GRASSLAND

JOURNAL OF THE SOUTH-WEST AND CENTRAL SCOTLAND GRASSLAND SOCIETIES

No. 7, WINTER 1965.

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Editorial Note

When the previous number of our journal was completed and ready for printing, I thought that we might have some space to spare in this number for original articles and the theme of 'How to judge grassland' seemed to be worth pursuing. S.A. Ross and David Reid both start the theme rolling, taking two of the criteria used, namely 'Gross Margin' and 'Herbage Production'. Apply these critical judgements to your own grassland and see what your rating is. Is your gross margin within the range mentioned by Sandy Ross? If they are not, then now is the time to identify the cause and apply the remedy.

Our journal has generally been divided into six main sections, (1) Original articles, (2) Accounts of visits to places of interest by members, (3) Reports on the activities of our two Societies, (4) Reviews of research, (5) Answers to correspondent's queries and (6) Up to date lists of members. Far from being short of material many items have had to be kept over to the next number. Correspondents' queries have been omitted. Two members from the South West Society and two from the Central Society attended the British Grassland Society Summer Meeting. Each has prepared a report on one of the tour days. Dr. Kellie Brooke's report and that of Tom Clark are printed in this number. The reports from the other delegates have been held over till the next number. To save space I have listed new members who have joined the two Societies instead of a complete list. Any member wanting a complete list should write for one to the Secretary of his Society.

Some members derive quite a lot of information from our journals but I have a feeling that others find parts of it too scientific for them. Please write in about such matters or mention them to a committee member or to the College Adviser in your region making sure that the comment is passed on to me so that the difficulties can be cleared up. The information in the journal is meant to be of use to every member.

A month or so ago, all members of the South West Society were sent two Questionnaires. Dr. Castle was to prepare an article based on these but so far only 80 or so have been returned. A few more are required to make the report worth while.

The journal is produced by the cheapest possible method of printing, through the assistance of my typist, Miss Rena Blain and the Superintendent of the Printing Department at the University of Glasgow. I was told the other day that the print was too small and sometimes not quite clear enough. In order to improve matters the page size and print size has been increased. An electrical typewriter (e.g. I.B.M. Executive)

could make it still plainer but this machine costs about £250. If our membership increased the journal might be printed.

Dates to Remember

(SW = South West, C = Central Grassland Societies)

Nov. 9th	SW	Annual General Meeting Speaker : V.H. Beynon, University of Exeter At Hannah Dairy Research Institute, Ayr.
Nov. 25th	C	Annual General Meeting Theme : Farm visits - Winter housing and feding - Stirlingshire.
Dec. 8th	SW	Speaker : A.S. Foot, National Institute for Research in Dairying on 'Cow Nutrition' at Glenluce, Wigtownshire.
Jan. 17th	C	Speaker : F. Raymond of Hurley on 'Herbage Quality' at Blythswood Square, Glasgow.
Feb. 15th	SW	Discussion at Ernesbie Hotel, Castle Douglas on 'High Quality Fodder'.
Feb. 28th	C	Speaker : Leslie Dawson, S.A.I. Ltd. on 'Seed Establishment' at Blythswood Square, Glasgow.
Mar. 3rd	SW	Speaker : Dr. H. Allen of Jealotts Hill, Hertfordshire on 'Goodbye Ploughing' in Dumfries.

The spring tour of the South West Society will be planned in Kirkcudbrightshire for the end of April or early May.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

Officials 1964-1965

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	A. Reid, Diddup, Saltcoats. 1964. W. Gray, Park Farm, Kirkoswald. 1963.
Dumfriesshire	T. Hamilton, Briery Hill, Lockerbie. 1964. A. Smith, Gotterbie, Lockerbie. 1963.
Kirkcudbrightshire	J. Finlay, Rainton, Gatehouse. 1964. I.L. Howie, Cubbox, Balmaclellan, Castle Douglas. 1963.
Wigtownshire	A.S. Jupp, Bailliewhirr, Whithorn. 1964. S.A. McColm, Cairngarroch, Drummore. 1963.

Advisory Officers of The West of Scotland Agricultural College

A. Campbell, College Office, 20 Miller Road, Ayr.
J. Thorburn, College Office, 41a Castle Street, Dumfries.
S.A. Ross, College Office, National Commercial Bank Buildings, Bridge Street, Stranraer.
R.M. Patterson, College Office, 82 King Street, Castle Douglas.

Co-opted Members

I. Jennings, Nether Cleuch, Dalry, Castle Douglas.

A.E. Parkinson, Director of County Advisory Service, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow C.2. (Glasgow City 5211).

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

CENTRAL SCOTLAND GRASSLAND SOCIETY

Officials 1964-1965

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

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

TREASURER - John Waddell, College Office, Portland Place, Lanark (Lanark 802/3).

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

MEMBERS OF COMMITTEE

Farmers

A.P. Anderson, Kippenross Home Farm, Dunblane, Perthshire. 1964/5.
Robt. M. Yuill Jr., Walston Mansions, Walston, Biggar. 1964/5.
James A. Minto, Coulterhaugh, Biggar, Lanarkshire. 1964/5.
A. Robertson, Auchafours, Toward, Dunoon, Argyll. 1964/5.
J. Gellatly, The Mains, Menstrie, Clackmannanshire. 1965/6.
W. Caldwell, Mid Gartocharn Farm, by Alexandria, Dumbartonshire. 1965/6.
A. Pollock, Cashley Farm, Buchlyvie, Stirlingshire. 1965/6.
A.J.K. Laing, Pollock House, Glasgow, S.3. (Renfrewshire). 1965/6.

College Advisers

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

Co-opted Members

A.E. Parkinson, Director of County Advisory Service, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow C.2. (Glasgow City 5211).

I.V. Hunt, Grassland Husbandry Department, West of Scotland Agricultural College, Auchincruive, Ayr (Annbank 234).

D.S. HENDRIE

Principal of the West of Scotland Agricultural College and Professor of Agriculture in the University of Glasgow.

"Acknowledgement is made to Principal Hendrie for his interest and guidance throughout this investigation".

Well over a hundred times members of my department have added this phrase at the end of reports on grassland investigations. It was no mere courtesy but a recognition of the help and encouragement given by our late principal through all stages of grassland research work. Amidst his many duties, he found time for discussions of the many unsolved grassland problems, of methods of investigation, on the interpretation of the results and the presentation of the final information.

In the same way, acknowledgement must be made to him for his contribution to our societies. In one way he was Member No. 1, since it was his enthusiasm which set the societies going. His was the top signature on the letter which went out to farmers inviting them to what became the 'Founders Day'. He was chairman of both meetings and, in keeping with his idea that these societies should be directed by farmers, assisted by College Advisers, he declined the invitation to be first chairman of the South West Society. Nevertheless, his membership was not a nominal one. He served on our committee, guided us to a sound constitution, contributed to our journal. He attended many of the meetings and tours and was indeed looking forward tremendously to the summer tour of Northern Ireland when he was quite suddenly taken away from us.

As Principal of the West of Scotland Agricultural College, his interests necessarily covered all aspects of College life - livestock production, economics, horticulture, poultry, dairy technology and chemistry to name but a few. To each of these he made valuable contributions and maybe it is presumptious of us to think that grassland was his special interest and pleasure. He enjoyed lecturing to his students on modern developments in grassland. He was in great demand as chairman and lecturer at meetings concerned with grassland. As chairman of the Grassland Committee of the Scottish Agricultural Improvement Council, member of the Royal Commission on Grassland Utilisation and governor of the Grassland Research Institute he had a direct influence on the present day programme of grassland research in Britain. - I.V.H.

JUDGING GRASSLAND FROM AN ECONOMIC POINT OF VIEW

S.A. Ross
County Adviser, Wigtownshire.

On a fine summer's evening, it is very pleasant to walk over one's grass fields, to admire them, compare them and perhaps assess the productive potential of the different mixtures and manurial treatments.

An experienced eye can tell a lot about the composition, quality and vigour. Some farmers are now supplementing this assessment with field recording to measure the output from each field in lbs Utilised Starch Equivalent per acre in much the same way that milk recording measures the number of gallons of milk from each cow.

Such information is very useful, and helpful in planning and modifying future management and manuring techniques. Like milk records, however, grassland records are not an end in themselves. Grass is grown by the commercial farmer, not just to look good, or to give high production of animal food, but to give a satisfactory financial return for his capital invested in the farm, his management skill, and his physical labour. The only final test is the financial performance per acre.

The simplest and most practical way of measuring the financial performance of grassland inputs and outputs is by the Gross Margin technique. To use this technique we need to know the gross output and the variable costs.

Gross Output is the financial value of everything produced during the year in question. It is all sales less livestock purchases, and addition or deduction to allow for any increase or decrease in the number or value of stock on hand at the beginning and the end of the year.

Variable Costs are the input costs which vary with the scale of an enterprise, or with a change from one enterprise to another. The main ones are feeding stuffs, fertilizers, seeds, sprays, contract work and veterinary expenses.

Gross Margin is Gross Output less Variable Costs.

In order to calculate the gross margin per forage acre, it is necessary to know the rate of stocking of each grazing livestock enterprise. On most farms, grazing stock is mixed, and conserved grass is used for more than one class of stock in unknown quantities. To calculate the density of stocking

it is necessary to use accepted standards to convert all stock into livestock-units (L.S.U.) - one cow equivalent = one L.S.U. - then calculate the number of forage acres per L.S.U., and finally calculate back the number of forage acres to allocate to each class of livestock or enterprise. This procedure is shown in the following example.

A farm has 150 acres grass (pasture, hay and silage), neither purchases nor sells any bulk feed, and carries 40 dairy cows, 15 calves up to one year old, 10 one - two year olds, 8 in-calf heifers and 200 breeding ewes.

		L.S.U.		
40 cows @ 1 L.S.U.	=	40	=	Dairy herd enterprise
15 cattle @ 0.4 L.S.U.	=	6		
10 " @ 0.6 L.S.U.	=	6	=	Cattle rearing enterprise
8 " @ 0.8 L.S.U.	=	6.4		
200 ewes @ 0.2 L.S.U.	=	40	=	Sheep enterprise
		98.4		

Forage acres per L.S.U. $= \frac{150}{98.4} = 1.52$

Dairy herd uses equivalent of	40 x 1.52	=	61 acres
Cattle rearing uses equivalent of	18.4 x 1.52	=	28 "
Sheep use equivalent of	40 x 1.52	=	61 "
			150

Having calculated the forage acres required for each enterprise, it is possible to budget or prophesy the effect on farm profit of any proposed changes in management, or grazing livestock enterprises.

The overall gross margin per forage acre is affected by:-

1. The gross margin per head of each grazing enterprise, e.g. per dairy cow, ewe, beef animal, fattening sheep etc.

2. Forage costs per acre.

3. Density of stocking.

Wide variations in the gross margin returns of each enterprise are found, but each enterprise varies within its own very definite range, and thus the type of enterprise, or combination of enterprises, has a very marked effect on the overall financial returns from grassland. Typical returns are shown below.

Dairying

In general, this is the most intensive way of converting grass to a saleable product. The two factors which generally have greatest effect on gross margin per cow are milk yield and level of concentrate use.

The following are margins that could be expected over a range of management systems:

	Traditional		Quality bulk-fed	
	Average herd	High yielding herd	Average herd	High yielding herd
Per Cow				
Gross output : Sales	£112	£140	£112	£140
Variable livestock costs	52	61	32	43
Margin	60	79	80	97
Variable forage costs	8	10	12	15
Gross Margin	52	69	68	82
	Gross Margin per Acre			
Forage acres per cow				
1.5	34.7	46	45.5	54.5
1.75	30.0	39.5	39.0	48.0
2.0	26.0	34.5	34.0	41.0

Some farms exceed the highest level of the scale, but some are <u>not</u> reaching the lowest.

Dairying gives the highest returns per acre from grassland, but it must also be remembered that it has the highest tenant's capital requirement and highest labour requirement, not only in the amount of labour, but in the need for reliable skilled labour. There are also special problems associated with a seven-day working week.

Sheep

Returns per acre are low, but return on tenant's capital is generally good. Sheep can be economically justified as convertors of grass to a saleable product on a traditional

system only where capital is limited or where natural conditions rule out most other farming systems.

Intensive forward creep-grazing systems can compare favourably with dairying, but these introduce wintering problems, unless additional acres are available for the winter or in-wintering is possible.

	£	
Gross output - wool and lamb sales	10	)
less ewe and ram depreciation	2	)
	8	) per ewe
Variable livestock costs	2	)
Margin	6	)

Variable forage costs - Fertiliser & Seed £3 per acre.
Gross margin depends on the ewes per acre as follows:-

Ewes per forage acre	Gross margin per acre £
3	15
4	21
5	27

With 1 ewe per acre there will be a gross margin of only £3 per acre.

Cattle Rearing and Fattening

Traditional cattle rearing or fattening, like sheep, has a low output per acre, and thus must be run on a low cost system.

Calculations produce gross margins within the following range:-

System	Gross margin (per forage acre)
Rearing dairy heifers to calving	£8 - £15
Single suckling	£10 - £20
Traditional rearing & fattening	£10 - £20
Multiple suckling	£20 - £30
Semi-intensive hay & concentrates	£25 - £30

Intensive systems such as those recently pioneered at Hurley and Leaths have given gross margins of £57 per acre.

Thus, by applying modern grassland management techniques to provide a plentiful supply of very highly digestible grass, and stock husbandry techniques to ensure a continuous satisfactory live-weight gain, it is possible for cattle and sheep rearing and fattening, to compare favourably with dairying in the profitable use of grass.

In conclusion, every endeavour must be made to manure and manage grassland to produce the optimum, not the maximum, amount of fodder, and then carry a high density of stocking to utilise it. At the same time, thought must be given to the economics of utilising it.

Although dairying and very intensive beef and fat lamb production generally produce the highest gross margin per acre, these systems also incur higher fixed costs, due mainly to labour, power and equipment costs. The fixed costs on a dairy farm are generally over £20 per acre, while those on a livestock rearing farm should be less than £12.

Where high fixed costs have been incurred, the intensive grazing livestock enterprises should be developed to maximum size, and the less intensive systems practised only as subsidiaries to make use of grassland which for a good practical reason cannot be used by the main enterprise.

On large farms with low fixed costs, grass can be profitably converted to a saleable product by less intensive methods which demand less capital investment and less management responsibilities.

No two farms are exactly alike. Even where land and grass swards are exactly similar, the acreage is likely to differ, and thus the ratio of acres to men and equipment must differ. The resources of capital and experience of farmers also differ widely. There is therefore no such place as the average farm, and each one must work out the policy best suited to the resources of the farm and the farmer. The gross margin technique is a valuable means to this end.

The following are factors suitable for converting various classes of livestock to L.S.U. (Live Stock Units).

	L.S.U.
Dairy cows	1
Beef cows	0.8
Other cattle over 2 yrs. old	0.8
Other cattle 1-2 yrs. old	0.6
Other cattle under 1 yr. old	0.4
Lowland ewes + lambs	0.2
Hill ewes + lambs	0.1
Rams	0.2
Other sheep	0.1

JUDGING GRASSLAND BY HERBAGE PRODUCTION

D. Reid
Hannah Dairy Research Institute

Methods for judging whether grassland is "good" or "bad" vary considerably in their complexity and in the accuracy of the answer they give. The criteria considered in this article are the quantity and quality of herbage produced by grassland. "Good" grassland in this context can be defined as grassland which gives a high total yield of herbage in a succession of few or many leafy, nutritious crops evenly spread over the season, and which maintains this performance in succeeding years. High-yielding grassland cannot be classified as "good" if the herbage is of low nutritive value or of low palatability, or if the seasonal production pattern is uneven.

Among the many drawbacks of this method is the difficulty of deciding exactly what level of yield can be considered as high. This has to be decided in relation to the expenditure on fertilizer applied to the grassland. Thus, the yield level considered as high on a sward receiving heavy dressings of nitrogen fertilizer will be considerably greater than the yield level regarded as high on a sward in which clover provides all the nitrogen necessary for herbage growth. As I.V. Hunt mentioned in his talk to the Central Scotland Grassland Society in January 1965 (see Greensward, No. 6, pp. 39-42) it should be possible to obtain 5 tons of herbage dry matter per acre using 150-200 units of nitrogen or about 2½ tons using clover only.

A second drawback to this method of judging grassland lies in deciding what is top quality herbage, since this will vary to some extent with the use being made of the herbage and with the class of livestock grazing it. For example, short leafy herbage with a high nutritive value and digestibility is required for fattening sheep, whereas a more mature herbage of lower nutritive value is preferable for store cattle.

Infrequent cutting or grazing, although giving a high total yield over the season, results in herbage of a lower nutritive value and digestibility. This is because the herbage is removed at an advanced stage of growth and because this type of management encourages stemmy grasses such as cocksfoot and depresses the leafy ryegrass and white clover. These effects are particularly marked with infrequent grazing since much of the herbage remains uneaten because it is trampled down or fouled. The end

result of infrequent defoliation is an open sward dominated by the taller grasses of lower nutritive value and digestibility, containing little or no fine-leaved grasses or clover, and of uneven appearance.

Defoliation, either by cutting or grazing, at too frequent intervals has the opposite effects reducing yield and increasing quality of the herbage. Such a management can cause an increase in the clover content of the sward, but if taken to an extreme and coupled with very close defoliation can lead to the more vigorous leafy grasses being replaced by unproductive plants such as annual meadow grass, bent and daisies.

Faulty systems of management must usually be contined over fairly long periods to have serious and irreversible effects on the sward. However, some practices can prejudice the production of the sward within a short period. An example of this is the practice of allowing a hay crop to become very mature before cutting. This can result in the loss of clover and the leafy grasses from the sward and the loss of any further herbage production from the sward in that season.

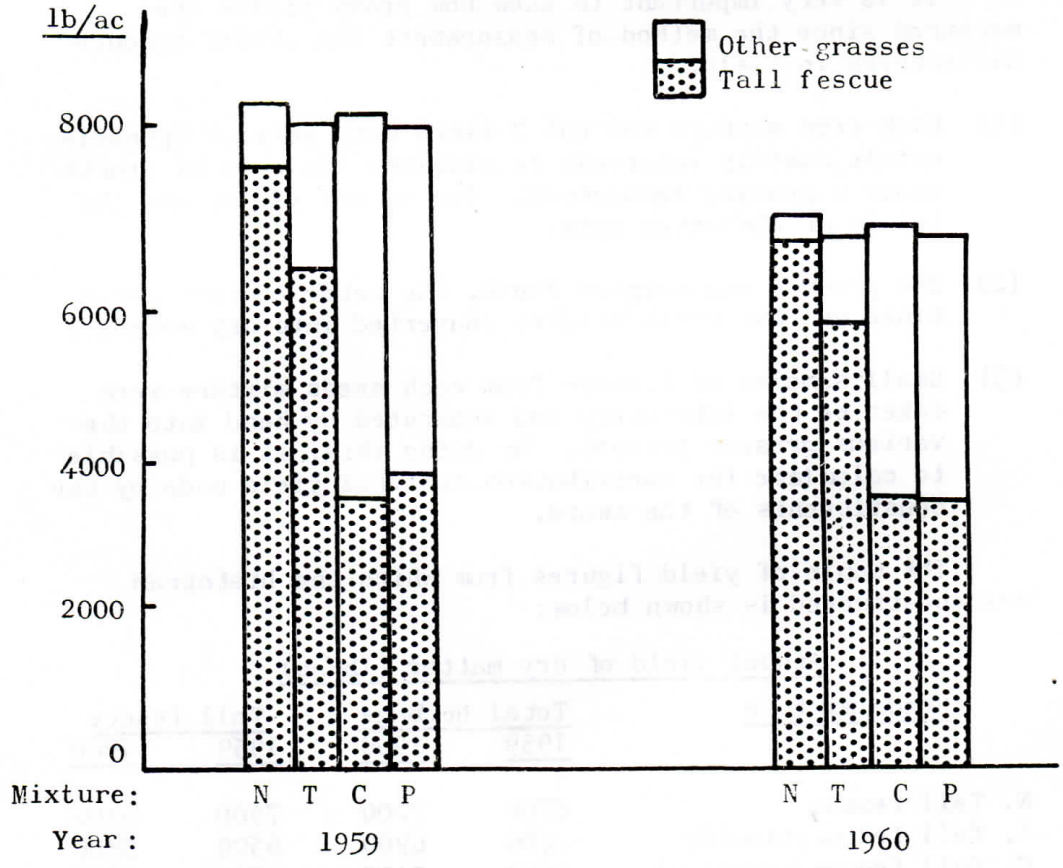
Probably the most important drawback to judging grassland on the basis of herbage production is that grass has really no value until it has been processed by the animal into some saleable commodity such as milk or meat. It is therefore essential to take into account not only herbage production but also the method of utilization, i.e. whether the herbage is cut or grazed and by what class of stock, and the standard of management applied to the grassland.

CHARTS AND DIAGRAMS No. 2

John Frame

In the previous issue of the Journal, the use of curves to show how the digestibility of grasses changed with advancing season was described. In this number, the use of histograms is discussed. Histograms are graphs in which information such as herbage yield figures, are represented by columns whose heights are in proportion to the yields. The diagrams shown below are taken from an experiment at Auchincruive to determine the effect of companion grass on the annual and seasonal yields of tall fescue swards and on the contribution of tall fescue to these yields.

Histogram 1 shows the annual yields of four tall fescue swards.



Mixture: N = Tall fescue
T = Tall fescue/timothy
C = Tall fescue/cocksfoot
P = Tall fescue/perennial ryegrass

The scales

Two scales are shown. The vertical scale at the left hand side shows the yields of dry matter from 0 to 8,000 lb/ac. The horizontal scale along the base of the diagram shows the managements etc. which are to be compared, namely, seeds mixtures and the years in which the yields were obtained.

The histogram

Four columns are drawn to represent the yields from the four seeds mixtures in 1959 and again in 1960. Each column is divided to show the proportions of the total annual yield derived from (a) tall fescue which is dotted and (b) other grasses, which is left plain.

Measurement of annual yield

It is very important to know how grass yields are measured since the method of measurement can itself produce differences in yield.

(1) Each seed mixture was cut 7 times each year at approximately monthly intervals to simulate the type of growth under a grazing management. The annual yields are the totals of the seven cuts.

(2) The produce was weighed fresh, the water content determined and the fresh weights converted into dry weights.

(3) Small samples of herbage from each seeds mixture were taken to the laboratory and separated by hand into the various grasses present. By doing this, it is possible to calculate the contribution to total yield made by the constituents of the sward.

The table of yield figures from which the histogram was constructed is shown below:

Annual yield of dry matter (lb/ac)

Seeds mixture	Total herbage		Tall fescue	
	1959	1960	1959	1960
N. Tall fescue	8700	7200	7900	6900
T. Tall fescue/timothy	3400	6900	6500	5800
C. Tall fescue/cocksfoot	8600	7100	3500	3500
P. Tall fescue/ryegrass	8400	7000	3800	3500

These figures tell the same story as the histogram but whereas it is necessary to peruse and study the figures to interpret their meaning, a clear idea can be obtained quickly from a brief look at the histogram. Where there are twice or thrice the number of seeds mixtures shown above, a table of figures would be even more difficult to follow and histograms become even more valuable. This is the reason why lecturers and writers of articles often use histograms to illustrate their results, e.g. comparisons of grass varieties, seeds mixtures and manurial treatments, etc.

Learning from the histogram

(1) The annual yields of total herbage for the four mixtures are similar in both 1959 and 1960.

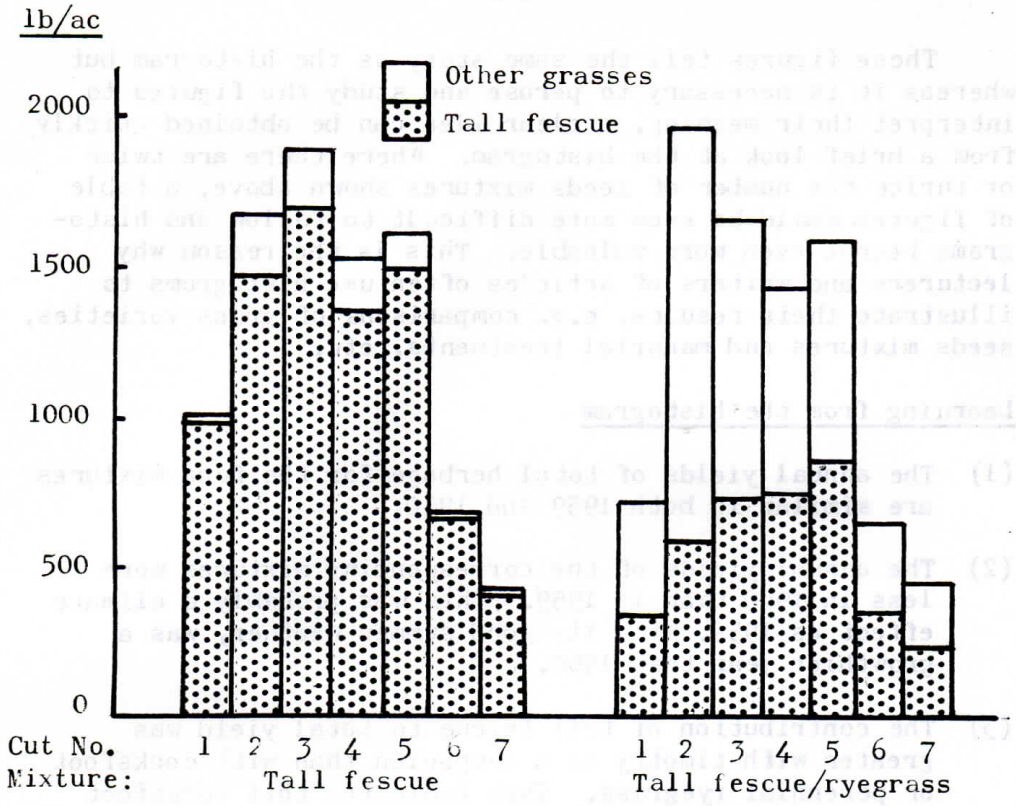
(2) The annual yields of the corresponding mixtures were less in 1960 than in 1959. This was probably a climate effect as 1959, with its good summer weather, was a growthier year than 1960.

(3) The contribution of tall fescue to total yield was greater with timothy as a companion than with cocksfoot or perennial ryegrass. This indicated that cocksfoot and perennial ryegrass were more aggressive than timothy.

(4) If a tall fescue dominant sward is needed because of its ability to provide early growth, then cocksfoot and perennial ryegrass are unsuitable for sowing in the same mixture. They are so aggressive that they make up 50% of the total produce and prevent a characteristic tall fescue sward from developing. Timothy, as illustrated by the histogram is on the other hand, eminently suitable as a companion grass because it does not compete strongly.

Seasonal growth

The seasonal growth of two of the seeds mixtures in 1959 is shown in Histogram 2. The vertical scale shows the yields of dry matter from 0-2,000 lb/ac. The horizontal scale shows the type of mixture and the cut number from No. 1 cut on April 20th and at monthly intervals to No. 7 cut at the end of the season on October 26th.



Learning from the histogram

(1) At cut 1, the tall fescue sward yielded more than the tall fescue/ryegrass mixture. The presence of aggressive perennial ryegrass has checked the ability of tall fescue to produce early growth.

(2) At cut 2, the position was reversed with ryegrass coming into its period of peak growth.

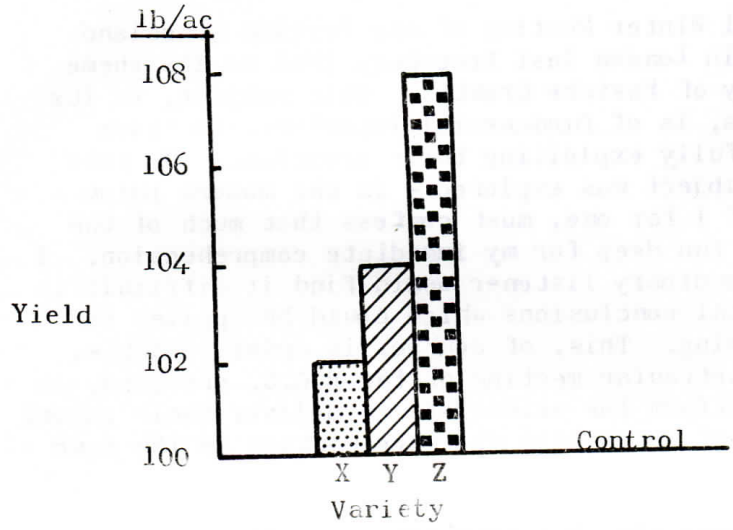
(3) The tall fescue sward yielded more in mid-season illustrating its ability for continuous mid-summer growth. Ryegrass tends to slump in mid season and the ryegrass/tall fescue sward did the same.

(4) The autumn yields of the two swards were essentially similar.

(5) At each cut, tall fescue made up only 40-50% of the total herbage in the tall fescue/ryegrass mixture compared with 85-95% in the pure sward.

Warning note

Care must be taken when looking at diagrams based on histograms to look closely at the scale. Sometimes, unscrupulous workers and lecturers show only part of the scale and the wrong impression is conveyed. Histogram 3 illustrates this point. Yields are given relative to a control of 100 and only the tops of the rectangles are shown, thus exaggerating the scale which should of course read from 0-108.



A glance at the histogram would give the impression that variety Y has yielded twice as much as variety X and similarly, variety Z has yielded twice as much as variety Y and four times as much as variety X. In actual fact, there is very little difference between the varities. Variety X is 2% greater than the control, variety Y, 4% and variety Z, 8%.

Complete accounts of this experiment have been published as follows:

(1) Frame, J. (1962). The effect of seed rate and companion grass on the establishment and yield of tall fescue. Experimental Record No. 5.

(2) Frame, J. and Hunt, I.V. (1964). The effect of companion grass and seed rate on the productivity of a tall fescue sward. J. Br. Grassland Soc., Vol. 19, pp.330-5.

Copies are available for interested readers on request to the Grassland Husbandry Department, West of Scotland Agricultural College, Auchincruive, Ayr.

On Tour

THE PHYSIOLOGY OF PASTURE GROWTH

Report of the 1964 Winter meeting of the British Grassland Society

by Derek M. Tough
Conniven, Kirkgunzeon, by Dumfries

The Annual Winter Meeting of the British Grassland Society, held in London last December, took as its theme "The Physiology of Pasture Growth". This subject, in its various aspects, is of fundamental importance to those interested in fully exploiting their grassland. On this occasion the subject was explored - in the modern idiom - "in depth", and I for one, must confess that much of the discussion was too deep for my immediate comprehension. I felt that the ordinary listener would find it difficult to extract practical conclusions which could be applied to day-to-day farming. This, of course, is understandable, because this particular meeting of the B.G.S. provided, in the main, a platform for scientists to deliver their papers to an audience of scientists who were working in the same field.

One came away with two impressions:- first, the wide gulf, in both approach and technology, that exists between basic research and practical farming, and second, the vast amount of work and time necessary to draw out from experimental conclusions, practical applications which will hold good through repeated trials and demonstrations and then, still yield significant advantages in the hands of a variety of farming skills.

Climate and plant growth

The first paper given by Mr. Roy Hughes, of the Welsh Plant Breeding Station, Aberystwyth, was entitled "Climatic factors in relation to growth and survival of pasture plants". In it Mr. Hughes stressed the importance of climatic environment at sward level, and how the effect of this very local climate is often more significant than the general climatic conditions. To illustrate this point, an example was given of a sward, part of which was grazed hard in September, and the remainder similarly grazed in December. The most rapid recovery in the following spring was in the September-grazed area. The poorer capacity to tiller in the December-grazed area was due to the loss of the protective canopy

when it was most needed. The close grazing of pastures in the winter can, therefore, retard growth in the spring.

Referring to the adaptation of plants to their climate, Mr. Hughes made the interesting point that Perennial Ryegrass seed produced in a Mediterranean climate produced a less hardy sward in this country than that sown from seed harvested locally.

Carbohydrate reserves

Professor F.L. Milthorpe and Dr. J.L. Davidson, both of the School of Agriculture of the University of Nottingham provided the next paper on "The significance of carbohydrate reserves in the regrowth of cocksfoot".

These workers showed that the reserve materials in a grass plant are reduced as growth takes place, although carbohydrate reserves may still be high at the time of defoliation if growth rate has been slow. These reserve materials consist of a large group of compounds, including proteins as well as carbohydrates, and it can be shown that the breakdown of protein material is as important as the carbohydrate reserves for the plant's regrowth.

Under conditions of stress, e.g. after cutting or grazing, the plant's root system suffers the main nutrient loss. A large root system does not necessarily give a vigorous recovery because the root requires more nutrients to sustain transpiration than it holds in reserve. Reserves in the leaf base will then be drawn upon. Recovery is therefore dependent on rapid photo-synthesis in the young growing leaves.

These studies are of importance in defining a system of grazing and cutting management which will give the optimum regrowth after the defoliation of a pasture. The practice of manuring grassland in autumn with nitrogen was thought to be useful in building up the plant's reserve materials and thereby aiding winter survival.

Pasture death and decay

The third paper, "Some implications of death and decay in pasture production", was given by Mr. L.A. Hunt of the Welsh Plant Breeding Station, Aberystwyth, who discussed the importance of senescence in the life cycle of the grass plant, and how plant death influences the productive capacity of pastures.

A proportion of all growing swards is in a state of decay and the amount of this material increases as the pasture grows higher and light losses to the lower leaves increase. This loss of plant material by decay and senescence can be restricted, for instance, by frequent cutting. Indeed the object of good grassland management is to achieve the optimum balance between loss of dry matter by decay and gain by photosynthesis.

Growth in Summer

Mr. R.C. Anslow of the Grassland Research Institute, Hurley, in his paper "Grass growth in midsummer", set out to explain the lower rate of herbage production found at this period compared with growth in late spring.

The experiments to measure the rate of herbage production per day were done on pastures given regular and equal applications of nitrogen, the soil moisture was maintained at an optimum level and cutting was carried out after similar recovery periods throughout the season May-September. Timothy showed the most marked depression of growth in June compared with other varieties. The loss of leaf by cutting is itself a factor in reducing growth rate, and plants also put out fewer tillers as they approach the reproductive phase. Thus, even with abundant nitrogen and water, rates of herbage production are lower in midsummer than in late spring and changes in tiller form and sward structure may be important considerations.

Grazing management

Dr. C.R.W. Spedding also of the Grassland Research Institute, presented, in a racy and most entertaining style, his paper on "The physiological basis of grazing management".

In defining the objective of grazing management, Dr. Spedding distinguished between the maximum herbage output per acre and the maximum animal output per acre. Similar results in terms of herbage output should be found both under a cutting regime and under intermittent grazing. In set stocking, however, there is no direct relationship between the weight of herbage available and nutrient intake. The latter is greatly affected by the selectivity of the grazing stock.

In an experiment at Hurley, two similar groups of worm-free lambs were put on two pastures providing either

5,000 lb dry matter/acre or 2,500 lb dry matter/acre and the herbage on both pastures had the same estimated digestibility. The 2,500 lb sward provided more than the lambs nutrient requirements for optimum growth rate, but the lambs actually did better on the 5,000 lb sward where they were literally wading in grass. This was due to the ease with which the lambs could select their food requirements.

Dr. Spedding also made the point that set-stocking did not necessarily lack the advantages of rotational grazing (i.e. where defoliation alternates with a rest period), because individual plants within a set stocking system are, quite possibly, rotationally grazed. Different systems of management might, therefore, have either different or similar effects on plant and animal growth, depending on grazing pressure. This must be borne in mind in interpreting trials which set out to compare such systems.

On Tour

B.G.S. SUMMER TOUR 1965

Tuesday, 20th July

by T.R. Clark

Watson Hill is a windy place, 350 feet up, near the West Cumberland Coast at Egremont. Here Edwin Bushby, owner and Host Vice President, got the tour off to a good start with a demonstration of his system of farming which was a model of simplicity and calculated industry. With 124 acres, all in grass, 3 men and 96 Friesian 'bed and breakfast' giving him gross receipts approaching £15,000, Mr. Bushby's methods were very convincing.

At Watson Hill, the grass is mainly Timothy Meadow Fescue with some Italian for the shorter term. The fertiliser application, massive by some standards, have averaged 255 N, 41 P and 95 K over the past 4 years. The purchased feed just under 2 lb/gal. The silage, 900 tons in two cuts (wilted this year) goes entirely to the cows calving July-September, no followers are kept and all calves are off the farm within the week. Replacement stock, about 25 a year, are bought locally. The A.I. service is used. Apart from 120 hoggs taken each autumn for wintering, the only sideline is 7,000 hens in batteries.

After a walk round part of the farm, the 200 present were obviously very impressed with this strikingly simple and efficient enterprise, the questions were few and none critical. Among Mr. Bushby's replies may be quoted - on grass mixtures 'I put the clover in to keep the seed merchant happy' - on slurry from the poultry 'causes burning, I would rather give it away' - and on his Philosophy 'just trying to make a living'.

After an excellent lunch at Workington we turned east again to 159 acre Hartlaw Farm, Silloth, owned and occupied by Mr. R.J.W. Slack. Here again was a story of intensive management though more diverse and conventional than that viewed in the morning. 60 byre milked Ayrshires, 50 followers (some summered away), 60 cross Suffolk ewes, about 50 acres of grain and 19 of potatoes, 1300 battery hens and 10,000 broilers. The cows receive no concentrates after 1st May and graze 1 acre paddocks enlarged to 2 as the season progresses. Silage and hay produce maintenance + 1 in winter. Mr. Slack and his 2 men achieve a gross output of £101 per acre.

Hartlaw Farm 8 feet above sea level and very flat is alluvial silt. The leys are principally ryegrass/timothy mixtures, direct re-seeded in August, replacing the previous systems of seeding after harvest, a method which, while successful tended to give poor results in the first year. Fertiliser application is around the 200 N/acre mark.

After a walk round, the Company retired to the Broiler House to hear a description and discussion of W.C.F.'s Livestock Marketing systems. Principal interest to the gathering were the calf rearing scheme and the contract rearing of dairy heifers by marginal farmers from more intensive dairymen like Messrs. Bushby and Slack.

After tea on to Burgh by Sands to see the famous Cumberland Sea washed turf produced by Messrs. Donald Ireland Ltd., described as probably the best quality turf obtainable in this country, it is in considerable demand for bowling and golf greens and ornamental lawns. The turf is cut from marshes several thousand acres in extent and requires mowing, fertilising and spraying for up to 2 years prior to removal. The cut area is left to recover naturally and can normally be cut again after a period of 10 years. The grasses remaining in the turf after treatment are mainly fine leaved fescues and bent. A demonstration of the equipment both mechanical and hand was given and samples of the various qualities of turf were on display.

This little known by-way of grassland activity made an interesting diversion before the party returned to Carlisle and a very welcome dinner as guests of the Cumberland & Westmorland Grassland Society.

Editor's Note

Tom Clark was one of our Society's delegates to the British Grassland Society's Summer Tour, July 1965 centred on Carlisle. See Greensward No. 6 page 33 for Tom Clark's views on haymaking and this number of the journal page 39 for his grazing system.

On Tour

B.G.S. SUMMER TOUR 1965

Wednesday, 21st July

BEEF CATTLE ENTERPRISES

by Dr. A. Kellie Brooke

The first enterprise visited was the Beef Farm of Lowther Park Farms, which are farms in hand on the Earl of Lonsdale's Estates. This farm was originally a large park, which carried a herd of red deer. During the war, it was requisitioned and used as a tank training area.

It extends to 2100 acres, and is situated from 600 to 1200 feet above sea level. Higher up, the soil is very thin over limestone, becoming heavy clay as it passes into the stoney sharper ground lower down. As can be imagined, this land was devastated by the tanks during the war. After the cessation of hostilities, the Agricultural Executive Committee took over the land with a view to repairing the damage of the war years. Some areas are beyond reclamation, due to the erosion of soil by the action of mechanised vehicle tracks and the weather in places where the soil covering was thin. Elsewhere a programme of levelling and reseeding was instituted where possible. In 1950, the land was handed back to the estate, and classified as eligible for the Hill Cow Subsidy and Livestock Rearing Scheme. Fences have been erected, roads made, dutch barns and cattle shelters have been built. Where necessary, drainage schemes have been carried out.

The aim is to be selfsupporting as far as possible. 200 acres of silage and 200 acres of hay being cut each year. The leys are sown down for 10 years. The grass mixture used is a Cockle Park Mixture of the following specification: 18 lb. Ryegrass, 8 lb. Cocksfoot, 6 lb. Timothy, 1½ lb. Red Clover and 2 lb. Wild White Clover totalling 35½ lb/acre. Direct reseeding was carried out in earlier years but now about 30 acres of oats are undersown and combine harvested. Barley is also grown and about 30 acres of roots for fattening lambs.

Creeping thistle which, it is suggested, might have been aggravated by poaching in spring is being controlled by crushing or spraying. 1000 North Country Cheviots are kept, half being put to the North Country Cheviot ram and half to the Border Leicester to produce Half Breds.

Last year, of 337 cows put to the bull, 303 calved from the second week in December onwards. The calves are sold off their mothers at the autumn sales. The previous year, 27 calves averaged £47:12:0.

In addition to this stocking, 250 cattle are taken in for 20 weeks summer grazing. The cattle are Blue Greys and Hereford Shorthorn crosses, which are put to the Hereford or Aberdeen Angus bull respectively. It has been decided that Blue Greys will be purchased in south west Scotland for all replacements or expansion, since the Hereford x Blue Grey cross makes £5 per head more.

At this altitude and with a rainfall of 45-50 inches per annum grass is late and there is considerable poaching. A shed, 270 feet x 90 feet, for 240 cattle is to be erected with a central passage wide enough to take a tractor and flanked by feed troughs. Straw for litter will be purchased but this will provide large quantities of farm yard manure which will build up the fertility of the land.

Out-wintered cows receive 60-70 lb. silage plus 12 lb. hay daily, and magnesium rich minerals ad lib. There has been no hypomagnesaemia during the past five years.

The success of the venture is shown by the fact that the Department of Agriculture have decided that 40% of the holding is now no longer eligible for the Hill Cow Subsidy. It was stated that the gross margin per cow worked out at £54; while the interest on owner's and tenants capital was around 15%.

It is proposed to increase the herd to 450 cows and the ewe flock to 1250 entailing further improvements of reclaimed land.

In the afternoon, the society visited the Hill Farm Unit of the Cumberland and Westmorland Farm School at Newton Rigg.

This is a typical fell farm. It consists of 200 acres of enclosed land and common grazing rights on the fell rising to 2300 feet. The annual rainfall is about 60 inches. The stocking is 500 Swaledales crossed with the Blue Faced Leicester Tup and 30 Blue Greys which are crossed with the Hereford bull and produce single suckled calves. With the heavy rainfall, there are lime and phosphate deficiencies which are replaced by heavy applications of low grade basic slag. Complete fertiliser is used for permanent meadows and newly reseed ground.

On Tour

DRAYTON EXPERIMENTAL HUSBANDRY FARM

Vital Statistics

Location: 3 miles east of Stratford-on-Avon, Warwickshire.

Acreage: 469. Soil: Stiff clay with plenty of natural lime and potash. Rainfall: 24".

Director: R. Bee (up to 1964 S. Culpin).

History: From 1940 to 1955 this was the Grassland Improvement Station, presided over by Sir George Stapledon. Heavy bramble-covered poor permanent grass was a challenge to Sir George and his research team, many of whom are now at Hurley, Nr. Maidenhead under Dr. Woodford.

Cropping 1965: Leys 218; Spring wheat 32; Permanent grass 11; Spring oats 2; Winter wheat 141; Spring barley 18; Winter oats 11; Beans 7.

Livestock - Cattle: The aim is to rear 120 Hereford X Friesian bullocks half autumn and half spring born calves.

Sheep: 360 Scottish and Welsh half-bred ewes crossed with Suffolk rams for fat lamb production.

Features of Special Interest

Yields of arable crops. In 1964, 133 acres of winter wheat averaged 41.3 cwt grain/acre. Spring wheat averaged 37.6 cwt, barley gave 38.5 cwt and spring oats 32.5 cwt. Winter beans gave 35.4 cwt/acre by combine harvester. In variety trials, three varieties of winter beans gave over 52 cwt/acre. This is of no direct grassland significance but when one compares cash return from arable at £50/acre and grass at £25/acre it will be realised why increased output from grass is a main theme of this station.

Vacuum silage. Experiments in hay and silage-making have formed a large part of the work, so it was natural that Drayton should be well off the mark in gaining experience of this new method of silage making.

The method originated in New Zealand, first by J. Doutre and later by Jowsey. The basis is two polythene sheets, one below the silage and the other as a cover over the top.

When full the two are sealed and all the air drawn out with a vacuum pump. This results in a tight consolidated mass of herbage which produces silage with considerably less waste than any other method. The two advantages of the method are (a) that no consolidation is necessary and (b) the low loss of feeding value of only 5% instead of the normal 25-50%.

From Drayton experience and our own observations there appear to be one or two disadvantages as follows:

(a) High cost of polythene sheet and sealing strip, especially as it will not last more than one occasion.

(b) The thin polythene sheet seems easily torn when ballooned out with CO_2 gas as always occurs a day or so after sealing, especially by birds or cats crawling over it.

(c) Difficulties in self-feeding and the possibility of stock eating the polythene sheeting.

No doubt these will be overcome, the cost of the sealing strip could fall from 4/6d/foot as at present down to nearer 6d. Butyl-rubber sheeting seemed more permanent but was also heavy and expensive. The idea is a "break-through" and most of us can sit back and wait for the "inventive ones" to set about smoothing out difficulties.

Nitrogen manuring for meat production. If grass output is to compete with cereal output, there must be a big increase not only in yield of grass but in yield of meat from that grass. Nitrogen will readily raise grass yields but it has never been easy to show increased meat production (extra stores yes but not finished cattle).

Four fields totalling 64.5 acres are devoted to comparing three systems:-

Code No.	Manuring	Livestock rate per 21.5 acres
N_0	No nitrogen	8 bullocks and 24 ewes
N_1	80 units nitrogen/ acre/year	10 bullocks and 30 ewes
N_2	160 units nitrogen/ acre/year	12 bullocks and 36 ewes

Each flock of ewes is self-contained, remaining on their own

area all their lives. The bullocks are put into the experiment as yearlings in the spring and are fattened in yards during the following winter. Each lot of livestock lives on hay from its own area. Some 'bought-in' concentrate is used as supplement for the bullocks. Some 1964 results are set out below:-

	Treatment (units N/acre)		
	None	80	160
Sheep			
Ewes	24	30	36
Lambs sold fat or stores	39	52	58
% lambs sold fat	98	87	78
Liveweight gain/acre as lamb	140	173	196
Cattle			
Bullocks	8	10	12
Liveweight/head 21st April	687	685	682
Liveweight/head 16th Sept.	985	1012	977
Liveweight gain/head /day	2.01 lb	2.21 lb.	2.00 lb.
Liveweight gain/acre	111	152	165
Fodder			
Acreage cut	9.1	10.8	12.2
Cwt/acre	27.4	24.8	33.5
Tons/21.5 acres	12.5	13.4	20.4

The general conclusions so far are that the 80 units of nitrogen seem financially worthwhile, but the difference between 80 and 160 units not. In future years, the top nitrogen level is to be raised to 240 units to see if there is any further improvement. The level of output achieved was rather disappointing and will have to be considerably improved.

There are a number of possibilities. So far the ratio of bullocks to sheep (1:3) has been the same but more sheep per bullock may be advisable at the higher levels of nitrogen.

The fertiliser nitrogen was applied to the grass in 4 equal doses. A different distribution may be more efficient.

Other interesting trials are in progress but space does not allow more than a mention of their titles.

Continuous wheat growing.

Wilting for silage.

Hay conditioning machinery.

Barn drying.

Comparison of feeding value of silage and barn dried hay.

Comparison of various fodder/concentrate systems on beef production.

In-wintering of sheep.

Effect of resting pastures in winter (from sheep).

Studies of calf housing, bedding, ventilation and supplementary heating.

Farmers interested can obtain free copies of the Annual Report and Farm Guides on writing to the Director, Drayton Experimental Husbandry Farm, Alcester Farm, Stratford-on-Avon, Warwickshire.

I.V. HUNT (visited 30th May, 1965).

EXPERIMENTAL HUSBANDRY FARMS

The National Agricultural Advisory Service (equivalent to our College Advisory Services) in England and Wales run 12 farms similar to Drayton, each one set up to study some special regional system of farming. Those in addition to Drayton (Warwickshire) and Liscombe (Devon) described in this journal which would have a direct appeal to our members would be as follows:-

1. Bridgets Farm, Martyr Worthy, Winchester, Hampshire.
   1035 acres mixed farming with a rainfall of 30"/year.

2. Great House Farm, Helmshore, Rossendale, Lancashire.
   460 acres at 700-1200 ft. on poor heathy soil with a rainfall of 50"/year. The director has a high regard for permanent grass.

3. Pwhlpeiran Farm, Cwmystwyth, Aberystwyth.
   3000 acres hill farm rising to 2100 ft. with a 60" rainfall.

4. Trawscoed, Aberystwyth.
   808 acres of somewhat better lower land with a rainfall of 45".

Reports and guides to these farms can be obtained by writing to the Directors.

On Tour

LISCOMBE EXPERIMENTAL HUSBANDRY FARM, SOMERSET

Liscombe farm in the Exmoor National Park lies at an altitude of 800-1,250 feet, and with an average rainfall of almost 60 inches per year it has problems similar to those faced by many hill farms in S.W. Scotland. No arable crops are grown on the 495 acres and the farm policy is to obtain maximum economic production from grassland. This is being done by liming, wise use of fertilisers and heavier stocking. The area in leys amounts to 285 acres and these are left down as long as they remain productive. Many of the original mixtures sown 8 years ago with persistent varieties still contain a high proportion of the original species. To assist spring growth, a proportion of the grassland is dressed with 40-60 lb of nitrogen fertilizer per acre in March or April and extra nitrogen may be applied later. The phosphate status of the soil is low and about 10 cwt of basic slag per acre is applied every 3 years. There is also a response to potash fertilizer. Total applications of fertilizer per acre are two or three times higher than the average for the adjoining area and this is no doubt one reason for the excellent swards of grass and clover to be seen at Liscombe at 1,000 feet and even higher.

Calves at grass

A particularly interesting and successful system of rearing calves at grass is now practised. Calves are purchased direct from local farms at about 7 days of age and reared on an early weaning system when they will eat about 2 cwt of an early weaning concentrate. The calves remain indoors until adequate grass is available and the weather improves and are then put on high-quality grazing. The stocking rate is about 4 calves per acre over 4 or 6 main paddocks and between 800 and 1,000 lb of liveweight gain plus 2-3 tons of silage per acre are being achieved at an altitude of 1,000 feet. No supplements are given and between May and September a liveweight gain of 2 lb per day can be achieved. The ley used must be free from cattle the previous year but no husk vaccine is required, and it seems a wise policy to grow cheap disease-free grass instead of paying for vaccines.

A 3-year experiment indicated that if sufficient good quality grass was available, the feeding of 2½ lb of rolled barley per day had no effect. The calves are eventually fed silage in the following winter and are sold at 14-16 months of age.

It has been found that the early-weaned calves will eat about 10 lb more silage per day during the winter than comparable single-suckled calves, and this is attributed to the rumen in the early-weaned calves being better adapted for a diet of roughage.

The system is returning a Gross Margin of £50 per acre and it would seem possible that this could be increased to £70 per acre in the near future by growing more grass and improving the utilization of the grass. Fertilizer costs may reach £14 per acre but this is money well spent.

Sheep intensification

Other work is being done on intensive sheep management but as yet the Gross Margin per acre is far below that from the cattle. The general sheep policy is somewhat influenced by the fact that grazing rights on surrounding hills go with the farm but one is hopeful that the success achieved with the cattle can be repeated in due time with the sheep. The present success of Liscombe is due largely to a wise and efficient use of grass and clearly indicates how this crop can profitably increase production on cold, wet and high land.

M.E. Castle

On Tour

HENLEY MANOR FARM, CREWHERNE, SOMERSET

Henley Manor Farm is one of a number of farms run by I.C.I. Ltd. to provide their own staff and the world at large with facts and figures about fertiliser usage. The nearest of such farms to our Grassland Societies is Leaths, Castle Douglas. Another almost as well-known is Dairy House, Northwich, Cheshire.

Henley Manor came to our notice a year or two ago when the report on their nitrogen versus no nitrogen farmlets was published (see Journal No. 2 page 26). 51 acres was established as a nitrogen 'farmlet' under the name of 'Seaborough', whilst 52½ acres, the no nitrogen farmlet was named Wensley.

This experiment was terminated in July 1963, and replaced by one which aims to measure the profitability of intensification of beef from grass.

Seaborough

51 acres as a one-man unit given the equivalent of 13 cwt/acre nitrochalk in 1964 carries 44 cows which will be increased to 50.

Wensley

52½ acres (former no nitrogen) now carries 36 suckler cows and calves plus 20 heifers. It is hoped to reach about 1½ cow equivalents per acre. It is early days yet but the objective is to clear £50/acre gross margin.

10-12 cwt nitrochalk/acre are used on the grass which is set out into 16 paddocks with a forward creep grazing system for the calves. Calves are Hereford X Friesian crosses born in December/February. Self feed silage is provided for the cows and creep feed for the calves.

Henley Manor.

The rest of the farm of 225 acres carries 105 Ayrshires and 90 followers. The grass on this part of the farm is given 215 units N/acre plus 50 units phosphate and 57 units potash. 1,200 tons of silage were made in 1964 using a Kidd Rotoflail forage harvester fitted with a deflector to cut and wilt the herbage. A Lundell was used to pick it up.

Interesting Features

Use of powdered calcined magnesite. One method of counteracting grass staggers is to top dress the sward. The old idea was to put the magnesium on to the soil, expecting the herbage to take it up through its root system. To achieve a worthwhile effect probably 10 cwt/acre Kieserite (Crude Epsom Salts) might be needed. The new idea demonstrated was to apply the 50 lb/acre fine powdered calcined magnesite costing 14/- per acre to grass when wet with dew. This forms a rainproof film on the grass quite sufficient to prevent staggers without affecting the palatability of the herbage.
(Lord Rowallan has been using a better method for many years on the Home Farm, Rowallan, namely spraying a solution of Crude Epsom Salts (28 lb/acre) onto grass at a cost of 7/- per acre).

Portable Cubicles

Very cheaply constructed cubicles which could be moved around using Railway sleepers set on edge and iron tubing looked useful for a farmer who wanted to expand a cubicle system or try it out on a temporary basis. Plans and measurements could no doubt be obtained for anyone interested.

'Tombstone' feeders.

These were strongly constructed silage face barriers which looked rather like a row of tombstones. They appeared to be very effective but readers should read what some Ulster farmers think of them (p.64).

I.V. Hunt

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On Tour

NORTH WYKE EXPERIMENTAL STATION, DEVON

A soil of medium heavy clay and an average rainfall of just over 40 inches per year in central Devon which means that cattle must be housed for between 160 and 170 days each winter are background features under which Fisons Fertilizers Ltd. conduct their grassland research work. These conditions are, however, typical of many acres in the west of Great Britain and the results from North Wyke could have a wide significance in grassland farming.

The farm and dairy herd

The commercial area of the farm, about 230 acres, consists entirely of grassland with the stress laid on long leys of either timothy, meadow-fescue and white clover, or ryegrass, timothy and white clover. The system of grassland management is flexible and each field is cut at least once per year in addition to providing grazing. Silage forms the major part of the winter ration of the cattle and 500-600 tons are made each year. It is normally wilted and picked up with a forage harvester. The farm has three principal livestock enterprises, dairying provides the principal source of income, but fat lamb production and beef production are expanding.

For the visitor from Ayr it is a delight to see the fine herd of Ayrshires which have an average production per cow of about 900 gallons. Concentrates are used efficiently and in 1964-65 the average weight fed was only 1.97 lb/gallon. Total milk solids averaged 12.83% and the margin between milk sales and concentrate costs was £99.8 per cow.

Beef production

The intensive beef enterprise relies on a spring and autumn purchase of Friesian and Friesian cross calves. The February-purchased calves are reared indoors on a milk supplement and weaned when weather conditions allow the calves to be put out to grass. This occurs about 10 weeks after purchase and concentrate feeding then stops. The calves are kept on an all-grass diet until November when they are housed again. Calves weighing over 550 lb are fed silage ad lib with up to 7 lb barley and 1 lb protein cake per day and sold fat in April. The calves under 550 lb are also fed silage but only 2-3 lb barley and are fattened at grass the following summer. The average selling price for

the 1963 Spring born cattle was £81.8 for animals aged 13-18 months plus £9.3 calf subsidy.

Autumn calves have a ration of ad lib silage plus 5 lb of rearing nuts during their first winter; they receive grass only during the summer, and are finally yarded and finished on a ration of silage and 8 lb barley.

Grazing management

The management is intensive and on most of the grass and clover fields three dressings of a high-nitrogen compound are applied; one in March, one in May and one in July.

Grazing management for all classes of stock is based on a rotational system. The dairy herd is strip-grazed throughout the season, and this form of control is preferred to paddock-grazing since less damage is done to the sward by poaching. With small paddocks under wet conditions the sward could soon be severely damaged as could be seen around the farm gateways. Calves are grazed on worm-free pastures, either new leys or leys on which no adult cattle have grazed for the preceeding 12 months.

Experimental work

The experimental work is planned to investigate the response of grassland to fertilizer particularly under grazing conditions. Since nitrogen is the greatest single factor limiting grassland production in Great Britain, this nutrient is receiving particular attention. The role of clover in grassland is under intensive study and it is reassuring to learn that the contribution which clover can make to increased yield is evident even when 180 lb of fertilizer nitrogen per acre are applied. In some years clover was found to be equivalent to a dressing of almost 200 lb of fertilizer nitrogen per acre.

The place of phosphate and potash in the fertilizer programme is also being actively investigated. The value of phosphate returned to the soil in animal excreta is questionable and so far none of the results have indicated any immediate response to the phosphate in dung. It is inferred therefore that in the short term phosphate requirements are largely unaffected by the system of grassland management, i.e. whether the herbage is cut or grazed.

Grass can readily take up applied potash and it would seem that, because ofthis, a single heavy dressing of

potash could be wasteful. Experiments indicate the desirability of limiting the amount of potash applied at any one time.

At North Wyke, there is sound proof, experimental and practical, to demonstrate the value of grassland for profitable livestock husbandry on a heavy wet clay soil.

M.E. Castle

GRAZING MANAGEMENT

Meeting of South West Scotland Grassland Society in the Lesser Town Hall, Castle Douglas, 16th February, 1965 at 7.30p.m.

Four speakers, all members of the Society, opened this most successful discussion evening in Castle Douglas.

Hill improvement

The opening speaker, Dr. A.K. Brooke, Blackcraig, Newton Stewart, a breeder of pedigree Galloways, drew attention to the fact that wages now account for 40-45% of the expenditure on hill farms and thus systems of management will have to be found to increase production from the hills with no increase in labour costs. The use of improved types of sprung fences was suggested but possibly the most important thing was to improve the grazing on the hills. Examples were given of reseeding up to 1,500 feet above sea level but an important point was that a balance must be struck between the various types of plant communities on the hill so that the stock have access to some plants throughout the entire year. Sheep select feed with a low fibre and a high moisture content and this can be encouraged by applying 3 tons of ground limestone plus 1 ton of low-grade slag per acre. Where seeds were sown it had been found an advantage to hand-feed the stock on the improved area so that the seed was firmly trampled into the ground. There was still much to be said for cocksfoot on poor hill ground and even Yorkshire Fog was being sown by the Forestry Commission in firebreaks and was providing good grazing for stock. Asked about the incidence of sway-back on improved upland Dr. Brooke stated that he had had only one definite case and two suspected. Sway-back was not a problem. Clearly surface seeding and applications of lime and slag can effect great improvements on the hills but this must be coupled with efficient grazing practices using both sheep and hardy cattle.

Strip grazing

This important aspect of grazing management was dealt with by Mr. J.M.L. Milligan, Culvennan, Castle Douglas who summed up his attitude in the one word "control". He had little or no time for small paddocks because of forage harvesting problems and the necessity for long lengths of fencing and had chosen strip grazing as the system for his farm.

His aim was to provide a fresh bite of grass for his cattle each day in order to obtain a steady milk yield without any large day-to-day variations. Strip grazing achieved this, especially if a back fence was used. His electric fence was moved twice daily and this was stated to be a simple job since fencing wire and fencing equipment was now so light and easy to handle.

At any one time two fields were in use. A night field near home which was normally sown with a short term seeds mixture of ryegrass and a day field further from the steading in which timothy and meadow fescue were predominant. The success of this speaker's grazing management was indicated by his production of about 500 gallons of milk per acre from a herd of approximately 70 cows and this output will certainly increase.

Topping the grassland was not favoured by this speaker but the careful integration of silage-making with grazing was strongly advocated. Perhaps the success of this farm was due to the wise use of nitrogen, about 200 units per acre are used annually, and the strict control of herbage growth by the animals and the forage harvester.

Paddock grazing

Another farmer speaker, Mr. Tom Clark, Newmains, Kirkbean, operates a system of paddock grazing for his herd of 100 milking cows. His farm of 256 acres has approximately 90 acres under potatoes and cereals, 25 acres for hay and the remaining 140-145 acres for grazing. No silage was made and no sheep were kept on the farm. To enable efficient grazing management to be practised, the fields were divided into paddocks varying in size from 8 to 10 acres. Throughout the summer between 11 and 14 paddocks were in use. Separate paddocks were used for day and night grazing and in early spring the herd was in each paddock for only 2 or 3 days. In contrast to the previous speaker, Mr. Clark tops his pastures at least three times per year with a Hayter Mower set to a height of about 4 inches above soil level. The speaker claimed that at this height the dung was not disturbed and the herbage was left in a clean and palatable condition.

On average about 55/- per acre was spent on fertilizers each year and the grazing system had the merits of simplicity and no need for a back fence. Occasionally a forward strip fence was used if there was a danger from bloat. At first glance his system of paddock grazing may appear to be vastly

different from that of Mr. Milligan with his strip grazing but in essence both systems had the same degree of grazing control which is so vital for successful grazing management.

When asked about access to his paddocks the speaker stated that he was fortunate with roads and in addition he made his paddocks radiate from the gateways and so tended to have triangular shaped paddocks.

Grazing systems

Grazing systems ranging from continuous grazing to intensively controlled grazing were described and classified by Mr. John Frame from Auchincruive. He stressed that all grazing systems were really a compromise between that which is best for the animal and that which is best for the pasture. One grazing can easily affect the results at the next grazing and planning though certainly not easy, is necessary if one is to obtain both the best from the pasture and the animal. Research work had indicated that intensive controlled grazing was the best from all points of view and this could be obtained by numerous methods depending on the whim and circumstances of the farmer. It was vital to have some form of control and this had been illustrated by the successful systems described by the two farmer members in the discussion. Although no universally applicable system can be given concerning grazing management, the most efficient systems were intensive closely controlled systems of grazing, such as strip grazing, because they gave control over the length of the grazing period and intensity of defoliation, the frequency of grazing and length of next period and the stocking intensity. It was then up to each individual to devise his own system of utilising his grassland efficiently bearing these points in mind.

Seeds mixtures

The importance of the seeds mixture in relation to grassland management was thoroughly discussed by many members of the Society. It was agreed that up to a point a good seeds mixture is important, but thereafter it is the management, in particular, the amount of fertilizer nitrogen applied which is really important. Mr. Clark defended what he termed his omnibus seeds mixture but Mr. Milligan preferred somewhat simpler mixtures and summed up the thoughts of the four speakers by stating that in his opinion fertilizer was really more important than the seeds mixture.

Summary

Although at first glance it appeared that the speakers were often advocating systems which differed widely, one could perhaps sum up the thoughts of the meeting that whether on high or low ground it was important firstly to grow a worthwhile amount of herbage and secondly to utilise this efficiently by a system of controlled grazing management; the form of control varying widely according to circumstances.

M.E. Castle

SPRING TOUR 13th May, 1965

Central Scotland Grassland Society

Theme: Central Ayrshire

As usual, the Central Society turned up in great strength for this fine day's outing.

Programme

10.00	Lessnessock, Ochiltree (R.W. Montgomerie).
12.00	Picnic lunch in Lessnessock farm yard.
12.00-1.30	Car tour through some beautiful countryside from Lessnessock to Pinwherry via Barr.
1.30-3.30	Glenduisk, Pinwherry, Ayrshire (J. Hogarth & Son).
3.30-5.00	Girvan Mains, Girvan (J. Hannah).
5.00	Tea provided by Mr. Hannah in Girvan Mains.

Features of the Farms

Lessnessock

Many people know or know of this name from its association with one of the important breeding lines of Ayrshire cattle. Less is known about its unique position in the science of grassland management. A scientific analysis of its grassland achievements was published in Vol. 13 of the Journal of British Grassland Society as "Grassland Management on a pedigree farm" by R.W. Montgomerie and I.V. Hunt. Some copies of this were distributed at the visit. A few more are available for interested members.

Special feature

The grassland management has been devised to make the best use of clover and to reduce the expenditure on fertiliser to a minimum. Three techniques contribute to this:-

(a) The seed mixture contains 2½ lb New Zealand white clover.

(b) No (not even a little bit of compound containing nitrogen) nitrogen is applied out of the bag to any of the cow pastures ever.

(c)/

(c) The cow pastures are grazed almost continuously but not heavily stocked. All uneaten grass is cut and collected for silage-making with the Whalley Gang-Mo Loader. The herbage is not allowed to grow long and in the peak growing season May/June it may be necessary to cut all cow-pastures at 10/11 day intervals.

This short grass could never be collected by a normal forage harvester but the Gang-Mo Loader manages quite well. A big acreage has to be cut to secure a worthwhile quantity of grass for silage making. The process of making the silage is prolonged. 400-500 tons is made during the season. There is a special art in making high quality silage in such small dribbles. No consolidation of silage is necessary; a small working face is maintained for putting on fresh silage.

Analysis of the product at Auchincruive has shown it to be generally the best quality silage in any year.

It is not surprising therefore that Mr. Montgomerie can get maintenance + 2 gallons milk on silage and needs just straw, turnips and a low protein home mixed concentrate for the rest of the milk.

Fertiliser policy

Mr. Montgomerie is not an anti-nitrogen crank since he used compound containing nitrogen or straight nitrogenous fertiliser on his one year hay leys and on his other crops.

For the grass to be grazed, he relies on 2½ cwt/acre potassic superphosphate each spring and 1 ton low grade slag at sowing time. This year he may change to potassic slag or to high grade basic slag for his annual dressing. His total overall bill for fertiliser is around £3-£4 per acre.

In order to make a success of this system it is not sufficient just to cut down on the nitrogenous fertiliser. The clover must be made to grow vigorously by Direct Reseeding, by using plenty of white clover seed, by keeping all surplus grass growth in check, by providing plenty of potash and phosphate.

The system is not without its troubles. Bloat can be a menace on clover-rich swards and is counteracted by feeding straw or hay out at grass and by care in turning stock out to grass. Grass staggers is not such a problem even though potash is used because the herbage contains so much clover which always contains twice as much magnesium as grass and that in a more digestible form.

The Result

The final measure of grassland management is the output of livestock and livestock products from grass and the limited reliance on other more expensive feeds. On 265 cold bleak poor-fertility acres, Mr. Montgomerie carries 80 top yielding cows and followers together with 100 ewes and lambs at 23 cwts. livestock starch equivalents per acre of grass.

This is far above the national average and is close to that normally reached by farmers spending £10-£12 per acre on grass fertiliser, using around 10 cwt/acre nitrogenous fertiliser.

A frequently put question is why does Mr. Montgomerie not use just a little nitrogen on his grass swards to help out spring growth. The answer is simple. It is impossible to use nitrogenous fertiliser without losing some clover and midseason herbage. To beat his present system he would need to spend another £2,000 on fertiliser. Any other person writing this report would have mentioned his pedigree stock and his pedigree sheep but I am afraid I couldn't see beyond the grass.

Glenduisk, Pinwherry

Farm statistics.

The total acreage of 192 acres is no more than a blind guess. There is no flat land. The farm generally stands upright and may in parts even overhang. The total includes 12 acres woods near the river, some flooded land and about 16 acres of rushy land hitherto relatively unimproved.

160 head of stock including 80 cows and 29 heifers turned out 55,703 gallons milk last year, a remarkable achievement considering the 1,400 gallons milk produced just 20 years ago.

Grassland

The policy is all-grass with a shift to the longer leys

maintained by proper fertiliser usage. A few of the leys will be reseeded after 3 years but most of them may stay down 10/15 years.

3 cwt Complete Fertiliser are supplied in spring to all grassland followed by 2 cwt Nitrochalk on grazing land or by extra complete fertiliser where a crop of silage has been cut. On average about £1,000 per year is spent on fertiliser.

The first objective is to make plenty silage from the lower lying fields for winter feed. Generally two cuts are taken and 700 tons silage made. 26 acres at the top of the hill is cut for hay giving ample winter feed and grazing.

Mr. Hogarth hopes to see 70,000 gallons milk coming out of the farm in future and from the quantity and quality of herbage there seemed to be every possibility. Again, I was robbed of an opportunity of looking over the steadings by going off with first and second parties by vertical take-off tractor and trailer to look over the wonderfully even uniform growth of lush grass on all the fields whatever their shape, height, size etc.

I have seen the byres on previous occasions and the amazing feature is the amount of concreting that has gone on. Yards and roadways are very easy to work on. Mr. Hogarth had put in his own 'bulk tank' and laid a really fine Terrazo floor in his dairy. The garden has not escaped the concreter. Lettuces etc. grow between rows of concrete. Strawberries grow in small holes in a concrete surface.

The farm is full of interest of many kinds. In one field there is a manuring experiment of the Grassland Husbandry Department, West of Scotland Agricultural College. The farm grassland has been fully recorded for many years using the forms prepared by our Grassland Department. The view from any part of the farm, especially the top fields, is superb.

In the yard lies a little bit of tragic history, a partly finished tombstone, the mason, probably a covenanter, was probably shot as he worked by the bullet lodged in the stone.

Girvan Mains, Girvan

Whilst the previous farms visited had little natural fertility or natural growing capability, here we saw the

most fertile land in Ayrshire. The whole farm of 400 arable acres lies in the Early Potato belt with 135 acres scheduled for potatoes. The rest of the farming, 120 acres wheat, oats, barley and 138 acres grass are subsidiary to the potatoes but nevertheless highly productive in their own right.

Potatoes

The earliest fields along the shore are planted alternate years with a catch crop of Italian ryegrass between crops.

The later fields of the rest of the farm may be in potatoes every third or fourth year with a two year ley and cereals coming into the rotation.

Water is critical for potato cropping and irrigation by main and from the river is given at the rate of 1" water every 10 days.

Cereals

120 acres are grown to provide straw for 120 bullocks to tramp into dung for the potato ground.

Grass

Of the 138 acres, 60 would be cut for silage, some twice to give about 800 tons silage. The rest would carry the grazing livestock, i.e. 30 cows and calves, 90 yearling beasts, 130 ewes with 180 lambs. The lambs would go off fat and be replaced by 500-600 bought-in and fattened by the end of the year. Formerly, cattle were winter on roots, silage and a little grain. Latterly, the roots were reduced. The next move is towards grain and grass silage.

I.V. Hunt

SPRING TOUR 20th May, 1965

South West Scotland Grassland Society

Theme: North Ayrshire

About 60/70 members joined this tour starting at Messrs. Howie & Sons', Eglinton Park Farm, Irvine, for land reclamation, passing on to Alex Reid's dairying on heavy land at Diddup, Saltcoats and finishing at the Holehouse, Kilbirnie, hill plus dairy farm of Mr. A.R. Logan.

All these were farming soundly without a number of the gimmicks one comes to expect on farm walks. Nevertheless, the visitors seemed highly pleased with what they saw. Only brief descriptions can be given since so much of what was seen could only really be appreciated by those actually present.

Eglinton Park Farm, Irvine (Robert Howie & Sons).

The farm totals 449 acres, all reclaimed from scrub, or after removal of timber. Generally, operations consisted of removing tree roots and boulders, ploughing with a Prairie Buster type of plough, followed by drainage and pioneer seed sowing generally in July with 3 tons ground limestone, 15 cwt high grade slag and 4 cwt compound manure. During the first year, liberal dressings of cow and pig dung helped to build up crop worthy fields. After 4 years the ground would be reploughed and brought into rotation after levelling and clearing the odd boulders, tree roots and boulders.

The process has taken many years.

The final clearing is still continuing and some of the fields are still in the first year or two after reclamation. The tragedy is that within sight of the complete creation of one of the most productive farms in all Ayrshire, it is about to be dismembered for town extension. No wonder that the enthusiasm of both Mr. James and Mr. Andrew Howie have been dulled.

The livestock and cropping 1965

Dairy cows in milk	74	Wheat	33	acres
Dry cows and followers	156	Barley	129	"
Bullocks	39	Roots	4	"
Breeding ewes	115	Hay/Silage	117	"
Lambs	190	Floodland	5½	"
Fattening pigs	1400	Grass	161½	"

During winter 1964/65, 120 cattle were outwintered and fed on hay or silage.

The automatic feeding pig fattening sheds are slatted and the slurry used on the grass with extremely fine results. Besides its value for fertilising the grass, it seems to be beneficial for clover growth. Cows show no reluctance to graze when turned out to the swards.

Diddup, Ardrossan-Saltcoats (Alex. Reid, Esq.)

This 220 acre farm has been an I.C.I. costed farm for some years and it was interesting to see that nevertheless it still bore the general appearance of a traditional farm, except that around 100 units of nitrogen/acre/year were used. It isn't very far from the Ayrshire coast, but far enough to make it quite distinct from the usual idea of a highly fertile early potato farm (compare Girvan Mains page 46). The farm is set up high and catches a lot of wind. The soil is heavy and poaches very readily. Thus the grass is not as early as one would expect and can easily be poached. This tends to restrict the carrying capacity. The main enterprise is commercial milk production plus some beef production and a few sheep. Both silage and hay are made. 18 acres each of barley and oats are grown with most of the rest of the grassland in leys of various ages. Mr. Reid had been pestered this year with leatherjackets on his cereal crop and some of his grass leys.

Holehouse, Kilbirnie (Messrs. T.R. and A.R. Logan)

Mr. Logan really has three farms, a hill farm, rearing farm and an intensive dairy farm each of which would have served as a single visit. Nevertheless with very little time, and some help from the farm tractor drivers who carried the party to the hill farm, we managed to glimpse the main activities and enjoy a cup of tea before leaving.

Size of farm and cropping

Hill farm	3,000 acres		
Rough grass	120 "		
Arable farm	330 "	-	100 permanent pasture
			220 leys
			9/10 rape
			½ potatoes

Livestock

1,150 pure Blackface ewes (85/90% lambing)
200 cross ewes
78/80 hill cows (Hereford bull x any breed)
20 heifers
50 calves
90 Ayrshire dairy cows
60 Ayrshire followers

Grass management

No hay is made. 800/900 tons silage is made and self-fed in a home constructed unit. Many kinds of silage have been made in the past from the wartime paper bags to the present indoor clamp, using Kylage and covering with a plastic sheet to keep air out. Some of the farmyard manure is carted out to the grassland cut for silage but about 250 tons a year is sold on contract. Strip grazing was formerly practised but the land poaches badly with a 70 inch rainfall and a paddock system is now followed.

All the grassland is given slag regularly and a 3 cwt compound (20:10:10) in the spring. This works well even on the rough grass below the hill resulting in a very fine dense sward of mainly natural grasses. Only selected bits of this rough ground are treated, probably 30 acres in half-acre pieces.

SUMMER TOUR 10th June, 1965

Central Scotland Grassland Society

Theme: Visit to Edinburgh School of Agriculture Farms

About 100 members attended this tour.

Programme details

10.30 - 12 Boghall Farm

(a) Manuring experiments. Mr. R. Heddle.
(b) Hybrid ryegrasses. "

Easter Howgate Farm

(c) Farm management. Dr. Cunningham.
(d) Method of sowing grass seeds and beef production. Dr. Herriott.
(e) Grazing system and beef production. Dr. Herriott.

12 - 2 Lunch at Bush House.

Castle Law Hill Experiments

(f) Management. Dr. Cunningham.
(g) Sod seeding. Dr. Herriott.
(h) Inwintering of cattle. Dr. Cunningham.

Langhill Farm

(i) Milk production from grass. Dr. Runcie.

Highlights of the Tour

(a) Manuring experiment. Boghall.

This experiment is similar to experiments set up at the Hannah Dairy Research Institute, the North of Scotland Agricultural College and the Macaulay Institute, Aberdeen and at a number of farms all over Scotland to study the effects of various combinations of nitrogen, potash and phosphate fertiliser on the yield, distribution of yield through the year and the chemical quality of the herbage. The results of the experiment as a whole have been reported in the Journal of Agricultural Science.

Yields etc. from six centres were recorded in 1953, 1954 and 1955. The experiment which we saw at Doghall has been continued from 1953 to the present day and shows some remarkably interesting differences in yields, in appearance and in the kinds of grass surviving.

Treatments.

36 combinations of 4 levels of nitrogenous fertiliser with 3 levels of potash and 3 levels of phosphate were compared as follows:-

Nitrogen as Nitrochalk 15.5% N	Code	
	N_0	No nitrogen
	N_1	5x1cwt Nitrochalk/ac
	N_2	5x2 " " "
	N_3	5x4 " " "

Phosphate as Superphosphate 18% P_2O_5	Code	
	P_0	No phosphate
	P_2	5cwt Superphosphate/ac
	P_3	5x1cwt " "

Potash as Muriate of Potash 60% K_2O	Code	
	K_0	No potash
	K_2	5cwt Muriate of Potash/ac
	K_3	5x1cwt " " " "

P_2 and K_2 were applied as a single dressing during the winter.
P_3 and K_3 were applied as 5 equal dressings of 1cwt. each in the growing season along with the nitrochalk.

The various plots were labelled by code numbers. Thus

N_0, P_0, K_0 received no fertiliser at all during the whole twelve years of the experiment.

N_3, P_3, K_3 received the top rates every year totalling 30 cwt. per acre per year or 18 tons during the twelve years.

There were big differences in the amounts of growth, some showing dense bulky growth of cloverless grass, others short thick clovery swards; still others, especially those given no nitrogen or potash, had reverted to fine leaved red fescues.

All along there have been useful responses to nitrogen, especially when given potash. Where no nitrogen was given potash has resulted in good clover growth.

The one interesting feature is the complete absence of any advantage in yield or botanical appearance of plots given phosphate (P_2 or P_3) compared to those given no phosphate (P_0).

This was shown throughout all the centres with the exception of some results from an upland site at Crofthead, Cumnock, Ayrshire. This statement that 'phosphate has made no difference to yield of grass or clover' is a very difficult one to interpret into farm recommendations.

It probably means that there is a tendency for some money to be wasted on excessive use of phosphates but on the other hand it does not mean that the thousands of farmers who do not use phosphatic fertilisers are justified.

Again, although yield of herbage may not be increased by using phosphates, there are other very important effects which justify regular use.

Phosphates influence the phosphate content of grasses and thereby the health of livestock. There are many instances of low thriftiness of stock and low milk yields because of a shortage of phosphates in the diet.

Secondly, phosphates affect the palatability and intake of herbage. The more dry matter which the animal eats, the better will it do.

(b) Hybrid ryegrasses.

A similar experiment is in progress at Auchincruive. Hybrid ryegrasses are crosses between Italian and Perennial ryegrass which it is hoped will result in a grass with the early growth of the Italian and the lasting power of the perennial ryegrass. Breeding is a lucky bag and the cross can result in a shortlived easily frosted grass combining the poorest features of the parents. The best known has been New Zealand H.1. which came on the British market about 1948 and Gartons Perennialised Italian ryegrass which is older still. French, Dutch and Danish breeders have pushed into this market and the hybrids are likely to compete with the Tetraploids for salesman's pressure during the next year or two.

None of them are outstandingly good. New Zealand H.1. and Mommersteeg are quite good. Regrid is terrible. Ariki (a New Zealand variety) is poor.

(c) Easter Howgate farm.

This 200 acre arable farm is managed in roughly 7 x 40 acre blocks in the following rotation: 2 yr. grass - Cereal - Seed potatoes - wheat - roots - barley - 1 yr. ley (Italian ryegrass). The 2 year ley is used for the beef production experiments described below.

(d) Sowing method and beef production.

Experiments to increase beef or lamb production by increasing the amounts of nitrogenous fertiliser applied have always proved disappointing. For example, it is common to find just an extra ½ cwt. beef per acre when the amount of fertiliser nitrogen has been raised from 30/40 lb. N per acre (1½ - 2 cwt. Nitrochalk) up to 200 lb. N per acre (10 cwt. Nitrochalk). The end result hardly justifies the extra cost of fertiliser. More store cattle can be produced but finishing on intensive grass seems elusive.

Dr. Herriott was struck with the possibility that it was the quality of grass which was important. Heavily fertilised (N) grass was almost cloverless. Swards given no nitrogenous fertiliser were full of clover. This difference becomes particularly important from July onwards because clover has very much higher palatability, digestibility and mineral content.

A method of sowing which allows clover to grow even though the grass is dressed with fertiliser nitrogen was successfully devised and it has resulted in very satisfactory results.

The method of sowing.

The grass seeds (15-20 lb. of ryegrass etc.) are sown with a corn drill in 7" rows. The clovers (2-4 lb.) are broadcast over the drilled grasses. The swards carry lines of grasses with the spaces filled with clover.

Results as lb/acre lamb produced

Nitrogen level lb N/acre	71	282	Average
Usual sowing method	486	668	577
Drilled grass method	534	756	645
Average	510	712	611

Results as lb/acre beef

Year	lb/acre N level	Results with usual sowing	Results with special drilled method	Gain
1962	30	532	608	14%
1963	60	476	589	24%
1964	40	557	639	15%

There is no doubt that the special sowing method has resulted in appreciable increases in meat production and in the case of the lamb experiment the effect of clover has been in addition to the effect of fertiliser nitrogen.

(If the essence of the sowing method is to produce a clovery sward which can stand some fertiliser nitrogen and which can produce high quality mid-season herbage it may be equally satisfactory if, instead of drilling, a mixture of Timothy/Meadow fescue with 2/3 lb. white clover were sown. Editor.).

(e) Paddocking and beef production.

Dr. Herriott described an experiment to compare beef production by three systems of grazing:-

A Continuous grazing. No rotation or resting was involved but the number of stock were reduced or increased according to the herbage available.

B Three-paddock system. Cattle were moved from paddock to paddock after 1 weeks grazing. Each paddock was thus rested for 2 weeks and grazed for a week.

C Six-paddock system. Again cattle moved after a week on a paddock but obviously had 5 weeks rest instead of 2 weeks as on system B.

Results.

Three paddocks gave 8% more beef per acre than continuous grazing.

Six paddocks gave the same beef as three paddocks but it was possible to also make ½ ton/acre of hay or silage dry matter.

Castle Law Hill Farm.

(f) Management.

1100 acres carried 400 Blackface ewes and 30 Galloways, 20 crossed with Shorthorn and 10 kept pure. 88 acres of inbye land had been improved and the manuring intensified to carry 64 suckling cows. Early born cows are brought down to the lowland farm and get up to 3 lb/day barley. The spring calves come down in October at about 530 lb. apiece. The Galloways are wintered on green oat hay.

(g) Sod seeding.

The results of sod seeding carried out with Cuthbertson's sod seeder some years ago. Plenty of white clover had established, especially where the initial dressings of lime in the furrow had been followed by a general dressing over all the area.

(h) Langhill.

This is an experimental dairy farm managed by Dr. Runcie and probably well known as the farm where zero-grazing was put to a practical test some years ago.

Now, it is run on two systems of management, Byre milking (40 cows) and Cubicles (83 cows) but it is early yet to draw conclusions.

I.V. Hunt.

SUMMER TOUR OF NORTHERN IRELAND

27th-29th July, 1965

Arranged with the cooperation of the Ulster Grassland Society

The party finally consisted of 47 including 10 ladies as follows:

South West Society (33)

Mr. & Mrs. D.B. Jamieson, Dr. & Mrs. Castle, Mr. & Mrs. W.N. McCaig, Professor and Dr. Paterson, Mr. & Mrs. C.H. Campbell, Mr. & Mrs. Robert Lammie, Mr. & Mrs. John Watson (McGill & Smiths), Mr.& Mrs. M. Cessford, Mrs. B.K. Gibbs, Messrs. L.D. Drysdale, W. McFadzean, J.D. Metcalfe, Alistair Campbell (College Office, Ayr), Alec. Reid, R.S. Smith (Saltcoats), A.A. Buchan, A.B. Wright, J. Gass, A. Scott Jupp, R. Thomson, A.M. Henry (Sandhead), J.G. Cochran (Garrockhill, Drongan), J.K. Henry (Kirkoswald), P.T. Gordon-Duff

Central Society (14)

J.N. Nisbet, R. Hamilton, T. Meikle, W.C. Carsewell, A. Paterson, J.S. Paterson, W. Findlay, W.N. Andrew, R. Campbell (Langleys, Newton Mearns), G. Ritchie, J. Warnock, W. Caldwell, A. Love, J.D. Edwards.

Outline of Programme

Tuesday, 27th July	2.30p.m.	Boat from Stranraer to Larne.
	5.30p.m.	Bus from Larne to Dunmurry.
	7.30p.m.	Dinner and Discussion with Ulster Grassland Society in Conway House Hotel, Dunmurry. Dr. John Lowe, President of U.G.S. spoke about grassland farming in Ireland (A). Bracketed letters refer to more detailed remarks below.
Wednesday, 28th July	8.45a.m.	Leave Hotel.
	9.30-10.30	A.A. McGuckian Ltd., Massareene Park, Antrim (B).
	10.45-1.45	Greenmount Agricultural College, Muckamore, Co. Antrim (C).

Wednesday (contd)	2.00-3.00	Mr. W. Macfarlane, Ardmore, Crumlin (D).
	3.45-5.15	Agricultural Research Institute for Northern Ireland, Hillsborough, Co. Down (E).
	6.00	Back to hotels for free evening.
Thursday, 29th July	9.00	Leave hotels.
	10.30-12.00	Mr. W. Hamill, Ballindreen, Coleraine, Co. Derry (F).
	12.30- 2.00	Lunch - Portrush.
	2.15- 3.45	Mr. S. Lynch, Ballylease, Portstewart, Co. Derry (G).
	3.45- 6.30	Return to Larne for boat via coast road.

Brief notes on the visits etc.

Arrival: Dr. John Lowe and Mr. Walter Smyth, President and Secretary of the Ulster Grassland Society were on Larne quayside to welcome our party after a very pleasant crossing. About 50 members of the Ulster Grassland Society gathered at the Conway House Hotel to spend three or four hours with us in informal chats and discussion which opened under the chairmanship of Mr. D. Bruce Jamieson.

A. Dr. John Lowe - Grassland farming in Northern Ireland

Facts -	Total acreage	3,352,000 acres
	Agricultural	2,860,000 acres
	Grass	2,270,000 acres
		∴ 80% or 4 out of 5 acres are grass.
	Rough and Hill land	700,000 acres
	Holdings	87,000 acres
	Farmers	65,000 (pre-war)
		40,000 (present day)
		25,000 (future)
	Barley	38,000 acres in 1953; now 165,000 acres.
	Oats	227,000 acres, now 125,000 acres.
	Cattle	1,044,000
	Sheep	1,000,000
	Pigs	1,300,000
	Poultry	10 million.

The value of cattle, sheep, milk and wool produced is £68 million per year.

Level of Grassland Output

There is a nucleus of first rate grass farmers probably concentrated among the membership of the Ulster Grassland Society. On estimate for each good grass farmer there are at least 9 poor ones. The overall output from grass was calculated for 1963 to be 15½ cwt. U.S.E. (Utilised Starch Equivalent - see Journal No. 3 page 50) per acre. This includes all the rough and hill grass. This yields 5½ cwt. U.S.E./acre whilst the rest of the grassland yields 19.6 cwt./acre. This is high compared to the rest of the United Kingdom but low if one considers the potential of this grass.

Fertiliser Usage

Farmers using 140-250 units/acre Nitrogen (N) make the headlines but the overall figure for grassland is less than 20 units N/acre with 26 units P_2O_5 (phosphate) and 12 K_2O (potash). These levels are lower than England and Scotland, higher than in Wales and much higher than in Eire. It should be borne in mind that the averages include all acreages, rough and hill given none at all, a big acreage given far too little and some given the maximum desirable. On average, the optimum would be 30/40 units N/acre, taking into account the high livestock numbers and the amount of organic manure available.

Farm output has increased since the war. There are now twice as many livestock with some slight increase in imported feeding stuff. The potential is much higher.

Grass silage. The climate led to early interest in silage stimulated by the establishment of subsidies for silo construction and a payment of 10/- to 15/- per ton for all the silage made each year. In the drier areas, uncovered clamps were popular. John O'Neil set the modern trend going with his Bed and Breakfast layout. Now many have self-feed set ups, with covered courts and/or cubicles. Nevertheless, still 400,000 acres are made into hay whilst only 100,000 acres made into silage. An interesting recent development is an increase in arable silage from 23,000 to 33,000 acres. Much uneasiness is shown regarding methods, and it is recognised that the ideal method is still not with us. Present methods use too much labour and the product lacks uniformity. Great hopes are pinned on vacuum silage but it is in its infancy and has many snags.

Sward type

The ryegrass/white clover sward is the most common. The best farms have some timothy/meadow fescue leys and Italian ryegrass swards. There is a little interest in tall fescue, mainly for use as an alternative to Italian ryegrass with the advantage of lasting many years.

Although a lot can be done to improve output from the present types of sward, ultimately most suitable swards for farm will be two or three kinds of sward each based on a single species or variety to suit a special purpose.

Problems

Many of these are the same ones which crop up all over the world. The best management system whether set stocking, rotational grazing, strip or paddock grazing or zero grazing is still undecided but personally I feel that a form of zero grazing is bound to be the more efficient.

Discussion

Questions covered many topics with quite a bit of interest shown in silage. The following are a few of the more interesting:

Q. Why is there so much variation in level of grass farming, evident as one passes along the road? Obviously good farmers run alongside bad ones. Has this anything to do with the small size of field or the tenancy agreement?

A. Mainly due to differences between farmers but possibly the small size of farm and the fact that they are mostly owner-occupied means that too much limited capital is tied up in the land and buildings.

Q. When are grassland societies going to take an interest in marketing of the extra milk, meat etc. for which they are responsible?

A. Many answers were given each unacceptable, such as quotas, variable prices etc. An Ulster farmer commented that horses were a delightful spectacle and the finish of a race was made more interesting by handicapping the more able horses. Handicapping the more efficient milk producer would be disastrous.

Q. What explanation is there for the low average N usage of 20 units/acre and the rather low optimum stated to be 30-40 units N/acre?

A. The 20 units is the average over all grassland including hill land. The low optimum takes into account the desirability of using no nitrogen on a large acreage and large dressings over 140 units N/acre on a smaller specially picked acreage. Dr. Lowe believed the use of small dressings of less than 120 units were useless.

Q. There were many questions on the use to which the silage/subsidy had been put. Northern Ireland had been very favourably treated.

A. No one seemed to be quite certain what form the subsidy took. It had changed once or twice. Roughly, a farmer could be granted £250 towards the construction of the silo and receive up to 15/- per ton grant for all the silage made. This had originally been intended as a compensation for the extra costs of beef production and cattle rearing in Northern Ireland, but it was mainly the dairy farmer who took advantage of it.

Basic slag, seed mixtures, Irish perennial ryegrass were also discussed.

The meeting concluded with a Vote of Thanks to the speaker and hosts by Mr. Alistair Campbell.

B. A.A. McGuckian Ltd., Massareene Park, Antrim.

Mr. Alistair McGuckian showed us round the farm of which the brief facts were as follows:

Acreage			Livestock	
Barley	363	acres	Suckling cows	87
Rotation grass	141	"	Calves	87
Permanent grass	11	"	Bulls & dry cows	59
Rough grass	70	"	Ewes	160
Roads, woods, etc.	99		Lambs	176
Total	684	"		

General features

The farm lies on the shore of Lough Neagh about 60/150 feet above sea level. The soil is heavy and easily poached. The object is a high output per acre of finished beef from suckling cows, and from store cattle bought in Southern Ireland. Mr. McGu kian was comparing the profitability of Autumn and Spring calving and the use of various combinations of supplementary feeding using beet pulp, barley meal, barley straw and hay.

Pigs

Many years ago, the Messrs. McGuckian made the headlines with their slurry lagoon, constructed with a bulldozer to store 500,000 gallons of pig slurry prior to pumping it out on to the land. The lagoon on this farm was not now in use, since most of the slurry was pumped directly on to the land.

Grassland Manuring

At sowing time 60 units N + 40 units P_2O_5 + 40 units K_2O (= 4 cwts/acre of a 15:10:10 compound). Thereafter, in addition to slurry as available 40 units of N were applied to each growth. At the time of the visit, the grass had received 200 units N.

Sheep

180 ewes were kept for most of the year on 23 acres of grass divided into 3/4 paddocks, keeping the excess grass cut for hay or silage.

Silos

Mr. McGuckian was one of the earliest to use Bed and Breakfast silos. Four of these had a total capacity of 1200 tons. The main features of the Bed and Breakfast silo is to provide room for stock to be on top of the finished silage, access for stock from the top of the silo down to the feeding face and to prevent urine from percolating into the top of the silage. Various designs have been used and many materials for providing bedding for stock on top of the silage. Polythene sheet plus straw bales was demonstrated but sawdust, limestone and straw have also been used

Travelling from Mr. McGuckian's farm to Greenmount, the driver managed to lose the way, by taking what was assumed to be a short-cut along a narrow lane. Unfortunately, the lane petered out after 2 miles. By some really skilful manoevering the drivers turned the buses round and brought us to Greenmount just a little late.

C. Greenmount Agricultural and Horticultural College, Muckamore, County Antrim.

This is a college or agricultural school similar to Lawers in Perthshire, which has developed very rapidly over the last few years under the Principalship of Mr. M. Boyd. Mr. Boyd was unfortunately away in U.S.A.

Students and courses

Living-in accommodation is available for 80 students, increased to 140 by using other accommodation in the neighbourhood. A one year course (September-July) in practical agriculture and also in practical horticulture is provided.

Experimental Recording and Demonstrations

A full range of experimental work on all aspects of agriculture and horticulture is carried out. All operations and all systems of farming are practised. The records kept are extremely valuable. Greenmount has the longest series of field by field grassland output records in the country.

Facilities

College Farm -	Agricultural land	462 acres
	Horticultural land	14 "
	Buildings, Plantations	99 "
Hill Farm		2400 acres

(Our visit was confined to the College low ground farm).

The facilities in land, staff, livestock, laboratories were all extremely fine. Six of these colleges are planned for Ulster.

Cropping: 166 acres cereals (mainly barley), 25 acres roots, 12 acres experimental plots, 258 acres grassland.

Livestock: 240 cattle (including 65 dairy cows) plus 90 hill cows, 100 cross bred ewes plus 800 Black-faced ewes, 90 sows, 2,000 laying birds, 7,000 broilers.

Demonstrations

1. Rye for Grazing: Rye sown at 84 lb/acre with Italian ryegrass at 20 lb/acre used for providing early herbage cut and fed indoors to dairy cows (zero-grazing). The best yields are obtained when the rye is allowed to reach 16". This is too dense for the Italian ryegrass companion grass.

2. Grass rearing of calves: Cheap methods of rearing calves are being demonstrated. Three one-acre paddocks were being used to rear 12 bought in calves (February/March) turned out to grass at 8 weeks.

3. (Tetraploids) Italian ryegrass (sown 1964): This field had been zero grazed in its first year but was being grazed normally this year. It was thin but with plenty of fertiliser N was growing strongly.

4. Beef production from permanent grass: 10 one acre paddocks given no nitrogenous fertiliser at all but plenty of pig slurry (2,000 gallons each dressing and an average of 4 dressings per year equal to 400 lb Nitrogen/acre).

5. Set stocking for lamb production: Ewes are brought out to 4 paddocks about 4 weeks after lambing and kept on them until June at 5 ewes + 7 lambs or at 7 ewes + 11 lambs per acre. Worm troubles were very bad this year.

6. Tall fescue: Yields are lower than for ryegrass swards and the herbage not so acceptable to stock.

7. Silo covers: Covering silage could be costly and it is necessary to balance the cost of the cover against the wastage saved. Measurements of wastage show that 13½ tons of silage were lost from a 200 ton pit of silage when no cover was used. This was reduced to 5 tons when polythene sheet was used (250 gauge) costing £5-£6 per silo. This was further reduced to ½ ton when a 3" layer of farmyard manure was put on the polythene sheet.

A fine lunch was provided for our party by the College.

D. Mr. W. Macfarlane, Ardmore, Crumlin, Co. Antrim.

This was a typical farm in size but outstanding in productivity, taking into account the difficulties to be surmounted. Firstly, the ground was heavy and sticky. Secondly the farm was established across part of an old wartime aerodrome with wide concrete runways forming a network over the farm. These had been reclaimed by bull-dozing about a 6-12" of soil over the concrete and sowing down to grass. Plenty of nitrogenous fertiliser made up for the small size of the farm.

Figures

Grass	75.1 acres
Reclaimed runway	12.7 "
	87.3 "

All grass sown to Italian Ryegrass given 250 units N/acre.

Livestock 60 cows (40 Ayrshires, 20 Friesians) and 40 followers.

Cows calve in August and are out to graze from mid April to November. No concentrates are fed from May to August. Milk yield averaged 924 gal/cow or 55,423 gallons from the whole farm at 537 gallons/forage acre. Supplementary feeding average 1.3 lb/gallon.

Manuring

400 tons farmyard manure were produced and mainly ploughed in before sowing grass. On average 270 units N, 66 units P_2O_5 and 66 units K_2O are applied per acre.

Silage

600 tons are made from young wilted grass. 'Tombstones' are used to ration the silage but some trouble has been experienced. A cow has been suffocated when a load of silage fell on its head and held it down in the groove between the 'tombstones'. Apart from this, they have been quite satisfactory.

A special feature of the farm is the tremendous area of concreted tracks and yards, made necessary by the heavy wet clay.

E. Agricultural Research Institute of Northern Ireland, Hillsborough, Co. Down.

This 500 acre estate is the main research institute in Northern Ireland. It is governed by trustees appointed by the Ministry of Agriculture, Ulster Farmers Union, Ulster Agricultural Organisation Society and Queens University, Belfast. The present director, Professor J. Morrison has been especially interested in conservation and cattle feeding and has the chair of Crop and Animal Husbandry at Queens University.

Livestock	300 cattle (including 80 dairy cows) 160 ewes plus pigs and poultry.
Cropping	120 acres barley, wheat and oats 335 acres grass.

Experiments

Beef production using various diets from grass only to barley only and comparing barn dried hay with grass silage.

Vacuum silage. Early experiences with this new method include measurement of effluent (10 barrels collected). When baled silage put in the vacuum silos, the vacuum drew the sheeting between the holes and tore it.

S.22 Italian ryegrass versus S.170 tall fescue. Dr. John Lowe described his experiments. After the first year, S.170 tall fescue was superior. No difficulties in grazing were experienced.

Sheep grazing and level of nitrogen used. This experiment has been going on since 1945. From no nitrogen up to 240 lb N/acre/year were used. At no nitrogen, the herbage contained 35% white clover. From 140 lb N upwards, there was no white clover in the herbage. No differences in production were shown between the above two levels. Over 140 lb N/acre output showed some increases.

> Back in the hotel, the full resources were put to the test. One member's bathing costume was in continuous use almost throughout the night in the hotel swimming pool.

F. Mr. W. Hamill, Ballindreen, Coleraine.

Three holdings totalling 224 acres carry 138 cows and in calf heifers. 15 years ago the number was 40. Now that numbers are well up, the policy has been to improve performance. This has reached an average over 100 cows of 990 gallons.

Grass policy

The leys are chiefly of perennial ryegrass / timothy with about 20 acres reseeded each year, partly in spring and partly in the autumn. Most of the dung and slurry is ploughed into the reseeds. The field to be reseeded in spring is plastered with these and regarded as a sacrifice paddock for this purpose.

The grass is given about 200/250 units N/acre per year using a compound for the second dressing and sulphate of ammonia otherwise.

> Most members will remember our bus arriving at Portrush for lunch but nobody knew where the lunch had been booked. This was soon put right, but two members who had been left behind in the town made a taxi dash to catch us up at the next stop.

G. Mr. S. Lynch, Ballylease, Portstewart.

This was a particularly small farm totalling 43 acres carrying 42 cows and 6 young stock up to 1964; the whole area was in Italian ryegrass but longer leys are now being prepared by sod seeding and by surface seeding after Fertiliser usage was as expected, heavy with about 250-300 units N per acre.

The rest of the day was a tour along the north east coast road back to Larne. The effect was spoilt by rain and mist and by the crowded boat but I don't think anyone minded very much. The trip had been very successful from many points of view.

RESEARCH REVIEWS NOS. 104-114

Ten research publications are reviewed in this number, six from the latest numbers of the British Grassland Society Journal, three from a Conference on Nitrogen held in Holland and one from Northern Ireland.

The six selected from the British Grassland Society's Journal might not be everyone's choice. Copies of the Journals are available on loan to members who are especially interested in the articles not reviewed but listed below.

Part 1. March 1965.

C.R.W. Spedding. The physiological basis of grazing management. pages 7-14.
J.L. Davidson and F.L. Milthorpe. Carbohydrate reserves in the regrowth of cocksfoot. pages 15-18.
R.C. Anslow. Grass growth in midsummer. pages 19-26.
L.A. Hunt. Some implications of death and decay in pasture production. pages 27-31.
R. Halliday and D. Wilman. The effect of fertiliser nitrogen and frequency of defoliation on yield of grassland herbage. pages 32-40.
T. Alberda. The problems of relating greenhouse and controlled environmental work to sward conditions. pages 41-48.

Part 2. June 1965.

G. Douglas. The weed flora of chemically renewed lowland swards. pages 91-100.
M.J. Head and J.C. Murdoch. The influence of supplements of flaked maize on the digestibility of silage, etc. by steers. pages 106-109.
W.J.M. Black and R.W.A. Richards. Grassland fertiliser practice and hypomagnesaemia. pages 110-117.
W.M. Ashton and K.B. Sinclair. A study of the possible role of chelation in the occurrence of hypomagnesaemia in sheep. pages 118-122.

104. MECHANICAL TREATMENT FOR IMPROVING UPLAND GRAZING

by R. Hughes and J.M.M. Monro, W.P.B.S., Aberystwyth and I.D. Warboys, Univ. Coll. Wales.
J. Brit. Grassl. Soc., Vol. 20, pp. 49-53.

In order to evaluate the use of the forage harvester for the improvement of Molinia and Nardus dominant swards, on wet and dry sites respectively, the following treatments were set up on a Welsh farm. 1. One pass of the harvester, 2. Harvester

plus lime and fertiliser, 3. Harvester plus lime, fertiliser and seed, 4. Rotovation plus lime, fertiliser and seed.

The forage harvester used was a 40 inch in-line type with a rotor speed of 1500 rpm. Two passes were made with the rotovator at a depth of 6-8 inches. It was found that the harvester was less liable to damage from boulders.

Results have indicated that the use of the harvester without fertilisers and seed resulted in 40 per cent bare litter patches and these were gradually infested by the Molinia, Nardus and sheeps fescue. Where fertiliser (2 tons limestone, 3 cwt. superphosphate, 1 cwt. nitro-chalk) was applied along with harvester treatment, a marked improvement was noted in the sward with the better Agrostis species appearing at the expense of Molinia and Nardus.

Harvesting plus fertiliser and seeds on the wet Molinia areas gave as good a result as rotovation. On the dry area, however, rotovation was only slightly superior to the harvested area.

From the preliminary observation, the forage harvester along with fertiliser and seed can form a useful method of pasture improvement. Good husbandry will be essential on the new sward, otherwise reversion to the native pasture will be inevitable.

R.D. Harkess.

Note: Observations on the use of the forage harvester in the south of England have been previously recorded in J. S.W.S.G.S. 1963, No. 3, page 63.
Major G. Shepley-Shepley, Troquhan, New Galloway has improved several hundred acres of hill land over the past 10 years using a Wolseley swipe and similar chopping machines plus fertiliser and seeds.
Molinia = Flying Bentgrass, Nardus = White grass.

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105. THE EFFECT OF THE BIPYDRIDYL HERBICIDES ON HILL COMMUNITIES AND THEIR ROLE IN THE IMPROVEMENT OF HILL GRAZING

by G. Douglas, C.J. Lewis and H.C. McIlverry, Jealotts Hill.
J. Brit. Grassl. Soc., Vol. 20, pp. 64-71.

This paper deals with the use of paraquat and diquat (both bipydridyl compounds) for hill reclamation work. Two techniques are discussed.

1. The use of a chemical to change the balance of vegetation in the sward. Molinia/Nardus/sheeps fescue areas were sprayed with ½, 1 and 2 lb. (see reviewer's note at end) per acre of paraquat and diquat at different times of year. At ½ lb/acre both Molinia and Nardus were greatly reduced whilst the fescue recovered to dominate the sward. Higher levels of spraying reduced all three components. This reclamation process is slow and takes at least a year to establish. By and large paraquat was more successful than diquat. May proved to be the best month for spraying in order to encourage fescue growth.

2. The second method of using paraquat was to completely kill the existing herbage and oversow with a seeds mixture. 2 lb. per acre of paraquat gave a good kill when sprayed anytime between June and October. Spraying treatment was followed by 2 tons limestone and ½ ton slag per acre. The plot was harrowed to form a seed bed. Sowing was delayed until at least 3 weeks after spraying. A fairly good new sward was soon established.

These improved areas could be valuable in spring and autumn to reduce pressure on inbye fields and possibly enable more grass to be conserved. They could also be useful for ewes with twin lambs, early weaned lambs and for tups in late summer.

R.D. Harkess.

Reviewer's Comments: It is important to note the use of lime and slag in order to encourage establishment of the new seeds, that cultivation was needed and that seeding was delayed until 3 weeks after spraying. Many have the idea that seeding can follow spraying immediately and that no cultivations are required. In very wet areas or where the killed sward is thin and the area is accessible to livestock, establishment can be successful without cultivation. However, from observations in the West College area it would appear that some form of cultivation (rotovators, harrows, cultivators) will usually be necessary on dense, matted grassy areas to encourage the establishment of new seedlings.

Paraquat will not kill mosses, sedges and broad leaved weeds so careful selection of the site is essential if colonisation by these species is to be avoided. 2 lb. per acre of paraquat is equivalent to 4 pints Gramoxone per acre which will cost in the region of £3:10s. To this must be added spraying charges, cultivation costs and other expenses on seeds, fertilisers, draining and fencing.

Unless a fairly large area is successfully renovated, fenced and carefully grazed, farmers cannot expect dynamic changes in stock carrying capacity or farm productivity to occur despite the earlier comments on the value and use of chemically improved areas.

R.D. Harkess.

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106. THE EFFECT OF LENGTH OF SILAGE ON ITS VOLUNTARY INTAKE BY CATTLE

by J.C. Murdoch, N.I.R.D., Reading.
J. Brit. Grassl. Soc., Vol. 20, pp. 54-58.

Silage in an unchopped, chopped (1-2 in.) and lacerated condition was fed to steers and dairy cows in two feeds a day. Sufficient was offered to allow intake to reach a voluntary maximum. It was found that intake was lowest with unchopped silage and highest with chopped silage while lacerated silage, similar to that from a forage-harvester, occupied a middle position. These differences in intake were largely eliminated when concentrates were fed along with silage. Another experiment in which unchopped, long chop (6 in.) and short chop (1 in.) hay was fed produced a similar result.

The question of whether or not chopped material is better for self feed silage was not discussed. It would appear, however, that some degree of chopping will help to increase animal roughage intake particularly where concentrate feeding is being kept to a minimum. It is important to note that other factors such as degree of crop maturity, percentage dry matter and type of fermentation can all influence silage intake and may do so to a greater extent than the effect of silage length.

R.D. Harkess.

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107. THE ASSESSMENT OF UTILISED-STARCH-EQUIVALENT (U.S.E.) OUTPUT FROM FARM GRASSLAND BY THE FARM-RECORDING METHOD

by J. Frame, W.S.A.C., Auchincruive.
J. Brit. Grassl. Soc., Vol. 20, pp. 77-83.

There is a need for a simple system of grassland recording involving a minimum of form filling. The method described in

this article meets these requirements and can be completed quickly from the crop and grassland acreage plus six annual figures.

A. Average numbers of the different classes of stock.
B. Amount of home grown crops sold.
C. Amount of crops and feed in hand at the end of the year.
D. Amount of purchased feedingstuffs.
E. Amount of home grown crops.
F. Amount of crops and feed in hand at the start of the year.

Much of the information on livestock numbers and cropping acreages can be obtained from the July and December returns and the remainder obtained from bills of sale, invoices and the farmers' own records. By applying conversion values which the author has formulated to these six factors, the starch equivalent of each can be ascertained and output as U.S.E. calculated from a balance sheet.

The result is an efficiency figure for the use of farm grassland. It does not distinguish between individual fields. None-the-less, it is a valuable starting point to enable a comparison of efficiency within one farm from year to year or to compare outputs of U.S.E. from a group of farms of similar size and type.

The paper reports on a survey concerning 60 dairy farms in the West of Scotland using this simplified recording technique. When the basic data was at hand the forms could be completed in under 30 minutes. Results showed that of the farms visited 25 had less than 20 cwt. U.S.E. per acre, 32 were between 21-30 cwt. and 3 had over 40 cwt/acre. The national average is 15-17 cwt. U.S.E./acre.

R.D. Harkess.

Copies of the balance sheet and the necessary factors used for calculating starch equivalent values can be obtained from the Grassland Department, Auchincruive, Ayr.

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103. A COMPARISON OF COCKSFOOT AND TALL FESCUE DOMINANT SWARDS FOR OUT-OF-SEASON PRODUCTION

by H.K. Baker, J.R.A. Chard, Hurley and W.E. Hughes, N.A.A.S.

This paper concerns an experiment carried out in several English counties from Yorkshire in the north to Cornwall in the south. All observations were made on commercial farms where

an entire field had been put at the author's disposal. Half of each field was seeded with a cocksfoot dominant mixture, the other half with a meadow fescue/tall fescue mixture which became a tall fescue dominant sward. Two summer managements - grazing or cutting - were imposed on each half until late August when the fields were top dressed with 50 lb. N/acre. Grazing recommenced in November and lasted till Christmas.

Whether swards were grazed or cut in summer had no effect on yield in November or in the following spring. Herbage quality was measured on two farms during autumn grazing when tall fescue proved to be more digestible than cocksfoot, the figures being 73 and 68% respectively.

The animal performance measured over the 13 centres was 1.6 lb. liveweight gain per day on tall fescue and 0.8 lb. per day on cocksfoot. Bulling heifers and store bullocks were the main stock used.

No difficulty was found in getting stock to eat the tall fescue in early spring, autumn or winter when it was preferred to cocksfoot. However, during the summer period the position was reversed and so the authors suggest that tall fescue should be cut and conserved at this time of year.

During the autumn grazing of swards, it is recommended to aim for 60-80% utilisation of the herbage and to maintain liveweight gain by the supplementary feeding of cereals.

R.D. Harkess.

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109. THE GROWTH OF LAMBS AT PASTURE. IV. GROWTH AT DIFFERENT TIMES OF THE YEAR

by R.V. Large and C.R.W. Spedding, Hurley.
J. Brit. Grassl. Soc., Vol. 20, pp. 123-128.

The growth rate of 25 different groups of worm free lambs over the years 1959-1962 is summarised. The table below illustrates the live-weight gain per head per day for the different times of year and for grass and clover or pure grass and nitrogen swards. Herbage was the sole diet.

May-June		July-Sept.		Oct.-Nov.	
Grass + Clover	Grass + N	Grass + Clover	Grass + N	Grass + Clover	Grass + N
0.69	0.58	0.58	0.40	0.31	0.29

Although adequate grass was provided at all times it is interesting to note the fall in growth rates later in the season. Lambs of a similar age were used at the different times of the year by using the Dorset Horn breed and hormone treatment which enabled tupping over a longer than normal season.

The inclusion of clover appears to have assisted production particularly in the July-September period. This is the time when grass growth is discouraged and clover growth encouraged by the climate factors that exist in the southern half of England.

The information presented illustrates the value of early lambing for highest daily gains and hence earlier marketing and also illustrates the slower fattening rates obtained at the back end when grass is of poorer quality.

P.D. Harkess.

Note: See also Review 103 (No. 6).

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110. GUILLE AS A GRASSLAND FERTILISER (Pt. III).

by J.E.D. Herriott, D.A. Wells and P. Crooks, Edinburgh School of Agric.
J. Brit. Grassl. Soc., Vol. 20, pp. 129-138.

An earlier paper by the same authors has been reviewed in Greensward No. 3, Review No. 47. As in that work, it was again found that in terms of availability and dry matter production slurry N was only about 60% as effective as fertiliser N.

The authors suggest that there is rapid leaching on sandy soils whereas clay soils or those with a high humus content retain more N. This is because N in slurry is in the form of ammonia which can be absorbed by clay and humus patches. When light soils are to be slurried it is recommended that there should be minimum of dilution with rain or wash water in order that as concentrated a material as possible is applied.

In winter, slurry should be applied to heavy soils or older pastures to reduce losses from leaching. Since there is also a high potash content in slurry it is advisable to use it on fields which are to be cut for silage or hay. Young leys for early spring grazing should not receive slurry since the high quantities of potash can predispose cows to grass tetany. This problem, however, could be overcome by applying extra fertiliser N along with slurry, so altering the N/potash rates and this would be particularly effective on soils low in potash.

Good clover growth is recorded, no doubt due to the potash in the slurry and the authors suggest that slurry is ideal for the less intensive grassland farming systems based on the clover plant.

R.D. Harkess.

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111. THE SUITABILITY OF VARIOUS AUTUMN SOWN CATCH CROPS FOR WINTER AND SPRING GROWTH

by T.A. Stewart, Greenmount Agric. and Hort. Coll., Muckamore. Rec. agric. Res. N. Ire. 1963, 13 (1), pp. 1-20.

To determine the suitability of various autumn-sown catch crops for winter and spring growth, a series of trials were carried out in Northern Ireland. The catch crops included (1) Italian ryegrass, (2) Italian ryegrass/rape, (3) Italian ryegrass/marrow-stem and thousand-headed kales, (4) Tall fescue, (5) Rye.

In the 1957-8 and 1958-9 trials, the Italian/brassica mixtures gave higher dry matter yields than Italian sown alone, whilst the mixtures containing 8 lb. rape outyielded those containing 4 lb. rape or 6 lb. kale. When brassica mixtures were cut in winter, they did not regrow the following spring.

In the 1961-2 trial, Italian ryegrass varieties, including Westerwolths, Hybrid and Dutch tetraploid types and also tall fescue grass, were assessed. The total yield from winter and spring cutting was highest from S.22 and Irish Italian ryegrasses and lowest from tall fescue, whilst Westerwolths gave the highest yields at the winter cut but the lowest yield when cut again in the spring.

In the 1962-3 trial, Lovaszpatonai rye and a Westerwolths tetraploid were tested in addition to the above grasses. The combined yield of rye outyielded the Italian and tall fescue grasses by as much as 300%. Because of the severity of the winter there was little growth on the grass plots, unlike the previous winter.

On the basis of these trials, Stewart has proposed the classification of catch crops for Northern Ireland as follows:-

Crops found most suitable for:-

Winter use (November/December)	Spring use (March/April)	Winter & Spring use
Brassica/Italian mixture	Rape/Italian mixtures	Irish Italian
Westerwolths		S.22 Italian
Tetraploid Westerwolths		Rye
Rye		

John Frame.

The following three papers were part of a Conference on "Nitrogen and Grassland" held at Wageningen, Holland, June 1965 under the European Grassland Federation.

112. Accumulation and availability of nitrogen in soils under leys

T.E. Williams and C.R. Clements
Grassland Research Institute, Hurley.

The total nitrogen content of the soil is made up of

(a) Organic nitrogen, which is living matter in various stages of decay. This forms by far the biggest part of the soil nitrogen and is not available to plants.

(b) Mineral nitrogen (as nitrate or ammonium nitrogen). Usually at 5-10 p.p.m. (= parts of nitrogen present in each million parts of soil) equal to about 1/10th to 1/4th cwt nitrochalk per acre in the top inch of soil. This is the most important form of nitrogen for plant growth. Fertiliser nitrogen doesn't increase it much. Any nitrogen added is used by the plant or leached out of the soil. Under grazing or in the presence of clover, this form of N might increase to 32 p.p.m.

The total nitrogen in the soil can be equivalent to as much as 60 cwt nitrochalk per acre in the top inch of soil. Its value for crop production depends on the rate at which it is converted to mineral nitrogen. The amount of mineral nitrogen will depend more on clover content and method of use of the grass (grazed or cut) than on the amount of fertiliser nitrogen added. Dung and urine will increase the mineral N but in dry soils and hot climates, no increase is found.

The rate of conversion to mineral nitrogen is increased by liming and aeration of soil and retarded by lack of drainage and matted roots. The variability of nitrogen supply from the soil, as a result of management or composition is not great when compared to the needs of high yielding grass swards for nitrogen.

I.V. Hunt

113. The fate of fertiliser nitrogen on permanent grassland soils

Woldendorp, J., Dilz, K. and Kolenbrander, G.
Agricultural University (J.W.) and Institute for Fertility, Groningen (K.D. and G.K.)

Up to 60% of the nitrogen applied as fertiliser can be recovered in herbage cut for hay or grazed. Less is recovered under some conditions. This paper was concerned with what happens to the remaining approximately 50% N applied.

It is rarely any use just analysing soil for its total nitrogen content since it is so big compared to the amounts of fertiliser nitrogen applied that changes in total soil nitrogen would hardly show up. The best approach is to apply fertiliser containing radio-actively labelled nitrogen, e.g. ^{15}N and trace its path after reaching the soil.

The possible sources of loss are as follows:-

1. Leaching

i.e. the nitrogen becomes dissolved in soil water and is carried downwards below normal root depth. This is most likely to occur during wet periods such as the early spring, before plant growth is vigorous.

Table 1

Application date	% recovery in crop	% leached	% unaccounted
15 March	79	1	20
1 May	66	1	33
15 June	71	1	28
1 August	54	16	30
15 September	49	8	43
1 November	37	32	31
15 December	49	21	30
1 February	73	1	26

Table 1 shows the results of applying 60 units N/acre to lysimeters (specially constructed pots so that all the drainage can be collected for analysis) on various dates throughout the year. Each pot was sown to meadow fescue which had already been given 30 units/acre N. From this, it looks as if leaching is worst during August/December, the period of

heavy rain combined with low growth rate. The September application seems to be the least efficient. Examples were shown of low recovery in the growth shortly after application of nitrogen followed by high recovery later because nitrogen had been leached down below root growth at the time of the first cut and brought back later in warmer weather when water and dissolved nitrogen may be sucked upwards. The recoveries shown are considerably higher than generally found in field experiments.

2. Incorporation into organic matter

Nitrogen may combine with various materials in decaying vegetation and animal life in the soil or it may be taken up and used by various living organisms such as bacteria, grubs, minute plants. Incorporation of added fertiliser nitrogen into organic matter can occur through nitrogen being taken up by the plant, and then released to the soil as shedding leaves, roots etc. This nitrogen is not available to plants and is called immobile nitrogen. Most of the nitrogen in the soil is in this form and a study of factors which lead to immobilisation in or encourage the release of this nitrogen is very important.

About 10-20% of the fertiliser nitrogen can be detected in the plant roots etc. at the end of each season's growth. This will be added to the organic nitrogen. Apart from this, there is very little evidence about the amount of fertiliser nitrogen which becomes incorporated as soil organic nitrogen.

3. Volatilization.

Some fertiliser nitrogen may be broken down into gaseous nitrogen or Ammonia which is carried up into the air. This can be a very considerable source of loss of from 10-40% of applied nitrogen. The breaking down of nitrogen compounds into gaseous N or Ammonia is called denitrification and takes place through the activity of 'bacteria' and similar micro-organisms who use the compounds as sources of energy.

An interesting observation of the authors was that 'denitrification' is stimulated by the presence of living grass roots and it is deduced that most of the losses by volatilisation occur round about plant roots.

I.V. Hunt

114. Yield in relation to fertiliser nitrogen and clover nitrogen in Scandinavian herbage production.

E. Steen, Institute for Agronomy, Uppsala, Sweden

Scandinavian herbage production is based on leys, which are increasing in acreage at the expense of root crops and natural grasslands. The growing seasons are short and for example cows are out for 160 days in Denmark, 145 days in South Sweden, 135 days in Finland, North Sweden and 90 days at the Arctic Circle. Thus, leys for winter fodder are most important. Yield levels from good white or red clover leys can be as high as 10,000 lb/acre in Denmark but fall with the shorter growing season in more northerly parts until in Finland and Central Sweden, the white clover is best replaced by the hardier red or alsike clover. Clover leys produce high quality forage but clover is not reliable and can be reduced by winter kill, eelworms, or the clover rot disease. Since clover is so unreliable one must turn to nitrogen and especially to the possibilities of deriving benefit from clover (in terms of quality and yield) and from the fertilised grass and not just a change in composition as has been shown by many research workers. The possibilities are shown in Tables 1 and 2.

Table 1 Effect of Nitrogen applied to Pure Red Clover (Salonen, Finland)

N applied lb/ac	0	30	60	90
Yield lb/ac	4960	5430	5210	5580

There is a very slight increase in yield.

Table 2 Yield of 1st hay crop after various nitrogen applications applied to grass/clover swards of different clover contents (Larson, Sweden)

	N applied lb/ac					
	0	15	30	45	60	75
Clover %	Yield	Increase over yield at 0				
20	4250	+700	+550	+500	+350	+350
21-40	5050	+600	+400	+350	+350	+150
41-60	6100	+400	+250	+150	+150	-
61-	6150	+250	+150	+ 50	+150	

The higher the clover content the less beneficial was the applied fertiliser, but in nearly all cases there was some increase in gross production. At the top level of application of 75 units N/acre no net increase in herbage was obtained with high levels of clover in the original herbage. That is, the fall in clover was equal to the increase in grass in the mixtures.

A fall in clover content is general as is shown in Table 3 even though it accompanies a general rise in yield.

Table 3 Yield of total hay, of separate grass and clover, and the % clover in the hay at various rates of application of N

Units N/acre	0	50	100	150	200
Yield: Total hay lb/ac	5000	6980	8450	9600	10150
% clover	29	18	12	10	8
Yield: Clover	1450	1260	1010	960	810
Grass	3550	5720	7440	8640	9340

The increased yield is entirely due to increases in the grass part of the crop. Clover does not remain constant in a ley but tends to fall off from year to year. Leys with 50% clover show very little benefit from low dressings of nitrogen but may do from higher dressings. These same leys in their second year with less clover show an advantage from the lower dressings of nitrogenous fertiliser. Table 3 summaries observations over several leys.

Table 4 Age of sward and response to fertiliser nitrogen (Ingebrigtsen)

		Level of N applied		
		0	42 units/acre	126 units/acre
1st year ley:	yield lb/ac	8570	9710	11230
	clover %	50	44	34
2nd year ley:	yield lb/ac	6940	8720	11400
	clover %	30	20	10
3rd year ley:	yield lb/ac	4650	6750	10170
	clover %	10	2	1

The ability of leys given high levels of nitrogen to maintain their production is also shown in Table 4.

Since clover content is very important in obtaining the top yields without nitrogen, the effect of top dressing cereal cover crops with nitrogen on clover becomes important. The yield in the first and second year grass may be adversely affected. In one experiment, increasing nitrogen to the barley from 0 up to 120 units N raised yields of barley from 2160 to 3020 lb/acre, but reduced hay yield in following year from 6660 lb down to 3610 lb/acre.

On average, the clover contents of herbage in Sweden are low and the advantages of a vigorous clover ley do not hold.

I.V. Hunt

MEMBERSHIP

South West Scotland Grassland Society

During the past year the following eighteen members have joined the Society. A full list was published in No. 5.

Ayrshire

T.G. Brownlie, 12 Underwood Road, Prestwick.
J. Caldwell, Moorfield, Kilmarnock.
J. Crawford, Dowhill, Girvan.
H.A. Crawford, Drumbeg, Turnberry.
T.C. Gray, Turnberry Lodge, Girvan.
W. McNaughton, Fulshawwood, Ayr.
J.N. Watson, Burnock Mill, Ochiltree.

Dumfries

J. Bell, Hoddamtown, Ecclefechan, Lockerbie.
G.W. Berry, College Office, 41a Castle Street, Dumfries.
J. Blackley, Berscar, Closeburn, Dumfries.
Col. M. Crawford, Dalgonan, Dunscore.
J. Struthers Symington, 116 Morningside Drive, Edinburgh, 10.

Kirkcudbrightshire

J. Marshall, Auchenleck, Auchencairn, Kirkcudbrightshire.
J. Agnew, Lee Park, New Galloway.
C.R. Phillips, College Office, The Market, Castle Douglas.

Other areas

R. Henderson, Potash Ltd., "Whitelaws", Garvald, East Lothian.
W.K. Letheren, The Poplars, Houghton, Carlisle, Cumberland.

Wigtownshire

S.A. Ross, College Office, National Commercial Bank Buildings, Bridge Street, Stranraer.

Central Scotland Grassland Society

A full membership list was published in the last number (No. 6) of our journal. The following thirty-nine have joined during the last twelve months:-

Argyllshire

A.G. Rodger, Ballimore, Otter Ferry, Argyll.
J.M. McConnachie, High Dalrioch, by Campbeltown.

B. Howard, Balinakill Farm, Clachan, Tarbert, Argyll.
A.M. Barbour, Dalrioch Farm, by Campbeltown.
D.W. Anderson, Lagavhlin Farm, Port Ellen.

Bute

J.F. Renfrew, Cranslagloan, Rothesay.

Lanarkshire

J. Alexander, Huntlyhill Mains, Lanark.
J.H. Ballantyne, Nethershields, Strathaven.
J.P. Baird, Nether Affleck, Kirkfieldbank, Lanark.
W. Strang, Auldhouse, East Kilbride.
A.W. Welsh, Lawmuir Farm House, Jackton, East Kilbride.
T.W.F. Morton, Howfaulds, Ravenstruther, Lanark.
A. Barr, Heatheryhall, Thankerton, Biggar.
J. Adamson, Swaites, Pettinain, Lanark.
W. Findlay, Avenuehead, Gartcosh, Glasgow.
M. Hamilton, Woolfords, Cobbinshaw, West Calder.
T. Haynes, South Hillhead, Carluke.
J.M. Lyle, West Hallside, Cambuslang.
R.M. Barrie, Howburn, Biggar.
W.P. Swan, Balgray, Crawfordjohn.

Perthshire

R.W. Dalglish, East Third, Auchterarder.
A.B. Campbell, Grainston, Dunblane.
F.R. Shand, Braincroft, Crieff.

Renfrewshire

A.K. Imrie Jnr., Auchentibber Farm, Neilston, by Glasgow.
B.J. Baird, Floors, Eaglesham.
W.C. Baird, Floors, Eaglesham.
B.N. Baird, Floors, Eaglesham.

Stirlingshire

J. Logan, Powis Mains, Stirling.
A. Gilmour, Drumelzier Farm, Denny.
J. Risk, Gowstone, Buchlyvie.

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J.C. Weir, c/o S.A.I., Whitelees Road, Lanark.
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J.D. Edward, Basic Slag Advisory Service, 19 Waterloo Street, Glasgow, C.2.