GRASSLANDS

JOURNAL

OF THE

SOUTH WEST

AND

CENTRAL SCOTLAND

GRASSLAND SOCIETIES

No. 13 SPRING 1970

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Contents

EDITORIAL

Time flies and number 13 which should have been the winter number 1969 has become a spring number 1970. It has thus become possible to justify the issuing of this bigger than usual number, make room for specially written contributions on the theme — Grazing Systems and still print the proceedings of our meetings with the exception of the last two meetings of our 1969/1970 winter programme.

The grazing system is part of the grassland system which is itself a particularly important part of the West of Scotland farming system. The whole grassland system will encompass the contribution made by grassland to the winter fodder requirements and to the maintenance of fertility in terms of soil nutrients or soil structure.

It is not easy to isolate the grazing system from the wider implications of the grassland system but the intention is to look at summer grazing or direct use of growing grass. Many summer grazing systems incorporate provision for fodder distinctly. Some of the meetings during the year which are reported in this number also bear on the subject of grazing systems — especially Dr Murray Black's paper on intensive sheep husbandry, Mr Fenwick Jackson's paper on his beef system, and Mr Graeme Copeman's paper on 'Beef from Grass'.

The next issue, Number 14 is already being prepared. Have you any comments which could help the editor provide what you want. Are the reports on meetings too long. Could we leave out the discussion of questions and answers.

What theme would you like for our opening meeting next November and for our next issue. I am inclined to make it winter feeding but I can easily change this.

I. V. HUNT.

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News about the Societies and Forthcoming Events

1. Central Scotland Grassland Society

The main news item has been the retiral of the secretary Mr Graham Berrie. He was largely responsible for guiding the founder members and first committee and put in a tremendous amount of work organising visits, meetings, etc. Meanwhile his duties as Deputy Director of the College Advisory Service have not become any lighter and it was necessary to choose between one or other. The committee thanked him for his devotion to the society and presented him with a token of their regard.

His place is taken by Ian Mitchell, Senior Officer and Area Agricultural Adviser for the Central Area covering Stirling, Clackmanan and West Perths. He served his apprenticeship on the committee of the South West Scotland Grassland Society and he was for many years county adviser for the Stewartry of Kirkcudbright.

2. South West Scotland Grassland Society

The new committee are hatching out next season's programmes. One meeting has already been devoted to general consideration of the purpose of our society and how it can develop its activities without becoming too burdensome, and without clashing with the activities of the many excellent Discussion Societies and Study Groups functioning throughout the South West of Scotland.

One interesting decision was that we should have a few informal late afternoon/evening farm walks/demonstrations through the summer months. As a start the 2 farmer members plus the county advisory service member representing each of the four counties in the society's province are to organise such a meeting. It will cater specifically for the members in the area concerned but notice of all of these will be circulated through the whole society.

3. Forthcoming Events

(a) As we go to press, the last of the winter meetings approaches, arranged by the Central Scotland Grassland Society in the plush surroundings of Stuart Hotel, East Kilbride, Invitations are going out to both our societies.

(b) The spring tour of the S.W.S.G.S. is to be to Wigtownshire, visiting two farms on Thursday the 14th of May.

(c) The summer tour of the joint societies is being arranged for June. Visits to Sourhope, one of the experimental farms of the Hill Farming Research Organisation will be followed by visits to a hill farm, a lowland beef farm, a big dairy farm. It will be possible for members to attend for a single day or continue with the complete programme.

4. Membership

A complete up-to-date list of members of the South West Scotland Grassland Society has been issued. Copies are available from the Secretary. Combined membership of the two Societies is around 600. New members joined since last October are listed below.

(a) South West Scotland Grassland Society

John McMaster Barr, Auchneel, Stranraer, Wigtownshire.
L. A. Bennett, The Leaths Old Farm House, Castle Douglas, Kirkcudbright.
Major G. R. W. Carter, M.B.E., Townhead of Glencairn, Moniaive, Thornhill, Dumfriesshire.
Wm. Cruickshanks, Jnr., Rattra, Kirkcudbright.
R. M. Daniels, Estate Office, Chequers Manor Farm, Cadmore End, Nr. High Wycombe, Bucks.
D. F. Grant, Burrance of Courance, Lockerbie, Dumfriesshire.
Thom. Harper, Roslyn, Stranraer, Wigtownshire.
T. Lindsay, Drummaston, Whithorn, Wigtownshire.
R. R. McHaffie, Arcady, Glebe Street, Stranraer, Wigtownshire.
M. D. C. Scholes, Management Recording Services, Scottish Milk Marketing Board, Underwood Road, Paisley.
J. Smith, Kilmaurs Mains, Kilmarnock, Ayrshire.

(b) Central Scotland Grassland Society

James Barr, West Crosshill, East Kilbride.
Alex. O. Brown, Springhill Farm, Baillieston.
R. Drife, Netherhill Farm, Crawfordjohn.
Ritchie Russell, Burnhouse Farm, Kirknewton.
Ian Leggate, South Flakefield Farm, Chapelton.
David McKerrow, Grougfoot Farm, Linlithgow.
J. P. Young, 10 Ravelston Park, Edinburgh, 4.
Robt. F. Millar, 3 Monkland View, Uddingston.
William Frame, Haspielaw, Hamilton.
James R. Hunter, Luckenburn, Slamannan.
N. S. Smith, Ardgairney Farms, Kinross.
John Caldwell, East Mitchelton, Kilbarchan.
William T. Baird, Levan, Gourock.
John S. Dykes & Sons, Nether Enoch, Eaglesham.
John W. Donaldson, Keirhill, Balfron.
Colin D. Young, 35 Malborough Avenue, Glasgow, W.1.
Norman S. Ritchie, 26 Garscadden Road, Glasgow, W.5.
M. J. R. Young, 8 Queens Gardens, Dowanhill, Glasgow, W.2.
J. Bickett, S.M.M.B., Underwood Road, Paisley.
George I. Spence, Carbrook Mains, Larbert.
James D. Hendry, Ballochruin Farm, Balfron.
Walter Graham, Cameron Farm, Greengairs.

GRAZING SYSTEMS — WHICH AND WHY ?

I. V. HUNT
West of Scotland Agricultural College.

Grazing systems are **systems of rules** for managing grassland or livestock to:—

(a) Produce maximum yield of grass/acre.
(b) Maintain herbage quality.
(c) Induce more uniform distribution of herbage to match daily stock requirements for the whole season.
(d) Make it possible to achieve a high conversion of grass into— milk, meat, wool or stock or other saleable livestock products.
(e) Provide necessary protection for stock from accumulation of parasites.
(f) Relieve the farmer of day-to-day decisions.

1. The simplest of all is **Continuous grazing** in which there are a few large grazing fields or even just one single field which carries stock on it throughout the whole summer and often through the winter as well.

When grass is plentiful during May and June (a) extra stock, possibly sheep, can be drafted into it; (b) part of the field may be fenced off for hay or silage; or (c) the surplus grass is topped with a mower and allowed to rot.

When grass is short as from July onwards, the deficiency can be met (a) by bringing in extra grazing such as catch crops or fields which have been mown, or making use of rough grazings; (b) by cutting down stock by selling them or transferring them to other land; (c) by using home grown or purchased supplementary feed as draff, grain, cake, hay, silage, etc., which is somewhat equivalent to buying-in acres.

The effects of grass shortages can be minimized by understocking through the early spring and summer. The system is satisfactory as a development from ranching if a low output per acre at low cost is satisfactory and land is unlimited. For such reasons it has remained acceptable on hill-land until quite recently. But now that land and other resources are limited it is necessary to push up output per acre from both lowland and hill-land.

This is possible under a continuous grazing system if the swards are fully stocked in the early part of the year and cheap methods of supplementing grass for July can be incorporated into a system. The difficulty is to find a sufficiently cheap supplement.

1. Rotational Grazing

From the dawn of grassland science, i.e. 200 or more years ago the advantages of controlling grazing have been preached over and over again. Instead of continuously grazing one field, it is subdivided into 2, 4, 8 or even 100 paddocks, so that at any moment

stock are grazing a proportion of the grassland whilst the remainder is being rested.

Shortly after the First World War this idea of rotating stock round grassland and the benefits to be obtained by resting grassland were crystallised in the Hohenheim System of Rotational Grazing, originating from a German Experimental Station. It involved 4 to 6 paddocks grazed for one week in turn, the cattle returning to the first paddock after 4, 5 or 6 weeks according to number of paddocks.

Very productive rotation of pastures for carrying young stock using just 2 paddocks for alternate 14 day grazing and resting were set up experimentally at Auchincruive in 1950 to 1960.

The advantages of these simple paddock rotation systems are (a) increased annual yields of grass because grass grows faster when rested than during grazing; (b) easy diversion of grass, surplus to grazing needs, to hay, silage or dried grass; (c) better control of the composition of the swards, by keeping down coarse weeds and maintaining a balance between high tillering grasses and clovers.

The disadvantages are (a) the additional cost of fencing, watering and provision of tracks and gates to the paddocks, and (b) the decline in quality of herbage and milk yields from the first to the last grazing day of a grazing period; (c) the extremely low yields of grass in mid-season. As soon as a system is put into practice, advantages and disadvantages are shown up, and the efforts of farmers and grassland scientists are directed to modifications which will retain the advantages and get rid of the disadvantages.

3. **Strip Grazing**

The electric fence was cheap and portable and made it possible to move stock to fresh herbage every day or even twice a day and to adjust the size of the grazing paddocks according to available grass. The grass not required could easily be mown ahead of the moving fence. Movement about the field to mow or apply fertiliser was easy when the fences were down. Cost of this portable fencing and the portable watering which went along with it was low.

Where did this go wrong ? Why wasn't it taken up and more widely developed ? Why did farmers set up these systems and then drop them after one or two seasons. It is difficult to see but some of the reasons are: (a) It was not a foolproof system. Decisions were necessary daily as to where to lay the fence. (b) Moving the fence was a fag, the wire broke or the batteries failed at critical times. (c) The system involves critical work on Saturdays and Sundays when the labour force is reduced. (d) The batteries, etc. were objects for vandalism. (e) The system broke down when the supply of grass failed in early spring or mid-summer and it was necessary to open up the grazing and let stock find their own herbage. The electric fence is still used but not the elaborate mobile systems of yore.

4. **Daily paddocks unlimited**

Some of the chores were taken out of strip grazing by using many fixed paddocks for short grazing periods down to 1 day. With 60 or so paddocks one could use 20 for grazing and 40 for silage or hay in the early part of the season when grass was plentiful and restart a new grazing cycle after just 20 days. When grass was short all 60 paddocks would be in use with a new cycle of grazing coming along after 60 days. Voisin and J. S. Morrey proclaim variations on this pattern. J. S. Morrey secures his main and very high quality conserved grass as an alternative to grazing.

The disadvantages of the method are (a) The high cost of the large number of paddocks. (b) The small size of these daily paddocks makes the use of modern machinery rather difficult.

5. **Alternate grazing and mowing**

This practice is followed by many farmers and recommended by many agronomists, and can be incorporated into many grazing systems.

One of the most obvious results of intensifying grazing is the appearance of more and bigger patches of rough rejected grass. These are most obvious in rotational grazing systems but are equally bad in other systems. The dilemma is whether to mow them and thus get rid of the uneaten grass and stimulate fresh growth or whether to let them be to contribute a bite when feed is short, or the beasts a bit hungry. Topping these tussocks makes for a tidy job and theoretically adds to the feed value of the grass thereafter but it can't be done without taking up someone's time which might be better spent in other ways. One solution was alternate grazing and mowing. Thus the swards were tidied up after each grazing. It is particularly appropriate for rotationally grazed large paddocks or strip grazed set-ups which can easily be defenced and put up for hay or silage.

This practice has much to commend it. It certainly leads to very high exploitation of grass potential and high outputs. It assists in controlling parasites and herbage quality, getting rid of the accumulating stubble which acts as a festering rubbish tip within a sward and is responsible for big drops in grass production, livestock intake and nutrient value.

The dead stubble can be eliminated by topping or gangmowing but these are non-productive methods of control. Alternate grazing/mowing makes a contribution to both summer and winter feed requirements.

The disadvantages are: (a) The grazing system includes the conservation acreage and occupies the whole of the grass acreage, all of which must be fenced and watered. (b) Although mowing has beneficial effects on the feeding quality of the herbage, it is a form of cropping.

Potash and other minerals are removed in the hay and must be replaced as fertiliser or as dung/slurry. Herbage suitable for mowing for hay or silage tends to be longer and more bulky than that suitable for grazing. Because of this and also because of the removal of N, P, K in a mown crop, the recovery is slowed down. Rest intervals must be longer where alternate grazing/mowing is practised.

Stan Morrey has overcome some of the objections by taking his silage crops at the same stage as his grazing crops. Wallace Montgomery, Lessnessock, has a better idea, he takes his conservation crop by gangmowing with a Walley Gang-Mo-loader whilst continuously grazing his cow pasture. He secures high quality silage and maintains a very high grazing quality in his pasture.

6. **Two swards**

The next step was the 21 daily paddock/2 sward system which is now being followed by a considerable number of farmers. Since mowing small fixed paddocks is awkward, it seemed right to completely separate mowing swards from grazing swards and to utilise grazing swards more fully — topping when necessary to control surplus grass.

This is described by J. D. Metcalfe in this number of Greensward.

The short grazing cycle with frequent applications of fertiliser nitrogen (every 21 days and usually 9 times in the year) produces a very vigorous sward. High stocking rates and the short rest interval tend to reduce the problem of surplus grass in the first two or three rounds. Under very dry conditions, a shortage of grass may occur in late summer but this can be met by bringing in extra acreage from the cutting swards.

Such a system is economical in potash and phosphate but tends to be less efficient in its use of fertiliser nitrogen. The short interval of 21 days doesn't allow the full growth potential of the herbage nor the full response from the nitrogenous fertiliser. Good young high digestible grass can be obtained at 20 lb herbage dry matter per lb N applied harvested at 4 week intervals. Rather less grass and a lower return for N is obtained from the 3 week interval. However this may be a cheap price to pay for a very smooth running system.

7. **The Simplified System**

The latest modification is that proposed by Dr Holmes at Wye College who puts a plea for simplification of the rules as follows:—

(a) Extend the interval to 28 days and get better value for N applied.

(b) Use fairly large permanent paddocks, sub-divided to give a daily fresh bite.

(c) Stock at 2 cows/acre.

(d) Ignore the rejected grass during the flush periods — it will contribute something towards the period of deficiency.

(e) Apply 56 units of N/acre/grazing.

(f) Stock to capacity in spring and be prepared to use supplementary feed in summer.

There is nothing new in any of these rules. Many of them represent steps backward as far as control of herbage is concerned and some ardent system devisers have attacked his whole system for these lapses—the fact remains that his outputs are very, very high — easily topping 1000 gallons milk per acre year after year. Although he steps backward in terms of topping and getting rid of the rejected herbage he is well forward in many other respects and all his so-called faults can be excused if high outputs are maintained.

8. **Zero Grazing**

The zenith of grazing control is probably zero grazing in which the animal is kept away from the grass-growing fields, maybe indoors but they can be outdoors crowded into a sacrifice paddock at 250 per acre as I saw in Canada 15 years ago.

Grass is cut and carted to the stock — no fences are necessary — grass surplus to requirements can be either dehydrated and sold or used as dried grass or stored as top quality hay or silage for winter feed.

This system seems to lend itself to complete automation. All that is necessary is complete predictability of grass growth in quantity and quality so that each day's supply of herbage is assured.

There are a few very successful exponents of this method, the latset, the I.C.I. at Dairy-House Farm, Cheshire. Its snags are high cost of harvesting grass and disposal of slurry and high cost of replacement of fertilisers.

Through all this development along different lines of grass and grazing control there have been waves of enthusiasm followed by ripples of doubt. Every now and then an experiment or a farmer demonstrates that we can get just as much output by going back on some of the accepted rules. The biggest ripple occurred in 1956 when C. McMeekan of Ruakura, New Zealand, questioned that rotational grazing systems were more productive than continuous grazing systems. The basis of his challenge was that most farmers and scientists setting out to compare two systems would be biased towards the rotational system to such an extent that they would put more stock on the system. After all, it was more costly, it must produce more grass and it must carry more stock.

With say 20 cows on a continuous grazing system and 30 cows on a similar area under a rotational grazing system, the latter was bound to prove more profitable.

He maintained quite correctly, that all the advantages shown to that date from controlled or rotational grazing systems could be simply due to increased stocking rate.

Since there has been general confirmation that stocking rate must be raised to bursting point before the advantages of one system over another can be demonstrated. The result of his work has been the startling rise in stocking rates on grassland, greatly increasing outputs from continuous and rotationally grazed systems.

Finally, he has been able to demonstrate advantage in output from rotational compared to continuous grazing systems, but they have not been very high. Some systems of livestock husbandry show advantages in continuous grazing and we may yet see the development of the perfect system — with the advantages of fenceless ground plus control of grazing.

I have heard one depsairing grass scientist say recently that the grazing system does not matter so long as the level of stock and fertiliser nitrogen are both high. There is no doubt that systems can affect the amount of potential grass for feed, but no system can ensure high output of livestock products unless both farmer and stock can cope with the extra grass made available.

LEADERS AND FOLLOWERS—A GRAZING REFINEMENT?

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

When dairy cows enter a field of fresh grass they normally eat the topmost part of the herbage first. These topmost leaves, the "tips" of the plant, are clearly the most palatable part, and they have generally a higher feeding value than the remainder of the plant. For example, in one experiment the crude protein content of the dry matter in the tips was 17.7% compared with 14.4% in the rest of the herbage. In another experiment it was found that the herbage dry matter eaten on the first day in a pasture contained 25% crude protein, but on the second and third days it contained 22% and 19% respectively.

The tips of the plant are also much more digestible than the lower parts and in general, the portions of a plant get poorer in feeding value as they approach soil level. Thus, as a result of the selective grazing behaviour of the cows, the intake of nutrients on the first few days of grazing in a fresh field is high. In the following days, as the herbage is grazed down, poorer quality grass is eaten, and the intake of nutrients falls. This variation in the intake of nutrients is then reflected by similar fluctuations in the milk yield of the cows. The yield of milk tends to be at a peak about 24 or 36 hours after the start of grazing on a fresh field and then the yield declines as the more stemmy and less nutritious herbage is eaten. This decline in yield can be seen from the results of an experiment conducted in Virginia, U.S.A., where the mean daily yield of milk was 33.8 lb. when the top part of a lucerne/cocksfoot mixture was grazed compared with 30.9 lb when the bottom part was grazed.

Splitting the herd

To overcome these fluctuations in milk yield and to make the maximum use of the herbage, it would seem a good idea to feed the tips of the grass to the cows with the highest milk yields and to feed the remainder of the herbage to cows with lower yields. One method of doing this is to divide the herd into two groups. The high yielding cows in one group would graze the tips of the herbage, and the lower-yielding and dry cows in another separate group would follow the cows in the first group and eat the remaining poorer quality herbage. This idea of "leaders and followers" is not a new one, and years ago the suggestion of splitting herds into two or even three groups of cows of different milk yields was put forward in Germany for use on intensively managed grass farms. J. S. Morrey, an acknowledged expert on grazing systems, has successfully used the technique of splitting his herd for many years.

An experiment to investigate this technique was conducted at the Hannah Dairy Research Institute and two grazing treatments were compared using dairy cows. The control treatment was a system of normal rotational grazing in which the cows grazed a sequence of paddocks and remained on each one for 8-10 days. The other treatment, termed the "leader" treatment, was a system in which the leader cows were always ahead of the follower cows. The leader cows grazed their paddocks for only 4-5 days and then the follower cows which were dry, grazed the same paddocks for a further 4-5 days. It was thus possible to compare the milk production of cows grazing on a system in which all the herbage was eaten, i.e. the control treatment, with a system in which only the top part of the herbage was eaten. The amount of herbage on offer to the cows was similar on both systems of grazing and all other factors of management, such as the amounts of fertilizer applied and the stocking rates were identical. The experiment lasted 18 weeks and the main results are summarised in Table 1.

Table 1. The yield and composition of the milk on the two grazing systems.

	Grazing system	
	Control	*"Leader"*
Milk yield (lb/cow/day)	33.4	35.1
Fat (%)	3.90	4.00
Solids-not-fat (%)	8.47	8.52
Liveweight (lb)	1077	1083

Grazing experiment

The yields of milk on both systems were satisfactory but on average the cows on the leader system gave significantly more milk than those on the control system (Table 1). The difference between treatments was more marked with the higher yielding cows than with the lower yielding cows, and the difference was also more evident in the spring than in the autumn. On the assumption that the leader cows ate half of the available herbage and the followers the remaining half, it is calculated that the mean daily yield of milk was 35.1 lb when the top part of the herbage was grazed compared with 31.7 lb when the lower part was grazed. This difference between the yields was 3.4 lb/day and is similar to the difference of 2.9 lb/day reported in the American experiment. The fat and the S.N.F. contents of the milk on the two treatments were not significantly different although the slight adavantage in composition was in favour of the leader treatment. The rate of decline in the average daily milk yield each week was 2.3 lb on the control treatment but only 1.2 lb per week on the leader treatment. This difference was significant and indicated that the difference in average milk yield between treatments could well have been far larger if the experimental periods had been longer.

Farm practice

The above results only relate to one experiment done in one grazing season but they confirm the theory on which the system of having leader and follower cows is based. By allowing the cows only the better portion of the grass, the lactation yield in a 180-day grazing season was increased by about 30 gallons, worth about £4 per cow. To offset this etxra income there is the additional cost of dividing the herd into two groups after each milking and taking two separate group of cows to the field twice a day. Furthermore, to make the most of the system, the number of grazing fields would have to be doubled so that fields were not grazed for too long at any one time. This would require an extra outlay on fencing and even additional water troughs. Where a system of small paddocks is already in regular use there would be no need for extra fences and water supplies and the system of splitting the herd would not be so difficult.

A grazing system with leaders and followers has without doubt some advantages over a system in which high and low yielding cows are grazed together, but these advantages are small compared with those to be gained by making full use of other well-tested techniques of grazing management. A successful grazing system demands the production of a regular sequence of highly digestible herbage which is utilized efficiently at a high stocking rate by animals fed little or no supplementary concentrates. When these major requirements for successful grazing management are fulfilled it is then a suitable time to consider refinements such as a system of leaders and followers.

21. PADDOCK GRAZING

J. D. METCALFE
Scottish Agriculture Industries, Ltd., Ayr.

Paddock grazing of one sort or another has been practised for a considerable period. Most of the earlier attempts were based on the principle of reducing grazing fields to more easily handled sizes which were grazed in rotation, the time spent on a paddock being dictated by the apparent needs of the stock. It was considered desirable to cut the paddocks, usually for silage, in mid-season in order to clean the grass of taint for second half season grazing. Paddock size had thus to suit the mechanics of silage harvesting as well as being a satisfactory area for grazing. This system had and still has a great deal to commend it as it suits some farm circumstances quite admirably. A basic limitation from which the system suffers is that milk production fluctuates up and down according to the period cows are on a paddock, going up when put on to a fresh one and dropping on succeeding days. This produces a see-saw effect on production and the stock get increasingly unsettled. Improvement can be achieved by strip grazing within these paddocks and thus ensuring some fresh grass each day.

More recently the 21 paddock system was introduced, first in Wales and about four years ago into Scotland when it was first tried on a dairy farm in Ayrshire. This system has a number of features quite distinctly different to the earlier concept of paddock grazing. These are:

1. That it can be sound practice to graze throughout the season without the necessity of cutting as a cleaning operation.
2. That a paddock area should be of size to suit for 24 hour grazing only and thus the stock would move to a fresh one each day.
3. That a minimum 3 weeks rest period is necessary to allow regrowth between grazings.
4. That after each grazing more 'N' should be applied to ensure adequate leafy growth before its turn again on the next grazing cycle.

Assuming it does what is claimed, there are a number of practical advantages to this technique. With four years experience as a guide it is useful to look at the system and consider the pros and cons. Grass provides a number of peculiar management problems, some of which continue to defy all but the most ingenious. Systems or techniques which enable more farmers to exploit its great potential must be worthy of consideration. The success of the 21 paddock system will be largely judged on whether or not it succeeds in increasing the number of grass enthusiasts and exponents. The enthusiastic propagandist however must not camouflage the problems still left unanswered.

Firstly the problem of the early summer peak growth, the May/June bulge. The technique does help to reduce the difference between the early summer peak and the mid-July trough but it does not eliminate it. To completely overcome this, some modification to management is necessary. A paddock will provide more than 24 hours grazing at the peak period and thus the introduction of an electric fence to increase the 24 hours to 36 or even 48 is practical and useful and it ensures that cows get a fresh bite. When cows are to return to a paddock for a longer period than 24 hours it is essential that they find some fresh grazing or they will soon make their displeasure noisily apparent. Adopting this technique makes the 21 paddocks too many at this period and the surplus can be taken for conservation, preferably as silage. Cutting of these paddocks should take place at the time intended for grazing so that recovery is adequate to provide the cow requirements on the subsequent cycle.

Secondly, the problem of fouling. A distant look suggests that this problem could become so serious after a third grazing that the system will fail. This third cycle is the most difficult in terms of rejected grass but it coincides with the mid-season period and to a large extent the problem solves itself. From this mid-season point the break down of dung becomes very rapid and most has disappeared by the time the cows return after the three week break. This rapid decomposition of the dung seems to reduce the unpalatability problem and it gets no worse from this point on. It seems, too, that the cows themselves become conditioned to eating this strong grass and in years 2 and 3, cows graze better than in year 1. If the problem does get too serious it is necessary to top paddocks and this should be done as soon as possible after the cows have moved on. Some farmers have found an answer in cutting a paddock in the mid-season prior to turning the cows in, the short wilt appears to remove taint and the stock eat the grass readily.

Thirdly, a problem whch has caused comment but is certainly not confined to padocks is winter kill. High fertility encourages autumn and early winter growth and this predisposes to winter kill. The paddock system certainly increases fertility and thus this problem can prove troublesome. All the answers are certainly not known with regard to this problem but it does help to clean up all surplus grass by one means or another before the winter really settles in. A late topping in September-October looks a useful management tool if stock have not done a really efficient job.

No resumé on paddocks would be complete without reference to the potential problem of poaching. No matter under what system, heavy stocking does increase this risk. It is fair to say after observation of the technique under a wide range of soil and rainfall conditions that it is no more serious on paddocks and in fact often appears a considerably less troublesome problem.

Access routes are the most troublesome and so far as possible if access is across fields no route should service more than three paddocks. When the access becomes very muddy the cows use the first quarter of the paddock as a foot mat and then reject it for grazing and then they can show their dissatisfaction with the quantity on the remaining three-quarters of the paddock. There is no need to be more afraid of poaching when on the paddock system than on any other.

Some enthusiasts call this technique the Two-sward system and this name is a good one. So far only the paddock area which provides the summer's grazing has been considered. Enough other grass is required for conservation as hay or silage. Swards therefore to suit grazing on the one hand and cutting on the other can be established instead of attempting the dual role expected of so many. The cutting area can be used for grazing at periods early and late in the season and to meet any unforeseen crisis if necessary during the summer.

Experience and observation have produced some golden rules which still have to be interpreted with the grass farmers' most important characteristic "flexibility."

1. The grazing area should be not more than $\frac{1}{2}$ acre per cow.
2. This area requires splitting into 21 equal sized paddocks. In some cases it is an advantage to have rather more paddocks, up to 28.
3. Surplus grass should be cut for conservation during the peak growth period, all the paddocks will be required early and as the season progresses.
4. The fertiliser programme must be maintained on a regular basis. Start with a basic application of 80-100 units 'N' and top up with 40 units after each grazing. Do not let more than three paddocks accumulate before top dressing and it is safe to apply fertiliser to the next 3 or 4 paddocks for grazing, i.e. up to 3-4 days before grazing so that a week's application can be put on at one time. Do not miss 'N' application till past mid-June. If recovery appears adequate a round can be missed in the second half of the summer but not in the first. 'P' and 'K' are also required and 50-60 units applied mid-season is convenient and adequate to maintain satisfactory soil levels.

The 21 paddock grazing system is now a well proven technique which could be used to advantage by a great many more stock and particularly dairy farmers. Careful planning before establishing paddocks is essential. In a first attempt, do not make the set-up too permanent as the first season is almost certain to show up some desirable modifications. Dairy cows in particular show a very handsome margin when grazed at two per acre and targets of 800-1000 gallons of milk are not too difficult to achieve. Those who have pioneered this system deserve congratulation and the sincerest acknowledgment of the value of their efforts would be a more widespread adoption of this useful technique.

ANOTHER LOOK AT INTENSIVE LOWLAND SHEEP

By J. WALKER-LOVE
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At the time of going to press, there are two things which stand out as if in neon lights — the continued fall in ewe numbers and the general lack of confidence in the future of sheep.

This lack of confidence stems from the lack of reward for sheep production and not through any lack of technical know-how. Many of the economic comparisons have been far from favourable for sheep. Gross margins as far as sheep are concerned, in large measure are not fair when taken in isolation and are often based on figures which are historical. Given the right incentive, the future could take on an entirely different look. Given the confidence, flockmasters would plan for the future effectively and put to good use some of the technical developments which are available. In this context the question must be asked " Does the answer for the future lie in intensification ? " If intensification means making full use of resources, then intensification it must be. However, there is a built-in resistance to heavy stocking rates as many can still remember numerous failures of not so many years ago. Today this should not necessarily discourage any move to greater intensification but it should be remembered that an intensive system can only be operated successfully if planned and executed meticulously.

Intensive Sheep Unit

From the sheep investigations at Auchincruive, a number of features can be noted and considered for inclusion in any code for intensifying sheep production. These details are described briefly and in a general way here.

The intensive sheep unit need not necessarily be associated with winter housing — justification must be reasoned on each individual case. Nevertheless housing may play a part in some intensive sheep units and is therefore covered as well as the grazing aspect.

Housing

1. Generally speaking housing cannot be recommended unconditionally, but where it is utilised it can only be economic if it is possible to charge it at a low cost. This can either be done by utilising the accommodation at other times of the year for purposes other than sheep or alternatively having a very low cost structure building.

2. Housing for sheep must be well-ventilated and with this in mind, it is essential not to bring the roof too low and to employ space boarding (4″ board, 1½″ space) in the walls — on all four if possible.

3. A pen area of 12½ sq. ft. and a feeder space of 18″ has been found necessary for each ewe weighing approximately 180 lb liveweight.

4. Slatted floors are not essential. When bedding is used, great care must be taken to see that the floor management is first class. This involves careful and regular observation (and treatment, if necessary) and putting the ewes through the footbath on three successive days before housing.

5. It will be found worthwhile to pen the ewes in groups of 20 which should have a good spread of lambing dates (obtained by keeling tups), otherwise there will be a greater chance of mismothering and more time needed to mother-up.

6. The lambed ewes with lambs should be moved from the pens to individual 4′ × 4′ lambing pens, as soon after lambing as possible.

7. The ewes and lambs should be put out to a sheltered area on which feeding is continued until spring grazing is available.

Grazing

1. To combat parasitism, clean ewes must be put on clean ground. This means (a) Dose ewes in the autumn and twice in spring immediately before going on to spring grass. (b) Plan to graze ewes and lambs on an acreage which has not had sheep at any time in the previous twelve months.

Strict adherence to these two points can eliminate the necessity for routine treatment of lambs during the summer.

2. The second pre-requisite is of course a good sward well-fertilised. This as the season dictates, can mean applications up to a total of 300 units N, and should include some form of rotational grazing. Five areas grazed and rested in rotation are usually found adequate.

3. The aim should be a high stocking rate — up to 8 ewes and lambs have been achieved at Auchincruive over the last four years but this need not necessarily be the maximum stocking possible.

4. Match the seasonal sward output with the nutritional requirement of the sheep flock. This can be achieved in two ways apart from taking a silage crop early in the season from any areas getting too mature for sheep. The two ways are (a) forward creep grazing of the lambs; (b) early weaning of the lambs. On the basis that the ewe has contributed most of the benefit from milk within the first 12 weeks after lambing, much can support the policy of early weaning the lambs from the ewes towards the end of June. This involves the moving of the ewes to a bare sward on which they are stocked at 20 ewes per acre leaving the intensive swards

solely for the lambs thereafter. So far this has worked satisfactorily at Auchincruive in achieving a large proportion of lambs fit for marketing by early August.

These then are a few principles associated with the production at present practised with the experimental flock at Auchincruive. It is felt that this is reasonably close to a system with some prospect of being commercially acceptable as it is a system which can leave higher margins and thereby make the intensive unit more feasible without adding greatly to the work load involved.

Proceedings of a Conference held in Castle Douglas, November, 1969

PAPER 1. PRIORITIES FOR PROFITABLE MILK PRODUCTION

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The range of subjects which must be considered by a farmer are vast and it is a very difficult task to pick out the priorities.

There are Animal Physiology, Nutrition, Reproduction and Breeding, Soil Science, Crop growth, Hygiene, Disease Prevention and Treatment, Engineering, both Electrical and Mechanical.

Beside all these 'technical' subjects there is human relations and particularly the interaction of animal behaviour × human behaviour and its effect on livestock growth and production and profitability which are included in the term stockmanship. Then there is the business side and the efficient use of resources in land, labour and capital. The range is vast and yet it covers what a farmer is expected to be familiar with. In a business other than farming, we would find a group of specialists.

Dairy farming is peculiar in that the production line is a large number of relatively small units each requiring specialist knowledge of all these subjects. Co-operation is one reasonable method of providing these specialist services. The Milk Marketing Board is one of the most successful examples of solving the need for specialist service by co-operation. The problems associated with marketing of milk no longer worry the individual farmer.

There have been considerable developments in buying expertise and thus lightening the load on the individual farmer, e.g., Package feeds, Fertiliser compounds, A.I., Milk recording, Business consultancy.

No one can be certain where co-operation will come next. Maybe in schemes such as the share milking system of New Zealand where the management of the milking herd is contracted out.

What then is left for the farmer ?

The priorities in the future will depend on this and on the degree to which the farmer is motivated by financial returns or job satisfaction. Dairy farmers are no different from other business men. If financial motivation is uppermost then return on capital is the priority with full occupation in problems of maximising production, hedging capital gains, estate duty, speculation, etc., etc. This can be a whole time job with room

for purchasing expertise. Few farmers are so devoted to this aspect. Other aspects of farming dominate the overall farming plan if not when the farmer is young, certainly as he gets over the 'hump' of enthusiasm and reaches the stage when the amount of capital invested in the farm could be realised and earn far more outside farming. At this period, a lower financial return is acceptable with more job satisfaction.

Study of Low Cost Milking Service

Four thousand farmers pay a fee for this service. In the past seven years, 7000 farmers have been in the scheme. Three thousand have gone out of the scheme; some have gone out of farming; some feel they have reaped what advantage there is; some have left dairy farming on the advice of M.M.B.; others continue.

From this vast store of information we hope to draw some lessons in cost reduction. This kind of survey can be criticised because it is always a record of past events and practice but there is much of use to the future which can be gained from studies of past trends.

In recent years, it is doubtful if there has been any major influence comparable to the introduction of the milking machine. Its introduction was widespread and produced an immediate jump in efficiency. It is remarkable how little change there has been in the milking machine, it is still a vacuum pulsator. A discovery as widely applicable and as important as the milking machine could upset one's forecasts and make study of the past less valuable.

Before we look at the changes over the period 1964-8, let us look at the features which have not changed. They are:—

1. Milk yield/cow/year.
2. Amount of feed used per gallon of milk produced.
3. Breed of cow.
4. Ratio of summer to winter milk.
5. Proportion of bought feed.

These may change in the future but over the last 5 years the average position has remained practically the same. Note that I am using the term average. There have been individual changes.

Let's look at these features more closely.

1. **Milk yield/cow/year:** Note that this is per year and not per lactation. The average milk yield remains steady at 850/cow/year with a herd range of 650 up to 1250 gallons per acre. This is probably the most important of these non-changing features. In a period of heavy investment in buildings, land, machinery for milk production, it is necessary to secure the maximum yield per production unit i.e. per cow. Sweden has a longer winter than Scotland and has a very high investment in buildings. Their yield per cow is rising. The proportion of costs borne by feed has lessened.

The rise of capitalisation is remorseless and milk recording identifies sources of low yield becoming more and more important.

Among the data, an interesting figure is the 19% average dry cows per herd. The range was from 8% to 30%, the low figures being found where down calving heifers are brought in; the high figures where there is a poor calving interval.

With a normal herd structure, a 365 day calving interval with 305 days lactation and 60 dry days, we would have 17% of the herd as dry cows. Find out what your own figure is using either the average calving interval or % dry cows and compare it with other herds and other years.

Feed per gallon and breed of cow: I will not dwell on these, they are subjects in themselves.

4. **Ratio of summer to winter milk:** During M.M.B. operations before the war, any shift in summer or winter milk price was followed by a corresponding swing among producers towards summer or milk production. Nowadays this response is not shown in the average figures for production.

Thus in 1938, when the average milk price was 13.4d per gallon with 10.4d in May and 16.0d in December, there was a difference of 5½d in favour of winter milk. This is a price differential of 41%. Summer milk was 54% of total production. Maybe a lot of our summer milk is not planned summer milk production but a winter milk programme with an erratic calving index.

The features which have changed are easily identified. They are as follows:—

1. Stocking rates have risen from 1.68 acres to 1.3 acres/cow.
2. Herd size has risen from 55 to 70 cows.
3. Nitrogen usage has increased from 77 to 131 units N/acre.

131 is still low but not when compared with a national average of 60 units N/acre on grass.

These are very big changes which have resulted in increased gross margin from £48 to £70 per cow. Some of this rise is due to increased milk and beef prices. When put on an acreage basis they rose from £29 to £54 per acre. This reflects more correctly the effects of management changes. The improvement is largely due to the increased stocking rate.

The change in stocking rate is equal to putting on 3 cows per head per year. The same acreage of grass was used in 1st and final year so that the limit to rate of increase would be available capital. Some increase is possible, using existing buildings when only sufficient capital to buy cows is needed. A stage is soon reached when additional stock demands a major modification in building. The change in demand for capital appeared to come after an extra 30 to 50 cows has been put on.

The capital needed for carrying the herd above this barrier is considerable. A report on buildings due to be published in January on the results of work at the Farm Building Centre, Stoneleigh, will be very useful. The investment rate in buildings for the dairy goes up by £23 million per year. Apart from investment in grain storage it is the biggest item in new building investment.

Where only alterations to buildings are called for the average investment in buildings is £36 per cow. Where new buildings are required this jumps to £47 per cow, and this in addition to requirements for the parlour, fitments, slurry clearance, etc. 99% of all herds are housed somewhere and only 1% outwintered.

The changes in accommodation are shown below:—

1969	Type of housing	1968
—	Cowsheds	—
31%	Partly covered yards	3%
59%	Fully covered yards	47%
10%	Cubicles	42%
—	Kennels	8%

The present changes are directed towards fully covered yards and cubicles, the biggest change being the increase in cubicles.

There will be quite remarkable results in the report. For example, no relationship could be found between type of housing or type of parlour and gross margin/cow, nor between the cost of housing and gross margin/cow. This merely emphasises that high cost buildings do not result in more milk. Thus, it is very important that building costs should not be excessively high.

Priorities should begin by considering what is likely to happen in the next 5 to 10 years. Should one stay in dairying or get out while so many alternatives are available.

This will depend on many factors such as skill, ability, investment whether one is tenant or owner, what are mortgage interest rates, productivity potential, market prospects for milk, position of milk substitutes, prospects of a better manufacturing price. Financial planning for a 5-10 year period is an essential step. Year to year financial planning is useless.

A study of all these factors should allow one to set up estimated costs of production and the changes likely to take place.

To this one can add a figure for whatever is the minimum return acceptable. This may be 25%. If you live in Wigtownshire you may accept 3%!

Look at this figure and assess possibilities of achieving, surpassing or falling below it. If you think the return will fall below this figure then you should be looking for an alternative to milk production.

2. PROFIT FROM BEEF

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This subject " PROFIT FROM BEEF " — has been one of my main interests for the past 27 years. On my previous farm, the tenancy agreement clearly stated that no dairy cows were to be kept. Had it not been for this, I may well have been here this afternoon expounding the merits of intensive dairying, as I found it extremely difficult to make a profit from beef during the late 40's and early 50's. It wasn't until I developed an 18-month Friesian Beef system that I was able to make a worthwhile profit from beef and I am now very grateful that my previous landlord has this non-dairying clause in the Tenancy Agreement. A cost investigation on my earlier and more traditional beef system using single suckler cows and fattening the progeny from these cows at 2-2½ years old, showed:—

1. a very poor return on the money invested—
2. a very slow rate of turnover in the more traditional systems of beef production—
3. that a large amount of food and energy was required for the maintenance part of the diet.

Although I have never done any barley-beef feeding, I think the system has given us two important lessons.

Firstly—the importance of food conversion and how quickly this food-conversion rate falls off as the animals become older.

Secondly—how very important it is when practising barley beef production, to slaughter the animals as soon as they reach the minimum grading weight. This applies to the 18-month beef system, but to a much smaller degree.

My main weakness in my early years as a beef producer, was that I was keeping the animals far too long, and giving them a store period. It wasn't until I cut out this store period that I was able to make a reasonable profit from beef. I am now convinced that there is no place for a store period in beef production under the present cost structure that operates on most farms.

It is essential to push these beef cattle on and aim for a liveweight gain of 2 lb per day throughout their lifetime. This 2 lb per day cannot, unfortunately always be achieved with most of the recognised beef breeds that are available in this country. To achieve this 2 lb per day, therefore, we have to look to the larger dual purpose breeds, such as the Friesian and South Devon. The only recognised beef breed that can achieve this 2 lb per day is

the Charolais, which so far, is in very small numbers in this country.

The system of beef production in which I have been interested during the last 15 years is the semi-intensive system using dairy bred calves, as these are the only source of calves that are available in any quantity. I have used pure Friesian steer calves and have found them very satisfactory providing a good type of calf is bought. I have tried the Hereford-Friesian cross calves and have found their performance to be no better. I have always found them to be at least £4-£5 dearer when purchased at 10 days old and also they are often lighter when ready for slaughter. For these reasons I have continued with pure Friesians. Pure Friesians are also more numerous in the markets and there is, therefore, a greater selection when buying a large batch of calves.

The success of 18-month semi-intensive beef production depends firstly on the ability of the farmer to produce a good and yet cheap feed. I have gone for intensively managed high quality grass and high quality grass silage. This is supplemented by barley when either the grazing or the silage is of insufficient quality to achieve my target of 2 lb liveweight gain per head per day.

Secondly, one must have good types of calves that are able to gain 2 lb per day when on this type of diet. I feel if these two aspects are achieved and a good standard of management is maintained, then a worthwhile profit is possible.

I am at present farming an 800-acre farm, of which I am a tenant. We are situated in a good corn-growing district in North Northumberland. The land rises to about 300 ft. and has a rainfall of 25″-28″. I grow about 550 acres of cereals and 250 acres of grass. Of the 250 acres which are in grass, 200 acres are in short-term ryegrass leys, whilst the other 50 acres are unploughable permanent pasture. This 200 acres of ley grass gives me a good grass break in my corn growing rotation.

Beef System. All of my 250 acres of grass is utilised for the production of beef. We are producing about 300 fat beasts per year, selling them at around the 10-cwt. mark. Of the 291 cattle sold last year, 243 went fat out of the yards, from February until the end of May, and 48 were sold fat off grass during July and August, 1968. 156 were sold fat off grass in the summer of 1969. Calves which are purchased at a week old, come mainly from the West Midlands area and are bought through dealers in batches of 60 to 80 at a time. They are early-weaned at 5 weeks, using a home mixed ration which is fed to appetite until they are 14 weeks old, along with a little good hay. They thrive and do very well during this period. At this 14 week stage, silage is introduced and the concentrates are gradually reduced to about4-5 lbs of straight barley by the time they are 20 weeks old, along with as much good silage as they can eat. They are kept on this type of feed until being turned out to grass sometime during April.

During the summer grazing period, the calves are grazed in batches of about 100 in paddocks of approximately 10 acres using about one new paddock per week. My grazing of these large numbers of cattle has not been successful as I would like. I have found the cattle very restless on the paddocks. They seem to be content for 2 or 3 days whilst they are eating the cream of the herbage, but then become reluctant to fill themselves properly during the last few days on the paddock.

This problem is more pronounced on permanent grass where conservation is not possible in-between grazings, and pasture rejection, because of soiling, is a big problem from July onwards. The problem is also enlarged with the high use of Nitrogen.

Parasites have to be dealt with when you have a very high stocking density with young cattle and we find it necessary to dose all cattle during July with 'Nilverm' as a precaution against stomach worms. I also use 'Dictol' on the younger end of the autumn born calves, that is the September and October calves, as a means of controlling husk.

All these problems are related to a high stocking density, but they must be tolerated. A high stocking rate is a must from the fianncial aspect. I, and most of us, farm for profit and high profit cannot be achieved these days unless you are able to keep a large number of cattle on a given acreage.

The cattle are housed at the beginning of November and, if there is a shortage of keep in October, silage is led out and fed at grass on a ley that is due to be ploughed out.

Winter Fattening Stage. The cattle are dosed, weighed, dusted for lice and clipped along the back when they are housed.

Until this winter, the silage has been easy-fed, cutting and throwing it down into troughs at the feeding face. It is fed ad lib. and I would here like to stress the importance of good quality silage if cattle are to fatten successfully and economically. By good quality silage, I mean silage that has a good fermentation and is palatable, so that the high intake, which is necessary, is achieved.

Dry matter, also, must be reasonably high, somewhere between 24% and 30%. Apart from the fact that good fermentation and high dry matter go together, it is known fact that cattle will eat more dry matter when given dry silage than they would if they were offered wet silage of a similar fermentation and quality. I feel that this question of dry matter is probably much more important with beef animals than it is with the dairy cow. A dairy cow has a built-in urge to produce milk and this in itself is sufficient to create appetite, whereas a Friesian bullock has no built-in urge to lay on flesh, and its appetite has to be encouraged with palatability and high dry matter.

Having satisfied these requirements of good fermentation and high intake, it is still, of course, vitally important that the silage is

of high energy and also of high digestibility. These qualities can only be achieved by cutting the grass when making the silage at the right stage of maturity. This is when the grass shows the first signs of ear emergence. In my experience, this stage will only last with ryegrass for about 5 days.

If silage is good, the amount of barley fed with the silage need not be high to achieve a liveweight gain of 2-2¼ lb per head per day, which again I think is a satisfactory target to go for. I have been in the practice of feeding 4 lbs of barley from housing until the New Year, and then increasing the rate to 6 lbs per day, and only feeding the harder plainer cattle up to 8 lbs of barley at the end of the fattening period.

But if silage quality is poor, higher rates of barley feeding would be needed to achieve the target of 2 lb plus liveweight gain per day.

Summer Fattening Cattle. Because of building limitations in 1965, we investigated the possibility of fattening those Friesian cattle off grass. One of the weaknesses of the winter fattening system is that it is very demanding on buildings, the cattle spending 12 out of their 18 months in a house. It also needs a very large conservation programme. Because of these limitations, 50 calves are bought in February for the purpose of fattening off grass. These calves have much the same treatment as those bought for winter fattening, in that they are early weaned. They are, however, turned out much younger to grass at the end of May and early June, usually onto a silage aftermath, as it is important that they have clean, parasite-free grazing at this young age.

Concentrates are fed during the summer at 3-4 lb per day, depending on the type of grazing available. They are then store-wintered on useful silage, supplemented with about 4 lb of barley. They go out to grass again in April and are fed 4 lb of barley while at grass until they are sold fat during July. These cattle have been going away at about 9 cwt at just under 18 months of age.

Table 1. Performance of Cattle sold: 1968/1969.

	Winter Fattening Sold Spring, 1969	*Summer Fattening Sold Summer*, 1968
Number Sold	243	48
	Average per Head	
Sale Price	£107 9s.	£91 4s.
Liveweight at Sale	10 cwts. 52 lb.	9 cwts. 19 lb.
Age at Sales (months)	20.5	18
Lifetime L.W.G.— lb. per day ...	1.8	1.7

N.B. **Summer Fatteners Sold—1968:**
Number Sold.....56
Average Sale price £96 5s. per head.

Table 2. Cattle Cross Margins—Cost Year 1968/1969

	Winter Fattening 1968/1969	*Summer Fattening* 1968	*All Cattle*
		£ Per Head	
Output	96.3	81.5	93.8
Variable Costs:			
Concentrates	27.3	26.2	27.1
Bedding			
Vet. and Med.	8.3	4.8	7.7
Miscellaneous			
Grass Costs	12.3	9.0	11.8
TOTAL	47.9	40.0	46.6
Gross Margin per Head	48.4	41.5	47.2
Gross Margin per Acre of Grass ...	60.2	60.2	60.2

Grassland. I have found over the years that ryegrass has been the best grass for the production of beef, both when grazed and when consumed as silage. Therefore, during the last 5 or 6 years we have only sown ryegrass mixtures. Ryegrass does have one disadvantage though, and that is that when it comes to ear, it soon turns into a fibrous material. It is essential that conservation is very rapid so as to catch the grass before it gets too mature.

I usually sow 150 acres of seeds under barley each year which are left down for 1 to 2 years. These seeds have to be grazed after harvest, as there is a considerable growth from this type of mixture. I have been buying 400-500 lambs to utilise this growth. The seeds are usually too tender to carry the cattle unless it is a very dry autumn.

Grazing in the back-end with sheep thickens the sward and helps to ensure that there is no winter kill in the Italian through going into the winter too lush. In addition, there is the profit which these lambs leave, as they get fat with very little box feeding.

Fertilisers. Large quantities of highly digestible grass cannot be grown without adequate applications of fertilisers. My practice on the leys during the last few years has been to apply 10 cwts. per acre of 14% Basic Slag to the maiden seeds during their first winter. We then come on with 1½ cwts. of Nitram in late March and 3 cwts. of I.C.I. No. 2 at the end of April. This totals 120 units of Nitrogen for the first cut of silage. Most of the acreage in leys is required for first cut silage, but the early season fields which are to be grazed in the spring is much the same, except that I omit Muriate of Potash in February. For second-cut silage, I either apply 3 cwts. of Nitram or 4 cwts. of Kaynitro 25 to give me about 100 units of nitrogen for this cut.

Leys which are being used for mid-season grazing after first-cut silage, get 2-3 cwt. of Nitram. I apply another 2 cwts. of Nitram about the end of July to all the leys for September/October grazing.

The permanent grass is given 10 cwts. of basic slag once every 3 years and usually three applications of straight nitrogen, each of about 60 units throughout the grazing season. I have found this to be sufficient for the grazing system that I am committed to on the permanent grass, because of soiling and the poor grazing utilisation.

Table 3. Fertiliser Usage on Grass

	1967	1968	1969
		Units per Acre	
Nitrogen	269	261	237
Phosphate	150	123	94
Potash	60	96	83
		£ per Acre	
NETT COST	11.5	12.3	10.6

Grazing Management. My experience has been that growing the grass is a comparatively easy task, and I have not had much trouble with the conservation of large quantities of silage. But I have found utilisation through the grazing animal to be more difficult.

To get the maximum production of grass, it is necessary to rest the pasture until there are 5″ or 6″ of growth, and then to defoliate it quickly. I do this by running large numbers of cattle on this growth, followed by a rest of 2 or 3 weeks before re-grazing.

The first grazing utilisation on maiden seeds is usually good, unless the weather is very wet during April and May, when considerable damage can be caused through poaching to these tender seeds. I also use alternate grazing and cutting as far as possible during the season and, again, I find good grazing utilisation where this practice can be applied.

It is where alternate cutting and grazing techniques cannot be used, as on the permanent grass, which is uncuttable, and on an area of bog land, which is too soft to carry the machinery, that grazing efficiency is poor with these young Friesian bullocks. Even so, my stocking rate last year was 1.2 acres per livestock unit. Put in a more understandable form, this is just over $1\frac{1}{4}$ beasts reared, grown and fattened per acre of grass, or about 300 cattle sold fat from a little under 250 acres of grass.

Conservation. Most of my conservation is in the form of silage, as good hay-making and the high use of nitrogen, I find, will not mix. So I geared myself up with tackle to deal quickly with large quantities of grass for silage making.

I cut down the grass with a flail mower for wilting, and the swathe is left lying for 24-48 hours, depending on the weather. It is then turned with an acrobat to speed up the wilting process. A Wilder flail harvester, fitted with a pick-up hitch to pull the trailers whilst filling, is used to lift the grass into large trailers for carting to the clamp, where it is buckraked into the silo. I use the wedge system of filling as there is a smaller area of grass exposed to the air during the process. Filling must be rapid when making wilted silage and a plastic sheet should be drawn over the clamp each night. A 6-man team using 3 trailers and 6 tractors can conserve 20-25 acres in a good day, making about 150 tons of silage per day. 150 acres are taken for the first cut and it is essential that this should be conserved in a maximum time of 10 days if digestibility is not to suffer.

I require 1,800 - 2,000 tons of silage each winter. The 150 acres of first cut, which in my part of the world is cut during the last week in May and the first week in June, usually produced about 1,200 tons. The second cut of approximately 120 acres, usually in the second week of July, provides the other 700-800 tons required.

Conclusion. One big advantage in favour of beef is that the labour requirement is not nearly so demanding as the very sophisticated dairy unit which is often only as good as the labour that you can employ. Most of the labour requirement on the 18-month system is during the winter months—from the beginning of November until the end of April. This fits in very well with the cereal growing on the farm. Silage making takes up the slack between seed-time and harvest and there is no week-end work from the beginning of May until the beginning of November.

I find this 18-month beef system fits in very well on a grain-growing farm. It makes good use of the labour available, gives income during the spring and summer months and provides a very good and profitable break in the cereal rotation. This is one of the main reasons why my grain growing is so successful, and after all, it is the overall farm output that is the important factor. This is shown in Table 4.

The average grain yield during the last two years has been about 36-cwts. per acre.

Table 4. Cereal Yield, 1968 Harvest: 36 cwts.

	£ *Per Acre*	
	Output	*Gross Margin*
Cattle	118.3	61.3
Cereals	48.3	39.7
All Farm, including lambs and Miscellaneous ...	70.1	46.3

The cattle have another great asset which cannot be shown on a chart and that is the personal satisfaction I get from producing and having a lot of good cattle on the farm.

3. PROSPECTS FOR FARMING IN WEST OF SCOTLAND

J. CLARK
West of Scotland Agricultural College

"The past and present are only our means, the future is always our end."

Although our theme for discussion tonight is the future, we cannot, however, neglect the past and the present. Because the past creates and the present holds many of the problems which have to be solved in the future. I suppose it is obvious to all present that I view the prospects of farming in the South West as being good, otherwise I should not have returned to this area on the 1st of May. To be more serious, however, perhaps we can look first at the past before analysing future prospects.

Agriculture in the West of Scotland

What is the agricultural business in the West of Scotland? There are in the College province 11½ counties but I am excluding west Perth from this account. The area is 4.7 million acres of which 3.4 million are rough grazing, 1.1 million acres of grassland, and 0.2 million acres of tillage. The main farming types for the 11 counties (and for Galloway and Dumfries) are shown in Table 1.

Table 1. Number of holdings by farming type 11 West of Scotland Counties.

Types of Farming	'000 *Farms*	
Dairying	4.2	(1.4) *
Upland	1.8	(0.8)
Hill Sheep	0.8	(0.2)
Livestock/Arable	0.7	(0.1)
Horticultural	0.3	(0.2)
Others	0.2	
	8.0	(2.7)

*( ) Refers to the four counties, Wigtownshire, Kirkcudbrightshire, Dumfriesshire and Ayrshire.

This confirms what we all know. As would be expected in a humid western area, arable farming is relatively unimportant in general but nevertheless important to individuals. Nevertheless, cereals can and do make a worthwhile contribution to the feed economy of livestock whilst potatoes including earlies make an important contribution to the farm income of the area. The relative importance of grass conservation in the form of hay and silage and of turnips and swedes can be judged by measuring their contribution in terms of percentage starch equivalent. 61% or ⅔rds of the total starch equivalent provided by these feeds comes

from hay and one quarter from silage. Traditionally, then, the West of Scotland is based still on a turnip and hay feed economy and in the immediate future one suspects will remain predominantly so.

So much for a very broad, general picture which I hope stresses the importance of rough grazing and of grassland. It is perhaps best to deal with the prospects under the major types of farming.

Dairy Farming: Over half the farms in the province have milk production as their main enterprise but, of course, the number of registered milk producers is declining. In the S.M.M.B. area they have declined from a peak of **8,000 in 1951 to about 6,000 by 1965** and **in 1969 there was under 5,000.** The number of dairy cows in Scotland has declined until recently but this decline may be flattening off or indeed showing a slight increase as farmers regain confidence. In 1968 the S.M.M.B. estimated that the average herd size in their area was **51** compared with the survey information for 1965 when it was **44.** This might well prove to be a conservative estimate if my observations in the area are correct. The survey carried out this year by the S.M.M.B. should give more accurate details when the results are published. Again, in the West of Scotland **82% of the dairy herd was in Ayrshires in 1965 with Friesians accounting for 13.7.** It will again be interesting to see if their 1969 survey shows a change in this. It may be that, from the car window I have got the wrong impression in the last 6 months, that there are more Friesians and Friesian crosses than this in the area. Some of you may well feel that in my 20 years in England I have lost the ability to distinguish between black and white Ayrshires and Friesians ! Irrespective of this I think we all know fairly clearly that the dairy herd in the West of Scotland will be dominantly Ayrshire in the foreseeable future !

Dairy Farming: Trends in Profit

How has dairy farming's profits fared in the 1960's ? Bob Hunt of our Department carried out a useful preliminary survey of this. He found that with the exception of the small, under 125 acre farms, the sample of dairy farms studied has shown a remarkable recovery in their incomes from the low level of profits achieved in the early sixties. Table 2 indicates Management and Investment Income (which is Net Farm Income with the estimated value of the farmer and wife's labour deducted). This, some may feel, tends to present a gloomier picture than need be given since the small farmer does not always view his labour as a cost. On the other hand, farmer and wife when working on the farm should be entitled to a reasonable wage similar to that of the agricultural worker and still be able to see a return for their investment and entrepreneurship. Even if the present generation do not always take this attitude, future generations will.

Table 2. Profitability on same sample of Dairy Farms

	23 *farms* *Up to 125 acres*	24 *farms* 126—200 *acres*	12 *farms* *Over 200 acres*
Average size ...	72 acres	156 acres	282 acres
	£	£	£
1956/57	328	584	1730
1962/63	—102	—31	905
1965/66	—5	183	1333
1967/68	—116	664	2111

The recovery broadly followed the pattern of changes in milk prices although there were other factors. One important reason which enabled some farmers to maintain their earning in spite of adverse trends has been the increased efficiency reflected in increased yields and herd size.

Growth in tenants' capital was slow on all except the large dairy farm.

Table 3. Tenants' Capital per Cow.

	Small	*Medium*	*Large*
		£ *per Cow*	
1956/57	160	147	152
1968/69	181	177	226
% increase (12 years)	13%	15%	49%

It would seem that for the large farms, investment had been in equipment and structures rather than solely for building up cow numbers. Cereal growing, with investment in machinery, on the larger farms may also have an important role in the increase in capital investment. As we noted, the larger farms had the higher income and **could thus afford to reinvest more** than their smaller brothers. Indeed, on the small and medium farm the farmers invested one-third of the net cash income which was in effect a remarkable achievement. But it was not good enough. It is a disturbing feature because in any modern industry, investment is the keynote if it is going to retain efficiency and cope with the price cost squeeze. Any industry be it farming or not which does not or cannot invest in modernisation will eventually go out of business. On the individual farm, lack of investment may not mean the present farmers go out but their sons will do so.

The story so far, sounds slightly grim for the small farm. But, of course, in any year there was a range in management and investment income and further work now being published on a much larger sample of farms for the year 1967/68 emphasises this. In this examination we divided each of the size groups up into the top 25% management and investment income, the middle 50% management and investment income and the bottom 25% management and investment income.

Table 4. Management and Investment Income per Acre

	Top 25%	*Middle* 50%	*Bottom* 25%
		£ per acre	
Up to 125 acres	11.3	0.3	—9.9
126—200 acres	11.3	2.7	4.2
Over 200 acres	13.1	4.1	Nil

The top 25% of small farmers achieved a good level of management and invesment income per acre and indeed this was equal to that achieved by the top 25% of the medium farms and only slightly less than on the biggest farms. But, of course, the size of farms influence the total sum. In total the management and investment income for the top 25% was £946 on the small farms, £1712 on the medium farms, £4073 on the large farms.

The striking feature is the position of 75% of the smallest farms, the middle group averaging £30 management and investment income in Total not per acre, and the bottom 25% achieving a substantial negative result.

It would be nice at this juncture to say that our further analyses gave a panacea for all farms but you are too experienced and practical to expect this. No doubt the ability of the farmer was closely associated with the difference in results but this is something we in an economics department cannot qualify. But if this is true, then perhaps the most efficient small farmers are only in the process of becoming medium or large farmer!

The dominant feature of the top groups for all sizes was that they achieved an average yield of up to 200 gals. more per cow. There was also some evidence that higher stocking rates were practiced by the top performers but this was not quite so clear cut, particularly on the larger farms. The top farms also cut more of their grassland acreage for silage. One would expect that the intensity of stocking with dairy cows as opposed to other grazing livestock would be a dominant feature of the high profit farms. However this was marginally significant in the small and medium sized group and not significant at all on the large size group. Even so, the stocking with dairy cows range from 51% of total grazing livestock on all the larger farms at all performance levels to 67% of the more successful small farms. But a high stocking rate with dairy cows rather than other stock is not a prerequisite for successful farming although it seemed to be more important on the medium and small acreage farms.

Perhaps the improvement on profit from beef and demand for dairy heifers had something to do with the ability of the farmers on large farms to make profits without the same emphasis on high stocking rate with dairy cows.

To achieve their superiority the best farms in all groups tended to have a higher feed bill per acre and also incurred somewhat higher labour costs. There was also a link between higher fertiliser costs per acre and profitability although this was by no means universally evident in all groups.

In order to analyse this position further, Robin Munro the author of the report, studied 20 farms depending mainly on milk for their income in the top group of the medium and smaller farms. The important conclusion that could be derived was that some farmers successfully operated a low cost system while others successfully operated high cost systems and the average profitability measured in management and investment income per acre did not markedly differ.

A further analysis showed that successful farms with high fertiliser cost per acre (£7.2) and high bought feed costs per acre (£32.4) had a management and investment income of about £14 per acre and a return on tenants capital of about 15% whereas successful farmers using low fertiliser rates of £2.8 per acre and £14.2 feed achieved a management and investment income of £10.5 and a return on tenants capital of 19%. Obviously in many circumstances the higher return of £3.5 would be of greater significance than the higher return of tenants capital. Fixed costs on two groups averaged £39.8 per acre on the high/high group and £22.4 on the low/low group, a difference of £17.4 per acre. The management ability required on the high /high group may well be greater and certainly will be different from that on the low/low group. Any farmer attempting to switch from one to the other will appreciate that it is not simply a matter of changing the level of inputs but of changing the system. The penalty for failure to achieve the necessary high output of £105.5 per acre of the high/high group compared with £58 on the low/low group could well be disastrous. Careful planning and investment would be necessary for such a switch.

Table 5. Analysis of 20 Specialist Dairy Farms in Top 25% Profit Group.

	High Fertiliser		*Low Fertiliser*	
	High Feed	*Low Feed*	*High Feed*	*Low Feed*
Number of farms	5	5	5	6
Average size	112	104	97	144
Average number of Farms	54	49	51	45
Yield/cow/gallons	1002	869	886	800

Table 6. Analysis of 20 Specialist Dairy Farms in Top 25% Profit Group.

	High Fertiliser		*Low Fertiliser*	
	High Feed	*Low Feed*	*High Feed*	*Low Feed*
	£ per Acre			
Output	105.5	61.0	89.7	58.0
Fertiliser	7.2	6.4	3.4	2.8
Feed	32.4	20.9	30.5	14.2
Total Variable	46.0	31.3	3.90	18.4
Gross margin	59.5	49.7	50.7	39.6
Fixed Costs	36.5	28.7	29.3	22.3
Net farm income	23.0	21.0	21.5	17.3
M. and I. Insurance	14.0	10.4	10.7	10.5
Return on tenants' capital	14.6%	14.2%	12.5%	19.0%

An interesting feature was that the use of feed on all farms in the small and medium sized groups was analysed in relation to profit indicators, (gross margin, net farm income and management and investment income). This indicated that the profit indicators increased with increasing use of purchased feed up to a level of about £35 per acre. This does not mean that even higher levels would result in greater profits nor does it detract from the need to use bought feeds efficiently. It could of course imply a query about the role of cheap home grown cereals on the small and medium sized farms from the land was suitable for intensive dairying with the high gross margin per acre.

One has to be cautious when dealing with such small groups as 20 farms and dividing them into four different categories but the associated evidence from all farms confirmed that successful farmers used different avenues to higher profitability.

Perhaps the experience of four small farms who co-operated with the Economics Department Milk Cost Investigation between 1962/63 and 1968/69 may be of interest to those who face the problem I have outlined. These farmers during the period converted the traditional cow byres to loose housing, parlour milking and easy/self feed silage systems. On average, the four farms increased their cow numbers from 26.8 to 51.4 and used less labour attending the cows. The effect of the change was to convert an overall loss of £41 per farm to a profit of £1224. Some of the increase was, of course, due to the general rise in milk profitability but by no means all of it. The return for their investment in buildings and cows was 23.5% — not allowing for the general raise in profitability. For these small herds the predominant objective was to increase profit. This they achieved by higher milk output mainly through increased cow numbers milked with less labour in attending the cows. This is an obvious practical first step since achieving higher herd yields although important is more difficult and is a longer term objective. In addition, there can be little doubt that these farmers have now mastered the management problems of more intensive and modern methods. In the future at considerably lower capital costs they will no doubt be able to expand further their herd size.

I feel at this stage I have said enough about the present and indeed the past problems of dairy farming in the West of Scotland. The way ahead in dairying has much in common with other industries. There will be increasing demand on the farmers management ability not only from greater technical knowledge on modern systems, but also on his business ability in keeping records which will show him where things are going wrong and allow him to plan investments in a sensible and orderly fashion. There seems little doubt that we will see even bigger herds in the future, more modern buildings, new techniques and perhaps even fewer but bigger dairy farms. All of this will require wise capital investment. Look-

ing to the future again although we have been considering dairying one cannot but imagine that meat prices are likely to increase more rapidly than milk prices.

Here I see the importance of beef fattening of dairy by-product calves either on your or someone else's farm. The problem is to make sure that in the West of Scotland calves from our dairy herd are suited to intensive modern fattening systems. This is a technical problem and not within the realms of a mere economist — the question is which cross or main breed. I believe some of the audience may say that we do not wish in the West of Scotland to see dairy by-product beef appearing in the shops. I would not know at present whether or not we do see it without realising it and in any case if we do wish this meat there is a market for it elsewhere in the U.K. The price received for calves has an important role.

To sum-up, the future for these in milk production based on today's prices looks reasonably good for those who can afford to invest in modernisation. But anyone faced with a large investment in buildings must make sure that he can see his investment back within the next ten years and that he does not depend on substantially higher milk prices to do this. If he has "done his sums" and cannot he should consider alternatives — Beef — Sheep — Arable crops — and think hard on where the risk is least. A good old fashioned rule in a period of uncertainty — and with looming world surplus of milk products and the advent of man-made substitutes, the next ten years is a period of uncertainty for dairying— invest first in animals and only where essential on buildings and machines and only where you can budget to get the money returned in at the next 10 years.

Beef and Sheep Production. In Scotland as a whole the most striking feature has been the spectacular increase in the size of the beef breeding herd, which from 1966 onwards exceeded the dairy herd. In the West of Scotland trends have been similar to the national ones but as would be expected in a prodominantly dairy area there are still twice as many dairy as beef cows. It is among the hill cows that the biggest increase has occurred nearly one third of the hill cows in Scotland are in the West province. In 17 years or so, the size of our hill beef herd was quadrupled. Why this should be so depends on many factors but climate in the area is probably the most important. The mildness and natural shelter has removed one of the main limiting factors of other areas — namely the need for housing in the upland and hill areas.

The province contains about half the Scottish hill ewe population. Argyll has the largest sheep population of any county in Scotland (15% of the Scottish hill ewe total). Three counties Dumfries, Ayr and Kirkcudbright generally associated with dairying contain 17% of the Scottish hill ewe flock.

Hill and Upland Areas. Due to many factors social, economic and political, the hill areas generally had not changed much and suffered from many disadvantages such as large overhead costs which were independent of level of output and kept rising. On the whole, they were dominated by low lambing percentage and heavy — perhaps too heavy dependence on sheep.

Table 7. Hill Farms—Southern Uplands of Scotland. Figures for the same 20 farms for 5 years with 2 farms less in 1967/68.

Average number per farm of:

				Per Farm	
	Ewes	*Cows*	*H.S.S.* (*i*)	*Net Farm Income*	*M. & I. Income* (*iii*)
				£	£
1962/63	840	17	6/-	726	509
1963/64	832	18	10/-	733	540
1964/65	841	21	25/-	1695	1519
1965/66	837	20	20/-	1342	1167
1966/67	844	22	21/-	804	613
Average 5 years	—	—	—	1060	870
1967/68 (ii)	883	25	23/-	958	737

(*i*) Hill sheep subsidy
(*ii*) 18 farms only
(*iii*) Management and investment income

The 1968/69 data is not available but the profits could easily be as good if not better than the 1967/68 level. Nevertheless, the returns indicate the heavy dependence on Government support not only in the H.S.S. but the Hill Cow Subsidy. This money available for re-investment will not be easy to find out of the management and investment income.

The rumblings of the wind of change are fairly loud on many such farms and I believe we can look forward to more rationalised integration of afforestation, sheep and beef production. Many of the recommendations of the H.F.R.O. (Hill Farming Research Organisation) on greater sub-division to affect better control utilisation of grazing which will improve carrying capacity, lambing percentage and quality of lambs will spread from the leaders. We may well see lambing percentage substantially above the 90% mark and 800-1000 ewes per man.

One cannot visualise large re-organisation on a grand scale but farms of this size will get bigger, more intensively farmed and the present targets of 800-1000 ewes per shepherd will be acceptable as the 800-1000 gallon cow is in dairying to-day. It will take time though because upland farming has had a very varied experience over the 12 year period since 1957. This has been due to a large extent to the unstable prices of cast ewes and lambs in the late fifties and mid sixties. Much will depend, however, on a revival of the sheep industry in the lowlands as well as self help in the hills and uplands.

Lowlands. The high capital cost and low returns from single suckled cows leads me to the conclusion that we may not see any major increase of this type of enterprise in the lowlands. We would see an expansion in hill ewes and a more affective use of dairy by-product calves in the area. Systems such as described by Fenwick Jackson (see paper 2) and others will have a role to play—either as a complement to existing dairy herds or as a replacement of them.

Sheep have long been the cinderella of the technological advance experience by other branches of the industry. New techniques, type of ewe etc. will become relevant by the mid seventies but where shepherding skills exist they have a better role in the future than Gross Margin per acre has led farmers to believe.

Table 8. Comparative Gross Margins

	£ *Gross Margin per acre*	
	Average Performance	*Top Performance*
Winter Wheat	35	45
Barley	30	35
Potatoes, maincrop	80	110
Dairy Herd	60	85
Beef (18 months Autumn born)	35	60
Ewe flock	20	30

The information for this data is obtained usually in surveys of existing practice. Three things are wrong for sheep.

(a) any fair comparison must be in the basis of like with like—too often the ewe flock is the " hoover " mopping up waste and too often is using land not suitable for cows or barley etc.

(b) the same management effort has not been applied to the ewe flock as to others.

(c) acreage is only one factor of production.

Briefly let me say there is increasing evidence that well managed flocks—without " high flying " new techniques—make gross margins of £40 per acre.

Table 9. Comparison of an extra investment in a ewe, beef animal and milk cow.

	Good Performance Sheep (1)	*Beef*	*Dairy Cow*
		£	
Gross Margin:			
Per animal	9	40	90
Per acre	36	35	60
Per standard man day	14	10	12
Per £100 capital	60	33 (2)	45 (2)

(1) 4 ewes per acre, 160% lambing.

(2) £50 housing per beef animal, £100 per cow.

Let us reappraise the situation on a well managed flock occupying similar land to beef and the dairy cow and look at all factors—land, labour and capital.

Where housing is involved for beef and dairy cows, sheep can give a gross margin per £100 invested better than or at least as good as other livestock. They have the following advantages—important in a period of uncertainty.

(a) An assured market.

(b) Most of the money is in livestock — and this is a redeemable investment — the investment is not partly in wasting assets.

Arable Crops.

Barley growing is an important feature of the area and is likely to remain so. Gross margin per acre for the 1968 crop was £30.9 and estimated net profit £10.2 per acre. It is an important supplementary enterprise to dairy, beef and sheep production. The query in my mind is its role in the small dairy farm. If these are going to remain in business it could well be that they should be all in grass, heavily stocked and buy their concentrates. As in all cases, this is an individual farm decision but the role of cereals and the capital requirements need to be looked at carefully before each farmer makes a decision.

Potato growing in the future is likely to be geared more and more to the processing of the crop and perhaps we will see more vertical integration and fewer small acreages.

Market garden crops present a challenge. By this I mean the field scale production of vegetables in suitable areas. This I believe will come but what is required is a thorough investigation of the present market requirements and even more important the future market demands for high quality products freshly marketed.

Whatever else he is, the farmer, like it or not, is a businessman. We have heard recently emphasis on the 'philosophical side' of farming. Very good but apart from the selected few, you can only afford this if your farming is profitable and that means knowing how much a philosophical decision has cost you.

May I ask two questions. What was your last big purchase of machinery or equipment? Why did you make it?

(1) Was it despair — a broken down combine in the middle of harvest ?

(2) Was it spontaneous — the last visit to Smithfield ?

(3) Was it keeping up with the Joneses ?

(4) Was it planned ?

(5) What do you think the item Machinery Depreciation means ?

If it was planned how did you plan it ? Did you finance it from a depreciation fund. Did you consider alternative ways of investing your money ?

There is no television set as a prize for the best answer. But in the future with scarce capital there could be a sizeable penalty in lost profits if you have not attempted the calculation.

Business methods demand that you:—

(a) State objectives.
(b) Plan resources to achieve this.
(c) Record both for controlling events during the year, as well as evaluating progress at the end.
(d) Revise your plans and objectives frequently and continue to record.
(e) Never forget the 'Why am I doing it. Can I do something better'?

DISCUSSION

Q1: If you get the same return from 18 month winter and 20 month summer system why bother with winter system and its high demand for investment in buildings?

Fenwick Jackson (F.J.): I started with the winter system and moved into the summer system. Most of my future increase will come from extension of the summer system.

Q2: What are your special problems with permanent pasture?

F.J. Getting the grass eaten down. Stock would take the cream off in 3 days and then refuse to take much on the 5th-7th days. This year was dry and it was less evident. I believe that I might improve matters by reducing group size to 50.

Q3: Would you consider smaller paddock size and going to daily moves?

F.J. I have not tried this system. Beef production is essentially a simple system chosen because milk production is too demanding. I think a daily move would be a move in the wrong direction and not necessarily justified.

Furthermore, my grassland is mostly short term leys and the task of moving paddocks would not fit my grass-arable system.

Q4: Philosophy is important in farming. We in the South West of Scotland seemed to be saddled with a 7 day week whilst the rest of the country manages on a 5 day week. If one looks at capital investment in this light it may be desirable to abandon the chase for an extra 1 or 2% return for the sake of peace of mind. Our differential in milk prices in Scotland is similar to that in England and Wales, but we have a production trend moving to more and more winter milk which is completely opposite to what would be expected. The introduction of cubicles and high investment in buildings has required better use of these facilities and particularly a more uniform throughout. Better use of labour comes from elim-

ination of seasonal milk production. I note from figures by Dr. Hodges and Mr Fenwick Jackson that there has been a change in milk gross margin/acre from £29 to £54 in five years and that Mr Jackson has achieved £48 to £60 from beef production. Taking into consideration higher capital requirements of milk production and the fact that 600,000 calves are slaughtered annually with Ayrshire calves running at only £3 as against £30 for Friesian, there seems to be a case for increasing the beef enterprise.

Dr. Hodges (J.H.): The long term prospects for beef are much brighter than for milk. In most of Western Europe and countries with similar farming systems, there is a surplus of milk and this is increasing wildly.

At the same time, there is a world shortage of beef with an increase in the population and in the demand for meat. Artificial economics in Britain are preventing the full impact of the differences in demand. If we go into the E.E.C. milk may remain a worthwhile investment objective but in the long term we should take a look at beef. In the North of Britain, we cannot hedge against a milk surplus by going into arable cropping and thus we are left with beef.

F.J. Beef never was as profitable as dairying but it is a much more pleasant way of farming. Dairying is not pleasant. If beef was as profitable as milk there would soon be a shortage of milk.

Mr. J. Clark (J.C.): The length of the 'long term' is important. I would agree with Fenwick Jackson over 5 years but with Dr. Hodges over 10 years. For large Galloway farms, intensification towards beef production would be less demanding in capital. Sheep are less demanding still, requiring low investment in buildings. At a change of prospects, they are soon disposed of.

Q5: The shortage is illusory in this country. If the price rose, then the housewife would switch to a cheaper supply. Dairy calves are less efficient converters of feed. The price fetched for suckled calves is £28 at 4 cwt. which is not quite good enough especially when one takes into account the poor breeding records of hill cows, and the risk of fluke, etc. Add to this a difficulty in selling and hill cows become a bad risk.

J.C. Single suckled hill cows provide a better balance to hill farming. The hill ewe has been good for a year or two but it would be wise to spread ones interests to include the hill cow. It is no use producing something which nobody wants.

F.J. I would consider myself lucky to buy a 4 cwt calf at £28. I agree with Jim Clark that there is no reason for single suckled cows on lowland but their place is on the hills.

J.H. I don't disagree that milk has the edge at the moment but I am looking to the 1980's. Prices of meat go up in the shops not because the producer demands it but because there is an insufficient supply to meet the demand. If milk prices were allowed to change on the same principles, the price would tumble down. The prospect for milk is very closely linked to the future for manufactured milk.

Q6: The short answer is to winter Ayrshire bullocks cheaply and receive £98 plus the subsidy. There is no investment in buildings. Maybe this is temporary. How permanent are our present ideas on sales of liquid milk.

J.H. This is a tremendously important subject and another reason for diversifying. With the replacement of the liquid milk market, the industry would be faced with tremendous challenge. It took the milk industry a long time to come round to the need to promote sales of milk. The advertising paid off handsomely but now we are faced with competition and substitution. I am pessimistic. Farmers are in no position to judge the situation. Few are milkmen; few have milkmen calling on them. They do not appreciate the resistence which the housewife can exercise to butter and milk. Formerly, it was the tin of milk. For some time there has been growing substitution from instant milk. The technologist will eventually get rid of its low palatability just as they have solved the difficulty of mixing. Then we will be really up against it.

Comment: It is obvious that costs must be cut. It is simpler to cut the cost of milk production than to go into beef. The 'mercy killings' will go on. The rest of us will remain in the rat-race or should it be the 'cow-race.'

Comment: Within 12 months we could be producing all our milk substitutes in this country.

Q7: How long will the surcharge remain on milk transport ?

J.H. Transport is becoming more and more efficient because of more bulk collection, fewer farmers, and bigger units.

J.C. I question whether substitutes will take over so completely.

J.H. Substitute milk is a much better prospect than substitute beef. There has been a definite encroachment by instant milk. One must accept this. At the moment instant milk production is linked with butter production since it uses skim milk. Maybe we have now just 1% encroachment but a 20% encroachment could be really serious.

Q8: One of the limiting hurdles to rising production is the demand for capital. The other is the number of feet per acre which the land will stand. Can the panel see a move towards concrete farms. I could certainly double my herd if they could stand on concrete.

F.J. Last year, this was a big problem, I proposed putting 200 bullocks into zero grazing but was told I was mad to inject that amount of capital to meet a passing emergency. I agreed and used the capital more profitably to buy another farm.

Q9: Would you think the same in a 50″ rainfall?

J.H. I have just returned from Israel and was interested to see two types of farms. The large Kibbutz with 200-250 cows and the smaller village collective of 10-12 cows.

All stock were kept indoors and fed on minimum roughage and maximum concentrates. In their circumstances, roughage was grown under drought conditions, and with expensive irrigation. Consequently, it was the precious part of the diet and restricted to the bare essentials.

Q10: Should capital be earned or borrowed ?

J.C. Many farmers think it should be earned and sink in their own capital. In a long term situation it should be borrowed.

Q11: With present high bank rates what return is necessary, 20%?

J.C. To pay back a bank on an investment in cattle, more than 20% is required.

F.J. I believe capital should be earned by the enterprise. If one is not making profits, one is in a bad position to borrow. If you are, you do not need to borrow.

Q12: Are the Government going to continue investing in hill farming.

J.C. Politically yes, because although tourism may be the more likely goal, the tourist could be depressed if he passed through thousands of acres of neglected land. It is necessary to have productive, lively, hill farming even to attract the tourist.

Q13: What variety of ryegrass does Mr Jackson use for the short leys. Has he used Tetraploids. Does he use additives for silage?

F.J. I sow 150 acres per year with 16 lbs S.24 plus 8 lbs Danish Italian ryegrass for 1 or 2 year ley. I increased the perennial ryegrass last year because the Italian is not resistent to winterkill. The tetraploids are good for grazing but poor for wilting into silage so I have not used them for a year or two. I use additives only when the weather is difficult because 8/- to 9/- a lb. makes them expensive. I estimate that 10% of my grass gets Add F. I find wilting and sunshine a very much cheaper additive.

Q14: What are the production costs of winter and summer milk ?

J.H. Summer milk averages 1¾d/gallon less to produce than winter milk. The important point to look at is the profit because the price varies from month to month. It is possible that on average winter milk is more profitable than summer milk, but there is a big difference between producers. Summer milk producers average 60 gallons less per cow. Possibly we should study very closely the top 10% summer milk producers. The average summer milk producer may just be a winter milk producer, who has failed to maintain this calving index.

Q15: The producers price has gone up 10-12% in the last few years during which time the consumers price has gone up 100%. The producer is becoming more and more efficient. Why are the distributors so cossetted. The housewife in Britain spends less and less on food, it was 5/- in the £ and is now 4/- in the £. This compares very badly with the European housewife. There is scope here for competing more vigorously with other products.

J.H. Part of this big change is due to the removal of the consumers milk subsidy 10 years ago. The distributor margins have also been cut.
It is true that the European housewife spends a higher proportion on food than the British housewife. If we go into E.E.C., subsidies will go and both should reach parity.
My concern is that there is now no political party for the Anti-Common Market.

Comment: S.N.P. !

Q16: By the 1980's beef may be in the same position as broilers that is in a few large units. Should small farmers be encouraged to go into beef.

F.J. Possibly not. The broiler has a fast turn-over whilst beef is very slow. Some aspects of beef production could move in this direction. The West Cumberland Farmers calf rearing scheme is a case in point.

J.C. The small farmer under 150 acres still has a place as a milk specialist. Beef is for the bigger farm.

Q17: What use of antibiotics is made by Mr Fenwick Jackson ?

F.J. I only use antibiotics when I am in trouble and never in low dosage in feed.

Q18: How are your paddocks constructed ?

F.J. 2 strands barbed wire.

WINTERING SYSTEMS AND INTENSIVE SHEEP HUSBANDRY

J. MURRAY BLACK, Farms Director
School of Agriculture, University of Edinburgh,
Edinburgh.

Paper presented at Thornhill, Dumfries, 21st January, 1970.

Before presenting his ideas and experiences of wintering systems, Dr Black outlined the reasons why solving the difficulties of wintering are so important.

Sheep husbandry is generally in decline. Over two years there has been a decline of 9% in our ewe flock. The reason is without doubt that it was becoming less and less profitable.

The remedy is to intensify.

Two methods of intensifying lowland sheep are available:

(a) Manage lamb production like battery chickens based on twice a year lambing with ewes giving 4 lambs per lambing.

(b) Improve the traditional system by remedying some faults of management.

The first requirement is a high standard of grass production

The first requirement is a high standard of grass production aimed at high overall yield. In addition, high quality at certain vital times of the year. Extremely good sheep pastures can be created from permanent pastures, which tend to improve year by year under intensive sheep management.

For example, Table 1 shows the performance of lambs at different stocking rates on an old pasture in 1965 when the experiment started and again in 1969. The experiment is still continuing.

Table 1. Stocking Rate of Old Pasture and Lamb (Suffolk x Galway) Performance.

	Stocking rate			
Year	4	6	8	*Ewes/Acre*
1965	0.45	0.43	0.26	lb. lamb gain per day
1969	0.65	0.68	0.50	lb. ,, ,, ,, ,,
% Increase	44%	58%	92%	

It is obvious that on this class of pasture 8 ewes per acre resulted in a low lamb performance but as the years went by even though it was low relative to the lighter stocking rates, there was a marked improvement.

When reseeded and old pastures are compared, the most marked difference is in early spring performance. The reseeded sward is growing vigorously at a time when lambs need it.

Fertiliser nitrogen is an extremely useful tool as far as sheep husbandry is concerned. In the past the sheep farmer has shied

away from N but all the experimental evidence and a growing amount of practical experience shows that there is nothing to fear from the sort of levels of N needed to support 6 ewes/acre over a whole year. As for all livestock enterprises, stocking rate is critical if the venture is to be profitable. In one of our experiments, stocking rates of 3, 4, 5 and 6 ewes/acre produced 145, 180, 230 and 280 lb. of carcase lamb/acre for sale with gross margins changing from £15 up to £31 per acre. These figures are based on Irish prices and although lower than in U.K. the trends are the same. It is necessary in many cases to think of doubling stocking rates if sheep are to be a suitable alternative to milk and beef production.

An all - the - year - round stocking rate of 6 ewes/acre is a reasonable target. It is equivalent or slightly less than 1 cow/acre which the dairy farmer speaks of. Six ewes/acre when grass is growing vigorously is one thing but an entirely different matter in winter. At that time it is important to consider the ewes in relation to the available food and to the quality of that food.

The basis for raising stock rate generally is paddock grazing. The greater the number of paddocks the higher will be the stocking rate achieved. Mixed stocking is quite satisfactory. Sheep and fattening cattle go together well. The peak requirement for sheep comes when grass is growing vigorously. By the time the cattle are grown and making demands for more feed, the lambs are being sold off. Matching of breeding cows and sheep is rather less satisfactory since both require fresh grass in the early spring and are in direct competition.

Sheep have three critical periods of nutrition or feeding.

(1) **Flushing** Ewes could be up to 20/acre on much reduced pasture after weaning, in order to save grass for a three-week flushing which will increase the number of ova or egg cells.

(2) **Late pregnancy.** Lactation can be improved, number of births and lamb births weights will be raised and a number of complaints such as pregnancy toxaemia avoided. There is some evidence to show that many losses of embryos can take place in early pregnancy as well if feeding is insufficient. They may not be noticed since they may be absorbed by the ewe.

(3) **Lactation.** The energy requirement at this time is much higher than is generally realised. For example, whereas a non-pregnant ewe needs 2C, that is, big calories or mega-calories of energy, a pregnant ewe needs twice as much whilst a suckling ewe needs 6C, three times the energy.

It is because of this that the provision of good early grazing is so important. Apart from these three periods, the ewes can be kept at maintenance levels.

So much for general management. There remains the winter problem which becomes more of a problem as intensity rises. As far as lowland sheep are concerned there are two view points: (a) The effect of wintering system on the ewe and (b) the effect of that ewe on the pasture.

The Traditional System. A winter stocking rate of 4 ewes/acre is traditional in the West of Ireland. The ewes do well and the pastures do not suffer.

When silage was made available, they ate an average of 170 lb. head over the whole winter. It is interesting to note that other similar ewes fed entirely on silage took 1070 lb./head so that one can reckon that the ewes were getting the equivalent of 900 lb. silage/head out of their grazing. Both groups performed equally well. The quality of the silage made available to the ewes on the grass was not important since any deficiencies in silage quality were compensated by the grass.

The two main disadvantages of this system are:

(a) Income is low at this intensity.

(b) A considerable area of grass is used through the winter. Its spring growth is delayed and the lambing requirements for grass in spring is affected. Thus after 4 ewes/acre, on St. Patrick's Day (17th March) there might be just 110 lb./herbage dry matter per acre against 1,000 lb./acre where no ewes had been grazed.

Changes in Systems. An ideal high intensity wintering system would be to house the ewes. There would be minimum pasture damage and maximum spring flush for lambing but there is the difficulty of capital expenditure.

3 systems were compared in Edinburgh and in Ireland, viz.:

(a) **Housing** with ewes at 10 sq. ft./ ewe.

(b) **Slatted area out of doors** at 12 sq. ft./ewe.

(c) **Sacrifice Field** at 40 ewes/acre.

The house was simply constructed with an open end and cost 50/- per ewe with a 10 year life. The slats consisted of a platform in a walled area with some rough shelter made of fertiliser bags. This cost about 30/- per ewe and has about a 5 year life. The sacrifice fields were due to be ploughed up anyway. Each contained a platform to carry feed and water. The rest of the field became very muddy but that did not matter as far as the field was concerned. The cost was low—just the fencing and trough area. These are three possible systems which could carry ewes without affecting the spring flush needed for lambing.

The house can have other uses so that its cost against the wintering would be less than given above.

The results were interesting and are given below in Table 2.

Table 2. Effect of Wintering Systems on Ewes.

	A *House* 200%	*B* *Slats* 204%	*C* *Sacrifice Fields* 168%
Litter size			
Weaning % (No. of lambs weaned per ewes put to lamb)	177	182	132
No. of ewes continuing for 5 seasons (out of 40)	27	22	23

There was little difference in lamb weights, or in amount of wear of teeth. It is seen that using either house or slats results in good litter size and weaning % whilst the sacrifice field shows much poorer results.

Housing shows an advantage over both slats and sacrifice field in the maintenance of ewe condition and survival for 5 seasons. The poor figure for slats was caused by ewe losses due to prolapse at the 4th and 5th lamb crop. Up to then there was no difference between house and slats. The slat system would probably be discarded for this loss. One thing is important. The feed supply and quality must be satisfactory. The ewe depends on the shepherd for this. She cannot look for her own food.

The advantages of housing

Better lambing.
Better ewe performance.
Longer life for ewe.
Greater comfort for shepherd.

Disadvantages

The cost is high.
The need for feeding.
More critical management required.
Good stockmanship is essential.

We have dealt with high and low stocking intensities—what about the halfway stage.

An experiment was set up to look at various winter stocking rates on winter grass. The results are shown in Table 3.

Table 3. The effect of winter stocking rate on performance.

Stocking rates over winter (Nov.—March ewes/acre)	4	12	24	48
Silage intake (lb./head)	170	680	910	1070
Ewe live-weight gain during pregnancy (lb./head)	14.2	11.3	5.1	1.6
Tooth wear of 2 front teeth in 1 1000th inches	52	46	40	29

Note the difference in silage taken. At 12 ewes per acre, the equivalent of 400 lb. silage per head is being obtained from the grazing.

The difference in tooth wear is interesting. Many people would expect more tooth wear where ewes were obliged to take silage. The explanation seems to be that where grazed grass is the main feed, it causes tooth wear because of soil mixed with it. Where silage is eaten, which will be much cleaner, then less soil is taken in with the grass.

A similar experiment at Edinburgh but with hay on offer instead of silage give the figures shown in Table 4.

Table 4. The effect of winter stocking rate on ewe performance.

Stocking rate	4	12	24
Hay intake lb./head	203	225	253
Ewe live weights gain lb./head	25	28	26
Tooth Wear	47	51	71

The tooth wear shows the reverse. Hay was on offer instead of silage but no explanation can be given for this reversal. Another experiment at Ballinrobe is summarised in Table 5.

Table 5. The effect of winter stocking rate on ewe performance.

Stocking rate, Nov.—April	9	12	18	48
Silage intake (lb.) per ewe	830	860	925	1210
Ewe live-weight 24 hours *post partum* (lb.)	109	107	104	104
Litter size (%)	152	147	142	136
Lambs born dead or dying 0–48 hrs.	3	7	11	15
Tooth wear (1/1000 in.)	64	57	56	42

The result is that 12 ewes/acre with supplementary bulk feed as hay or silage is feasible. Spring growth is severely depressed but the swards recover. They are 14 days behind but concentrating the stock has ensured that sheep free grass is available for lambing.

Later the swards show considerable improvements — an increase in ryegrass in the case of old pastures and in clovers in all swards.

Summarising the pros and cons for these three systems:—

Four ewes/acre. Income is too low. Loss of grass for lambing. **Housing.** High cost of house and feed.

12 ewes/acre. Seems to be the ideal. It is satisfactory from an income point of view and its effect on the sward can be controlled. For example, on a farm carrying 4 ewes/acre, $\frac{1}{3}$ of the grassland can be used for wintering at 12/acre whilst $\frac{2}{3}$ can be reserved for lambing.

The basic fear of sheep intensification is a possible poor return. This is no longer true. What is certain is that there is no profit in casual sheep keeping, using them as scavengers, etc. There must be either no sheep or intensive sheep. The wintering system is critical. The system chosen will depend on individual circumstances.

DISCUSSION

Q1: With the Common Market in view is there a place for sheep in a mixed farm?

A: The sheep enterprise is likely to **benefit** more than any other if we enter the Common Market. Milk production is doubtful, meat is possible but sheep are definite. Fattening cattle and sheep go well together. As I have indicated, there is no competition in the critical spring time. Beef cows are another matter and less likely to mix with sheep. No experimental work has been completed on mixed stocking since McMeekan's work in New Zealand.

Q2: Can you give us details of your paddock system for sheep, and its manuring?

A: 6-8 paddocks are used. At low stocking rates, no advantages are found from paddocks but as stocking rates increase, the need for more paddocks become evident. However, even where no advantages are shown in production, management becomes simpler in paddocks. When ewes are lactating, the rotation covers the whole farming grassland. Up to 100 units N/acre are used on the sheep paddocks in total. In one instance we applied 40 units to half the grassland early in the season, 40 units to the other half later and 40 units over the whole area still later. Potash and phosphate are applied if the soil analyses indicate that they are needed. We used 3 cwt. superphosphate and 1 cwt. muriate of potash/acre once a year.

Q3: What about diseases, my ewes die in many ways. What about yours?

A: One thing in favour of paddocks is that if there is trouble the ewes are all there to be seen and trouble can be detected.

Q4: The liveweight or carcase yields from your example on the effect of stocking rate on grass margin seemed to be rather low?

A: Yes, they were low. This was due to inherent low lambing potential of the Galways, the breed used in the experiment and also of course to the low prices in Ireland.

Q5: The main reason why farmers are not interested in intensifying sheep husbandry is lack of profitability. Your figures for gross margin do not present the important requirement —net profit.

A: There is no doubt that it is so. The gross margins and profitability may be low compared to other enterprises but look at these returns in terms of the low capital requirements and the ease with which one can go into sheep and get out again.

Q6: If we go into the Common Market there could be a 20% levy on imports from New Zealand. The bulk of our import competition comes from New Zealand. 20% on this would mean that instead of 1/3d a lb. it would come in at 1/6½d per lb.
If I am to lose all supports for wool, etc., I will need a much bigger incentive than that to meet such competition.

A: I am not an economist but am led to believe that we are in a favourable position to export to the Common Market and whatever happens to other agricultural enterprises the change would be favourable to sheep.

Q7: I have trouble inwintering Black-face ewes at 1 per 11 sq. ft. This develops 2 to 3 weeks after housing. 5-10% of them lose condition badly. It seems to be due to a pecking or bullying order which cuts out the weak ones.

A: This is common, and depends on the size of the individual groups. I prefer to split them by sorting the ewes according to size, birth date, etc. After all one of the advantages of housing is that lots with different requirements can be treated separately.

Q8: How long would you keep ewes out where they are to be housed? Grazing is cheap, housing is expensive, is there advantage in keeping them out till December or later?

A: This is a good question but requires further experiment. In the absence of facts I would certainly keep stock out whilst the ground was dry and undamaged and there was sufficient grass.

Q9: Any recommendations for specific varieties or species of grass. Can ewes make good use of tetraploids?

A: In the absence of much data on this aspect, I favour a mixed sward which gives a balanced all the year production but research is needed to find out which are the best grasses and how fields of special purpose grasses could best be combined.

FORAGE CONSERVATION IN THE NETHERLANDS

P. J. J. PHILIPSEN
Institute of Storage and Processing of Agricultural Products
Wageningen, Holland.

On successive evenings, 10th and 11th December, Mr P. J. J. Philipsen, head of the Department of Green Fodder Crops and Animal Feeding Stuffs of the Institute of Storage and Processing of Agricultural Products at Wageningen in the Netherlands lectured to The South West and Central Scotland Grassland Societies on the subject of Grassland Conservation.

He first described the background of grassland farming in the Netherlands, namely small one-man dairy farms averaging 30 acres and with stocking rates of 3 cows per 5 acres. More than 50% of the Netherlands is below sea level with a flat topography. Much of the soil is peaty. Since the price of cereals is high, approximately £35 per ton of barley for example, farmers try to make as full use of grassland as possible. With a calving pattern aimed for summer milk, priority is given to good grazing.

The next priority is good quality winter fodder. This means cutting at an early stage of growth. The acreage cut for conservation is around 66% hay and 27% silage about; 2% is cut for dried grass. An important point is that advice to Dutch farmers stresses cutting hay at a very young stage (almost what we would term silage stage in U.K.). This to give him flexibility so that if the weather breaks and he cannot make hay, he can then make good quality silage and not " salvaged hay " silage.

Hay

Mr Philipsen showed graphs of the evaporation of moisture when a hay crop is turned and tedded. Evaporation was initially quick and then slowed down so that the difficulty in drying comes in the final stages, not in the initial stages. To reduce field time and avoid weather risks, emphasis was placed on finishing the job indoors. He made the point that after cutting, there should be no delay in turning and tedding hay in order to stimulate quick drying.

He went on to talk about ventilated hay. In our terms this is a form of barn dried hay or storage dried hay using cold air. Very few farms in the Netherlands now use the warm air ventilation system because of electricity costs.

He gave figures which demonstrated that the losses of dry matter, crude protein and starch equivalent were slightly more with cold air drying than with warm air drying but the extra quality from warm air drying did not meet the extra cost of the electricity.

For cold air hay, the moisture content when hay is stored must not exceed 35%. He described methods of filling the hay into

sheds with roofs which could be pulleyed upward as the stack of hay increased height. A circle of sheeting or netting suspended from the edges of the roof shaped the stack. The cold air was blown by fan via a central duct and lateral ducts in the stack. The central duct could be blocked with bungs to deflect air along the required ducts. He showed a system where the hay was blown through the top of the roof and then distributed around the stack, that is loose filling. The job was mechanized for one-man use. An alternative system is of course to use bales as at Auchincruive but not many Dutch farmers use them.

The following table shows losses in hay under 2 systems.

% Losses in Hay.

System	*Dry Matter*	*Digestible crude protein*	*Starch equivalent*
Field hay	21	33	42
Ventilated hay	11	21	31

He stressed the undesirability of using the hay's own heat for curing and drying. Not only was there a risk of fire but this kind of curing results in tremendous losses in digestibility. Starch equivalent losses can be 30-60% and digestibility of protein losses as high as 80-100%.

Silage

Between 80-90% of all the silage was made without the use of additives, since experimental work had so far shown no advantage in their use.

About half the silage that is made is pre-wilted to obtain a silage produce of 35-45% dry matter. He mentioned that the average use of nitrogen in the Netherlands was 180 lbs N/acre although individual farms were going up to a maximum of 400-500. Since such high nitrogen levels produces a crop with less sugar and more protein than lower nitrogen levels and results in silage with slightly more butyric acid and ammonia nitrogen it is important to lacerate to overcome this problem by inducing good fermentation. He also stressed the importance of wilting to obtain high dry matter silage since losses incurred in wilting would be much less than subsequent losses from seepage of unwilted herbage. He quoted figures showing that dry matter loss in silage-making was 9% where made from grass of 23% dry matter as opposed to 34% loss from grass of 13% dry matter.

Most of the silage is stored in small outside stacks covered with plastic sheets since the farms are small. He stressed the use of plastic sheets and air tight seals during storage and the need to reclose the seals after removing quantities of silage during feeding.

Dried grass

About 150,000 tons a year are made in the Netherlands mainly for pigs and poultry. It is sold on the basis of crude protein and carotene. A similar quantity is imported from France, Denmark and U.S.A. The price for dried grass is around £24 per ton. He showed figures which demonstrated that large scale operations cut costs of drying grass as did pre-wilting. Costs of drying could be reduced from £20 to £10 a ton.

New approach to drying

On oil-burning multi-jet flame thrower was used experimentally to dry a standing crop for silage or hay. Moisture content was halved in less than two hours. To reduce oil costs and speed up the drying a prototype steaming machine was developed. This steam-dried the standing crop rapidly so that the herbage could then be brought in for wilted silage or tedded and brought in for storage drying as hay. Results so far show no effect of this treatment on feeding value of the product or on subsequent regrowth of the sward. A machine is being developed which will steam $2\frac{1}{2}$ acres per hour.

Discussion

In the discussion it was brought out that the dairy herd in the Netherlands was mainly spring calving (about 70%) and 30% autumn calving so that relative to this country there was less need for high quality conserved products. Nevertheless great importance is placed by the Dutch on high quality conserved fodder because cereals are expensive.

Most of the grassland in the Netherlands is permanent pasture. The average level of fertiliser nitrogen used is 180 lb/ac although some individual farms are up at 400-500 lb/ac without ill effects on animal health.

Slurry disposal is becoming a great problem because of the potential build up of soil potassium which could predispose stock to staggers.

The sale value of average arable land in the Netherlands is £400 to £500 per acre.

BEEF FROM GRASS

G. J. F. COPEMAN
North of Scotland College of Agriculture, Aberdeen.

Paper presented at Stirling, 26th January, 1970.

" Beef from Grass " is a very wide topic but I propose to concentrate on the grazing situation which is the subject of most of our experimental and development work. However, it is wrong to ignore the conservation side altogether because the two go hand in hand. Well made hay is a useful commodity but hay making has little place in intensive systems of grassland management. The low amount of nitrogen that can be used in producing it because of difficulties in curing and the slow recovery after cutting big hay crops renders hay unsuitable.

I intend to speak of the growing and fattening animal rather than the suckler cow although there is scope for intensification there too.

Before going into the utilisation of grass for beef I would remind you of several points in relation to growing the grass. Intensification means effectively:—

(i) More nitrogen
(ii) Heavier stocking rates.

With heavier stocking rates there are two important requirements

(i) Good drainage
(ii) Establishment of a good tight " sole."

Grass seed can be drilled or broadcast and depending on how well it is done either method can give a good or a bad take. Tilth and consolidation are important. An adequate supply of phosphate and potash are essential in the seed bed: these are often neglected when seed is undersown. Direct sowing is usually better than undersowing although poaching can occur on heavy land in the establishment stage. Undersowing a cereal crop for silage is one of the best ways. Unfortunately this makes poor quality silage suitable mainly for suckler cows or young dairy cattle.

In our experience the most suitable type of mixture for intensive grazing by beef is perennial ryegrass/timothy/white clover. We always sow clover even when we anticipate using high rates of fertiliser nitrogen. If you do not sow it you are committed to high fertiliser usage and it usually does some good in the first year or so before it gets smothered out. How worthwhile it is to sow timothy is debatable. The theory is that apart from what it produces it acts as a buffer against winterkill. In practice it seems to be soon swamped by ryegrass—but we still sow it !

Winterkill in perennial and Italian ryegrass is a major problem but the following can minimise this hazard:—

(i) Use of hardiest varieties;

(ii) No nitrogen after early August;

(iii) No slurry in autumn or winter;

(iv) Bare off proud growth before winter by topping if necessary. Lambs can be profitably used for this. At Craibstone, we are taking in over 300 lambs in September and October and turning 25/- to 30/- per head on them.

We are now sowing two mixtures for intensive grazing or cutting. One contains predominantly early varieties and the other intermediate varieties starting growth and maturing about 12 days later; these are sown on an acreage ratio of 2 : 1. This spreads the flush which otherwise is difficult to control for grazing and means that more acres can be cut for silage making at optimum feeding value.

Assuming that fertility has been corrected for lime, phosphate and potash the one thing left that will increase production is nitrogen. I have never had much doubt that beasts can be fattened on highly fertilised grass.

It is only in the last four years since the College acquired the use of the MacRobert Experimental Farm next to Craibstone that I have been able to prove the point myself. In 1966, we carried out a pilot trial using 300 units N/acre and the results were promising. In 1967, we started a three year experiment comparing beef production from 150 and 300 units N. In 1968, we set up a test run using 540 units N/acre. There were no apparent health problems and cattle stocked at 3 per acre put on nearly 3 cwt per head over the season. Beasts that became fat were replaced and all those that went on at the start of the season were fit to grade by the end—some were sold as forward stores. I do not know how the buyer made anything out of them ! Fat beasts have been graded on the hoof and the hook. Grades realised and killing out percentages have been entirely satisfactory and as good as would have been expected off less heavily fertilised grass. No discolouration of fat or other abnormalities have been found.

Whilst we have used up to 540 units N/acre I am not suggesting that this is economic. Looking at our work to date we would suggest that, provided the grass is stocked adequately, if it is worth using 150 units it would also be worth using 250 units N/ac. Thereafter the return may diminish sharply except on previously heavily cropped land where 300 units might be profitable.

Under grazing there is a fair return of phosphate and potash in dung and urine but a cattle beast is not a perfectly designed fertiliser distributor. Because of the depressing effect of potash

on the magnesium content of herbage we advocate about 80 units straight nitrogen in the spring followed by a compound containing perhaps 50 units of N, P, and K and three dressings of straight N at 40 units each, the last early in August. It is helpful too if one third of the grass is manured first in spring, followed by the second and third parts ten days or so later.

This brings me to grazing method. Experience in the early 50's indicated that strip grazing suited the habits of neither beef cattle nor beef cattlemen. About that time too, three-paddock systems were tried, which led to as many problems as it solved. The break-through came when people started thinking of higher levels of N and more paddocks. Our experience indicates that 9 paddocks is practicable—more a farmer will not accept. Fewer than 9 and decision making as to when to move cattle on or cut out surpluses is more difficult. MANAGEMENT MUST BE FLEXIBLE. The number of days that animals remain on a paddock will vary but ideally this should be 2 to 5 days at most.

I have said that 9 paddocks is best but this will in fact depend on the overall system of grass management and beef production practised. Our work has provided measures of the potential of the grass to produce beef and the selected stocking rates have been constant over the summer with animals taken off fat replaced by lean ones. A more likely state of affairs is that animals are fairly forward in spring, the stocking rate is reduced as the season progresses and they go off, fat. Alternatively, grass cut for silage in May/June, comes into use for grazing later on—in this last case there may be a case for 6 paddocks with the silage aftermath as a large 7th paddock for the second half of the season. The maximum number of beasts run in a group should be about 60. Large groups of 100 and more tend to suffer stress.

Now I come to one of the most important considerations in grazing beef cattle and that is stocking rate. In fact, numbers of animals per acre is not very meaningful because obviously two 4 cwt animals per acre are not the same as two 8 cwt animals per acre. However, as stocking rate is increased the performance of individuals will suffer. On the other hand, up to a certain stocking rate, liveweight gain per acre will increase. Beyond this point, liveweight gain per head will be depressed to such an extent that there will also be a lower liveweight gain per acre.

A balance must therefore be kept between liveweight gain per head and per acre. Within limits gain per acre is likely to be more profitable; for instance:—

1.8 animals @ 1.82 lb/head/day = 553 lb total gain per acre.

2.4 animals @ 1.49 lb/head/day = 599 lb total gain per acre.

However, with forward cattle, it may be better to sacrifice some gain per acre in favour of gain per head so that animals can be ready in June/July before the price per cwt falls.

In addition to benefits accruing from grazing, paddocks allow surplus grass to be cut for silage. Paddocks should be cut out before the grass gets too long, otherwise they remain out of circulation too long since recovery is slow. Topping is usually necessary after 2 or 3 grazings, perhaps twice a year. We dose our cattle before they go on to the grass and that seems to take care of worm problems. In all our high nitrogen trials we have had no hypomagnesaemia trouble but we have had two animals that tended to " blow." One was taken off and put on to less intensive grass but continued to " blow."

As far as our own trials go we have had little difficulty achieving gains of about 2 lb per head per day over the season and, stocked at $2\frac{1}{2}$ beasts per acre over 160 days, a gain per acre of 800 lb has been obtained.

Most of our work has been with cross black cattle weighing about $5\frac{1}{2}$ cwt at turnout and putting on about $2\frac{3}{4}$ cwt over the season. The best result was recorded in Orkney in 1969 where smaller animals stocked at 4 per acre put on over 1000 lb per acre —a target that has eluded us on our Aberdeen farm.

Several farmers are now paddock grazing and I will conclude with two examples to illustrate the financial picture.

Farm 1. Friesian, Hereford and A.A. cross.
67 cattle on 30 acres.
782 lb. at turn out
1073 lb. final
291 lb. gain/head
5.9 cwt. per acre gain

Direct costs: Fencing £2
Seeds £2.5
Fertilisers £6
Total £10.5
Gross margin £42.15/- per acre.

Farm 2. (2 lb. barley/head for 10 days at turn out).
52 cattle on 12 acres + 23 acres aftermath for 3 weeks in mid-season.
3.3 cwt. at turn out
5.8 cwt. at finish
2.5 cwt. gain per head

Value: £12/cwt. at turn out
£10/cwt. at finish
Gross margin £57.15/acre
or £13.6/head

DISCUSSION

Q1: Did you top the pastures ?

A: I believe pastures must be topped after the second or third grazing. Possible the earlier grazings should also be topped. The toppings can be grazed.

Q2: When your cattle were turned back from silage aftermath to the paddocks, how did they settle ?

A: They were not too happy, particularly the younger animals. The older ones are less fastidious.

Q3: Can you give us more information about the type of land ?

A: The experimental farm has average to well drained land. We are fortunate in being able to take stock off the paddocks on to drier land if the ground gets too wet. Poaching is no worse in paddocks than in continuously grazed land. The heavy concentration of stock brings about apparent damage to a paddock in a very short space of time but recovery is quick. Similar damage under continuous grazing developed over a longer time would not recover so quickly.

Q4: What level of N and how many paddocks were used in your example 2 ?

A: 345 lb N/acre and 7 paddocks.

Q5: Is Anhydrous Ammonia suitable for paddock grazing systems ?

A: Anhydrous Ammonia is not as effective a source of N as other types of fertiliser and this must be considered when comparisons are made. Anhydrous Ammonia is less effective in Aberdeenshire than other parts of the country because of sandy or stony soil and loss of some of the gas during injection.

Q6: Have you any information on the value of supplementary feeding ?

A: So far we have not been experimenting on this aspect. With a high stocking rate and the use of high levels of fertiliser nitrogen we find it desirable to prevent loss of weight in August. So far we have reached 800 lb/acre liveweight gain. It may be that 1000 lb/acre will be reached by supplementary feed. There are problems in how to feed 100 beasts in the latter part of the summer. After a time, they will tend to look for the feeders instead of grazing. This can be compared with the situation under strip grazing where cattle stand around waiting for the new strip.

There were many further questions dealing with zero grazing, grass drying, set stocking, phosphates, clearing of dung pats and cocksfoot and general agreement that gross margins were not a suitable figure for comparing farms although they might be quite useful guides to conditions within a farm but even there, they provided insufficient information on their own and could be misleading.

SURVEY No. 4 — DOCKS AND CHICKWEED

I. V. HUNT

At the time of writing I have received completed questionnaires on experiences in eradicating docks and chickweeds from 71 members of the South West Scotland Grassland Society and 41 of the Central Scotland Grassland Society. The forms for the latter society were sent out later and are still being returned. The following are some of the impressions gathered from a preliminary look at the forms.

1. The chickweed problem in grassland seems far less widespread than I had imagined. Most members have not considered it worth taking action against.

2. The majority of members feel that the dock problem is worsening especially so in the last two or three years and associate its spread with a number of reasons generally following on attempts to increase production.

The following are the causes of spread put forward:—

(a) Constant haying.
(b) Use of poultry manure.
(c) Fall off in arable cropping especially in cleaning crops.
(d) More use of dung and slurry on grass.
(e) Increased levels of fertiliser.
(f) More frequent flooding.
(g) Decline in regular spraying of corn crops, maybe along with changes in the rotation to give less arable breaks.
(h) Increased stocking rate and prolonged grazing season leading to poaching together with rising fertility of the land.
(i) Most of the trouble comes from bought hay.
(j) Increasing use of combine harvester.
(k) Use of flail mowers.
(l) Taking two or more silage cuts and the opening up of the sward.
(m) Outwintering of stock supplemented by dock infested hay.
(n) Docks have become more noticeable since they are now better fed — high fertiliser levels.
(o) Modern fertilisers contain a secret additive which stimulates dock growth. This I believe is a jocular suggestion !

There are a number of members who seem to have the dock well under control and have not seen any marked worsening over the last few years. These are generally arable farms where an opportunity is provided for regularly spraying a corn crop or a catch crop of Italian ryegrass with one of the cheaper general

weedicides based on 24D or MCPA. I can't very well name the sprays because I might do an injustice to one firm's product by omitting to mention it. Most chemical firms produce this weedicide in one form or another.

Experiences with sprays

Every available spray has been used. They can be divided into about three groups. Firstly, the cheap and continued regular spray which does eliminate many weeds but does not eliminate the docks. The docks are temporarily shrivelled. Secondly, we have the weedicides containing dicamba which were developed specifically for knotgrass but are more effective than 24D/MCPA on docks. They are quick acting but do not have a permanent effect, and continued spraying is necessary either to tackle the recovered docks or fresh crops of docks which are always waiting on opportunity to regrow.

Finally, we have the weed killers which are especially produced to kill docks. Asulox is the latest of them. Many members used it but it is so recently introduced that one must be fair to it.

Those who used it two seasons ago were at first disappointed because of its slow action. It takes 2 or more weeks for the dock plant to die down. There were also disappointments because the weedicide seemed to have a serious effect on the crop itself, the grass sward. The second phase in experience was delight that in the following season the docks had been markedly reduced. Closer study has however revealed that there is still some recovery of docks and something further is necessary, either a second or third application or a change in management.

Those who applied it last season are more optimistic.

This is a very brief summary of the reports so far received. A more detailed summary is being prepared and will be circulated to all members.

A group of college staff called the Crop and Grass group are to study the reports and see if a programme of experiments can be developed to seek either a better method of employing Asulox or a better spray material.

OTHER SURVEYS

All those who participated in the Dock//Chickweed survey are thanked. Other surveys are being planned. There are no shortages of problems which can be tackled in this way.

In fact, James Walker-Love our Specialist Advisor in Animal Husbandry is very keen to look into the causes of 'Couping' of ewes. The question was raised at our Hill Farming Discussion Meeting in Newton Stewart and it seems there is room for investigation of the causes and prevention of this source of loss of outputs. If you are interested let me know and I will put you in touch or write directly to Mr Walker-Love at the College.

What problems would you like tackled by Survey ?

141. THE EFFECT OF FERTILISER N ON SILAGE FERMENTATION

J. B. FOX and S. M. BROWN,
Greenmount Agricultural College, N. Ireland.
J. Brit. Grassld. Soc., Vol. 24, pp. 23-24.

The data presented in this short paper are from one year's experimental work, none-the-less the results are worth noting. Levels of N used were 0, 67 and 196 lb N per acre applied at the end of March. Some of the 196 lb fields received a further 56 lb N 10-14 days before the grass was cut for silage in late May. Molasses was added at 0, 1.6 and 3.2 gal./ton to the grass cut from the different N regimes. Resulting silage pH levels were lower with the lower N use and where the high level of molasses was applied, the additive offsetting the effect of high N use. This higher pH from higher N use is related to the higher N and lower soluble carbohydrate content of the ensiled grass. The following table summarises the results presented in the paper.

	Level of N/acre (lb.)			
	0	67	196	196+56
		Silage pH		
No. Molasses	3.6	3.7	4.1	4.9
1.6 gal. Molasses	3.7	3.8	3.8	4.6
3.2 gal. Molasses	3.7	3.7	3.9	4.4
		Composition		
Crude protein %	12.0	13.6	19.1	22.6
Soluble carbohydrate %	21.3	19.3	13.4	12.7

The authors therefore suggest caution where large quantities of N are applied even as long as 8 weeks before cutting lest the silage is inadequately acidified by impeded bacterial fermentation due to lack of carbohydrate.—R.D.H.

142. A COMPARISON OF SILAGE MADE IN POLYETHYLENE CONTAINERS WITH AND WITHOUT THE REMOVAL OF AIR BY EVACUATION

R. F. WILSON, R. A. TERRY and D. F. OSBOURN,
Grassland. Research Institute, Hurley.
J. Brit. Grassld. Soc., Vol. 24, pp. 119-122.

This experiment was set up to compare direct cut silage stored in vacuum silage packs or in a similar pack without drawing out the air. Syn 1 and S.170 tall fescue, Tetila Italian ryegrass and an S.24 ryegrass + S.100 white clover mixture were ensiled. 500 guage plastic bags were used each holding about half a ton of

silage. After five months the silage was fed to sheep and tested for digestibility with the following result:

	Evacuation	*No Evacuation*
DM digestibility %	76.3	76.6
Daily Intake (lb. DM)	1.42	1.45

All the silages were well preserved with a pH of around 3.9 and clearly from the digestibility and intake levels, method of storing has had no significant effect on the nutritive value of the silage.

The authors stress the need to keep the sheet in contact with the silage to prevent surface wastage and conclude that provided plastic sheeting is properly used and well sealed once filling is complete, little is to be gained from evacuating air from the silo. The main advantage given to evacuation was the more rapid consolidation resulting in economy in the use of sheeting.—R.D.H.

143. THE EFFECTS OF WINTER GRAZING ON SUBSEQUENT PRODUCTION FROM PASTURE

D. A. S. LOCKHART, et al.
Edinburgh School of Agriculture.
J. Brit. Grassld. Soc., Vol. 24, pp. 146-150.

The uncontrolled wintering of sheep on lowland grassland has been criticised in that it reduces herbage yield in the following season. Four experiments at Edinburgh were set up to examine the effect of time of winter grazing between November and February and rate of stocking ranging from 3 to 10 ewes per acre on subsequent spring and summer grass yields. Different N rates were also used in the spring. Results are summarised by the reviewer in terms of cumulative ewe-grazing-days (average of two trials) as follows:—

	Early May	*Mid June*
Control	102	281
Grazed Nov. and Dec.	50	264
Grazed Jan. and Feb.	42	272
Grazed Nov. to Feb.	26	269
Spring N 3 cwt./ac. 21% N	63	302
1½ cwt./ ac. 21% N	46	240

A further trial gives results in terms of the production of dry matter (100 lb/ac) as follows:—

	4 *May*	25 *May*	16 *June*
Control	8	32	60
4 ewes/ac.	5	28	62
7 ewes/ac.	4	26	56
10 ewes/ac.	3	23	56
Spring N 5 cwt./ac. 21% N	6	30	60
3 cwt./ac. 21% N	4	25	57

From these two tables it can be seen that whilst winter grazing has reduced the ewe grazing days or yield of dry matter in early May, the effects of the winter grazing are less pronounced in late May and almost disappear by the June hay cut. Also the use of fertiliser N in the spring helps to overcome reduced herbage yields by silage time although early bite in early May always suffers a setback particularly where prolonged winter grazing or high stocking rates were employed.

In conclusion the authors suggest that winter grazing can save feeding costs and provided a suitably well drained field is available trampling will not have too deleterious an effect on the sward.—R.D.H.

144. THE DIGESTIBILITY AND PRODUCTIVITY OF SELECTED HERBAGE VARIETIES

R. D. HARKESS and R. H. ALEXANDER,
West of Scotland Agricultural College.
J. Brit. Grassld. Soc., Vol. 24, pp. 282-289.

Since most of the early digestibility data on silage varieties was obtained from swards in the south of England, the experiments reported in this article were set up to examine herbage yield and digestibility in the West of Scotland. Varieties examined were S.22 and Tetila Italian ryegrass, Scots timothy, S.215 meadow fescue, S.37 cocksfoot, S.170 tall fescue, English broad red clover and S.100 white clover. Primary growth from May till July was examined for yield and feeding value under several simulated utilisation systems involving grazing, silage and hay cuts.

It was found that the fall in digestibility was delayed by 12-18 days when Auchincruive data was compared to that of Hurley, Berkshire. In order to harvest material of 70% organic matter digestibility or higher, Italian ryegrass and meadow fescue must be cut by 10th June; timothy, cocksfoot, tall fescue and red clover by 6th June and white clover by 5th July. Of course, earlier cutting for higher quality silage is desirable. Hay crops ranged from 68-56% digestibility. Grass cut at the grazing stage always had a superior value although this did decline as the season progressed.

Highest yields of digestible feed per acre were obtained from the heavy hay crops, but the digestibility was low and so animal intake would be reduced. Herbage at the silage stage was a compromise of a reasonable yield and a useful digestibility and would be advocated in preference to hay making where a high intake of digestible conserved feed is desirable.—J.F.

Note.—Copies of this article can be obtained by writing to Dr. R. D. Harkess, Grassland Department, Auchincruive, Ayr.

BLINDED WITH SCIENCE

PATRICK GORDON-DUFF-PENNINGTON
Delegate to the B.G.S. Winter Meeting, Dec. 1969.

The theme of the meeting was " Beef from Grass," even though there was not a blade of grass in sight and Nasturtium had not arrived in town. I was slightly cheered to be told that some of my predecessors had not managed to put pen to paper on return and reckoned that if I succeeded I should deserve the Editor's affection.

The first to speak was Dr. H. K. Baker of M.L.C. on the future of Beef Production in the U.K. He is an attractive speaker and painted a moderately rosy picture, with the F.A.O. forecast of a strong world demand until at least the mid 1970's, and with British and Irish beef at present supplying 75% of home demand compared with 50% in 1939. He did, however, state that the only hope of gaining a reasonable living at an acceptable price to the house wife would come from a blend of genetics, feeding, science, and farming skill.

The present composition of the home beef market was:—

Home produced	59%
Irish fat cattle	4%
Irish stores	12%
Imported	25%

Of the 75% supplied by home and Irish production:—

54% came from dairy herds;
29% came from suckler cows;
17% Irish.

Dr. Baker quoted results of trials comparing pure Friesian cattle with Hereford-cross-Friesian giving the cross beasts an advantage on food conversion, but as they finished at lighter weights and were more expensive as calves, the results should be treated with care. He thought that our aim should be 1 cow + calf per acre at the least and that future advances would be based on:—

1. Selection of bulls. Red breeds were at present showing an advantage over Herefords who were beating the Aberdeen Angus, Beef Shorthorns and Galloways.
2. Reduction of calving interval.
3. Reduction of losses.
4. Increase of weight per beast sold. He pointed out that an increase of 0.1 lb liveweight gain per day produced an increase in gross margin of:—

   £1.4 per head on intensive cereal beefs.
   £3.4 on semi-intensive grass/cereal.
   £1.5 on suckler production.
   £1.8 on suckled calf fattening.

Paul Flechia of I.C.I.'s Henley Manor Farm in Somerset spoke on the intensification of single sucklers. The farmlet was 63 acres carrying a stock of 55 Hereford x Friesian cows + calves + fattening calves. He produced a gross margin of £34 per acre and was aiming for 1 cow + finished calf + forage per acre. The initial bulls were Hereford, but these had now been replaced by South Devons. Comparative results were:—

	Killing weight	*Days*
S. Devon heifers	997 lbs.	449
steers	1038 „	467
Hereford heifers	821 „	455
steers	917 „	475

Calving used to be in January but there were now so many scour problems that they aimed for September, October and November. Their target weights were:—

Birth	100 lbs.
Mid-April	460 „
July	640 „
Slaughter	1135 „

Calves were creep fed with up to 3 lb rolled barley and cows were wintered on $5\frac{1}{2}$ tons silage + 10 lb per day straw. Cattle were in-wintered in a building erected for £50 per cow + calf and fattening calf. Cows were paddock grazed on 30 acres until July when the calves were speaned and the grazing area reduced to 21 acres. The bulk of the grass was sown to 24 lbs/ac. S.23 and 6 lbs/ac. Timothy, but some tall fescue was used and seemed ideal for high dry matter silage and backend grazing. The grazing ground received 350 units N, 30 P, 30 K with a further 30 P and 60 K added per cut for silage ground. Pasture was also dusted with 40 lbs per acre calcined magnesite to reduce the risk of staggers.

The paper was interesting but the results seemed less convincing when he mentioned the loss of 18 calves through brucellosis, and the need to inoculate with 45/20.

Professor Holmes from Wye, the President, then gave his address, which was the more heartening for being slightly anti-establishment. He considered some research was mis-guided and pleaded for a better farmer/scientist relationship with field trials undertaken on a much larger scale. He questioned the use of some herbicides and asked whether we might not improve the sward equally by better grazing systems. He referred to the increasing awareness of the potential of permanent grass, and to the fact that over 3,000,000 tons of hay were produced annually at an average yield of only 30 cwts per acre. He considered that this " mediaeval practice " should be relegated to the picture books. There was a need for more research into silage techniques and better utilisation of grass. The average USE in Britain was currently 15 cwts per acre: with a little fertiliser this could be raised to 30 cwts and with optimum fertiliser usage to 60 cwts.

Professor Holmes questioned many of the conventional wisdoms such as the concentration on production of leaf to the exclusion of stem, when, on the whole, protein was not a limiting factor in systems using grass. He wondered if the phosphate status of the soil was not so high that we could give phosphate a rest (a thought with which I doubt if most farmers in South West Scotland would agree). He mentioned that the average dairy cow still ate 2.1 lb concentrates per day from April to November and asked if this was right. He thought we needed to produce some simple rules for grazing management—this presumably directed at the farmers of Southern England, judging by what one sees out of a train window. He saw future trends aimed at better utilisation of grazed grass without depressing production per animal, and at the breeding of earlier and more productive grasses. When he concluded I felt that, at last, the scientific side of agriculture had a better understanding of the more practical aspects of farming, and were prepared to descend from their ivory towers and their pot plants to a level where they can help us more quickly, and speak a language which we can understand.

Up to this point your secretary was writing like a madman and I wondered if what he had written could have been recognised as having any connection with the meeting to which my notes referred.

Lunch with John Watson of the 'Hannah' made me feel better (it's just the general impression that matters !).

After lunch the speakers were rather above my head, and the air was hot, and I wouldn't have been human if I hadn't felt sleepy. Dr. Conway from Grange Agricultural Institute, Co. Meath, spoke first on grazing management for beef production. His trials with paddocks had shown no advantage over set stocking at low stocking rates. With higher rates there was an advantage, but a careful watch should be kept on the balance between stocking rate and animal performance. The effects of high stocking rate were not so marked up to early August, and he suggested it should be adopted for the first 20 (!!) weeks of the grazing season. He appeared to achieve better gains with a mixed stocking of cattle and sheep, but from the questions afterwards the significance of this seemed doubtful. 900 lbs per acre liveweight gain had been achieved and they aimed to keep 25 cattle on 15 acres from April to March. N was applied to grazing paddocks in early March and to silage paddocks in April. There was a cry for lean meat and they had discovered that the fat ratio in a carcase is reduced at high stocking rates. With reference to feeding at grass, he believed that a beast supported its liveweight gain from the barley which replaced grass and did not supplement it.

Dr. Forbes from the Research Institute at Hillsborough spoke on silage and winter fattening. It is impossible to finish beasts under 5 cwts at the beginning of winter on silage alone. Dry

matter intake is very important and it is almost impossible to take sufficient energy from an all roughage diet to support a tolerable liveweight gain. The best results he had achieved were with young cattle fed 5 lbs barley and 40 lbs silage.

The final paper was read by Dr. J. G. Taylor of Hurley, on dried grass and beef production. He had found that milled and pelleted dried grass gave higher digestibility and lower heat loss than chopped material. The intake of grass dry matter increases with fineness of milling and in form of the pellet must not be too hard nor too easily broken down. He claimed a 37% higher liveweight gain comparing milled and pelleted grass with chopped, and the response was greatest with larger cattle. With this, I regret to tell, I fell asleep and do not know whether I dreamed that the speaker said it wasn't worth the cost or whether it was just my impression.

" Advertiser " Office, Ayr