant that in actual fact there was no real antagonism between the two sources of nitrogen. If the farmer on a farm such as Mr. McColm demands a high output from grass to obtain a high turnover, then high nitrogen applications from fertilizer are absolutely vital. On a farm such as Mr. Montgomerie's, clover can provide a cheap source of nitrogen, and nitrogen fertilizer has little place. Thus, on any farm, once the desired output from the grassland has been decided, it can be decided how much of the farm shall be under clover leys and how much intensively fertilized. This is the most economic way to use both clover and fertilizer nitrogen, but even then everything ultimately depends on the overall management of the grassland. The speaker described clover pastures which outyielded swards receiving heavy dressings of fertilizer nitrogen merely because of management differences.

Summary

Indeed, if one could summarise the meeting, it would be that whatever the choice of fertilizer policy followed on an individual farm, it is the subsequent management and utilization of the grass that really matters. The two farmer speakers appeared at first glance to be farming their grassland in completely different ways and yet basically both men were making outstanding use of grass according to the individual requirements of their own farms.

M.E. Castle
The Hannah Dairy Research Inst.

Research Reviews

This fourth skimming of current research is culled from the following Journals:-

Vol. 18. Journal of the British Grassland Society, Nos. 57-68 and No. 80, i.e. 13 reviews out of more than 50 articles published in this one volume. Copies of this Journal are circulating among members and held available for consultation or borrowing at the offices of the College County Agricultural Advisers.

Vols. 58, 59, 60 and 61. Journal of Agricultural Science, Nos. 69-74.
Vol. 30. Journal of Dairy Research, No. 75.
Vol. 5. Animal Production, No. 76.
Vol. 17. Journal of Society of Dairy Technology, No. 77.
Vol. 9. Experimental Husbandry, No. 78.
Vol. 14. N.A.A.S. Quarterly Review, No. 79.

They cover the following classes of topics:-

Grass Production. 57, 58, 68, 69, 74, 78, 79, 80.
Grass Feeding. 59, 61, 62, 63, 66, 67, 68, 70, 71, 72, 73, 75, 76, 77.
Hill Land Improvement. 60, 64, 65.

Members might be interested in the Journal called 'Experimental Husbandry' which is published by H.M. Stationery Office for the Ministry of Agriculture, Fisheries & Food at irregular intervals. Each one contains reports on about 10 experiments completed at the Experimental Husbandry Farms. Some of these E.H. Farms are more widely known than others. The types of experiment undertaken at them often concern matters of interest to ourselves here in Scotland. In the latest number (9) from which Mr. Dickson takes his Review No. 79 there are a number of interesting articles.

From Rosemaund E.H.F. (Hereford), grass flushing resulted in much better lambing percentages than corn flushing (restricted grass acreage plus 1 lb/head cereals) or than maintenance (restricted acreage without supplementary feed). W.A. Taylor of Boxworth E.H.F. (Cambridge) gives an account of his success in turning out autumn born Friesian calves on to grass in early March and April instead of the traditional late May turn out. The result is a cost of hay and concentrates per calf of £2:12:3, £4:1:5 and £7:6:4 for March, April and May turn outs. N. Forbes, Boxworth E.H.F. (Cambridge) reported studies of the rate at which wild oats disappears under a long ley. J.H. Baldwin, Norfolk Agricultural Station compared the yields from sprouted and unsprouted potatoes. Sprouting raised yields by 1 ton per acre. A comparison of broadcast fertiliser with fertiliser drilled either side of the setts and fertiliser drilled in contact with the setts favoured broadcasting because of absence of scorching. Drilling was best if it did not result in scorch. F. Hanley and W.J. Ridgman of the School of Agriculture, Cambridge compared broadcast and drilled fertiliser for arable crops of various types. Drilling seemed to be superior to broadcasting only when low rates of fertiliser were being applied; the superiority disappeared as rates of fertiliser were raised. D.B.J. Thompson and J.M. Willcock of Liscombe E.H.F. (Somerset) describe experiments on the manuring of swedes and kale under conditions similar to those in Galloway. Swedes required 60 units of phosphate as a minimum but gave increased yields up to 100 units phosphate. 90 units of

potash gave a useful return. The nitrogen response was variable and small. Kale, on the other hand, responded to 90 units nitrogen per acre. For Somerset conditions, the yields of present varieties are considered too low to compete with their equivalents as grass silage.

An article by M.J. Strickland and R. Wickens of Drayton E.H.F. (Warwickshire) and J.R. Hopkins of N.A.A.S., Wolverhampton describes the effects of crop conditioning, i.e. tedding, flailing, crimping etc., on the quality of the resulting hay and a comparison between barn drying and field drying. The results are extremely interesting. The important features affecting quality are whether the mechanical treatments cause any loss of leaf etc., whether it permits quicker drying and avoids leaching of soluble nutrients by rainfall.

Flailing, for example, increased drying rate but also caused some loss of leaf. Barn drying by itself did not give better hay than field drying provided the same material was used and no rain fell, but when barn drying was compared to weathered field cured hay, bullocks eat more and grew faster on it.

From Rosemaund E.H.F. (Hereford), E.L. Jones and A.L. Francis described their performance tests for beef bulls based on weight gain, food use and body measurements.

The final article in this number of Experimental Husbandry was an article by C.H. Mudd and his colleagues from Great House Experimental Farm (on the Lancashire/Yorkshire border). They compare Nitrochalk and Sulphate of Ammonia on high altitude grassland on an acid soil under high rainfall conditions. In three out of ten years, Ammonium Sulphate gave significantly higher yields than Nitrochalk; in one year Nitrochalk gave the higher yields. This difference corresponded to the amount of rainfall. In years of high rainfall, Sulphate of Ammonia was better than Nitrochalk. Out of the remaining 6 years, Sulphate of Ammonia gave higher yields than Nitrochalk but the difference was not big enough for one to be mathematically certain that the fertiliser was responsible for the difference in yield. It is pointed out that continued use of Sulphate of Ammonia could increase the acidity of the soil. In the Great House experiment, 5 cwt. per acre per year of limestone was considered adequate to balance this.

This rather brief outline of the content of No. 9 Experimental Husbandry (1963) will draw the attention of technically minded members to a source of facts on many modern farm practices.

57. NITROGEN AND HERBAGE PRODUCTION

by M.E. Castle and D. Reid, Hannah Dairy Research Institute, Ayr. Jour. B.G.S. 18, pp. 1-6.

Nitro-chalk at the rates of 6, 12 and 18 cwt. per acre per annum were applied to pure grass and to grass/clover swards. The inclusion of clover in the seeds mixture encouraged higher dry matter production even when the highest level of N was used. By calculation, clover in ryegrass swards fixed the equivalent of some 7 cwt. 15% nitro-chalk per acre annually as compared to 5 cwt. in more aggressive cocksfoot swards where there was some suppression of the clover.

4 lb. per acre of white clover at a cost of 17/- per acre over three years increased the yield by some 2800 lb. of dry matter. To obtain this response from bagged N it would cost £2:10s. per annum excluding distribution costs. The authors point out that even this higher fertilizer cost is still cheaper than buying dairy concentrates.

In order to obtain reasonable production from clover it is suggested that 30-40% of the flora must be clover and this should provide herbage production up to 7000 lb. dry matter per acre. Since this will tend to decline as the ley ages it may be necessary to use nitrogen in the third and successive harvest years. This suggests that a successful system could be developed whereby N was only used on clover deficient swards. Of course, should acreage be a limiting factor to any enterprise then more reliance must be placed in fertilizer N in order to fully exploit the available area.

R.D. Harkess.

(This article is based on Dr. Castle's talk to the British Grassland Society at their Winter Meeting, 1962, reported by J.C. Wardrop in Journal No. 2).

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58. THE USE OF NITROGEN ON GRASS/WHITE CLOVER SWARDS

by J.S. Brockman and K.M. Wolton, Fisons Ltd., Devon. Jour. B.G.S. 18, pp. 7-13.

Results obtained at North Wyke support the findings of the previous paper from the Hannah Institute in that even where fertilizer

N is used, it is still worthwhile to include clover in the seeds mixture. Results are presented of fertilizer N trials in which the N was applied as one large dressing in the spring or as several smaller applications over the season. Invariably split dressings were valuable for evening out annual production particularly in mid-season and autumn.

In summing up, the authors divide grassland farming into three categories:

1. Not very intensive, low cost production from a well managed grass/clover sward. If the clover dies out 5-8 cwts. of a 20% N fertilizer will be required.

2. Higher sward production needs more N, the quantities being 6 cwt. on a grass/clover sward and 10-12 cwt. per acre on pure grass.

3. Really intensive production where no value is placed on clover and up to 15 cwt. of N fertilizer is used per acre per annum.

Surveys on fertilizer use in this country indicate that the average application of N fertilizer on grassland is 2-3 cwt. per acre. Which category are you farming in?

R.D. Harkess.

(This paper was also given as a talk at the 1962 Winter Meeting of the British Grassland Society).

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59. THE EFFECT OF PELLETING AND WAFERING ON THE FEEDING VALUE OF ROUGHAGE - a review.

D.J. Minson, Canada Dept. Agric., Ottawa.
Jour. B.G.S. 18, pp. 39-44.

This article reviews various experiments carried out in the United States and Canada on the effect of fine grinding and pelleting of hay and hay that is chopped and compressed into cubes two to five inches in diameter and two inches thick. Grinding and pelleting tended to slightly depress digestibility although the net energy value of the feed remained the same. Such treatment did increase the voluntary intake of roughage possibly due to a higher rate of passage through the gut and in turn this gave rise to greater liveweight gains and slightly better milk production. Several workers did note, however, a depression in butterfat when ground pelleted rations were fed.

The effect of wafering the hay into cubes also improved intake and hence animal performance of dairy cows, beef cattle and sheep. It was largely the intake of the poorer hays that was improved by the treatments so that little is to be gained by so treating good quality roughages. In experiments where concentrates were fed along with the treated hays no improvement in milk production was obtained when compared with diets of untreated hay.

It appears, therefore, that since roughage is rarely the sole diet of the dairy cow the pelleting and/or wafering of hay is not justified with present day feeding techniques.

R.D. Harkess.

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60. THE EFFECT OF DALAPON ON THE SPECIES OF HILL GRASSLAND

J. King and G.E. Davies, H.F.R.O., Edinburgh.
Jour. B.G.S. 18, pp. 52-55.

Observations were made in order to establish what hill plants may be suitable for dalapon treatment and to what degree they recovered. No seeds were sown. Moor mat grass (Nardus) and flying bent (Molinia) were both classed as very easily killed. Heathrush was almost as easily killed.

Brown bent, common bent, sheeps and red fescue and tussock grass are all moderately susceptible to dalapon. Brown bent was more easily killed by May spraying while sheeps fescue was controlled best by August spraying.

Yorkshire fog, creeping soft grass and the sedges were resistant to dalapon.

The rate to use depends on the species present and the degree of kill required. For example, moor mat and flying bent can be completely killed by 5-10 lb. a.e. per acre. This will only check bent grass and fescues which can recover provided that there is not too much competition from more resistant plants.

Up to 20 lb. of dalapon per acre gives a complete kill of existing herbage. Such a technique followed by seeding is successful under wet conditions but where rainfall is low it may be more advisable to change the sward by careful spraying.

Note: The Grassland Department at Auchincruive has carried out many experiments with dalapon and would be pleased to answer any problems relating to its use.

R.D. Harkess.

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61. STUDIES IN HERBAGE DIGESTIBILITY

R.D. Harkess, Univ. of Nottingham (now at Auchincruive).
Jour. B.G.S. 18, pp. 62-68.

These experiments were carried out to investigate factors which could influence herbage digestibility. It was found, for example, that sheep and dairy cows have similar digestive capacities when fed similar herbage either as hay or fresh grass. Indeed animal factors had little influence on digestibility while the stage of growth of the herbage had a marked effect. Fresh grass fed at the grazing stage had a digestibility of 81%. When cut later for barn drying the digestibility was 71%. Late cut and badly cured hay was only 54% digestible. Differences between the grass species were also obtained with ryegrass and timothy/meadow fescue being more digestible than cocksfoot or lucerne. Of particular interest was the high feeding value of white clover which maintained a digestibility of 79% into late June - a time when the grasses rapidly become stemmy and less digestible. This feature will enhance the feeding value of a grass/clover sward at this time and will help to sustain milk yields from cows and promote good live weight gains, especially from lambs.

J. Frame.

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62. THE INFLUENCE OF HEAVY NITROGEN FERTILIZATION ON THE HEALTH OF LIVESTOCK

Th. de Groot, Dutch Nitrogen Fertilizer Industry.
Jour. B.G.S. 18, pp. 112-118.

Professor Groot has observed the health of dairy cows on commercial farms in Holland where the nitrogen use was 220 and 440 lb. of N per acre per annum. His conclusions indicate that cows on the high N farms milked better than, and held to A.I. equally as well as cattle on low N farms. He did note some trouble with hypomagnesaemia and tackled this in two ways. Firstly by

feeding calcined magnesite either direct or applying it to the sward at 1 cwt. per acre per annum where low herbage magnesium (Mg) levels were recorded. He found that ammonium nitrate dolomite was useful in that it provided both N and Mg. Secondly, where tetany was caused by excess potassium in the soil upsetting the Mg:K balance, these fields were cut frequently and no potassium fertilizer was used. This problem of excess K was mainly found in fields near the buildings and after four years of the treatment the problem was surmounted. In a trial started in 1960 Professor Groot is keeping cows on two areas, one fertilized with 30 cwt. and the other with 5 cwt. nitro-chalk per acre per annum. Preliminary data show that milk yields and liveweights are greater on the higher manuring areas but butterfat percentage did seem to be slightly depressed.

It would appear therefore that provided a high level of nitrogenous manuring is coupled with good management, farmers need have no fears about the health of their livestock.

R.D. Harkess.

(This was one of the papers given at the Winter 1962 Meeting of the B.G.S.).

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63. THE VALUE OF NITROGEN FOR MILK PRODUCTION

R.R. Turner, I.C.I. Jealotts Hill, Berks.
Jour. B.G.S. 18, pp. 119-125.

The author describes the I.C.I. dairy farm recording methods and illustrates how the use of nitrogen can increase farm profit. One particular experiment is described in which two farms in Somerset, each of 54 acres were compared. One farm received 211, 41 and 90 units of N.P.K. per acre per annum while the other received nil, 52 and 72 units of N.P.K. The results are presented in tabular form below for the 5 years 1957-1962. No young stock were carried.

	High N	No N
Numbers of cows	35.5	22.0
Gallons of milk per cow	1063	1037
Concentrates fed per gallon milk	1.3	1.4
Acres/cow	1.4	2.3
Labour cost £/cow	16.8	20.4
Food cost "	66.2	74.1
Total cost "	103.6	120.6
Income "	157.9	152.1
Profit "	54.3	31.5
Profit per acre	38.8	15.0

These results speak for themselves. The return of £15 per acre from the no N farm indicates a high standard of management. The increase in profitability through the use of N is well illustrated and the paper gives results from four other intensive farms, all showing profits of £32 per acre. The types of pasture used were H.1. and S.22 Italian ryegrass on half the area and timothy/meadow fescue on the remaining ley area.

Note: One major criticism that may be offered is that stock numbers were altered each autumn in accordance with the quantity of silage available, a system not normally applicable in dairy management. Unfortunately the costings given are for a five year average. In view of the decreasing returns in the dairy industry it would have been of interest to see the individual annual data.

R.D. Harkess.

(Paper given at Winter Meeting 1962 of B.G.S.).

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64. HILL FARMING AT GLENLOCHAY IN THE CENTRAL HIGHLANDS OF SCOTLAND

Sir James Denby Roberts, Auchterarder.
Jour. B.G.S. 18, pp. 126-130.

This is an interesting article on the improved stock carrying capacity of the 16,000 acre estate of Glenlochay purchased by Sir James and three colleagues in 1941. At that time only three of the eight hirsels carried sheep. Fallen dykes, blocked ditches, large areas of overburning and rough undergrazed areas were obstacles that had to be surmounted. Today seven hirsels each carry nearly 600 Blackface ewes. 120 hill cows aid in controlling the rough pasture. When the area was first acquired, 200 Highland cross cows were bought to control the overgrown areas and the beneficial effects of these cattle could be seen by 1943 - only two years after taking over the estate. At present Glenlochay markets around 1500 lambs per annum and the prices obtained for these reflect the good quality of produce which is now obtained from the Glen.

R.D. Harkess.

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65. THE EFFECTS OF MUIRBURNING MOLINIA DOMINANT COMMUNITIES

S.A. Grant, R.E. Hunter and C. Cross, H.F.R.O., Edinburgh.
Jour. B.G.S. 18, pp. 249-257.

The information presented in this article has been collected from six experiments carried out from 1956 to 1962. Flying bent (Molinia) was dominant on all trial sites and observations indicate that burning does not control the spread of this grass. The growing points (buds etc.) of flying bent are below the area destroyed by fire whereas grasses such as sheeps fescue and wavy hair grass are largely killed out and so offer little competition to the recovering Molinia. The authors conclude that the destruction of flying bent by controlled cattle grazing would bring about better improvement and that muirburning is a self defeating practice.

R.D. Harkess.

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66. A COMPARISON OF SILAGE AND BARN DRIED HAY FOR BEEF PRODUCTION

J.A.M. Kerr, J. Morrison, W.O. Brown, Hillsborough, N. Ireland.
Jour. B.G.S. 18, pp. 261-267.

The question of hay versus silage is continually raised when beef fattening is discussed. In this series of trials, hay and silage were cut on a similar date. The hay was field cured for two days then baled and barn dried. The silage was wilted for 24 hours before being picked up by a forage harvester. Tests on the finished products showed that they had very similar digestibilities. The following table summarises the results. No other form of feeding was offered to the cattle.

Trial	Feeding System	Silage D.M.%	Liveweight Gain in lb/day	
			Hay	Silage
1	Self Fed	24	1.88	1.55
2	Trough Fed	28	1.96	2.39
3	Stall Fed	28	1.23	1.27

In trial 1, the silage animals did not gain so well as those on the hay feed. A lower feed intake due to the dry matter of the silage and the effort needed to pull silage from the silo possibly account for this. In trial 2, the silage was trough fed and so

less effort was needed to feed. Because of the higher dry matter content of the silage, intake would possibly be higher and as a result of these two factors, liveweight gain from the silage fed beasts was better than that from those on the ad lib. hay. The silage fed in trial 3 was the same material as that fed in trial 2. The poorer gains are believed to be due to the fact that the stock being tied in stalls were less contented and not so comfortable as the loose housed cattle in trial 2.

R.D. Harkess.

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67. THE USE OF GRAZING CONTROL FOR INTENSIVE FAT LAMB PRODUCTION (Part I)

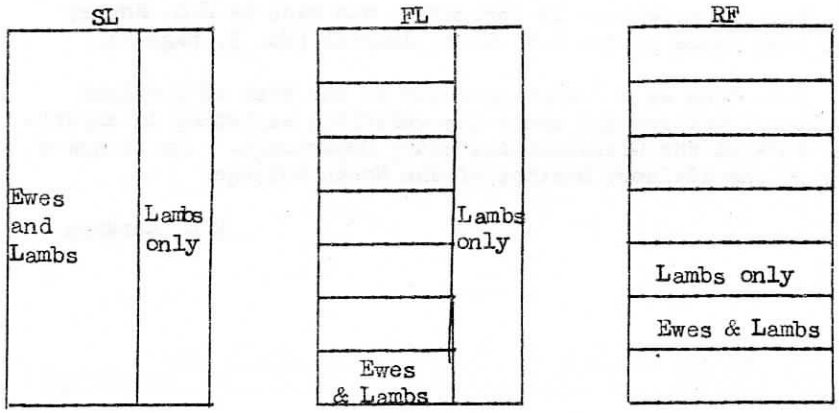
P.J. Broadbent, Univ. Reading.
Jour. B.G.S. 18, pp. 280-284.

Six ewes and twelve lambs per acre were kept under three management systems. Those were set stocking with a lateral creep (SL), folded grazing with lateral creep (FL) and forward creep grazing (RF). Lambs were slaughtered once they reached 75 lb. liveweight. Since stocking rate and slaughter weight were similar for all treatments, output per acre was similar. However, the times taken by the lambs to reach slaughter weight were 115 days on SL, 93 on FL and 89 days on RF. The authors believe that stocking rate in the SL treatment was correctly judged but that it could have been increased to 8 ewes and 16 lambs per acre on FL and RF.

No difficulties were encountered in encouraging the lambs to use the creep where folding or rotational grazing of the ewes was applied but under set stocking lambs were slow to use the creep. This is possibly due to the lower stocking density in the ewe grazing area since this was not subdivided as in the other treatments.

In this experiment the forward creep system appears to be the best practical management system but the authors believe that the folding system (i.e. rotational grazing with the lateral creeps (FL)) has a higher potential for more intensive stocking. The reason for this is that the ewes never graze where the lambs creep and hence worm burden problems should be less pronounced.

A diagram has been included overleaf showing the main differences between the three grazing systems.



R.D. Harkess.

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68. THE EFFECT OF IRRIGATION AND STOCKING RATE ON THE OUTPUT FROM A SWARD. Part II, DAIRY COW PRODUCTION

J.S. Bone and R.S. Tayler, Univ. Reading.
Jour. B.G.S. 18, pp. 295-299.

The results of two years trials are given. 1960 was a wet year and only 4 inches of irrigation water were needed whereas in 1961, 7 inches were needed to prevent the soil water deficiency from exceeding 2 inches. Two levels of stocking were used on both irrigated and non-irrigated paddocks. Over the two years, irrigation increased milk production by 266 and 375 gallons per acre for the low and high stocking intensities respectively. In 1960, irrigation increased the cow days per acre by 24%. In the drier 1961, the increase was 44%, most being obtained from June to September.

The authors hesitate to answer the question "does grassland irrigation pay?" They point out that if irrigation costs £12 per acre then 100 gallons more milk will be needed to cover costs. However, if used in the correct circumstances irrigation is likely to be highly profitable provided a high stocking density is also used.

Note: The area in which these trials were conducted was on a light sandy loam with a rainfall of 25 inches per annum and an average summer deficit of 6" between rainfall and water lost by evapo-transpiration.

Note: Further reference to irrigation was made by J.S. Morrey in the last issue of the S.W. Scot. Journal (No. 3, page 9).

Note: J.S. Bone is a former graduate of the West of Scotland Agricultural College and spent his vacations assisting in experimental work at the Grassland Husbandry Department. He is now a member of the Advisory Service of the North College.

R.D. Harkess.

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69. LIQUID MANURE AS A GRASSLAND FERTILIZER
I. THE RESPONSE TO LIQUID MANURE AND TO DRY FERTILIZER

by M.E. Castle and A.D. Drysdale, The Hannah Dairy Research Institute, Ayr.
J. Agric. Sci., 58, p. 165 (1962).

This article reports the first of a series of trials to investigate the use of liquid manure as a grassland fertilizer. Its chemical composition suggests that liquid manure from cows should be a valuable fertilizer, but in Scotland at present much of it is allowed to run to waste.

Over the 3-year period of this experiment liquid manure gave about the same increase in the dry matter and crude protein yields of herbage as could be expected from applications of equivalent amounts of dry fertilizer. Little or none of this increase was due to the water content of the liquid manure, as was proved by the lack of response to applications of similar quantities of ordinary water.

A striking effect of liquid manure applications in this experiment was the stimulation of white clover growth. Where conventional fertilizers were applied the herbage contained 18% white clover at the end of the 3-year period, compared with 32% where liquid manure was applied. The liquid manure supplied about the same weight of nitrogen as the dry fertilizer, but considerably more potash, which probably stimulated the clover.

Thus, economy in fertilizer expenditure can be achieved by the use of liquid manure on grassland, and at the same time white clover allowed to play a greater part in sward productivity.

D. Reid.

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70. THE HERBAGE INTAKE AND MILK PRODUCTION OF STRIP AND ZERO-GRAZED DAIRY COWS

by J.F.D. Greenhalgh and K.V. Runcie, Edinburgh School of Agriculture.
J. Agric. Sci., 59, p. 95 (1962).

In association with the farm-scale study of zero-grazing on the Dairy Unit of the Edinburgh School of Agriculture at Langhill, detailed nutritional investigations have been made. The results from one of these is reported in this article.

One group of 8 cows was strip-grazed while another similar group was zero-grazed on herbage cut daily from the same field. Over the whole experiment both groups ate almost the same quantity and quality of herbage and gave about the same milk yield. However, the milk from the strip-grazed cows had, on average, a higher S.N.F. content than had the milk from the zero-grazed cows.

As the season progressed the yields and S.N.F. contents of the milk from both groups declined as the herbage matured. This was more pronounced with the zero-grazed cows, because they were unable to select the more digestible and palatable herbage as could the strip-grazed cows.

D. Reid.

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71. SUPPLEMENTING HIGH-YIELDING COWS AT PASTURE WITH CONCENTRATES FED AT A LEVEL DETERMINED BY MILK YIELD AND SEASON

by R. Laird Jnr. and J. Walker-Love, West of Scotland Agricultural College, Auchincruive, Ayr.
J. Agric. Sci., 59, p. 233 (1962).

This article provides further confirmation that the feeding of concentrates to milking cows on good pasture is unnecessary and unprofitable.

Two experiments were made at Auchincruive with spring-calving Ayrshire and Friesian cows, all yielding over $4\frac{1}{2}$ gallons of milk per day. The cows were grazed on good pasture and were paired, one member of each pair receiving concentrates, the other none. Concentrates were fed at 4 lb. per gallon for every gallon over 4 gallons at the beginning of the season, but this was altered to every gallon over $3\frac{1}{2}$, 3 gallons etc. as the season progressed.

Milk yield was increased by concentrate feeding in both experiments. However, in the first experiment, which ran for 11 weeks, the profit from this extra milk was small, while in the second experiment of 21 weeks concentrate costs exceeded the value of the extra milk and a considerable loss was sustained. The results suggest, nevertheless, that the time of calving influenced the response in milk yield.

Feeding concentrates to these cows on good grass had no effect on milk quality, lactation length, liveweight and fertility However, supplementary feeding can still be recommended for special purposes such as the prevention of grass staggers, bloat or scouring on spring grass.

D. Reid.

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72. EFFECT OF RATIONING GRASS ON THE GROWTH RATE OF DAIRY HEIFERS AND ON OUTPUT PER ACRE WITH A NOTE ON ITS SIGNIFICANCE IN EXPERIMENTAL DESIGN

by W.H. Broster, V.J. Tuck and C.C. Balch, National Institute for Research in Dairying, Shinfield, Reading.
J. Agric. Sci., 60, p. 371 (1963).

A series of trials is described in which the herbage consumption and growth rate of heifers grazing grass in the field was compared with that of heifers eating the same grass cut and fed indoors. The indoor-fed or zero-grazed heifers ate less herbage and grew at a slower rate than the grazed heifers. However, production per acre in terms of both animal grazing days and total liveweight gain were greater with zero-grazing.

The growth rate of heifers on winter feed is usually low and this must be compensated for by high growth rates in the summer so that the heifers reach a reasonable size by first calving. The greater growth rate per animal obtained from grazing in the field is therefore more important than the greater output per acre obtained from indoor-feeding or zero-grazing.

D. Reid.

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73. THE INTER-RELATIONSHIPS OF GRAZING METHOD AND STOCKING RATE IN THE EFFICIENCY OF PASTURE UTILIZATION BY DAIRY CATTLE

by C.P. McMeekan and M.J. Walshe, Ruakura Animal Research Station, New Zealand.
J. Agric. Sci., 61, p. 147 (1963).

The Ruakura experiment described in this article ran for 4 years and was designed to study the combined effects of grazing method and stocking rate. It was conducted on a large scale so that conditions would be as close as possible to those prevailing on a practical farm. Forty cows were used on each treatment over the first 2 years, and 42 cows on each treatment subsequently.

Two grazing methods - rotational and continuous grazing - were compared at each of two stocking rates. Stocking rate was controlled by varying the area per treatment and keeping cow numbers constant. Thus, 35 acres were available for each treatment at the high stocking rate, and 44 acres at the low stocking rate.

The results confirmed those from previous experiments at Ruakura. High stocking rates generally gave higher milk yields per acre than low rates despite lower yields per cow. Rotational grazing was on average superior to continuous grazing in terms of milk yield per cow and per acre, but the difference between these two extreme grazing methods was only half that between the two stocking rates.

The full benefits of rotational grazing were only realized at the high stocking rate. The authors suggest that the optimum stocking rate is 5-10% higher under rotational than under continuous grazing.

The small superiority of rotational over continuous grazing in terms of milk yield per acre, leads the authors to conclude that one of the main advantages of rotational grazing is that it makes conservation easier, since it permits the farmer to judge more readily whether surpluses are available or not.

D. Reid.

74. LIQUID MANURE AS A GRASSLAND FERTILIZER II. THE RESPONSE TO WINTER APPLICATIONS

by A.D. Drysdale, The Hannah Dairy Research Institute, Ayr.
J. Agric. Sci., 61, p. 353 (1963).

In the preliminary trial of this series (see Review No. 69) which showed that liquid manure was a valuable fertilizer for grassland, applications were made at intervals during the summer months. Winter applications are usually necessary in practice because of the problem of storing large volumes of liquid manure. This article describes a series of trials to investigate the effectiveness of applying liquid manure in the winter.

The trials continued over three winters and were made on several sward types. In each treatment, a single dressing of liquid manure was applied at the end of November, December, January, February or March. At the same times equivalent quantities of conventional fertilizers were applied to other plots. Crops of herbage were cut from the plots in May and again 8-10 weeks later.

Liquid manure gave the greatest increases in grass yields where it had been applied in February, but January and March applications were only slightly less effective. November and December applications gave much smaller yield increases. Applications of conventional fertilizers at the same times generally gave slightly greater increases in grass yields than the equivalent dressings of liquid manure.

On average winter applications of liquid manure were most effective on swards containing the later growing grasses and where the soil fertility was low.

D. Reid.

Note: See A.D. Drysdale's article in No. 3 of our Journal, pp.46-48.

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75. A COMPARISON OF HAY AND SILAGE FOR MILK PRODUCTION

by J.C. Murdoch and J.A.F. Rook, National Institute for Research in Dairying, Shinfield, Reading.
J. Dairy Res., 30, p. 391 (1963).

Hay and silage are the main conservation products fed to dairy cattle in Britain, but few comparative trials have been made in which either silage or hay was the only roughage offered. This article reports on five trials of this type.

In these trials when equal quantities of dry matter were fed either as hay or as silage the cows gave much the same yield and quality of milk whichever roughage they received. On the other hand, when the cows were given free access to one or other of the roughages, those offered hay ate 50% more dry matter than those offered silage. As a result the yield and S.N.F. content of the milk from the hay-fed cows were considerably greater than that from the silage-fed cows, though this difference was progressively reduced by increasing the concentrate rations of both groups of cows.

The above results were obtained from trials in which the hay and silage were both made from the same grass crop cut at the same time. Another trial was made comparing early-cut silage with late-cut hay and silage. This showed that early-cut silage gave greater milk yields but depressed the S.N.F. content of the milk.

D. Reid.

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76. INTENSIVE BEEF PRODUCTION
3. PERFORMANCE OF FRIESIAN STEERS GIVEN LOW-FIBRE DIETS

T.R. Preston, J.N. Aitken, F.G. Whitelaw, A. Macdearmid, Euphemia B. Philip and N.A. MacLeod, Rowett Research Institute, Bucksburn, Aberdeen.
Animal Production, 5, Pt. 3, pp. 245-249, Oct. 1963.

In view of the interest taken in "barley beef" as a side-line this report holds interest for the dairy farmer particularly as the question of barley substitutes frequently arises.

Two groups of Friesian steer calves were self-fed to a slaughter weight of approximately 8 cwt. on diets composed solely of either 85% rolled barley or ground maize with 15% of a supplement providing additional protein, minerals and vitamins. No hay was on offer to either group.

The results presented show that liveweight gain, age at slaughter and killing out percentage was better in the animals on the maize group but it must also be noted that five of the 15 cattle given the maize died from bloat.

Clearly until more is known about maize feeding substitution for barley should only be made on a fifty-fifty basis when a small amount of hay should also be on offer for safety.

J. Walker-Love.

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77. EXPERIMENTS ON THE MAXIMAL UTILIZATION OF CONSERVED HERBAGE FOR WINTER MILK PRODUCTION

W.O. Brown, Ministry of Agriculture for Northern Ireland.
J. Soc. of Dairy Tech., 17, No. 1, pp. 12-18 (1964).

This paper reviews some of the work done by the Chemical Research Division of Northern Ireland concerned with the use of additives and other treatments with a view to reducing silage making losses in trench silos. The paper then goes on to report three experiments on the feeding value of silage carried out in co-operation with the Agricultural Research Institute at Hillsborough.

The first experiment compared forage-harvested (with a dry matter of 20.9%) and long grass (with a dry matter of 20.5%) silage for milk production, both types of silage being made from the same sward. Although the dry matter intake was slightly higher on the long grass silage, a higher level of milk production was achieved on the lacerated silage, (44.3 lb. against 42.7 lb. milk yield/day). Such a result suggested that there was another difference or differences between the silages not perceived.

The second experiment is of particular interest as it is related to the dry material content of silages. Silages of 19.9 and 24.7% D.M. were fed to dairy cows. Daily consumption of dry matter as silage was 23.2 lb. for the high dry matter silage and 18.6 for the low dry matter silage; the feeding of the high dry matter silage produced approximately 8 lb. more milk/day.

In the third experiment a further increase in D.M. intake (28.4 lb/day) was obtained from the feeding of silage of 52% D.M.

These experiments demonstrate once again that there is a future for high dry matter silage provided that it is made from material which in itself is of high digestibility.

J. Walker-Love.

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78. AN EXPERIMENT COMPARING RESPONSES TO NITROGEN FERTILIZER OF FOUR GRASS SPECIES

F.V. Widdowson, A. Penny and R.J.B. Williams (Rothamsted).
Experimental Husbandry Number 9 : 28-36, 1963.

In this trial, leafy early flowering varieties of cocksfoot (S.37), meadow fescue (S.215), perennial ryegrass (S.24) and timothy

(Scotia) were used. The seeds were broadcast and covered with only a shallow layer of soil with the result that the grasses established slowly. Perennial ryegrass and cocksfoot germinated well compared with timothy and meadow fescue.

The grasses were grown without N fertilizer or with applications of either 30 or 60 units N per acre per cut (as "Nitrochalk"). The experiment was conducted from 1958-1960 and 2 or 3 cuts were taken per season.

When no N was given cocksfoot had the poorest yield, the yields of the other three grasses being similar. With both levels of N application cocksfoot yielded most dry matter and perennial ryegrass least dry matter. Timothy yielded more than meadow fescue. At the higher N level the dry matter yields in cwt/acre were 237.0, 211.7, 191.1 and 187.2 for cocksfoot, timothy, meadow fescue and perennial ryegrass respectively.

R. Laird Jnr.

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79. EFFECT OF HEIGHT OF CUTTING ON THE SUBSEQUENT REGROWTH OF A SWARD

T.F. Blood, National Agricultural Advisory Service, South Western Region.
N.A.A.S. Quarterly Review, Vol. XIV, No. 60, pp. 139-143.

This article is an attempt to summarise and draw conclusions from the many experiments set up to assess the effects of leaving cut swards with long or short stubble and also those to compare the effects on regrowth of the mower and of the forage harvester.

Work at the Hannah, at Cockle Park, at Hurley and at Wye College is quoted and indicates that close cutting (1 inch) gives higher yields than lax cutting (2 to $4\frac{1}{2}$ inches) and that this effect is observable whether cutting is at the grazing or silage stages. Close cutting encourages vegetative growth, increases tiller numbers and improves individual tiller performance. The work at Wye also confirmed that cutting at the silage stage increased yields, compared with the grazing stage, due to greater grass growth reducing clover's contribution to the total. Attention is, however, drawn to the fact that close mowing can be so frequent as to reduce the vigour of growth of the grass.

Under drought conditions the top few inches of soil under a long sward are moister, and the lower layers drier, than comparable

levels under a short sward. Close cutting of a long sward under these circumstances induces drought to a considerable depth in the soil.

Although the flail leaves a sward that looks weak, neither flail nor mower was found to be harmful to recovery. This is to be expected since the regrowth does not come from the cut leaves but from basal tillers.

Note: Dr. Reid of the Hannah Dairy Research Institute was the first person to point out the increased yields resulting from close mowing. An explanation of his work is to be found in an original article, p. 60, this number of our Journal.

I.A. Dickson.

On Tour

ICELAND

A Busman's Holiday

A.B. Hall

"We have around 2,500 hestars (1 hestar ≡ 1 horseload ≡ 100 kilos ≡ 2 cwt.) of good hay for the winter". So wrote the young farmer in Northern Iceland for whom I worked for a month in the spring of 1963. I had left this hill farm at the end of June when the grass on the 74 (+25 rented) acres of meadow land (tún) had been fertilised. It had only just started growing appreciably and I could only guess how much hard work and long hours would be put into gathering and drying this 250 tons of hay.

Hay is the mainstay of Icelandic agriculture and the key to rural prosperity, though it is and has been the farmers' constant worry for 1000 years. Given hay, sheep, cattle and horses can survive the long grassless winter of this Arctic's edge. Without it they will perish and their owners founder. Every autumn, hay stocks are inspected by a local committee and if considered insufficient for the stock, some animals must be sold. This custom - one of long standing - dates from the years when a shortage on one farm could prejudice the livelihood of neighbours attempting to help their hayless friend.

The national pattern of production can be seen from the hay crop figures (Table I) which show a gradual decline in the amount cut on uncultivated land and an increase in the crop taken from cultivated land as a result of reclamation. This area has rapidly increased since machinery became available and is most striking in the decade 1950-60. This in turn is reflected in the figures for livestock (Table II) where sheep numbers, despite the slaughter of thousands of ewes to eradicate disease after the war, have increased enormously. Cattle numbers have also increased whereas ponies have begun to decline now that they have been almost completely superceded by tractors for draught purposes though they are still invaluable for shepherding.

The growing season is short and though long hours of daylight must assist growth, the ground in a cold spring such as 1963 may be frozen a few inches below the surface even in June. The inbye fields had been used at lambing by the old ewes and hoggs and also for some of the ewes with twins. Late lambing ewes had also been brought in

from the hill but as soon as their lambs had been inoculated and earmarked, they returned to the hill so that the meadows could be shut up for hay.

Winter feed requirements are based on the figures in Table III. On this farm in 1962/63 hay was fed to the cows from October - June and the sheep which went to the hill during the daytime were housed at night until May 25th and fed indoors. As it is seldom possible to buy hay it is imperative that an ample quantity is secured. This is achieved by heavy dressings of fertiliser bought as straights (Table IV) which are mixed in the field, the rate varying according to the response expected. On one of the best fields about 8 cwt/acre was applied in the third week of June containing a plant food ratio of approximately 2:1:1. Great care is taken of the reseeded land which suffers in its early years from frost damage and may have to last many years. Stones are removed and also lumps of unrotted dung left from the previous autumn when sheep houses were cleaned out. Chain harrows are also used.

Hay is not baled but carted loose to the haysheds which are invariably built alongside byres and sheep houses and have solid walls. The new hay blower on this farm was a small portable fan which blew the hay from ground level outside the shed to the far end thereby eliminating much hand forking. The ducting was then rearranged and air blown under the stack if drying was required. This was only done on dry days as the blower which was tractor driven did not provide hot air and blowing humid air through the hay was not beneficial.

Rising costs unaccompanied by increased returns encourage Icelanders to increase the stock carrying capacity of their farms. This can only be done by increasing the quantity of hay available for the winter. Great strides have been made even on small farms to reclaim the better land. Much of this is level but wet and deep drainage channels cut by dragline excavator are necessary. Cultivations are carried out with co-operatively owned crawler tractors and consist mostly of discing and rotovating rather than ploughing. Probably the most important feature of this peaty land is that it is not acid. Difficulty has been experienced in getting persistent grass species to grow in this cold climate. Meadow grasses and Meadow Foxtail have been used in the past but a Norwegian Timothy is now proving successful. Fencing and fertiliser provide subsequent control over the new meadows which may take several years to make a worthwhile contribution to the hay crop.

More hay means more buildings for both crop and stock and my friend had had a busy summer as not only had he his new meadow to

reseed and fence but building work as well - "New haysheds must be built and filled with hay".

Table I.

HAY CROP

Year	Cultivated Land in Thousand Hestars	Uncultivated Land in Thousand Hestars
1901 - 10	530	1030
1911 - 20	544	1157
1921 - 30	723	1036
1931 - 35	1001	1019
1936 - 40	1158	1089
1941 - 45	1332	879
1946 - 50	1533	640
1958	2750	448
1959	3196	296
1960	3394	312

Table II.

LIVESTOCK

Year	Sheep in 1000's	Cattle in 1000's	Horses in 1000's
1900	469	23	42
1910	579	26	45
1920	579	23	51
1930	690	30	49
1940	628	40	56
1950	416	45	42
1960	834	53	31

Table III.

WINTER KEEP

		Hestars		Cwt.
1 Cow	needs	40	=	80
1 Riding Pony	"	20	=	40
1 Wild Pony	"	5	=	10
1 Sheep	"	$2\frac{1}{2}$	=	5

Table IV.

FERTILISER COSTS

	Price per cwt.	Price per unit of plant nutrient
Ammonium nitrate 33% N (Produced in Iceland)	13/3	4.7d.
Triple Superphosphate 45% P_2O_5 (Imported from Norway)	12/6	3.3d.
Potash 50% K_2O (Imported from Germany)	8/10	2.1d.
Comparable British Fertilisers		
Sulphate of Ammonia 20.5% N	12/5	7.1d.
Granulated Superphosphate 22% P_2O_5	20/10	4.2d.
Muriate of Potash 60% K_2O	11/3	6.1d.

On Tour

1963 WINTER MEETING OF BRITISH GRASSLAND SOCIETY

I.V. Hunt

This year's Winter Meeting lasted two days, consisting of a joint meeting with the Nutrition Society concerned with the topic "The Utilisation of Grass by Ruminants" and a second day in which the Grassland Society concerned itself with Grassland Recording and with the Economics of Livestock Production from Grass. The week during which the British Grassland Society's Winter Meetings are held (Smithfield Week) is a particularly busy one. Many scientific organisations hold meetings of interest. I took time off to hear Dr. David Armstrong, now at Newcastle and formerly a colleague of Dr. Blaxter (Hannah Dairy Research Institute) speak about the feeding value of grass. The nine papers heard during this short visit contained so much "meat" that all I can do is to pick out the odd fact or two.

The paper which made the most impression on me personally was Mr. V.H. Beynon on "Grass and Livestock Production - Current Economic Problems and Prospects". Mr. Beynon is an economist and has written

much on grassland but on this occasion he had the audience gasping, squirming and spluttering. He proved quite effectively that with all the special emphasis on grassland (Commissions, Societies, Clubs, Grants etc.) the net advance in grassland production and utilisation was not comparable to the advances made in other spheres of agriculture. Thus, pleas that 'grass is the cheapest food' were not strictly true for some of those who grew it intensively and failed to use it efficiently. Many of the leading exponents of the new grassland techniques could not stand economic scrutiny of their efforts. The figures quoted for comparing the cost of producing grass starch equivalent and other sources of starch equivalent were out of date. The cost of producing barley was falling, that of grass rising and it was little wonder that on farms geared to barley production, barley was a cheaper source of starch equivalent than grass.

The first paper of the meeting "Technical aspects of the utilisation of grass" by Frank Raymond of the Grassland Research Institute was a model of how to put over a scientific paper in a form readily understood by the widely varied audience. His objective was to point out how the efficiency of grassland utilisation might be improved. Nowadays the ability to grow grass has outstripped the ability to make the fullest use of it. The problem is to improve intake (amount eaten) of grass, to increase the digestibility (amount retained by the animal) and to increase the feeding value of the digested food.

The difficult parts to resolve are the varying effects of management on these.

Thus for example, (a) management aiming at high yield per acre leads to low digestibility of the grass, (b) increasing stocking rate leads to low animal output.

The objective of grass management should be to resolve these opposing effects bearing in mind that high performance per animal may not be the best economic solution.

Possible methods of combination which might give optimum output per acre plus output per animal were:-

(a). Combining a generally low grazing stock rate with highly efficient conservation. (Note: This is the method adopted by Mr. Montgomerie at Lessnessock).

(b). Grazing separate categories of stock. High 'doers' first at low numbers per acre followed by low 'doers'.

(c). Combining high stocking intensity with supplementary feeding to maintain output per animal. This method is frowned on by economists and many grassland investigators have shown the response to supplementary feed is uneconomic. Nevertheless, theoretically it should be possible and further work is needed into managements at grass including supplementary feed.

Dr. Blaxter spoke on the "Utilization of the metabolisable energy of grass", a subject which is likely to become more and more prominent since it attempts to bring more precision into expressing and comparing feeding rations. All actions, all production can be expressed in terms of energy either in calories (more commonly used for human consumption) or in starch equivalents more used for animal feeding studies.

Metabolisable energy is a part of the energy contained in the food eaten by livestock which is used for production purposes.

The relationship can be explained thus:-

(a). The energy value of food can be determined by measuring the heat produced when it is completely burned = the energy value of the intake.

(b). When the food is eaten part is retained and part passes through the animal undigested. The amount of energy eaten minus the energy of undigested faeces = apparent digestible energy (A.D.E.). This is similar to the way in which the digestibility of any other portion of food is measured and giving such terms as apparent digestible dry matter, apparent digestible crude protein, apparent digestible organic matter etc.

(c). Part of the apparent digested energy (A.D.E.) is excreted after being utilised by the animal as urine and methane, the amount left is called metabolisable energy and the letters M.E. will become as widely used as S.E. (starch equivalent).

(d). There is in fact a further fraction of energy which does not enter into the energy of the final livestock, namely that used for raising the temperature of the animal. When this has been subtracted, one is left with the net energy value of a food or ration.

Mr. J.A.F. Rook of the National Institute for Research in Dairying, Reading, described his work on "Ruminal volatile fatty acid production in relation to animal production from grass".

These substances found in herbage of various kinds such as Acetic acid (A), Butyric acid (B) and Propionic acid (P) and proportions depending on type of grass, stage of growth, season of the year produce variations in milk yield, in % Butterfat and in % Solids-not-fat in the milk.

Thus, grazed perennial ryegrass is lower in A and higher in B than cut grass. The more mature the grass the higher the A and the less the B.

A tends to increase milk yield. Increased proportions of A and B increase the % fat but higher proportions of P decrease it. More P increases % S.N.F. whilst the other constituents have no effect on % S.N.F.

Mr. R.C. Campling of the National Institute for Research in Dairying considered the "Factors affecting voluntary intake of grass", namely palatability, digestibility, availability of the grass and the amount and type of supplementary feeding. The cause of differences in intake was the length of time food was retained in the gut but the subject was still complex. No explanation could be offered for example for low intake of silage. Silage was eaten and digested more slowly than hay. The digesta from silage must be retained in the gut longer than those of hay. It is impossible yet to say whether this is the cause or the effect of low silage intake.

Dr. Holmes, Wye College and formerly of the Hannah Dairy Research Institute considered the "Efficient use of fresh grass" and came to the conclusion that this could lie in a combination of rationed grazing plus barley.

Dr. Murdoch of the National Institute for Research in Dairying, Reading rounded off the meeting with a talk on "Efficient utilisation of conserved grass". Intensifying grass production inevitably leads to surplus grass over short periods of the year which must be conserved as hay or silage. To justify the expense of equipment and installation this conserved grass must be used efficiently. Both conservation methods involve some loss of the nutrients (food value). In silage these occur as surface waste on the outsides of stacks, as respiration and fermentation within each particle of the fodder and as effluent seeping out of the stack. Surface waste can be reduced by the type of container from perhaps 52% in an uncovered stack to 28% in a pit.

Effluent loss can be reduced by raising the % Dry Matter of the herbage ensiled. Respiration losses are low and will depend

on the type of bacterial growth in the herbage. Hay also suffers some losses by Respiration (as part of the curing process), mechanical damage resulting in loss of leaf etc., by leaching when lying exposed to rain and by storage under bad conditions.

Losses of dry matter could range from 36% for field cured hay under wet conditions, 21% when no rain experienced to 19% for barn dried hay with cold air down to 15% for barn drying plus heated air.

In the account of grassland recording systems, Dr. Baker put a case forward for adopting the terms cow grazing days and cow equivalents instead of starch equivalent to express and compare the outputs of grass as calculated by grassland recording. The main reason for this change is to make it more acceptable to farmers.

Full reports of these papers will appear in the Journal of the British Grassland Society.

From the College Librarian

A further list of reprints of articles published by members of the College staff is printed below. Copies of reprints will be sent on request. These can be asked for by quoting the list number and reprint number without writing out the full title. Those written primarily for scientific readers are marked with an asterisk.

* 1. Page, E.R., Schofield-Palmer, E.K. and MacGregor, A.J. Studies in soil and plant manganese. IV. Superphosphate fertilization and manganese content of young oat plants. (In Plant and Soil Vol. 19, No. 2, October, 1963).

* 2. Pickard, J.A., Martin, J.T. and Grainger, J. Spray application problems: LXVIII. Mercury residues in ground crops. (In Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol, 1962).

* 3. Glendinning, Dorothy, Macdonald, J.A. and Grainger, J. Factors affecting the germination of sporangia in Phytophthora infestans (In Trans. British Mycol. Society Vol. 46, part 4, 1963).

* 4. Grainger, John and Clark, Marjorie R.M. Interactions of Rhizoctonia and potato root eelworm. (In Eur. Potato J. Vol. 6, No. 2, June, 1963 Letters to the Editor).

5. Frame, John. Tall fescue. (In Scottish Agriculture, Autumn 1963).

6. Frame, John. Winter grazing. (In Scottish Agriculture, Summer 1963).

7. Frame, John. Ayrshires in Finland. (In Scots Magazine, December 1962).

8. Harkess, Ronald. Digestible pasture. (In Agriculture, July 1963).

9. Hunt, I.V. Grasses for the hill farm. (In Scottish Agriculture, Summer 1963).

10. Hunt, I.V. The improvement of hill land by surface treatment in the West of Scotland. (In Proceed. Eur. Conf. forage prod. on natural grassland in mountain regions, 1962).

* 11. Gardner, A.L. and Hunt, I.V. Inter-varietal competition in perennial ryegrass swards. (In J. British Grass. Socy. Vol. 18, No. 4, 1963).

12. Hunt, I.V. Tetraploids - gimmick or breakthrough? (In Dairy Farmer, February 1964).

13. Thomson, J.M. and Hall, J.K.S. The Auchincruive cubicles (In Farming Review 25, Winter 1963/64).

14. McLaren, A.P.C. Some important fungal diseases of animals (In Scottish Agriculture, Autumn 1963).

* 15. Butler, E.J. and Vet. invest. and agric. adv. officers of the East and West of Scotland Agricultural Colleges. The mineral element content of spring pasture in relation to the occurrence of grass tetany and hypomagnesaemia in dairy cows. (In J. Agric. Sci., Vol. 60, 1963).

16. Helmsing, J.S., Laird Jnr., R. and Walker-Love, J. Commercial beef recording : a pilot scheme in the West of Scotland. (In Scottish Agriculture, Autumn 1963).

17. Walker-Love, J. A few factors affecting the compositional quality of milk. (Paper presented to the Socy. Dy. Tech. (Scottish Branch) 19th November, 1963).

THE CUTTING MANAGEMENT OF GRASSLAND

D. Reid
The Hannah Dairy Research Institute, Ayr

An increasing acreage of grassland is being cut for silage-making with the forage harvester. This machine allows the herbage to be cut closer to ground level than was possible with the conventional mower. Since the forage harvester also collects the grass, the herbage can be cut when it is short and relatively young. It is possible to cut a greater number of crops in a season from a field. In this article, which is based on the results from a series of experiments made at the Hannah Institute over the past 10 years, the effects of varying closeness and frequency of cutting on grassland are considered.

Frequency of cutting

Experiments at the Institute, and other research centres, show conclusively that the greater the number of times a grass sward is cut in a season the lower is its total yield of herbage in that season. The main reason for this is that for a period of about 7-10 days after cutting, the growth rate of the sward is lower than it would have been if left to grow undisturbed. Where six cuts are taken in the season these periods of slow growth will total 40-60 days instead of the 20-30 days where three cuts are taken. Three cuts a year give in effect almost an extra month of vigorous growth. The effect will probably be greater under low fertility conditions.

Coupled with this decrease in the yield of herbage and increasing frequency of cutting, there is an increase in the quality and feeding value of the herbage. The young herbage obtained with a frequent cutting system has a high protein content, a low fibre content and high digestibility. These qualities deteriorate as the interval between cuts increases. Up to the time the crop is at the "silage" stage, when the grasses are beginning to shoot quality decreases more slowly than yield of herbage increases. After that stage herbage quality deteriorates rapidly. Cutting at the "silage" stage gives therefore the best balance between yield and quality. This stage of growth will be reached by allowing 4-5 weeks between crops in early summer and lengthening this period to 6 weeks or more in late summer. The result will be 3-5 cuts in the season depending on seeds mixture, fertility level and weather conditions.

Height of cutting

With the usual farm mower, it is generally not possible to cut closer than 2-3 in. from the soil surface even on a level field because of the design of the machine and the possibility of damage by stones. Mechanically, the forage harvester is capable of much closer cutting on a level field, and less easily damaged by stones. Experiments have shown that this is an advantage, because greater yields of herbage can be obtained from closer cutting. Total yields of herbage dry matter over the season have been increased by 30-40% simply by reducing cutting height from 2½ in. to 1 in. from ground level. In one experiment the yield increase obtained in this way was greater than that resulting from applications of an extra 4 cwt. of "Nitro-Chalk" per acre. Additional advantages of closer cutting in these experiments were increased yields of white clover and a considerable depression in the production of flowering shoots by the grasses. As a result, the feeding value of the cut herbage was increased.

These advantages of close-cutting have been shown to be independent of weather conditions, and have occurred both in dry and in wet seasons. They have also been obtained on swards subjected to a range of cutting frequencies. For example, in a recently completed experiment which lasted for 3 years, cutting to 1 in. from ground level gave greater total yields of herbage than cutting to 2½ in. whether 4, 6 or 12 cuts were taken in the season. The 12 cuts per season treatment involved cutting every 14 days. Experiments at other stations have indicated that the advantages of close cutting are lost only when the interval between cuts is as short as 7-10 days, which will rarely apply in practice.

However frequent the cutting the close-cut swards in these experiments remained vigorous and weed-free from year to year, so long as fertility was maintained at a high level. For example, cutting to 1 in. from ground level, eight times in the season maintained a vigorous sward over a 3-year period where nitrogenous fertilizers were applied regularly together with phosphate and potash. The same management applied without the nitrogenous fertilizers resulted in a weakening of the grass plants in the sward, and by the end of the 3 years these plots were open and weedy.

Practical conclusion

All the results lead to the conclusion that the ideal cutting management is one in which the herbage is cut to about 1 in. from ground level at intervals ranging from about 4 weeks in the early part of the season to about 6 weeks later in the season. This

management will give the best compromise between optimum yield and optimum quality of herbage, and will maintain a vigorous weed-free sward over the life of the ley so long as soil fertility is maintained by regular fertilizer applications.

GLASGOW UNIVERSITY VETERINARY SCHOOL

R.G. Hemingway
Department of Animal Husbandry and Veterinary Preventive Medicine

Glasgow University Veterinary School is the eventual successor of the Glasgow Veterinary College which was founded by James McCall, a native of Newton-on-Ayr, in 1862. For 46 years McCall owned the College and ran it as a private enterprise in conjunction with his own practice and a variety of other interests. Only in 1909 did the Scottish Education Department see their way to provide financial assistance. This coincided with the appoint of the first Board of Governors, but McCall remained in effective control until his death in 1915 at the age of 81.

In 1925 all Government assistance was withdrawn. The very greatest credit must be accorded to Dr. A.W. Whitehouse, Principal from 1922 until 1945 who managed, by reliance mainly on student fees (which provided 80% of the income) but also on private benefactors and local authority grants, to bring the College through this most difficult period. Lecturing was undertaken mainly by part-time teachers and at one time Professor Whitehouse held the only full-time appointment.

The Loveday Report in 1944 recognised that substantial changes were needed in veterinary education and recommended that all responsibilities should be transferred to various Universities. Glasgow University accepted this task and in 1945 The Department of Agriculture re-established its grant. During the period 1945-49 there commenced an improvement in the staffing and general facilities. At first it was considered that the clinical aspects of veterinary training should be undertaken at Auchincruive but it was eventually decided that a close association with the Medical Faculty in Glasgow would be of paramount importance. Final incorporation into the University took place in 1949.

Since that date the development of the Veterinary School has proceeded apace and its range of activities, number of staff and physical resources by way of apparatus and buildings is ever enlarging.

In 1950 the University erected the first of a projected series of new buildings at Garscube, an attractively wooded estate which they had acquired between Anniesland and Bearsden. This is in all senses an animal hospital and the initial building houses such Departments as Medicine, Surgery and Reproduction which call for extensive animal accommodation for teaching purposes. It was fully anticipated that by the end of the 1950s the whole of the

Old College at Buccleuch Street would have been transferred to Garscube. This old building (surely the worst form of academic slum) was first occupied (and that as a rough conversion) in 1883. It is now hoped that it may be fully evacuated by the mid 1960s. Meantime, the teaching of basic subjects such as Anatomy and Pathology are of necessity conducted in totally unsatisfactory surroundings.

Teaching of Biochemistry and Physiology are undertaken within the appropriate University Departments at Gilmorehill. Meat inspection classes are held at the Glasgow Abattoir and essential and much appreciated co-operation is obtained from artificial insemination centres, the Poultry School at Auchincruive, feeding stuff manufacturers and farmers with specialist enterprises.

At Garscube there are elaborate facilities for Xray examinations, diagnostic services of many types, post-mortem rooms and operating theatres for large and small animals. There is a licensed abattoir and a wide range of animal accommodation which requires the services of a dozen stockmen and almost as many kennel maids. A new building endowed by the Wellcome Trust provides facilities for the joint use of animal and human surgeons in the investigation of new operative techniques.

In 1954 the University acquired an estate of 250 acres at Cochno, near Duntocher. This provides much needed facilities for the more practical aspects of livestock husbandry and accommodation for long-term experiments. The farm carries a herd of 45 Ayrshire and Friesian cows and flocks of Cheviot and Half-bred sheep. In addition to a commercial herd of pigs, special facilities have recently been provided by the Pig Industry Development Authority for the rearing of minimal disease pigs obtained by operative procedures at the Veterinary School. In so far as is possible, the farm is run as a commercial enterprise but of necessity teaching and research activities take priority, e.g. for frequent pregnancy diagnosis. A variety of old buildings and Nissen huts have had to be used to house experimental animals, but during 1964 (some ten years after occupation) construction of a limited amount of further permanent accommodation will be commenced.

The Glasgow Veterinary School has two main functions — teaching and research. The undergraduate course lasts 5 years and there is an annual intake of 50 students. The professional staff consists of some 60 lecturers. There are in addition about 75 technicians. By no means all the staff are veterinary surgeons. Modern research demands much in the way of team work with essential

contributions to be made by chemists, biochemists, bacteriologists etc. Within recent years there has been an extensive development of post-graduate work and such research students come from many parts of the world.

Finance of the Veterinary School in so far as the basic undergraduate course is concerned is entirely the responsibility of the University. Provision of funds for research is much more problematical. University resources must of necessity be augmented by research grants from bodies such as the Agricultural Research Council, P.I.D.A., the Scottish Milk Marketing Board, various research foundations and a wide range of interested commercial organisations. The recently formed Horse race Betting Levy Board have provided a most valuable number of research scholarships which are not of any necessity confined to work with horses.

The Veterinary School do not operate either a large animal or small animal practice. In consequence, they are almost entirely dependant upon the co-operation of local veterinary surgeons and the farming community for a continued supply of teaching material. The law does not allow operations to be performed unnecessarily on normal, healthy animals even for instructional purposes. Even though many operative procedures and clinical conditions are recorded on film (there is an excellent photographic department) nothing is more vital than a comprehensive supply of diseased animals for student instruction. For professional reasons there can be no direct contact with a farmer other than through his own veterinary surgeon. The surgeon can in turn benefit from the extensive facilities and specialities available at the Veterinary School, i.e. by use of Xray and pathological and biochemical diagnostic services. Nevertheless, the Veterinary School are keen to be aware of new animal enterprises especially those involving intensification in order that they can anticipate potential disease risks.

The Glasgow Veterinary School admits each year a number of students from abroad. The staff have in recent years developed a growing interest in husbandry and disease problems in overseas territories. Extended visits abroad have been made by individual members of staff to such varied countries as Turkey, Pakistan, Greece and Chile. At the moment several lecturers are giving assistance with the initial development of the new Veterinary School in Kenya. Only in such ways can full realisation be obtained of the disease problems of the developing countries.

The range of problems under investigation at Glasgow is extremely wide. Some, such as studies of heart, liver and kidney functions, are undramatic but nevertheless of fundamental importance.

For example, recent surveys have indicated that some 50% of the livers and kidneys of barley-beef animals are rejected as unfit for human consumption at abattoirs. This can only reflect conditions of exceptional stress on these organs during the life of the animal. Diseases such as calf scour with a wide variety of causes can never yield a spectacular and universally effective cure appropriate in all circumstances but nevertheless investigations make steady progress.

One outstanding Glasgow discovery has been the development by navel techniques of a vaccine against the lung-worm causing husk in calves. This product was the first successful attempt to make a vaccine effective against such a large-sized disease organism. Great hopes are aroused that many other diseases may yield to such treatment and intensive work is in hand concerning its application to a variety of parasitic diseases of sheep and cattle. Some success has been recorded in the production of a vaccine against coccidiosis in poultry and this year a product useful against hookworm in dogs will commence large scale field trials in America. Success here will open up possibilities of application of similar techniques to the production of vaccines against the distressing parasitic diseases of the inhabitants of many tropical regions.

Many aspects of the nutrition of sheep are under investigation. There can be little doubt that twin-lamb disease is largely connected with inadequate nutrition of the ewe in late pregnancy. Deliberate fasting for a few days almost invariably leads to the condition and no theropeutic remedy can compensate for the inherent dangers of inadequate nutrition. Work is also in hand concerning the requirements of housed ewes and in-wintered ewe hoggs. In-wintering of hoggs leaving a liveweight gain of 15-20 lbs. on a diet of oat straw (ad lib.) and $\frac{3}{4}$ lb. per day of kibbled maize plus 5% fish meal, minerals and Vitamin D has been achieved at a comparable cost to away-wintering at grass.

Hypomagnesaemia in sheep has received a great deal of attention. Contrary to frequently expressed views, careful work has indicated that potassic fertilizers used at rates of up to 60 units K_2O/acre have no discernable influence on blood magnesium levels. It has been confirmed that $\frac{1}{2}$-1 cwt. per acre of calcined magnesite applied to damp herbage as a dust a day or two in advance of grazing gives a useful effect where incorporation in compound feeds is not practicable. Many clinical cases of hypomagnesaemia in ewes also involve a low blood calcium status and an adequate supply of minerals during pregnancy and early lactation may be useful in preventing a proportion of such losses. Much effort has been expended on the search for a suitable product containing

magnesium which could be used as a rumen bullet to provide a "built in" supply of magnesium over the critical period of about 6 weeks. It is hoped that a number of field trials will be possible in 1964.

Copper metabolism in sheep from both the deficiency and toxicity points of view is also receiving attention. There can be little doubt that swayback may be caused by a straightforward deficiency of copper in the diet of the ewe and again investigations are in progress whose object is the production of a copper containing bullet. Recent work has shown that the risk of copper toxicity in housed sheep is not as great as is commonly supposed particularly if the diet is reasonably well supplied with protein.

Many analyses have shown that a high proportion of hay and silage crops grown in Scotland are low in phosphorus, calcium and magnesium. The importance of an adequate supply of phosphorus for bone formation and its role in maintaining fertility are well recognised. Recent joint work with the Glasgow Dental School has shown the poor state of enamel formation in the teeth of young stock fed inadequate amounts of phosphorus.

The activities of the staff of any veterinary hospital inevitably cover such diverse topics as injured swans, sick budgerigars, pneumonia in circus chimpanzees, digestive disturbances in barley beef cattle, heart conditions in many species and the efficient maintenance of colonies of rats, mice and guinea pigs for diagnostic purposes. All require the development of better techniques whether they are Xray, pathological, biochemical, surgical or anaesthetic. Many diseases nevertheless remain well within the control of the farmer employing preventive medicine (with the advice of his veterinary surgeon) in the widest sense. A host of parasitic diseases may be controlled by efficient grazing techniques, foot rot is all too unnecessarily common, ventilation is frequently quite inadequate and cases of lead poisoning arising largely from carelessness are all too widespread. New and intensive husbandry techniques give rise to increased risks of disease and early co-operation between the farmer and his veterinary surgeon and the anticipation of problems by research workers can do much to maintain and promote the efficiency of livestock production.

MEMBERSHIP

South West Scotland Grassland Society

A full list of members was printed in No. 3 of our Journal. The following are the new members who have joined since that list was made out.

Carson, W.D., Fisons Basic Slag Ltd., Harvest House, Ipswich, Suffolk.
Hodge, G., Myremill, Maybole, Ayrshire.
Hodge, W.S., Burnton, Crosshill, Maybole, Ayrshire.
Lillingston, H.A. (Agronomist, Shell Chemical Co. Ltd.), Lagg House, Dunure, Ayr, Ayrshire.
Shearlaw, T.S., Craigenton, Kirkoswald, Ayrshire.
Armour, G., Craigen Puttock, Dunscore, Dumfriesshire.
Hall, A.B., Craiglearan, Moniaive, Thornhill, Dumfriesshire.
MacGregor, J.W. (Fisons Technical Service), Watchhill, Lochmaben, Dumfriesshire.
Gibbs, Mrs. B.K., Slogarie, Mossdale, Castle Douglas, Kirkcudbrightshire.
Hunter-Blair, F., Marbrack, Carsphairn, Kirkcudbrightshire.
Ritchie, T.W., Ashmount, Kirkcudbright.
Henry, A.M., Little Float, Sandhead, Stranraer, Wigtownshire.
Henry, N.M., East Galdenoch, Stoneykirk, Stranraer, Wigtownshire.
Lindsay, J., Auldbreck, Whithorn, Wigtownshire.

The membership of the South West Scotland Grassland Society now stands as follows:-

At Sept. 1st 1963	248
New members	22
	270

A further 8 members are listed on page 73.

Mr. A.M. McClymont, Creebank, Newton Stewart, has been appointed to the Scottish Landcourt, will be residing in Edinburgh and has resigned.

Central Scotland Grassland Society

A full list of members of this Society is issued in this number of the Journal.

Argyllshire (8)

BARBOUR, R., High Peninver, By Campbeltown.
FELLOWES, Brigadier R.W.L., Cladich, By Dalmally,
HAYES, Mrs. M.V., Craigdhu, Barbreck, Lochgilphead.

HENDERSON, A.B., The Hotel, Isle of Gigha.
McVICAR, Miss Sheila, Formenter, Benmore, By Dunoon.
ROBERTSON, A., Auchafour, Toward, Dunoon.
TROTTER, R., Gruinart, Islay.
YOUNG, G.D., Ardyne Farm, Toward, Dunoon.

Bute (8)

BROWN, J.G.S., Rullecheddan, Rothesay.
LYON, A., Drumachloy, Rothesay.
McALLISTER, J., Kerrytonlia Farm, Rothesay.
MILLAR, Ivy Cottage, Brodick, Isle-of-Arran.
REID, W., Quogach Farm, Rothesay.
ROBERTSON, A., Rullechaddan Farm, Rothesay.
SIMPSON, C.D., Barnauld Farm, Rothesay.
SIMPSON, N.D., Largievrechtan, Rothesay.

Clackmannanshire (3)

GELLATLY, J., The Mains, Menstrie.
TULLIS, Major R., The Baingle, Tullibody, Alloa.
WILSON, R.M., Muircot Farm, Tillicoultry.

Dunbartonshire (7)

CALDERWOOD, W.H., Clachan Farm, Roseneath, Helensburgh.
CALDWELL, W., Mid Gartocharn Farm, By Alexandria.
CUNNINGHAME-GRAHAM, R.E., Rosebank, Ardoch, Cardross.
FISKEN, P., High Craigton, Milngavie.
HOWIE, R.L., Drumfork, Helensburgh.
SCOTT-PARK, J.H., Portnellan, Gartocharn, Alexandria.
TORRANCE, A., Carleith Farm, Dalmuir.

Lanarkshire (89)

AITCHISON, R., Starbirns, Lesmahagow.
ALLAN, H.W., Quothquan Law, Biggar.
ALLAN, J.F., Southholm, Pettinain.
ALLISON, W., Laigh Cleughearn, East Kilbride.
ARGO, J.M., Newton Farm, Cambuslang.
ARMSTRONG, W., South Brackenridge, Lesmahagow.
BAILLIE, D., King's Inn Farm, Carnwath.
BAIRD, A.A., Browntod, Hamilton.
BANKIER, A.J., Fernieshaw, Cleland, Motherwell.
BANNATYNE, J., Drumalbin, Carmichael.
BELL, G.K., Dillars Farm, Lesmahagow.
BROWNLIE, J., Homestead, Hamilton.

BRYSON, A., Turnlaw, Cambuslang.
CARRUTHERS, W.K., Nethertown, Auchenheath.
COFFEY, E., Devonhill, Meikle Earnock, Hamilton.
CUTHBERTSON, G., Bents Farm, Chapelton.
DICKIE, E.B., North Torfoot, Drumclog.
DUNCAN, J.R., Blackburn, Crawfordjohn.
FRAME, A., North Quarter, Hamilton.
FRAME, J., Dyke Farm, Sandilands.
GIBB, A., Birkhill, Lesmahagow.
GILLILAND, T.D., Greenfield, Strathaven.
GILMOUR, G.M., West Crosshill, East Kilbride.
HAMILTON, A., Dechmont Farm, Cambuslang.
HAMILTON, G., Silvermuir, Ravenstruther.
JOHNSTONE, W., Hillhead, Thankerton, Biggar.
KEDAR, A.J., Netherfielddyke, Strathaven.
KENNEDY, J., East Hookhead, Strathaven.
KERR, J., Kirklands, Dunsyre.
KING, W., High East Quarter, Glassford.
KIRKWOOD, J.A., Baads Farm, Harthill.
KNOX, G., Hilton Farm, Bishopbriggs.
KNOX, W.B., Mid Lettrick Farm, Cambuslang.
LAW, D.L., Maidenwell Farm, Glassford.
LAWSON, Messrs. A.T. & Sons, Parklea, Carmunnock.
LEGGAT, J., Broomfield, Larkhall.
LEGGATE, W.M., Silverrig Farm, Chapelton.
LOGAN, Messrs. R. & W., Eastshield Cottage, Carnwath.
LOHOAR, R., Holmhills, Cambuslang.
LYON, A.W., Linnhead, Lanark.
LYON, I., Linnhead, Lanark.
MACFARLANE, A.D., Little Kype, Strathaven.
McGREGOR, J., Boghill, Lesmahagow.
McGREGOR, W., East Law, Carluke.
MANGER, W.A.B., Overburns, Lamington.
MEIKLEM, R., Broomilton, Larkhall.
MINTO, J.A., Coulterhaugh, Biggar.
MOFFAT, T., East Tarbrax, Shotts.
MOFFAT, W., Dalmore, Burnbrae Road, Shotts.
MORGAN, A., South Medrox, Glenboig, by Glasgow.
MUIRHEAD, D.T., Carnbroe Mains, Bellshill.
NEILSON, Messrs. T. & W., East Brackenridge, Strathaven.
NISBET, J.M., Mid Drumloch Farm, Hamilton.
OWEN, J.T., Greenside Farm, Newhouse.
PATE, R., Muirsland, Kirkmuirhill.
PATERSON, A., Garnqueen, Glenboig.
PATERSON, T., Wemysshill Farm, Overtown.
PETTIGREW, J., Newsteadings, Lanark.
RHODES, G.M., Newhouse of Jackton, East Kilbride.
ROBB, D.S., Meadowside Farm, Strathaven.

ROSS-TAYLOR, W., Wandel, Abington.
ROSS-TAYLOR, W.P., Wandel, Abington.
RUSSELL, A., Low Whiteside, Lesmahagow.
RUSSEL, T.H., Scorrieholm, Lesmahagow.
SEMPLE, A.G., Unthank, Coulter.
SMITH, A., Hazeldean, Stonehouse.
SMITH, W., Hall of Carnduff, Strathaven.
STEELE, J., Monksfoot, Douglas.
STEEL, Messrs. L. & Son, Blackhill, Crossford.
STEVENSON, J., Wellburn Cottage, Lesmahagow.
STRUTHERS, A., Auchmeddan Farm, Lesmahagow.
STRUTHERS, A.A., Millhill, Lanark.
STRUTHERS, R.T., Hallburn, Strathaven.
STRUTHERS, J., Craigendhill, Hamilton.
TELFER, W., Hartside, Lamington.
TEMPLETON, R., Roundhill, Strathaven.
THOMSON, J.W.A., Collierhall, Douglas Water.
TORRANCE, Messrs. A. & A., Crookedstone, Quarter.
WALKER, D., Sunnyside, Larkhall.
WARNOCK, J., Netherton Farm, Harthill.
WARNOCK, Messrs. J. & Son, Bogmoor Farm, Pettinain.
WARNOCK, J., Sandilands Farm, Lanark.
WILSON, A., Gartland Mains, Lanark.
WILSON, R.J., Longwell Farm, Lamington.
WYLLIE, J.W., Crofthead Farm, Strathaven.
YOUNG, J., Hill of Murdostoun, Cleland.
YOUNG, W. Jr., Pather Farm, Wishaw.
YUILL, J.A., 28 Burn Road, Chapelton.
YUILL, R., Burn Farm, Quarter.

Perthshire (14)

ANDERSON, Messrs. P.S. & Son, Kippenross Farm, Dunblane.
EWING, Sir R. Orr, Cardross, Port of Menteith Station, Stirling.
GWYN, Brigadier R.A., Monteith House, Port of Menteith, by Stirling.
HENDERSON, D.J., Glenhead, Dunblane.
JACK, G.B., Comelyburn, Blackford.
JOHNSTON, W. Douglas, Monkscroft, Auchterarder.
JOYNSON, P.A., Braendam, Thornhill, Nr. Stirling.
MacDIARMID, I., East Bracklinn, Callander.
MacNAB, J.C., Younger of MacNab, Kinnell Estate Office, Killin.
MORRISON, J., Todston, Madderty, Crieff.
ROBERTS, Sir James Denby, Strathallan Castle, Auchterarder.
SIMPSON, R., Duchlage, Crieff.
SMITH, R.F.Y., Culcrieff, Crieff.
TENNANT, P., Invertrossachs, Callander.

Renfrewshire (30)

AIREY, J., 3 Broomvale Flats, Newton Mearns.
ANDERSON, L.M., Warlock Gates, Castle Semple, Lochwinnoch.
ANDREW, W.N., Crossflat, Kilbarchan.
CARRUTH, R.J., High Auchensale, Kilbarchan.
CARRUTH, W.A., Callochant, Kilbarchan.
CARSWELL, W.C., Kirkton Farm, Neilston.
CLARK, J.B., Dunrod Farm, Inverkip.
DUNN, J., Burnside, Langbank.
ELDER, W.B.R., Mid Glen, Langbank.
FULTON, R., Smithyhill Farm, Neilston.
GOW, Brigadier, J.W.H., Hallhill, Howwood.
HARRIS, R.J.M., High Linthills, Lochwinnoch.
JAMIESON, R., Little Burntshields, Kilbarchan.
LAING, A.J.K., Pollock House, Glasgow, S.3.
LOVE, A., Nether Johnstone Farm, Johnstone.
LYLE, H.A., West Porton, Bishopton.
MACLAY, Lord, Duchal, Kilmacolm.
McINTYRE, A., Craiglinscheoch Farm, Kilmacolm.
MEIKLE, T.P., Floak Farm, Newton Mearns.
MORRISON, J., Crosslees Farm, Eaglesham.
ORR, W.M., High Howe, Kilmacolm.
SMITH, J.D., Balgreen, Lochwinnoch.
STRANG, J.S., Waukers Farm, Eaglesham.
TELFER, J.M., High Branchal, Bridge of Weir.
THOMSON, A.T.Y., Woodneuk Farm, Barrhead.
THOMSON, T.B.L., Woodneuk Farm, Barrhead.
THOMSON, W.A.N., Killoch Farm, Barrhead.
WHITE, R., Ryat Farm, Newton Mearns.
WILSON, A., Capellie Farm, Neilston.
YOUNG, R.H., Fulwood Mains, By Johnstone.

Stirlingshire (8)

CHALMERS, J., Beam Farm, Falkirk.
GARTROIG FARMS LIMITED, per S.M. Duff, Wester Auchentroig, Buchlyvie.
HERBERTSHIRE TRUST, per G.T.A. Ogilvie, Callendar Estate Office, Falkirk.
McEWAN, J.W., Lurg, Fintry.
McGREGOR, D., Allanfauld, Kilsyth.
PATERSON, A., Woodend, Balfron.
POLLOCK, A., Cashley Farm, Buchlyvie.
SIMPSON, E., Hill of Kinnaird, By Falkirk.

Non-Farming Members (30)

AIKMAN, C.D., 28 Station Road, Killearn, Stirlingshire.
BERRIE, G.M., W.S.A.C., 6 Blythswood Square, Glasgow, C.2.

BLACKHALL, G.E., S.A.I., Whitelees Road, Lanark.
CRUICKSHANK, G.A., 3 Cameron Park, Edinburgh, 9.
GENTLES, R.N., Caberfeidh, Alexander Street, Dunoon, Argyllshire.
GIBSON, E.C., Grangeview, 68 Grahamsdyke Street, Laurieston, Falkirk, Stirlingshire.
GILCHRIST, J., Mossknowe, 6 Hunterhill Road, Paisley.
GILCHRIST, R., 6 Hunterhill Road, Paisley.
GODLEY, Mr., South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4.
HARKER, A.B., c/o B.O.C.M., 19 Blythswood Square, Glasgow, C.2.
HEMINGWAY, Dr. R.G., Glasgow University Veterinary School, Bearsden, Dunbartonshire.
HENDRIE, Professor D.S., W.S.A.C., 6 Blythswood Square, Glasgow, C.2.
HUNT, I.V., Grassland Husbandry Department, W.S.A.C., Auchincruive, Nr. Ayr.
HUTCHEON, I.B., 19 Argyll Avenue, Stirling.
KAY, C., 31 Hills Road, Strathaven, Lanarkshire.
MACFADYEN, J.D., 295 Mearns Road, Newton Mearns, Renfrewshire.
MacLAGAN, Dr. D.S., 7 Park Terrace, Glasgow, C.3.
MACPHERSON, J., Knockaline, Symington, Biggar, Lanarkshire.
MALCOLM, A.G., W.S.A.C., Beechwood House, Stirling.
MUDIE, W., Broomhill Farm, Carnwath, Lanarkshire.
PARKINSON, A.E., W.S.A.C., 6 Blythswood Square, Glasgow, C.2.
PATERSON, J.S., Crofthead, Mid Calder.
PATTON, D.L.H., Agricultural College Office, Portland Place, Lanark.
RAINY-BROWN, J., 1 Hope Terrace, Edinburgh, 9.
ROSS, S.A., W.S.A.C., 12 Burnside Street, Campbeltown.
RUSSELL, R.G.C., Craigbank Farm, Larkhall, Lanarkshire.
WADDELL, J., 151 St. Leonard Street, Lanark.
WATSON, C.C., 7 Craighlaw Drive, Waterfoot, Eaglesham, Renfrewshire.
WOODFORD, J.G., 35 Snowdon Place, Stirling.
YUILL, J., 11 Rawhead, Biggar, Lanarkshire.

Total membership of Central Scotland Grassland Society 16/2/64, 197.

Additional members of South West Scotland Grassland Society

The following members joined since this list was prepared.

Brander, J.L., East Glenarm, Lochfoot Road, by Dumfries.
Bannister, M.J., Carseminnoch, Newton Stewart.
Baxter, T.A., Ardachie, Kirkcowan, Newton Stewart.
Beck, J., Castle Clanyard, Drummore, Stranraer, Wigtownshire.
Barr, T.B., Knocktim, Ervie, Stranraer, Wigtownshire.
Drysdale, L.D., Stewarton, Wigtown.
Gray, W.L., No. 7 Kilfillan, Glenluce, Newton Stewart.
Lammie, R., Lowdrummore, Drummore, Stranraer, Wigtownshire.