GRASSLAND

JOURNAL

OF THE

SOUTH WEST

AND

CENTRAL SCOTLAND

GRASSLAND SOCIETIES

No. 11 SUMMER 1968

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EDITORIAL

This issue of Greensward is later than usual having suffered because of the general pressure of work in the editor's department.

Dr. John Frame is still away in Argentine and according to all reports getting on fine. He experienced one of their showers of giant hailstones recently which smashed all the windows of his house. This is a hazard which fortunately does not occur here. Two of these storms occurred whilst I was there. The hailstones weighed 2 ounces each and were as big as oranges. They can kill livestock and drive holes through tin roofs of buildings or cars. An article on the background to this co-operative effort between the Grassland Husbandry Department and an experimental station in the Argentine is included in this number.

Mr Gordon-Duff-Pennington is to be congratulated. He is one of the brave band of farmer-members who has accepted an obligation to support the Journal by contributing an article. Otherwise, we depend as usual on Dr. Castle of the Hannah and members of staff at the Hannah Institute and the West of Scotland Agricultural College.

I have left the membership lists of the two Societies out of this number. They take up a lot of room and are often out of date by the time they appear. A separate membership list will be sent to members later on.

A list of forthcoming events as so far arranged is included but it is likely to be altered. Notices of each meeting with final instructions, etc. are sent to members by post. Last year, a member of the Central Society travelled to Dumfries for a South West Society meeting which had been postponed. It is advisable to check final arrangements with your Secretary or County Adviser before setting out for a meeting of the sister society.

There have been many scientifically interesting events this year.

A conference of Grassland Workers of Scotland was held at Auchincruive and the European Hill Land Productivity Symposium was held at Aberdeen. The proceedings are now being prepared for printing and will be available for purchase by our grassland society members.

As the final touches of the journal were being prepared our summer tour took place to Reading. A report will be prepared for the next journal, but whilst there I visited Dr. William Davies in hospital. By the end of the week he had passed away.

Dr. William Davies was the leading grassland scientist of our age, with a wealth of published works some of which have been translated into other languages. All grassland society members owe him a debt since he more than anyone else was responsible for the creation of the B.G.S. and for extending its interests to Local Grassland Societies.

I. V. HUNT.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY
EXECUTIVE COMMITTEE 1967-68

Chairman: J. G. Marshall, Hardgrove, Carrutherstown, Dumfriesshire. (Carrutherstown 209).

Vice-Chairman: A. Gray (Jnr.), Ingleston, Borgue, Kirkcudbrightshire. (Borgue 208).

Past-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, West of Scotland Agricultural College, Auchincruive, Ayr. (Annbank 331).

Elected Members:

1966-68: M. J. Bannister, Carseminnoch, Newton Stewart, Kirkcudbrightshire.
J. L. Bell, Hoddamton, Ecclefechan, Lockerbie, Dumfriesshire.
L. D. Drysdale, Stewarton, Kirkinner, Wigtownshire.
R. S. Smith, Corsankell, Saltcoats, Ayrshire.

1967-69: A. Buchan, Ladykirk Estate Office, Monkton, Ayrshire.
H. O. Chalmers, Craigencrosh, Stoneykirk, Stranraer, Wigtownshire.
P. Gordon-Duff-Pennington, Kirkland, Tynron, Dumfries.
A. Gray (Jnr.), Ingleston, Borgue, Kirkcudbrightshire.

College Advisers:

A. Campbell, 20 Miller Road, Ayr, Ayrshire. (Ayr 64627).

S. A. Ross, Edinburgh Road, Stranraer, Wigtownshire. (Stranraer 2649).

J. Thorburn, 41a Castle Street, Dumfries. (Dumfries 4169).

R. M. Patterson, 104 King Street, Castle Douglas, Kirkcudbrightshire. (Castle Douglas 2743).

Co-opted Members:

Professor J. S. Hall, West of Scotland Agricultural College, Auchincruive, Ayr.

A. E. Parkinson, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

G. M. Berrie (Secretary: Central Scotland Grassland Society), West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

CENTRAL SCOTLAND GRASSLAND SOCIETY
EXECUTIVE COMMITTEE 1967-68

Chairman: R. Howie, Drumfork, Helensburgh, Dunbartonshire. (Helensburgh 2329).

Vice-Chairman: W. B. R. Elder, Mid Glen, Langbank, Renfrewshire. (Kilmacolm 2492).

Past-Chairman: J. M. Argo, Newton Farm, Cambuslang, Lanarkshire. (Cambuslang 3023).

Treasurer: J. Waddell, College Office, Portland Place, Lanark, Lanarkshire. (Lanark 802).

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

Elected Members:

1966-68: J. McGregor, Boghill, Lesmahagow, Lanarkshire.
W. B. R. Elder, Mid Glen, Langbank, Renfrewshire.
R. Simpson, Duchlage, Crieff, Perthshire.
J. Risk, Gowstone, Buchlyvie, Stirlingshire.

1967-69: James Clark, Dunrod, Inverkip, Renfrewshire.
A. Smith, Hazeldean, Strathaven, Lanarkshire.
W. Allison, Laigh Cleughearn, Auldhouse, East Kilbride.
M. Argo, Newton Farm, Cambuslang, Lanarkshire.
W. Douglas Johnstone, Monkscroft, Auchterarder, Perthshire.
Peter Fisken, High Gayton, Milngavie.

College Advisers:

Campbell Watson, 8 St. Mirren Street, Paisley, Renfrewshire. (Paisley 9152).

I. W. Mitchell, Beechwood, Stirling. (Stirling 5464).

Co-opted Members:

Professor J. S. Hall, West of Scotland Agricultural College, Auchincruive, Ayr.

A. E. Parkinson, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

I. V. Hunt (Secretary: South West Scotland Grassland Society), Grassland Husbandry Department, West of Scotland Agricultural College, Auchincruive, Ayr.

FORTHCOMING EVENTS

The following is the provisional winter programme of our societies, South West Scotland Grassland (S.W.S.G.S.) and Central Scotland Grassland Society (C.S.G.S.).

7 Nov.	A.G.M. (S.W.S.G.S.) Hannah Dairy Research Institute, Ayr. Dr Ken Baker of Meat and Livestock Commission on "Beef—performance and profitability."
21 Nov.	A.G.M. (C.S.G.S.). Farm visit in Perthshire.
Dec.	"Hill Farming." Thornhill (S.W.S.G.S.).
Jan.	"Low Cost Housing." Discussion meeting at Castle Douglas (S.W.S.G.S.).
13 Jan.	Ralph Bee, Director of Drayton, Experimental Husbandry Farm. Newhouse Hotel (C.S.G.S.).
24 Feb.	Neil McCall Smith on "Hill Land Improvement" at West of Scotland Agricultural College, Blythswood Square, Glasgow. (C.S.G.S.).
26 Feb.	P. D. Jones, Director, Bridget's Experimental Husbandry Farm, Hampshire. (S.W.S.G.S.).
Mar.	Spring tour Ayrshire. (S.W.S.G.S.).

MILK PRODUCTION AND STOCKING RATE

by M. E. CASTLE
Hannah Dairy Research Institute, Ayr

Many factors influence the profitability of milk production but without doubt one of the most vital is stocking rate, i.e. the acreage of land which is required per animal. Most dairy farmers are well aware of methods for increasing the yield of pasture, e.g. by the use of extra fertilisers, but it is often not realised that the real key to higher milk production and higher profit per acre lies in improving the utilisation of the herbage. To do this usually means increasing stocking rate. There is no point in growing extra grass and clover if it is not converted into a saleable end-product such as milk.

The importance of stocking rate was demonstrated recently by an experiment conducted in Ireland. In this experiment an increase in the rate of stocking from one cow on 1.5 acres to one cow on 1.2 acres resulted in the production of 25 per cent. more milk from identical areas of land and with no difference in the level of fertiliser applied to them.

A similar result was obtained from a grazing experiment conducted at the Hannah Dairy Research Institute in 1964. Here two groups of cows were grazed at the rate of either one cow per 0.92 acre or one cow per 0.70 acre and the outputs of milk per acre were 490 and 610 gallons per acre respectively. The daily yield per cow was 2½ lb less on the high than on the low stocking rate treatment, but milk production per acre was 24 per cent higher. The composition of the milk was virtually unaffected by stocking rate, with a total solids content of 12.58% on the low stocking rate and 12.52% on the high stocking rate. The weight of herbage dry matter available to the cows on the two treatments was almost identical but the animals at the high stocking rate ate more of the available herbage than the animals at the low stocking rate. In other words, at the high stocking rate the herbage was utilised more efficiently by the animals. It is not unusual for about half of the original yield of herbage dry matter to be left in a pasture when the animals are moved to a fresh area.

If herbage is not being utilised efficiently because of an overall low stocking rate on the farm, there is little or nothing to be gained by altering the grazing management to, say, a paddock or a strip-folding system. This has been demonstrated clearly at Ruakura, New Zealand, where a series of grazing experiments showed that the advantage of changing from a system of set stocking to rotational grazing was worthwhile only if stocking rate was high. Without doubt, production could be increased economi-

cally on many farms in Great Britain by increasing stocking rate, and then more detailed attention could be paid to the system of grazing employed.

Perhaps the greatest merit of the system of paddock grazing is the fact that at the outset of the grazing season only a half-acre of grass is allowed for each cow. This ensures a high rate of stocking for the entire grazing season and is coupled with a system of rotational grazing. In order to have sufficient grass to support this high rate of stocking adequate amounts of fertiliser must be applied, but the really vital factor in the system is the stocking rate.

It may be thought that, where grassland is heavily stocked with dairy cows, the feeding of supplementary concentrates would be necessary and economic. Experimental work certainly indicates that, as stocking rate increases, the response to concentrate feeding also increases, but at the stocking rates likely to be achieved on most farms the feeding of concentrates to grazing cows on good grass will probably continue to be uneconomic. In a grazing experiment at this Institute in 1965, when 0.58 acre per cow was used for grazing and for some conservation, 12 lb of rolled barley was needed to produce an extra gallon of milk. Barley is a relatively cheap source of nutrients, but with this poor response in terms of extra milk it was hardly worthwhile to feed it even at this high rate of stocking.

Of course, too great an increase in stocking rate could reduce the milk production per cow to such an extent that the yield per acre would start to decrease. However, such a high stocking rate has rarely been reached in experimental work and is unlikely to occur in farm practice.

Increases in stocking rate should be made gradually so that reserves of conserved feed can be made, and experience gained in handling larger numbers of animals with an improved system of grassland management. New skills may have to be acquired with, of course, the necessary confidence in dealing with a larger unit.

The lesson to be learnt is that stocking rates must be high if the most efficient conversion of pasture to milk is to be achieved. A target of about one acre per cow should be our aim and already this is being achieved profitably by progressive grassland farmers.

MUD, A MUG AND A HUNDRED COWS

by PATRICK GORDON-DUFF-PENNINGTON

Approached by the Celtic charm of our editor and a few deft blows of his verbal battle axe (which would have felled Owen Glendower himself) this reluctant author thought he had better use the occasion to try to justify to himself the quite unjustifiable folly of his farming system.

I am the Mug—me, the employee of a hundred cows; they cannot lose. They cannot be starved or I shall need a golden bowler which the nation are too poor to afford; they pay no S.E.T. and a grateful Government loves them so dearly that it pays just enough for their keep to keep me in slavery long past the tender age of sixty-five when any sane individual would be expecting a rebate ! At least, this is what we are led to believe when long-suffering College advisers with long faces and hearts kinder than their clients deserve, pronounce that we cannot make money honestly from beef; Max Aitken, a more notable journalist than I, preaches the same gospel, while my predecessor in the farm with his ultimate twenty-five dairy cows on one hundred and eighty acres says that only dairying can pay ! ! They sometimes tell us heredity is bosh, but I know that it isn't, for somewhere along the line a mixture of Aberdonian obstinacy and West Coast dreaming left me, the Mug, out on a branch of the tree, determined to prove they are all wrong and ready to take one large jump straight into the soup.

And that is how I landed in a derelict dairy farm, six miles from home, entertaining a hundred cows that eat like Clydesdale horses, but luckily having had the wit to employ a first class stock-man. Having got into the soup and simmered quietly for two and a half years, I am now in a position to speak with authority about the problems. The farm is one hundred and eighty acres, of which twenty-five are cut woodland, flooded by choked drains, and the remainder a subtle blend of stones and mud — when one wants to plough, the stones are total, and when one wants to graze, the ground seems only to have enough stones to cut a cow's foot and poaches just as well as other people's. The dykes are a disaster and the cows don't help them. The buildings, mostly now demolished, were vast, ugly, wet and thoroughly dangerous. Only someone wanting kicks could have stood among the rattling rusty tin on a windy day, and seen the slates flying through the clouds, and listened to the creaking joists, and watched the sky through the hole above, while the roof lay idle in the next door field. Now and again there was a noise like an Alpine avalanche, as another two ton of stone rumbled off a precarious perch. Fifty acres were ploughed up, thirty-seven of which had been in barley for five years. The house was riddled with damp. The farm cost £78 an

acre. Faced with the problem, the best answer seemed to be to offer a prize for the solution to the Young Farmers. The one I thought deserved the prize sent his answer late and had obviously waited until he saw how I had stocked the place. He should go far but the judge thought otherwise !

I already possessed the cows and had not noticeably robbed anybody in the process. Like so many expensive machines one has to learn to live with their faults. The best of them were Irish, great framey beasts with plenty of milk, but there was everything else which had nothing much to do with any known herd book, and at the bottom of the league a few Galloways and Scottish blue greys, growthless, ill-mannered and ungrateful. As I am finishing my calves on another farm I do not mind about the colour of their faces, but if a suckler enterprise is to succeed I am convinced that the two most important considerations are the milkiness of the dams and the ability of the bull to transmit high weight gains at low cost. With this in mind I purchased two Beevbilde bulls from Mr Pentecost of Cropwell Butler with daily gains at thirteen months of 2.89 and 2.88 lb. In their working clothes they are not much too look at, but they have transmitted high gains and excellent food conversion to their calves. They are red, polled and based on a three way cross (Lincoln Red, Red AA, Polled Shorthorn). Their cost was £250 and has been amply repaid. I have now purchased a further two. The problem of replacing the cows is much harder. We weigh the cattle regularly between speaning and slaughter, but with the present identification system are apt to lose the connection between mother and calf by the time of slaughter. I should like to continue working with Irish cows, but am scared of disease, and feel that we shall be forced into breeding our own replacements; for this it will be essential to have an easily read identification on the cows. Freeze branding is still too expensive, but the new plastic tags can be recovered when a cow decides to leave us — feet first or otherwise !

Finally, the Mud. The most important part of the enterprise is the stockman, and a hundred cows, together with the making of their silage, for which he has assistance, seems a large enough unit to keep him busy. The first thing was to improve his conditions, starting with the house, following it up with a good tractor, and finally providing somewhere for the cows in the winter. For the first two winters the mud was unbearable, so in the interest of the stockman and the cows it was decided to overthrow all advice and training, not to mention better judgment, and invest £45 a cow (net) in a 70′ x 105′ clearspan shed. There were the usual building troubles — mostly human, not technical — but the shed which was to be finished by November 1st was eventually finished at the beginning March. The cows are bedded in straw and use twenty bales per day, but a 9′ space behind the barriers is scraped daily.

The shed is divided into six sections. The cows lie comfortably and have plenty of air. Slats were not installed for the insufficient reason that the West Coast lady further up the tree left me with an intuition that I should be better without them ! I am sure that the cows will be easier kept, the stockman more content, the grass earlier in the spring, and not least, my stomach will be less like George Mair's slurry tank when he was finished with the agitator. The capital value of the farm has been increased by more than the £25 an acre the shed has cost me. We will try to work our calving to July-October so that the calves are past the scouring stage by shutting up time, speaning them before the cows go to the grass in the spring. The cows can then be kept very tight until the silage is made, when an increasing supply of grass will be available as they come to the calving. The calving index is excellent and this year we have had one hundred and three calves from one hundred cows. The calves will be fed from birth to slaughter with the intention of having them slaughtered at twelve to fifteen months. They will have no barley if possible, as I have achieved much better results with a mixture that does not include it. This system will give us the advantage of the steep weight increase curve of young beasts, without the expense of keeping the speaned calves for a winter away from their mothers.

About my grassland policy I shall write another day if anybody wishes, but the editor will have to give me more than a week's notice so that I can discover what it is ! I hope these words will be sufficient to discourage any dairy farmers from thinking the efficient farmer is better suited to a suckling herd than milk. I do not say that my system would suit anybody else, and I know there are arguments against everything I have done, but if I listened to them all I would never take a decision. My intention is eventually to show myself and the world that a simple system can be evolved to make suckling cows a viable proposition, but unless there are sufficient animals for one man to look after at the same time as leading a civilised life, such an enterprise can have no future. We shall have to become increasingly specialised and increasingly cost conscious, but I am sure that, with careful attention to the paper work, we shall build a successful business. In conclusion, the gates of the Snade are always open to any member of the Society who is either interested or argumentative enough to come.

F.A.O./S.F. 186

by I. V. HUNT

The letters F.A.O. probably have very little meaning to West of Scotland farmers but in the headquarters (Rome) and in countries where F.A.O. operates, they are very meaningful.

They stand for *Food and Agricultural Organisation of the United Nations*. Although the word United Nations figures in the full title, F.A.O. is an older organisation with connections with a similar organisation of agricultural co-operation which operated from Rome before the last war.

It now works along with the United Nations but its independence is revealed by the fact that among its member nations there are some who are not members of U.N. and also that all U.N. members are not necessarily members of F.A.O. Its remit is quite simply to further one of the great aims of U.N., namely to ensure Freedom from Hunger as a right for all inhabitants of the earth. Many well known agencies such as U.N.R.R.A. (United Nations Relief and Rehabilitation Association) and F.F.H.C. (Freedom from Hunger Campaign) operate within the organisation.

F.A.O. is vast; concerned with collecting information on food production and food requirement and acting as a clearing house for knowledge and experience. The basis of its campaign is not direct relief such as passing food from areas of plenty to areas of need but making knowledge on crop, grass, fish production etc. available to the technical advisors, research workers and food producers in these deficiency areas.

This is the soundest solution, namely to make it possible for the under-nourished areas to feed themselves.

Many are the criticisms of the organisation, often by people who turn a deaf ear to the requests for aid. The task is much bigger than is realised and is beset by the need to:—

(a) secure the approval and co-operation of the contributing countries and

(b) ensure the co-operation of the receiving country which in early stages of development may be suspicious of the motives of these seemingly powerful bodies.

S.F. 186 is the code name of the particular project to which I was attached, charged with demonstrating how to increase meat production in the Mesopotamian Region of Argentina through the improvement of grassland. S.F. stands for Special Fund and it represents a series of projects tackled by

i. Analysis of the problem.

ii. Collecting an international team of experts in the subjects required to meet the problem.

iii. Pairing off these incomers along with local experts so that the whole problem is tackled by a twin team, one of which will leave the country after 3 to 5 years whilst the other carries on the work that has been initiated.

There were a number of difficulties in getting this particular project in motion because of the scarcity of suitable international experts who had the necessary experience of the problem, who were prepared to be uprooted, who could be released from their normal duties and who were acceptable to the Argentinian government. During the term of the project, experts on animal production, range management, machinery, soil survey, biological survey, economics, plant nutrition along with myself concerned with pasture management spent 1-3 years on the project.

It is necessary to clarify the reader's mind on the word 'expert.' In Britain, the word has come to mean a person who knows the answer to all problems and as such I would hate to describe myself as an expert. In South America it is part of the verb 'experimenter' to try or to have experience. The past participle of the verb is 'experto'—'one who has tried.' This I would accept.

The Problem

Argentina is a vast country, over 2000 miles long from near tropics to near Antarctic, shaped rather like an ice-cream cone about 900 miles across its broad subtropical top. Most of it is dead flat, but along its western boundary with Chile and Peru are the Andes rising to over 20,000 feet.

General Statistics Argentine x Great Britain x Scotland

	Argentina	*Great Britain*	*Scotland*
Total area (million acres)	700	56	19
Natural grassland (million acres) ...	275	17	12
Annual crops (million acres)	31	12	1.5
Sown pastures (million acres) ...	35	17	3
Cattle (millions)	43.5	11	2
Sheep (millions)	48.5	29	8.5
Population (millions)	21	55	4.5
Number of farms	470,000	400,000	56,000

The country is vast and compared to Britain, thinly populated. However, the important point is that of all the great agricultural areas of the world, Argentina and neighbouring South American countries are showing a fall in agricultural production, whilst sharing with all other communities a rising population.

Living conditions are improving very rapidly and a vast increase in population through improved health measures and immigration seems certain. Whereas before the war, export of meat was on a vast scale (three times that of Australia or New Zealand), nowadays it is on a much smaller scale. Total meat production in Argentina with all its vast numbers of livestock and its size is just about equal to that of Britain. Export of agricultural produce, meat, wheat, linseed etc. is the mainstay of Argentina's economy. At present rate of increase of population, export of agricultural produce will cease. Even now a drought sets back production so that there is insufficient even for local consumption. Last year, it was necessary to import wheat from Spain. In a few years time, if nothing is done about livestock production, it will be necessary to import meat.

It is understandable that British farmers are concerned at the competition which Argentine beef presents to them. It is equally understandable that the Argentine Government looks to Britain as the main market for its product. Britain imports more meat that any other country and Argentine competes for a share in that market by offering the cheapest beef in the world. This may please the Argentine Government but it brings no joy to the Argentinian farmer who cannot afford to produce meat at this low price except by a system of land exploitation—taking everything without putting back anything.

The economics of meat production in the Argentine is responsible for the fall off in production. The price of meat is too low, the cost of fertilisers, feed, seed, labour, fencing machinery and everything that is necessary to cash in on the marvellous growing conditions in the Argentine is extremely high. The producer is at the mercy of drought and flood and cannot afford preventive measures. Cattle must die in thousands or be sold off at give away prices when feed is scarce. At about 50/- per live hundredweight, he can hardly gross £5 per acre. Given the sort of money which a European farmer receives for beef, Argentine production could go up twentyfold.

It is the manipulation of this vast potential mean production for the benefit of the hungry that interests U.N., not the production of cheaper meat for Europeans who can well feed themselves. Maybe the simplest solution would be to transfer population from areas of poor production potential to Argentina and send with them the means of combatting drought and flood.

MR JOHN MARSHALL, HARDGROVE, CARRUTHERSTOWN, DUMFRIES

by J. THORBURN

One of my first recollections of John Marshall was meeting him fairly early one morning at the end of the byre with his sleeves rolled up. This is typical of the man who has a keen interest in his stock which is not surprising considering he spent two years learning the trade with Bert Drummond at Bargower.

The first few years of his life were spent at Glenluce in Wigtownshire, moving from there to Ayr where he was educated at the Academy. A course at the West College brought him a diploma in agriculture which did not really condition him for his service in the Royal Artillery. It did help to prepare him for farming, however, and eventually he bought Hardgrove in Dumfriesshire, moving there in 1954.

Hardgrove is a big farm of around 500 acres and rather difficult in some ways to work—the land varies from sand and gravel through a bit of peat to clay. At one time 30 acres of potatoes were grown with 200 acres of barley, but this has been streamlined to 100 acres of cereal and the potatoes eliminated, and the emphasis is now on grassland.

The present dairy herd consists of 150 cows in which Ayrshires predominate, housed in cubicles and fed with haylage from twin towers. Including the beef stock, which are Shorthorn/Ayrshire crosses, there are about 400 head of cattle on the farm. It is interesting to note that the Shorthorn is the only bull on the farm—the rest have to make do with A.I. A battery unit of 6,500 hens completes the permanent stock and there is still room to winter about 350 ewes.

John Marshall was persuaded by Annan branch of the N.F.U. to become their President a few years ago, and since then he has done a lot of public work for farming—President of Dumfries Area N.F.U., Vice-Convener and Convener of the N.F.U. Milk Committee.

John still finds time to relax, however, and enjoys his round of golf, but even when he should be relaxing committees still claim him and he helps to run the Annan Wine Club, which sounds a nice way to spend an evening.

A background and interests such as these make John Marshall a very acceptable Chairman for our Society.

R. HOWIE, DRUMFORK, HELENSBURGH

by C. CAMPBELL WATSON

Drumfork has been the scene of many farming innovations and changes since 1888, when the present Mr Howie's grandfather took over the tenancy. The year 1900 saw the establishment of a pedigree Ayrshire dairy herd and 1910 the milk recording of the herd. The pioneering spirit of the early Howies has been displayed by the present Mr Robert Howie, the herd becoming the first dehorned herd in the area many years ago, and also the first in the area (1962) to be kept under loose housing conditions.

Drumfork extends to some 312 acres, of which 200 acres are arable and the remainder permanent pasture, the land rising from 75 feet to 500 feet above the River Clyde. The best land around the steading is of a light to medium loam, whilst the heavier land, down mainly to permanent pasture, lies on the higher contours.

As one might expect of the Chairman of the Central Scotland Grassland Society, efficient grassland management has enabled Mr Howie to adapt his farming policy to meet the challenge of changing times. Over the last 6-7 years grassland has enabled him to increase the dairy herd from around the 65 cows mark to the present 110 cows, and at the same time compensate for the loss of 30 acres of potato land to building. It also supports a breeding flock of sheep. Some 70 acres of barley are also grown for feeding to the dairy herd. The cows are now kept on a court/parlour/self-feed silage system, 150 gallons of the daily production of 200 gallons being retailed in the surrounding area.

Fertiliser usage on the grazing fields averages 180-200 units N and 40-50 units of P & K, whilst the silage fields receive approximately 230 units N and 60-70 units of P & K per acre.

Having recently purchased Drumfork, Mr Howie intends to build up the cow numbers to approximately 130 head, to enable him to service the additional capital involved. He considers that grassland, properly exploited, can fill this role.

CENTRAL SCOTLAND GRASSLAND SOCIETY

Visit to Wigtownshire, 18th April, 1968

About 70 members travelled to Wigtownshire, the country of mild winters, early grass, haylage and big dairy herds. The bad late spring had affected Wigtownshire but this was not noticeable to our more northerly society. Four farms were visited and a resume of each is given below.

Mr J. Birrell, Kenmuir, Sandhead

Size

124	acres	arable.
34	,,	rough.
2	,,	buildings and roads.
160	,,	total.

Stock

106 dairy cows.
15 August/September born calves.

Cropping and Manuring

The farm is all in grass and is managed to provide the grazing requirements for the entire stock and to make 500-600 tons silage.

A dressing of 155 units nitrogen per acre is given to all fields in spring. The rate of subsequent applications depends on growing conditions and on whether the field is being cut or grazed. Straight nitrogen is applied in spring and late summer, and a 2-1-1 compound during June and July.

The fields range in size from 16-20 acres. Fields being grazed are halved with an electric fence and each half strip grazed. Grassland recording is carried out. In 1967, fields produced up to 38.7 cwts. U.S.E. per acre.

Buildings

The cows are run in two lots. During the day, lot 1 is housed in a 58 stall byre which has an R.T.S. pipeline. The other lot are in a 48 stall cubicle house with access to a self-feed silo. At each milking, they alternate places.

1966/67 Performance

Per forage acre

Milk sales	£110
Conc. feed costs	24
Margin over conc.	£86
Fert. costs	11
Margin over bought feed and ferts.	£75

Target

It is hoped that by autumn, 1968, the dairy herd will be increased to 116 cows. 15 A.I. home bred Cross Friesians will be retained each year for replacements. 6½ score Blackface hoggs will continue to be wintered.

Mr S. A. McColm, Cairngarroch, Drummore

Size

134 acres arable.
17 „ permanent pasture.

151 „ total.

Stock

90 Ayrshire cows.
25 in-calf heifers.
14 bulling heifers.
25 calves.
2 Ayrshire bulls.
All grazed and wintered at home.

Crop

30 acres early potatoes.
10 „ barley.
111 „ grass.

Rotation

Most of the farm is in a 7 year rotation.
1st Year — potatoes or barley.
2nd Year — Italian ryegrass.
3rd Year — potatoes.
4th, 5th, 6th and 7th years — grass.
20 acres of light land alternate potatoes and Italian ryegrass, 10 acres of each, each year.

Management of Grassland

Italian ryegrass and first year grass are strip grazed once, cut for silage, then strip grazed again in summer. All other grass is divided into 5 - 6 acre paddocks, strip grazed in early part of season, then closed in June for a July silage cut.

Manuring of Grassland

The Italian ryegrass and young grass receive 140 units N. per acre in February, followed by approximately 100 units for a silage cut and at least a further 100 units for later grazing. Remainder receives 100 - 110 units N. per acre in March, followed by approximately three dressings of 80 units each.

Fertiliser has averaged 400 units N. per acre. In 1968, it is hoped to make sufficient silage to self-feed 100 - 105 cows during winter.

Mr H. R. Parker, Inchparks, Stranraer

Size

150 acres arable.
10 „ rough.
160 „ total.

Stock

82 Ayrshire cows.
111 other cattle.

Crop

34 acres barley.
8 „ kale after early grazing.
118 „ grass.

Dairy Herd Management

About 40 acres grassland is divided into 20 paddocks, and each is grazed in rotation. The paddocks are divided by an electrified barbed wire. Milk sales to S.M.M.B. in 1967 averaged about 1,000 gals/cow.

Messrs R. Lammie & Sons, Low Drummore, Drummore

Size

290 acres.

Stock

180 dairy cows and approximately 160 other cattle.

Crop

20 acres early potatoes; remainder grass.

Dairy Herd Management

High dry matter silage is conserved in two steel silos, 50′ high and 18½′ in diameter, each holding approx. 250 tons. The silage is mechanically unloaded and delivered to feed troughs.

Surplus grass from grazing, etc., is ensiled in a pit silo for feeding to dry cows and young cattle.

The cows' lying area is in process of being converted to cubicles with wooden beds and slatted passages. One side of shed is completed.

CENTRAL SCOTLAND GRASSLAND SOCIETY

TOUR OF LANARKSHIRE AND RENFREWSHIRE
16th MAY, 1968

Introduction

Approximately 80 members visited the farms of Mr Kedar, Netherfielddyke, Strathaven, and Mr W. Wilson, Waukers Farm, Eaglesham, and the Grassland Husbandry Department's plots at Greenfields, Eaglesham.

Netherfielddyke, Strathaven (Mr A. Kedar)

This farm lying at 600 ft. above sea-level extends to 155 acres (142 arable) and is all in grass. During the past year, the dairy herd has averaged 146 milk cows. Until recently, the replacements were reared on the farm, but these have been disposed of with a view to increasing the dairy herd further.

The grass on the farm is mostly Timothy/Ryegrass and Timothy/Meadow fescue leys and Mr Kedar intends to keep them down as long as possible.

During the past winter all the grass received 10 cwt./acre potassic slag and since then the grazing fields have received 70 units of nitrogen and the cutting grass 130 units of nitrogen. The members also saw a field which had received 200 units of nitrogen applied as anhydrous ammonia. Although badly cut up by the applicator, the scars had by now filled in.

The cows are paddock grazed, each paddock being 8-10 acres and lasting for $3\frac{1}{2}$-4 days. In spite of the cold, wet spell prior to the visit, the growth of grass was good, although there was evidence of poaching on the heavy loam soil.

In winter the cows are housed in a modern cubicle/self feed silage/parlour unit and some 900 tons of silage are made. Last year it was wilted and filled on the " wedge " system and covered by a polythene sheet. Draff which is stored adjacent to the silos is fed to the cows on an easy feed basis and a barley/beet pulp mixture is fed up to 3 gallons, with high yielders receiving cake. Last year the milk sales were 850 gallons/cow.

Waukers, Eaglesham (Mr W. Wilson)

This intensive dairy farm of 140 acres lies on the 500 ft. contour and is run in conjunction with the neighbouring unit of Hairmyres (300 acres). Both units are concerned solely with milk production, there being 125 cows at Hairmyres and 110 cows at Waukers. Mr Wilson retails some 800 gallons per day, of which approximately 550 gallons are home produced, the remaining 250 gallons being obtained from neighbouring farms.

Following the fairly recent acquisition of Waukers by Mr Wilson, the decision was made to follow an all-grass policy and to aim for a 120 cow dairy herd with a considerable reduced young stock carry of around 20-25 head. Due to the layout of the buildings, it was also decided to expand the existing byre to house 90 cows, instal a round-the-shed milker, a bulk tank, and a byre mucker. A dairyman and his wife are employed to look after the herd, assistance being obtained for the washing of dairy utensils.

Last year some 50 tons of hay and 500 tons of silage were made and 40 tons of moist barley harvested from the 22 acres hay, 50 acres silage and 18 acres barley. Barley growing will be discontinued when the dairy cows reach 120 head.

Feeding of the herd during the winter months is based on silage, hay, draff and barley, to supply maintenance + 2 gallons, a concentrate mix consisting of barley and a protein concentrate being fed for every other gallon. Total milk production from an average of 97 cows for the year ending 30th April 1968 was 77,563 gallons (800 gallons per cow) at a concentrate usage of 2.23 lbs. per gallon (including the barley fed in the basic ration). It is hoped to improve these figures this coming year.

The silage feeding is eased, as much as possible, by the provision of special barrows which can be hauled the full length of the byre.

Following a tour of the dairy premises, members inspected the one-day paddock system which had been adopted during the summer of 1967. The discussion which then took place centred around the performances from the paddocks in terms of milk production per cow and per acre etc. Mr Wilson expressed his satisfaction with the system to date and gave the following figures for the period May-October 1967 from an average of 90 cows:—

Total grazing acreage	44 acres (21 paddocks)
Total milk production	44,470 gallons (£6,383)
Milk production per cow	£70.9 (472 gallons)
Feed cost per cow	£2.1
Fertiliser cost per cow	£8.5
Gross margin per cow	£60.3
Milk production per acre	£145 (965 gallons)
Feed cost per acre	£4.2
Fertiliser cost per acre	£17
Gross margin per acre	£123.8

Fertiliser usage over the farm as a whole averaged £10-£11 per acre, the silage fields receiving a total of approximately 140 units N, 60 units P_2O_5, and 82 units K_2O, while the paddocks received approximately 400 units N, 50 units P_2O_5, and 50 units K_2O.

JOHN WADDELL.
C. CAMPBELL WATSON.

GREENFIELDS, EAGLESHAM (Mr D. Meikle)

From the site of these experiments of the Grassland Husbandry Department, it is possible to see thousands of acres of wet peatland covered with poor hill herbage such as Matgrass or Whitegrass (Nardus stricta), Flying bentgrass (Molinia caerulea), Cotton grass (Eriophorum angustifolium) and drawmoss (Eriophorum vaginatum) in beds of mosses.

At the experimental area about 300 plots of emerald green, vigorously growing, closely grazed plots of clover, and grasses stand out in contrast to their surroundings.

For four years, members of the grassland husbandry department of the West of Scotland Agricultural College have been sowing down experiments.

Expt. 1 (E.314)

The effects of rate and type of phosphatic fertiliser (Basic slag, Rock Phosphate or Superphosphate) on white clover growth and also the need for potash fertiliser.

This is the oldest experiment now in its fourth year. All the plots were given 3 tons/acre ground limestone and sown with 3.6 lb/acre inoculated white clover. The three forms of phosphate were applied at amounts giving the same quantities of P_2O_5 namely, 50, 100, or 150 units/acre.

Where no phosphate was applied there is no clover growth.

Expt. 2 (E.315)

A second experiment carries 14 varieties of timothy, also sown broadcast without ploughing along with lime, phosphates, and compound fertiliser. Any of the varieties would provide good winter keep.

Expt. 3 (E.316)

S.215 meadow fescue was sown, each plot having had different combinations of N, P, K fertilisers at three levels. There is no doubt about the response to Nitrogen.

Expt. 4 (E.328)

27 different seed mixtures of one grass variety along with white clover were sown in 1966 and have been open to concentrated grazing by sheep through 2 winters and 3 summers. Some remarkably fine swards of red fescue, tall fescue and cocksfoots were to be seen.

Expt. 5 (E.342)

The most recent experiment concerns rate of seeding at 10, 20, 30 lb/acre of meadow fescue, ryegrass or cocksfoot each with 2 lb white clover.

These were sown in August 1967 and did not look very much different from the natural herbage. They will begin to show their improvements by 1969.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

DUMFRIESSHIRE FARMS TOUR — 24th MAY, 1968

The weather for the spring tour of some Dumfriesshire farms was ideal and a complete contrast to the elements which the Society endured on a similar visit several years ago. There was plenty of variety among the three farms chosen and everyone found something to interest them—top quality Friesians, sophisticated slurry handling, direct nitrogen, and of course, many aspects of grassland.

Summerfield Farm, which lies against Dumfries, was the meeting point for about sixty society members. On the way to the fields, Mr Robert Dick detoured slightly to show the party his Friesian stock bull, Annandale Olympus, which cost him 1,500 guineas a few years ago—in general the stock are off Milton, Beattock (Messrs Armour). Farmed along with Fountainbleau the unit extends to 375 acres of which 300 are arable and there are 150, mainly Friesian, cows run in two herds still operating on a byre system—all the Friesian bullock calves are retained.

Seed mixtures used are mainly Timothy/Ryegrass with no Italian at all being grown and direct reseeding practised—during the last two years the grass seed has been sown by a grass seed drill.

Fertiliser treatment on the grassland consists of alternate dressings of a high N compound fertiliser and straight nitrogen with lime being applied where necessary. About 120 acres are made into first cut silage followed by 80 or so as a second cut. This silage is fed in the byres and during the summer the cow grazing is controlled by an electric fence. Some 35 acres or so of kale and cabbage are grown for winter feed to be cut and fed in the house.

Although silage making had not started Mr Dick demonstrated his silage equipment. To cut the silage he uses an 'Owatanna' machine knocking down about 30 acres a day and using 1 gallon of fuel for each 6 acres. A Rex full chop machine picks up the grass and can handle at least 20 acres a day after the grass has been wilted and three swathes thrown into one row for picking up—thus the Rex lifts a width of thirty feet at one go.

Meikleholm at Courance, farmed by George Mair, was visited in the early afternoon after members had eaten their "alfresco lunches" at various laybys on the road. There are 300 acres of arable land on this 460 acre farm and at present the dairy herd runs to 110 cows. These are Friesians, Friesian/Ayrshires and Ayrshires all run on a self-feed silage/cubicle system. A slatted floor house is used to fatten the bullock calves.

Apart from about 50 acres of cereals the land is laid down to grass where the seed mixtures are Timothy/Meadow Fescue, with

a trend towards tetraploids. Like the last farm, there is no place in the system for Italian, and direct reseeding is the practice. Lime and potassic slag are used as basal fertilisers in conjunction with high N compounds and straight nitrogen. Following a preliminary trial last year the grazing land was treated with 250 units of Direct Nitrogen early in the season before the fences were erected for the paddocks. An intensive system of grazing is followed using half-an-acre per cow laid off in 21 single day paddocks—about 55 acres to graze the 110 cows.

The system adopted for disposal of slurry proved of great interest to the party. Scraped from the silos and cubicle houses the slurry is pushed into a small slatted concrete tank below ground—an Alfa-Laval Tive pump lifts it from there, every other day or so, into an above-ground Boythorpe storage tank. To get it out to the land the slurry can be sluiced out of the tank and pumped into an Onneley 1,000 gallon tanker, for distribution.

After leaving Meikleholm, the party went on to Brieryhill at Lockerbie, farmed by Tommy Hamilton, another enthusiastic grassland farmer. Here there are 115 Ayrshire cows on 200 acres with 40 acres of this set aside for cereals. Recently another 84 acres have been acquired and will be improved to Brieryhill standards so that fairly soon there will be 180 cows on the unit. After a lot of calculation and some soul-searching, Tommy has decided to expand the present cubicle and self-feed silage system rather than go for haylage towers.

The grassland system at Brieryhill is based on Timothy/Ryegrass and Timothy/Meadow Fescue with one interesting field of Tall Fescue. This field has been down for seven or eight years providing a lot of silage as well as early spring grazing. Direct reseeds is the policy with high N compounds and straight nitrogen being applied—lime is used as required to keep the pH at a normal level but slag is seldom used.

Like the last two farms visited, bullock calves are retained for fattening.

Looking back on the day's activities it was really a very successful outing. Had the weather only been a bit kindlier during the previous fortnight there would have been more grass and probably silage making for us to look at, and talk about.

May, 1968. JOHN THORBURN.

THE VALUE OF PERMANENT GRASS IN THE FARM ECONOMY

by H. A. MUDD

NAAS Greathouse Experimental Husbandry Farm, Lancashire.
Meeting at Lochmaben 20th March, 1966

Although the title of my talk is permanent grass, I am by no means belittling the value of the ley. The ley is valuable in boosting mid summer milk especially in the first year and can also allow of a lengthening of the season. Early growth can however be deceptive, the grass may be tall but not very dense. The value of clover is also worth considering since it is of high feeding quality with higher protein and mineral contents than grass. At Greathouse, clover in the ley provides N equivalent to 6 cwt sulphate of ammonia per year whereas the permanent pasture with wild white clover only fixes equal to 2 cwt sulphate of ammonia. In its final year, the ley can be ill-treated and used as a sacrifice area with the knowledge that it is to be ploughed. Leys are also useful, of course, as a break in a crop rotation and in providing a living to the plant breeder, seed merchant and perhaps the contractor.

The disadvantages of the ley are the cost of seed and the frequency of poaching due to a thinner skin than the old sward. Then there is the time lag between sowing and using especially when direct seeding in spring. This may be 6 weeks for ryegrass and 8 weeks for timothy and meadow fescue. The herbage from a ley must be used at the correct time especially with the digestibility curve falling rapidly after ear emergence. One virtue which is doubtful, is the productivity. How much dry matter credited to the ley is based on a before and after ploughing basis and the high growth obtained for the next few years is boosted by the lime and fertiliser used? The ley gets credit for higher production because as shown by national surveys, leys receive twice the quantity of fertiliser that is applied to permanent grass. There are few experiments comparing leys and older grass other than the classic trials of Davies and Williams after the war which showed that leys were at least not inferior to old pasture. Indeed leys showed little difference especially if cost of establishing them was considered.

Ley or permanent pasture

Fifteen years ago at Greathouse, plots were set up to compare new seeds with old grass at several altitudes and soil types. We were surprised to find that in terms of dry matter, production was

very similar. Another method of assessing productivity is by use of the animal. Three areas of different natural herbage were selected as follows.

1. 40% perennial ryegrass, 60% weed grasses mainly Agrostis.
2. 20% perennial ryegrass, 80% weed grasses mainly Agrostis.
3. 5% cocksfoot and white clover, 95% Nardus and weed grasses.

Half of each area was ploughed and re-seeded, all areas were fenced and then grazed by dairy cows. Milk production and carrying capacity over a 5 year period were better on the old sward. Even on the third sward the old pasture plus fertiliser was slightly better, not all at once of course, but over a period of years. In order to see if the same effects occurred on lower fields the trial was repeated and after 2 seasons the old swards produced more milk. In a drier area, perennial ryegrass was increased from 20 - 60 per cent in 3 years and again the old sward produced more milk. At Hurley, in a sheep grazing trial the ley produced more meat and milk than old grass over the first two years at which time the trial was concluded. The old pasture however was rapidly improving and the trial was stopped far too soon.

In surveys and output recording where production of silage, hay, cow days and milk yield have been undertaken in the south, final conclusions showed that on average leys gave higher livestock output in terms of U.S.E. i.e. utilized starch equivalent but they had also received more fertiliser. As fertiliser usage was raised, the difference between leys and permanent pasture lessened. In Cheshire similar results were obtained from all sward types; N was the only factor significantly influencing pasture production, a feature also noted in Fisons national survey. Irish recorders endeavoured to link output to sward type and soil type. The best correlation was between high output and soil sweetness (pH). Correlations with grass variety were poor and fields with an increasing content of Yorkshire fog showed a negative correlation. This is not really surprising since fog is an indicator of low fertility.

Rex Patterson who has recorded for many years has been unable to show outputs from different swards to vary even where rough stalked meadow grass takes over from Italian ryegrass. Again the level of fertility is all important.

The quality of herbage in permanent pastures is difficult to assess. Some of the so-called weed grasses are rich in protein and minerals. Nardus has a short period of high protein and in one trial in Wales, Agrostis showed higher protein than perennial ryegrass. Digestibility maybe a better indicator and rough stalked meadow grass is similar to perennial ryegrass.

Another doubtful attribute of the ley is its supposed value in preparing good soil conditions for arable cropping. On light lands as the exception, leys can be replaced by fertiliser.

Permanent pasture

This is a sward which is in balance with its environment. It is not subject to rapid change but its method of use will effect plant type. Areas mainly cut will develop tall types of plants. If allowed to grow on in spring and given N then perennial ryegrass can become dominant. Tussock grass will become dominant if under-used. N will decrease buttercups. Pure Nardus can change to better fescues with improving fertility. However, some grasses no matter how well they are fed will not produce much yield, e.g. annual meadow grass. Nardus, even under fertile conditions, is rejected by stock after June. Sheeps fescue too, becomes unpalatable. However, a weed grass such as rough staked meadow grass if given a chance will yield well. At Greathouse, this grass can equal ryegrass which is late to start growth at our station anyway. At Hurley, tests with Agrostis showed that after one year it produced more than S.23. In another trial where 140 units N were applied, Agrostis outyielded Irish perennial ryegrass and timothy. So given equal conditions differences may not be large and there does exist some confusion between cause and effect. Agrostis is rated as poor because on poor soils it is not productive. Perennial ryegrass only grows on higher fertility areas and is indicating the fertility of the soil. Don't condemn fields from their botanical composition only. Try to improve the overall fertility of permanent pasture by giving it plenty NPK as well as lime and give attention to drains.

Pasture management

Whilst fertility is very important one must not overlook management. Topping is essential as this keeps down rough grass and weeds and stimulates the better grasses. Harrowing is useful but care is needed since the harrow will tear out clover as well as buttercups and ryegrass as well as bent. Some observations showed that harrowing reduced yields by ripping out many grass plants. It is perhaps better to harrow at the end of the year for spreading droppings.

Permanent grassland has a big advantage since no seed or establishment costs are incurred. The density of a permanent turf is also valuable. A good 3 year ley has only half the tillers of an old pasture. If N is provided there are masses of tillers to respond to the fertiliser. The thicker sward, of course, also resists poaching and may allow stock to be carried later in the autumn. I believe that the mixture of varieties in a permanent pasture lengthens the season of growth and gives more even production over the season than more sophisticated leys.

Permanent pasture is self selecting for its own locality and the most adapted grasses survive under their particular management,

soil and climatic effects. In Lancashire, there is a lot of SO_2 gas in the air and our permanent grasses have selected themselves for this pollution. Imported varieties frequently succumb to these acid conditions. At Greathouse, plants have been brought in from Wales and from the Fylde area of Lancashire. These have invariably died off. Likewise, Greathouse plants have not survived the salty atmosphere of areas in the Fylde when transferred in pots to that lower area. Just as there are horses for courses so there can be specific grasses for specific fields.

The following table illustrates some of the results obtained at Greathouse from temporary and permanent grass of the three types already mentioned; moderate, poor and very poor. In each case the total financial return per acre over a five year period was higher with the permanent pasture, but over the first two years the leys were superior.

	Moderate		Poor		Very Poor	
	Perm.	*Temp.*	*Perm.*	*Temp.*	*Perm.*	*Temp.*
Return/acre	£290.4	£256.11	£218.1	£203.12	£233.10	£242.12
Cost of seed fert./acre	—	£10.5	—	£10.16	—	£12.5
Net return/acre	£290.4	£246.6	£218.1	£192.96	£233.10	£230.7

Another experiment in progress consists of two farmlets each of 40 acres. One is entirely permanent grass, the other is on a five-year ley rotation. Each farm carries a cow on 1.7 acres. Both farms receive 180 units N per acre and all cows are milked by the same staff. The following table illustrates the mean results per year for the first four years.

	Permanent farm	*Temporary farm*
Yield per cow (gall.)	600	699
Concentrates per gallon (lb.)	3.2	3.3
Milk income (£)	104	109
Margin over concentrates per cow (£) ...	79	82
Ley depreciation cost per acre (£)	—	1.8
Gross margin per acre (£)	33	30

The higher yield of milk from the cows on the temporary grass was mainly due to the summer flush from new leys. Some feed also had to be bought in this group. Milk yields are not high and probably related to the potential of the animal rather than the grassland. None-the-less the exercise does show some advantage for the permanent grass of the type available at our farm. A botanical analyses of the permanent grass area at the start would have rated 60% of the grasses as weeds and 40% as good species however this situation was soon reversed by management and fertiliser.

Discussion

Q: Are leys and permanent pasture equally suited for intensive paddock grazing with no conservation ?

A: There are few extra benefits from the ley. However, if early bite is important you may need some Italian ryegrass but for the remainder of the year permanent pasture is very suitable. Indeed it has advantages in that a) it is more resistent to treading and b) due to better biological activity in the sward, dung is more quickly broken down and there is less fouling and wastage of herbage.

Q: Do you use slag or some form of phosphate and if so what grade ?

A: Yes. I use slag. It provides some lime and is better than mineral phosphate. Also slag has magnesium which is useful especially with ewes and lambs. Grade used is whatever is available.

Q: How would you split £1000 of fertiliser on 100 acres of ley on good ground and 100 acres of permanent pasture on poor land ?

A: Put the fertiliser on the more responsive area — must have the best land producing at 100% before moving up on to the permanent grass. You could use some fertiliser on the permanent pasture for rearing heifers and the like. If all things are equal then the permanent pasture can show better response than the ley.

Q: What is the value of plant breeding in the place of the ley ?

A: The breeders have not yet hit the jackpot. Many of our varieties are selections from indigenous pastures and by selection have produced late and early flowering types and leafy varieties but in terms of competing with nature they are not all that great. Hurley people claim that some Agrostis types are quite good.

Q: Is it worth sowing expensive seed then ?

A: By sowing cheap seed you may lose in the short term but in the long term you may gain as indigenous grasses will gradually come in. Sow persistent types of white clover (wild white) and perennial ryegrass (S23).

Q: Should we stick to seed from Scotland rather than elsewhere and how does liquid N fit in ?

A: High dressing of liquid N are questionable so if one has to split application it would probably be in order to use bag N. It would appear sensible to use local grasses.

Q: Should we go in for 2 year and then jump to 7 year mixtures ?

A: Yes there is a lot to be said for this.

Q: After using slag for a number of years, my soil analyses show no difference — do you have similar results ?

A: Yes — one must put phosphate into the bank before it can be drawn out — it's a topping up process that takes time.

Q: Is permanent pasture still best with heavy stocking of dairy cows and 250 units N ?

A: Yes, the older pasture is good — it will respond and provide the benefits already mentioned (i.e. poaching resistance and biological dung disintegration).

Q: What about beef and sheep and the permanent ley ?

A: In Ireland, they found that beef production was better from the ley at low N levels. Once 160 units were used the beef output was the same after 3 years. As far as sheep are concerned 10 ewes + 15 lambs per acre have been carried with high N use. 8 year old reseeds are now full of indigenous species and produced better than new paddocks. Ploughing may have helped the better indigenous species by reducing competition from other plants.

Comment: I have a 16 year old pasture receiving liquid N which still responds well and cattle seem to go off this field quicker.

Q: Will improved hill require continued applications of N.

A: No. N is needed to get the system active, then the animal takes over by recirculating the N. We applied 400 units N for two years but after that similar production was obtained from 250 units because of the return through the stock. P & K will also be needed of course. If the money is tight use N to get the carbon and nitrogen ration improved.

Q: How far can you cut back on N ?

A: Don't know yet. This may depend on year and time of season.

Q: Any comments on intensive sheep ?

A: At 900 ft a.s., 40 acres carried 220 ewes all the year round. 250 units N were applied and 15 acres were cut for winter feed. However at this intensity be careful — you are likely to meet every disease in the book !

Q: How do you top your pastures ?

A: Using a low set 'swipe.'

Recorded by R. D. HARKESS.

SLURRY HANDLING

Discussion Meeting at Glenluce 14th February, 1968

Chairman: J. G. Marshall.

Speakers:

P. Rentoul, Low Kilphin, Ballantrae, Ayrshire.
J. Kerr, Camsiscan, Craigie, Kilmarnock, Ayrshire.
J. M. Ferris, Wymondham, Melton Mowbray, Leicestershire.

P. Rentoul—Cow and Hen Slurry

Mr Rentoul described the system developed at Low Kilphin and set out the reasons for choosing the system which was now operating.

Formerly the slurry had been washed away but like so many farmers faced with the River Pollution Act 1965, the Rentouls were obliged to dispose of it on to the land.

Collection. Two tanks were available. One with concrete sides and a slatted roof and the other with concrete sides plus a concrete roof provided with inspection holes.

Disposal. Three methods had been considered.

1. Tankers sucking out the slurry and then taken out to field by tractor and distributed by gravity from tanker.
2. As above but the slurry forced out to give a wider spread.
3. The system in use was a tanker to take the slurry from the yard to the field gate. Then it was pumped via pipes and spraying on to the field. It took 3-4 hours to pump out all the tanks. This was slow but it was unnecessary to be there the whole time. Other jobs could be done.

The procedure was as follows. The operator set up the pipes and the spray gun in the field, taking 20 minutes, agitates the slurry in the tank by recirculating and then opens the pump to the field pipe and gun. It can then be left to empty itself. It is checked at around 40 minute intervals in case feathers are choking up the nozzles. The smaller tank of 5000 gallons is emptied in 65 minutes. The whole job lasts 8 a.m. to 12 noon. The man is on the pump for just $2\frac{1}{2}$ hours during which time 18,000 gallons is spread over 4 acres. This quantity is accumulated in 1 week from 65 cows and 4000 hens.

The pipes are 3″ aluminium alloy and although 33′ long are very light and easily handled. They need not be perfectly straight but can be angled up to 10° because leakage at the joints is prevented by using rubber gaskets.

The mixture of cow and hen slurry appears to be ideal for grass growth, the hen slurry being rich in phosphates. 30 acres of grassland are treated each winter. During summer only the hen slurry is available. It must be diluted or it will scorch the grass. This is because it is sticky enough to stick to the surface of grass leaves. Of last winter's 30 acres, 20 were cut for silage whilst 10 were grazed. The silage area produced 8½ tons grass silage per acre from a single cut. No other fertiliser is used on this slurry treated ground. The rest of the farm has fertiliser.

J. Kerr—Cow and Pig Slurry

Two years ago, a cubicles and slats system was set up which brought him right away to the problem of slurry. A 50,000 gallon tank was available. At first, it was thought necessary to put in 25,000 gallons of water at the bottom of the tank but this year only 20,000 gallons of water was used giving a 40%/60% mixture of water to dung and urine.

80 cows produced 9 gallons/day each and filled the tank in 6 weeks. A pump and agitator can churn the mixture into the consistency of ice cream in ½ hour. A piston pump managed to put out 5000 gallons/hour.

Uneven application. The guns were shifted the full range of the grass but due to wind changes, unmanured or flooded patches were common. Now the guns are moved just 33 ft. at a time and a man is necessary at the guns the whole time. This may seem a luxury but Mr Kerr preferred to ensure the evenness of application.

Figures on quantities. 80 cows produced 250,000 gallons per year (40% water). Tanks were emptied 5 times/season and spread over 35 acres. This was equal to ⅓" rain or ⅓ acre inches in irrigation terms. Each jet swept over 1/5th acre taking 5 minutes to put out 450 gallons at ½ gallon per sq. yard.

Cost	*Per 1000 gallons*
Equipment cost £900, including 650 yards of pipe	10/-
Labour, 2 men (luxurious)	3/-
Tractor	1/-
Total cost per 1000 gallons	14/-
Value of Slurry	
Conventional value for N.P.K. content/1000 gallons ...	15/-

This doesn't look very good but the slurry must be disposed of. The system was foolproof and could be used any and all the time. The main disadvantages were that the work at the guns was unpleasant and rejoining the pipes could be tricky since each pipe held 12 gallons of slurry.

Keir Ferris

Mr Ferris was an engineer who first described in detail the mechanical properties of dung, urine and mixtures of these with water. This mixture was alive and continually changing in both physical and chemical characteristics.

For example, the dung and urine tend to separate and it is necessary to mix them together. The method of effecting the mixing alter its drying quality. Thus sewage sludge resists drying. Scraping makes matters worse. Distributing the mixture on to soil is alright so long as the soil remains open but eventually there is no further seepage and fresh land must be used for disposal. This is why in sewage purification, sand drying beds are necessary.

If the mix is scraped into a pit, then it must be taken out by bucket or augur. It is not suitable for pumping out.

This is the basic difficulty of slatted floors. The mix goes in easily but is very hard to take out. The method of handling must be chosen to match the kind of material which is being made. This is largely a matter of the time of storage and the quantity of water used.

Three basic types of slurry

1. **Plastic.** Similar to scraped muck, rather like mortar which does not flow but merely becomes flattened. This must be moved by augur or tractor foreloader. It heats therefore there is aerobic bacterial activity and Ammonia and Carbon dioxide are released. Ventilation is necessary since this mixture can be poisonous.

2. **Floating muck.** A skin or crust of muck forms on the top. Under this respiratory gases can collect, conditions are anaerobic and smells of putrefaction. In order to take it out it must be agitated. Its behaviour is unpredictable.

3. **Liquid muck.** This is true water sanitation and the correct method hygienically, hydraulically and agriculturally. The dung/urine/water mixture is not stored but pumped directly out to the field. Any changes which take place do so in the soil.

The most important advice which could be given is that when planning slurry handling consider first making the type of slurry which has the right consistency for mechanisation.

Discussion

Q.1: Was February too late to apply slurry where grass was to be grazed? Pipe shifting is disagreeable. The use of 2 men was wasteful. Isn't it simpler to set up a main pipe with laterals for 2 guns. One problem experienced with 4″ pipes is the large amount of waste when pipes are opened for rejoining. Would 3″ pipes be enough?

A: The size of pipe depends on the pump. A 3″ pipe matched an 80 lb. pump and a 4″ pipe matched a 150 lb. pump. It is always messy when the pipes break. One should always work uphill when changing pipes.

A: I use 150 lb. pump to send slurry 600 yds. through a 3″ pipe and out of a nozzle at 50″ pressure.

A: My pipes only deliver 45/88 gallons a minute. I find 3″ pipes adequate. Two men are possibly wasteful but with one man my land is either overdone and the worms killed or not done at all.

A: Grazing after spring spraying is difficult. The main cause of the difficulty is that the slurry sticks to the foliage and dries on it as a film. It might be better to close mow the herbage before spraying.

Q: How does slurry deteriorate? What storage capacity is required per 100 cows?

A: The Keir Ferris System involves weekly spreading. It is an easy discipline to organise. At 10 gallons/cow/day and a mixture of 3 parts of water to 1 of cow muck, the requirement is for 40 gallons/cow/day or 28,000 gallons per 100 cows per 7 days.

Q: What happened to the patches missed by slurry?

A: No visible difference but when applied slurry to a poor grassland site, the daisies disappeared and clover came in.

Q: How can it be better to mow for hay and silage grass which stock refuse to graze? It will be useless for milk production.

A: Rain will wash away the taint by the time the grass is cut for silage.

Q: How long before grazing is it safe to put slurry on grass? What is the value of the fertiliser saving? How much fertiliser N is now necessary?

A: About 3 weeks but longer if the weather is dry. In my case, I am still using the same amounts of N, giving 200 units/acre on the intensive section and 80 on the rest of the grassland.

A: 3-4 weeks before grazing. The silage fields are given the most. In my experience the silage may get very long and rank and unpalatable. Fertiliser usage remains high, not easy to evaluate.

Q: Is there a likelihood of staggers after much slurry?

A: No. Magnesium supplement is fed. Some milk fever occurs.

A: Hypomagnesaemia is unknown in Switzerland where all liquid manure is returned to grass.

A: I find grazing quite satisfactory 10 days after slurrying.

Q: Pig slurry mixed in with cow slurry results in no trouble in grazing. Why is it necessary to use heavy metal pipes in these days when plastic is so common ?

A: Plastic is too dear. Aluminium alloy is the cheapest material available with the necessary strength and lightness. Long plastic pipes which can be rolled into position are available, but it is a much heavier job than our 33′ pipes.

A: The pipes only cost 1/- per 1000 gallons for labour and they are not heavy.

Q: What size of nozzle is necessary ? Is more lime needed on slurried ground ?

A: $\frac{1}{2}$″ or 12 mm.

A: I use a rubber nozzle.

A: No effect noticed on lime status.

Q: Any information on comparing cow production from slurry v. N grass ?

A: No.

A: Regarding effects on grazing, I observed a field which divided into three parts, dunged October, dunged March, dunged 1 week before grazing in April. The cows grazed the month old herbage bare and that slurried the previous week almost bare but did not touch the dunged area.

Fraser Evans proposed the votes of thanks.

Recorded by I. V. HUNT.

GRAZING MANAGEMENT FOR CATTLE

by M. J. WALSHE

Our speaker after the Annual General Meeting of the South West Scotland Grassland Society, held on 9 November in Castle Douglas was Mr M. J. Walshe, Office-in-charge of the Dairy Research Centre, Moorepark, Fermoy, Ireland. Many members of the Society had already had the pleasure of meeting Mr Walshe when they visited Moorepark in July on the Irish tour. Indeed, as the chairman remarked, it was the favourable impressions gained on the visit to Fermoy that prompted the committee to write and invite Mr Walshe to speak at our meeting.

In his introduction our speaker stated that the object of the Dairy Research Centre in Co. Cork, was to solve both the practical and the fundamental problems of livestock on the small farm in Ireland. The price received for milk averaged about 2/- per gallon and it was thus imperative for the farmer to produce a low-price product. It was far better to invest capital in animals than in buildings or expensive equipment. To illustrate this point Mr Walshe stated that he would prefer to see a building to shelter the cows rather than one to cover the silage. If the silage was covered with a polythene sheet it was relatively well protected and the cattle could easily and cheaply have access to it outside. The silage can be built on a concrete base but in many cases it will suffice even on bare soil. Naturally, under these conditions, there will be quite a mess with mud around the silo but this should not deter the farmer if capital costs are low.

Nitrogen fertilizer

Again on the subject of low-cost production the speaker quoted results from Moorepark experiments which showed that in his area it was not economic to apply nitrogen fertilizer to pastures if only one bullock per acre was grazed. The nitrogen fertilizer contains 23%N and costs about £22 per ton and is thus much dearer than in Scotland. The additional nitrogen may grow extra grass but if it was not properly grazed and utilized it did not produce extra beef per acre. With up to $1\frac{3}{4}$ bullocks per acre the use of nitrogen was hardly economic but at higher stocking rates the nitrogen could be worthwhile. An absolute maximum of 200 units of nitrogen per acre was suggested as it is virtually impossible to achieve a high enough stocking rate to utilize the large amount of herbage grown by applications of nitrogen over 200 units per acre. Mr Walshe felt that much more experimental work with nitrogen fertilizer was required before exact optimum dressings could be suggested.

Stocking rate

In the speakers opinion one of the most vital factors influencing the output of meat and milk from pastures was that of the stocking rate. Many farms are grossly understocked and hence did not achieve the profit which they should. He quoted the results of one important experiment in which an increase in the rate of stocking from one cow on 1½ acres to one cow on 1¼ acres gave 25% more milk from the same area of land and with no change in the level of fertilizer application. Profit was closely related to stocking rate and it was vital that we had enough stock to cash in on the grass we grow. Once stocking rate was at a high level, refinements could be made in the method of grazing. For example, in another experiment quoted by the speaker, 16-17% more milk was produced by using a system of rotational grazing compared with a system of set-stocking. If stocking rate was low then the system of grazing management was not of such importance. Similar results have been obtained from extensive experiments in New Zealand and without any doubt the results are equally applicable in South-West Scotland.

Calf feeding

With the accent on reducing costs, Mr Walshe discussed systems of cheaply rearing calves at grass. Calves put out to grass at only 3 days of age have grown as well as similar calves put out at 33 or 63 days. It was suggested that about 10 days might be a suitable age and then all milk and meal feeding could be stopped at 12 weeks. Using this system animals were being reared cheaply at grass and would calve down at 2 years old having eaten nothing but grass since the day they were weaned. If calves were grazed ahead of the dairy herd good results could be achieved. Our speaker mentioned one farm where 10 heifer calves were grazed in front of a herd of 35 cows all summer and gained 1.7 lb per day. With this system the fences must be good, and Mr Walshe thought that we could usefully copy the New Zealand system of races, offset gates and well-fenced paddocks. These would replace the jumble of fences on many farms and be of great help in the control of grazing management.

The future

If Ireland enters the Common Market it is anticipated that the price of milk would rise dramatically and there might even be a place on the farm for feeding limited amounts of concentrates at certain difficult periods of the year. Stocking rate would have to be high for supplements to have any useful effect and experiments are being designed at present to investigate this matter. One cow will be kept on 0.9, 0.8 or 0.7 acre and fed various levels of meal.

The aim will be to produce 1,000 gallons per acre or an income of about £150 per acre. Comparisons will also be made between summer and winter milk production as at the moment most farmers have spring-calving herds and are summer milk producers.

In answer to questions put by members of the audience, Mr Walshe stressed that his research work was done in an area receiving 38 in. of rain per year and that it was not vastly different from the dairying area in South-West Scotland. Slurry can be a problem even in Ireland and thus the correct siting of the slurry pit is important. He preferred to see the slurry dry out in layers 1-2 ft thick and then moved with a front-loader in summer. Simple equipment is the best on any farm as few farmers are mechanical geniuses or do much machinery maintenance.

Our speaker felt that there should be the minimum of ploughing and reseeding and that this should only be done if a field was sacrificed on purpose. Many pastures can be poached quite badly and produce slightly less dry matter than if not poached, but still give large yields of meat or milk. There may be a 10% difference between the output on old and reseeded pastures but the cost of renewing may not be worthwhile. Mr Walshe instanced some old permanent pasture which yielded over 1,000 lb of liveweight gain per acre when adequately fertilized and stocked heavily. Ryegrass and clover were favoured by the speaker and he saw little or no place for cocksfoot.

Mr Walshe summarised his advice to members along the following lines:—

(1) For the best return on capital it is wiser to invest in stock than in expensive buildings and equipment.

(2) Extra fertilizer applied to grass does not necessarily mean more milk or meat unless the stocking rate is correct.

(3) High stocking rates per acres are important since stocking rate and profitability are closely related.

(4) Old pasture can produce high yields per acre and we should question carefully the costs of ploughing and reseeding.

Mr John Marshall the Chairman, thanked Mr Walshe for a stimulating and valuable address.

Recorded by MALCOLM E. CASTLE.

Animal Husbandry Department,
West of Scotland Agric. College,
Auchincruive.

12th July, 1968.

To the Members of the South-West Scotland
Grassland Society.

Dear Member,

Glance through the membership list and you will see that a high proportion of the members have sheep as a very important part of their farming activities. The Society has responded by catering for the interests of sheep men in its programmes and these have stimulated some very interesting discussions. The question that I would like to put is whether you would like to have more frequent opportunities for finding out about the other man's approach to his sheep husbandry problems.

It seems to me that the need for a fresh look at our methods of keeping sheep is very widely appreciated today, whether it be to modify well-proven techniques or to start at square one with a completely new system. In hill areas one can hear discussions on increasing lamb numbers, finishing lambs at home, pasture renovation, fencing, inwintering and even new breeds or de-hefting, as well as those difficulties that are always with us, e.g. ticks and liver fluke — perhaps I should not even mention the Forestry Commission? I hear that some of these topics may well be aired at the December meeting.

The questioning is just as persistent about the future of low-ground flocks. Has the day of the Half-bred gone? Have the multicross "breeds" something to offer? Can you fatten lambs grazed at a high stocking rate? Need a ewe flock compete with the dairy herd? These points have been raised simply to remind you, if reminding is really necessary, that there is plenty scope for argument. Would you be interested in more frequent meetings at which sheep and sheep/grass problems could be aired?

The organisation of the meetings and visits to satisfy these needs could be arranged simply by setting up a new body. However, there is a lot to be said for asking for a sub-committee of the Grassland Society to be set up to arrange these matters. Firstly, the necessary structure is already in existence; secondly, it will be more easy to co-ordinate the meetings of the sections; and thirdly, most sheep are going to be kept on grass and grass products for many years yet, aren't they?

Could you come to the A.G.M. in November and let us hear your views?

Yours sincerely,

IAIN A. DICKSON.

128 Costs and Efficiency in Milk Production, 1965-66

(Her Majesty's Stationery Office, 1967).

Grassland farmers will find that many of the results presented in this report are a challenge to their skill. For example, in the 434 dairy herds in this survey, the average quantity of concentrates fed per cow was 22.8 cwt; sufficient, on conventional standards to produce 638 gallons, or 80% of the average yield of 809 gallons per cow. One can conclude therefore that only 171 gallons per cow were obtained from grass and bulk feeds such as hay and silage. Assuming a 305 day lactation, the grass and bulk feeds provided maintenance and only just over ½ gallon of milk per day. This is certainly a long way from the expectations of maintenance and 4 gallons from grass and maintenance plus 1 gallon from silage which are not considered unusual by some grassland farmers. A surprising feature is the large amount of concentrates fed during the summer period, April to September. The average amount was 8.4 cwt/cow or almost 40% of the total weight of concentrates fed each year. It would seem that most of the farmers in the survey were either poor at grassland management or had little confidence in the ability of their grassland to produce milk. Equally depressing and revealing are the estimates made of the utilized starch equivalent (U.S.E.) from the grass and fodder acres. Over all the farms this averaged 13.4 cwt/acre and is almost the same value as that found by the Caine Committee on Grassland Utilization some nine years ago. The average cost of producing 1 cwt of U.S.E. from grassland was 18s. and compares with 20s. for barley charged at production costs, 30s. for barley at market price, and 53s. for standard dairy concentrates.

Thus, so far, the average picture of what grassland can contribute towards economic milk production is not particularly bright. A more detailed look at the results in the report are however more encouraging and reveal the true part which well managed and well stocked grassland can play in the economy of the dairy farm.

Concentrates and Stocking Rate

Two important factors are examined in detail, concentrate feeding and stocking rate. Cows in herds receiving the higher level of concentrates, 30 cwt/cow, tended to produce more milk than cows fed smaller amounts of concentrates, 15 cwt/cow, but not sufficient to do more than offset the higher feed costs. This can be seen in Table 1.

TABLE 1

	Weight of concentrates fed (cwt./cow)				
	Less than 15.0	15.0–19.9	20.0–24.9	25.0–29.9	*Over* 30.0
Yield (gal./cow)...	690	769	807	857	922
Margin over feed costs:					
£/cow	82	82	84	83	84
£/acre	41	41	46	44	44

There are no significant differences between the various groups of cows in margin over feed costs per cow, and the likely explanation is that in the majority of herds receiving large amounts of concentrates, the cows had not the potential milking capacity to respond fully to the extra concentrates. Thus, with the average type of cow and with average management there would appear to be little effect on either margin per cow or per acre as a result of altering the amount of concentrates fed. The effect of changes in stocking rate were far more important as seen in Table 2.

TABLE 2

	*Acres per cow**				
	Less than 1.50	1.50–1.74	1.75–1.99	2.00–2.24	*Over* 2.25
Yield (gal./cow)...	822	832	792	801	783
Margin over feed costs:					
£1/cow	86	88	82	81	73
£/acre	60	51	43	38	27

*Acres=Forage acres plus equivalent acres of bought bulk feed.

The effect of stocking rate on the margin over feed costs per cow is not clearly defined but there is no doubt whatsoever that higher stocking rates are associated with higher margins per acre. Where less than 1.50 acres are used per cow the margin was £60/acre whereas if 2.25 acres or more were required, the margin was only £27/acre. A study of the combined effects of changes in the use of concentrates and stocking rate does not alter the picture to any extent and the really important element was clearly the stocking rate. A more detailed study of the results from Friesian herds suggests that 5% increase in stocking rate was associated with an increase in the margin over feed costs of £2.7/acre.

Fertilizer

Because of the overwhelming importance of a high stocking rate as a means to higher returns, it is important to see if there are any factors which are closely associated with high stocking rate. An obvious item which might be considered important is the use of fertilizer. The report however shows that there was no important connection between stocking rate and expenditure on fertilizer. Some farms had a high expenditure on fertilizer and had a high stocking rate but there were other farms, also heavily stocked, on which fertilizer expenditure was small. Similarly on the low stocked

farms there were high and low users of fertilizers. Clearly, whatever fertilizer may do to affect the yield of grass, the relationship between fertilizer use and the profitability of milk production is determined by the efficiency with which the grassland is utilized. To utilize grass efficiently it is important to have a high stocking rate.

In conclusion the report states that since the availability of land is a limiting factor on most farms, the intensity of land use for feeding the dairy herd is critical to the success of the enterprise. A high summer stocking rate led to higher margins per acre for all combinations and levels of concentrate and bulk feeding. This was achieved by skilled management in obtaining full utilization of a high level of grassland production.

Note: This useful publication of 51 pages may be obtained from Her Majesty's Stationery Office, 13a Castle Street, Edinburgh, 2; price 5/9d.

129 The experimental development of systems of beef production from grassland

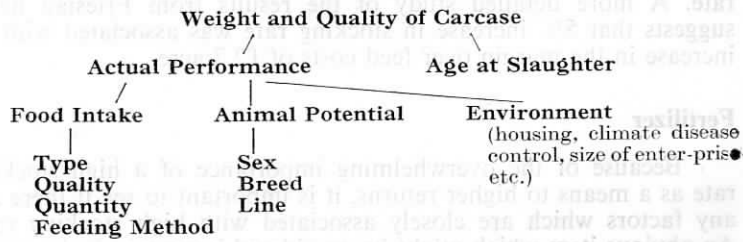
H. K. BAKER

Proceedings of Xth International Grassland Congress, Helsinki, 1966, p. 483

Dr Baker was until recently chief executive officer of the Beef Recording Association (U.K.) Ltd. but has now taken up an appointment with the Meat & Livestock Commission.

As readers will see from Forthcoming Events we are to hear Dr Baker speak to our S.W. Scotland Society at the Annual General Meeting.

This article caught my eye so much that I have carried around with me a copy of the following interesting diagram summarising the factors concerned in beef production.



Differences in any factor or combination of factors can have major effects on profitability, feed conversion, rate of gain etc.

Study of all these factors in isolation and synthesized leads to the development of profitable beef production systems such as that now advocated by 'Hurley.'

130 Report of survey on high dry matter silage or haylage : 1966-1967

S. J. WATSON, M. J. NASH (Agricultural Dept.)
P. McDONALD, R. A. EDWARDS (Biochemistry Dept.)
A. BLYTH (Economics Dept.)
L. M. WALKER, D. A. JACK (Engineering Dept.)

This 28 page report was prepared on the basis of information collected through the West and East College Advisory Services totalling 87 samples (16 farms) in 1964/5, 77 samples in 1965/6 and 69 samples in 1966/67.

Only the briefest extract of figures is presented here.

Quality

Season	pH	% D.M.	% C.P.
1964/5	4.33	38.6	11.3
1965/6	4.44	39.9	12.9
1966/7	4.85	42.9	12.3

	1964/5	1965/6	1966/7	*Average for 564 ordinary silage samples*
pH	4.33	4.44	4.85	4.02
% dry matter (D.M.)	38.6	39.9	42.9	23.0
% crude protein/D.M.	11.3	12.9	12.3	12.1
% digestible crude protein	6.62	6.91	7.91	7.40
% starch equivalent/D.M....	46.0	45.6	44.1	46.0

There were wide variations between good and bad haylages so that dry matters ranged from 30 to 50 per cent, total crude protein from 8 to 16 per cent and starch equivalent per 100 lb feed from 40 to 50 lb.

Investment per 1000 cubic feet storage capacity

	From	*To*
Machines and equipment... ...	£63	£188
Tower silo	110	185
	£214	£357

They calculate that the average annual cost of a haylage system is £933 as against £567 for a conventional silage system. The difference of £360 between the systems could be much wider if mechanical feeding systems etc. were added.

The report questions how this difference is to be recovered.

The quality of the haylage is not very different from conventional silos except in dry matter content. Losses of feeding value in the haylage tower are low but this gain is partly lost by the usually higher losses in the field. It is quite certain that the material going into the tower must be of as high a quality as possible.

131 Some factors affecting the in-vivo digestibility of hay and silage

M. J. STRICKLAND
Great House Experimental Husbandry Farm
Experimental Husbandry No. 15, 1967, p. 1-10

It is known that the digestibility of herbage or fodder is a very important aspect of its quality, that the digestibility of herbage falls as it matures especially after heading, that different varieties and species of herbage plants have distinct digestibilities and patterns of change in digestibility (digestibility curves), that it is possible to predict the digestibility of a particular grass or clover or mixture of grasses and clovers from the date of cut or that of most herbage plants from the stage of growth and that the digestibility of a fodder is the same as that of the original herbage provided it has been well conserved.

If herbage has been well conserved, it is thus possible to predict its digestibility from the date of cut, knowledge of the seed mixture and stage of growth.

Many fodders are badly conserved and the digestibility can be markedly reduced.

This report is an attempt to measure the importance of some aspects of conservation on digestibility so that with these facts plus those concerned with the original herbage, more accurate prediction of fodder quality may be possible.

The results as dry matter digestibility are summarised below:—

Method	Direct cut silage	66.4%
	Wilted silage	67.4%
	Silage	67.9%
	Barn dried hay	68.5%
	Barn dried hay	65.4%
	Field hay	63.4%
Machinery	Tedder	62.0%
	Roller	61.6%
	Forage harvester	61.1%
Rain on swath	Rain	55.9%
	No Rain	62.0%
Date of Cut	A fall of 0.3 per day for each day after 30th April.	

It is obvious that date of cut is the most important factor. Rainfall on the swath was the next most important factor.

132 Comparisons of liquified (anhydrous) ammonia and ammonium nitrate as nitrogenous fertilizer for grassland

R. S. L. JEATER, I.C.I. Jealott's Hill, Berks.
J. Brit. Grassld Soc. 1967, Vol. 22, pp. 225-229

Three experiments were carried out to determine the herbage yield from plots receiving a range of 50 to 270 units N per acre in the form of anhydrous ammonia (82% N) and ammonium

nitrate (34.5% N). Both single and split dressings of the solid and liquified ammonia were applied and two areas received an autumn injection of ammonia.

A summary of results is given below in which yields are expressed as a percentage of the solid N.

	Site 1	*Site* 2	*Site* 3
Solid N—split dressings	100	100	100
Liquified NH3—spring	72	70	72
Liquified NH3—autumn	64	44	39

The single dressing of injected ammonia in spring yield 30 per cent less than the usual split dressings of solid N. Sites 2 and 3 were in a 23 inch winter rainfall area with the result that leaching occurred and ammonia injected in the autumn was lost. At Site 1 the winter rainfall was 13 inches.

The next table shows the actual yield in cwt per acre obtained at Sites 2 and 3 from single and split dressings of anhydrous ammonia.

Fertilser	*Units N*	*Yield Site* 2	*Units N*	*Yield Site* 3
Solid N	60 + 70 x 3	108	60 + 70 x 3	98
Liquified NH3 ...	64 + 78 + 70 + 87	98	59 + 82 + 75 + 78	88
,, ...	259 spring	90	272 spring	83
,, ...	274 autumn	76	264 autumn	66

The split dressings of injected liquified ammonia have slightly improved yields but in none of the trials did anhydrous ammonia outyield the solid N. The injected N was also slower acting in the spring due to the need for nitrification as the soil temperature increased. The author concludes that there is no commercial future for liquified ammonia in intensive grassland farming.

R. D. HARKESS

Reviewer's Comment: Although these experiments were conducted by an organization with vested interest in solid N, they do reflect similar results from Holland and Auchincruive. The paper makes no mention to costs. Anhydrous ammonia is around 35 per cent cheaper per unit than solid N, and the yield drop recorded (28-30%) may be tolerable in certain circumstances. The major drawback however is that the cost of ammonia injection is high—30/- to 40/- per acre and it is usually a contractor's job. Clearly several injections of ammonia raises the costs outwith a practical level. The wet spring conditions in the West of Scotland may mean delayed application and so solid N is better for early

growth both in feasibility of application and speed of action. Injected ammonia will boost yields in second or third crops, and it may well be in the future, if better injection methods are developed, that solid N and liquified ammonia become complementary commodities.

133 Nitrogen contribution from the soil for herbage growth

B. F. BLAND, Agricultural Department, West of Scotland

Agricultural College, Auchincruive, Ayr, Scotland

Plant and Soil. Vol. xxviii No. 2, April 1968, pp. 217-225

This article is based on research work undertaken by Dr Bland and successfully presented for his doctorate.

The problem is the fascinating one of the nitrogen nutrition of herbage and the relative importance of various sources such as soil, accompanying clover and fertilizer.

Nitrogen is the most important requirement for herbage production under West of Scotland conditions. The air above the plants and within the soil has large amounts of N in the form of the gaseous element or as buried animal and plant remains. Both sources are useless to grasses. Before a grass can use such N it must be converted into Nitrate-N, Ammonia-N is not so useful to the plant.

The position reported from other countries as is follows:—

Source of N

1. **Organic matter in soil** — 25 lb N/ac ≡ 22 units N/ac ≡ 1 cwt Sulphate ammonia/ for every 0.1% N in the soil.
2. **Rainfall** — One of the classical experiments of olden times showed that Nitric acid was a constituent of rainfall especially after thunderstorm. In open country, the amount is small but near cities it can be large from 2-40 lb N/acre ≡ up to 36 units/ac ≡ $1\frac{3}{4}$ cwt/acre Sulphate of ammonia.
3. **Azotobaeter** — These bacteria live in well aerated phosphate rich soil with good lime status and can contribute 26-37 lb N/acre ≡ up to 33 units/ac ≡ $1\frac{2}{3}$ cwt/acre sulphate of ammonia.
4. **Clostridium** — These bacteria live in poorly aerated soil and can contribute up to 4 lb N/acre ≡ 3 units ≡ 1/5th cwt sulphate of Ammonia as an alternative to source 3.

5. **Other** bacteria and small living organisms are insignificant sources.

The estimated total from these sources calculated for West of Scotland was 100-119 lb N/acre ≡ 89-106 units ≡ 4-5 cwts Sulphate of Ammonia. About $\frac{2}{3}$ of this can be expected in herbage shoots (i.e. 60-80 lb/acre). Actual tests using grasses and clovers grown together showed that the mixed crop contained 198 lb N/acre. By separate analyses of the grasses and clovers it was shown that 98 lb came from grass and 100 lb from the clover. A special technique for growing clover and grass together but with their roots separated showed that 31 lb of the N in the grass had come directly from the clover which is able to utilise N from air and is independent of soil N. Therefore the amount taken by grass from the soil was approximately 67 lb (98-31).

In 1964, a figure of 88 lb/acre was calculated for perennial ryegrass grown alone, whilst in 1965 the figure given was 65 lb very close to the theoretically expected figure.

I. V. HUNT

134 Grassland Research on Blanket Peat in Ireland

M. A. O'TOOLE, Glenamoy, Co. Mayo, Ireland

J. Brit. Grassld. Soc. 1968, Vol. 23, pp. 43-50

Twenty-five per cent of Ireland's land area is in the form of rough grazings and is mostly on peaty areas. Over the last 10 years experiments at Glenamoy have centred on the reclamation of blanket bog with particular reference to fertiliser use as well as seeds establishment.

Lime—the pH is 4.6. Best response is from a dressing of 2 tons per acre ground limestone and a repeat dressing after 5 years. No advantage was obtained from larger initial dressings.

Phosphorus—without phosphate there was little or no earthworm or bacterial activity and the establishment of grasses and clovers was poor. Levels found useful were 75 units of phosphate per acre for areas to be cut and 55 units for grazing. Where the lime status was reasonable superphosphate gave a quicker response than basic slag or ground mineral phosphate. However, 1 ton of slag as an initial dressing encouraged the establishment of grasses and clovers without lime and an annual dressing of 3 cwt slag was found in some instances to supply the needs of both phosphate and lime.

Potassium—grasses and clovers did establish without potash but failed to persist. Annual yields of dry matter were in the order of only 2000 lb compared to 6000 lb per acre when adequate potash was applied. Rates used were 105 units per acre for cutting areas and 50 units for grazing areas.

Nitrogen—20 to 40 units N per acre at sowing greatly helped the establishment of grasses and clovers. After this initial phase the use of moderate levels of N (i.e. up to 140 units) was not economical.

With S24 perennial ryegrass and S170 tall fescue a response was obtained using up to 350 units N/acre although clover did suffer at the higher levels of N.

Other elements—Copper sulphate at 20 lb per acre as an initial dressing and 5 lb per acre annually thereafter maintained satisfactory copper levels in the herbage. Nodulation of the clover roots was also greatly improved by the application of copper. Iron deficiency is a problem on Irish peats causing the grasses to turn yellowish green. Perennial ryegrass, tall fescue and Yorkshire fog are less susceptible to iron deficiency than timothy, cocksfoot or meadow fescue. However the use of basic slag usually alleviates iron deficiencies.

The establishment of grasses and clovers on peat are discussed. By and large rotovation is more useful as a levelling process to remove the hummocks than as a method of seed bed preparation per se. Heavy grazing before and after sowing has given excellent results and because of the wet nature of the peat, trampling by sheep is preferred. Cattle can cause excessive poaching.

R. D. HARKESS.

Comment. The Grassland Department of the West College has many grass and clover plots on land similar to that described in this article. Members of the C.S.G.S. visited one such experimental centre in Renfrewshire earlier this year and a brief account of the site is given on page 22 of this Journal.