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SOUTH WEST

AND

CENTRAL SCOTLAND

GRASSLAND SOCIETIES

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CONTENTS

NO SIMPLE ANSWER

During the twelve months since the last issue of Greensward, our two Grassland Societies have had fifteen meetings involving talks, discussions and visits on all aspects of livestock husbandry. Most of the meetings are recorded in the following pages.

Whether the subject is seed mixtures, fertiliser use, grazing systems, conservation, supplementary feeding, breeding or marketing, there would seem to be more than one method of achieving a satisfactory output as milk, meat or profit. It would be a foolhardy man who would say that only one answer was right and all others wrong. Take, for example, Charles Platt's advocacy of "set stocking" in his talk on 'Cheap Milk from Summer Grass.' This essentially simple system of livestock management has tremendous advantage because it requires few fences and gets rid of the daily chore of applying fertiliser nitrogen to pocket handkerchief paddocks. Mr Platt picked up the idea from a talk by Dr Castle on preliminary experiences with "set stocking" at the Hannah. Many other farmers throughout Britain are taking to this system.

Does it mean that rotational grazing is out?

Then again, Sam Mayall in Shropshire is doing very nicely without using any fertilisers other than the return of organic matter as dung/slurry compost. Are all farmers who spend £10 to £20 per acre on fertilisers wasting their money?

It happens that Mr Mayall practices strip grazing for his dairy herd. Is it possible that the advantages of strip grazing are compensating for his low input of fertilisers or is he just more able than the average farmer in other directions.

Will all our difficulties be solved when we move to zero-grazing? There is no doubt that more livestock can be carried per acre when zero-grazed but the increased cost for equipment, labour and fertilisers could be astronomical.

Applying extra nitrogenous fertiliser increases the yield of grass but unless there are additional animals capable of making use of that extra grass, it will be wasted and the output with or without fertiliser will be the same.

Rotational grazing also raises the yield of grass and unless stock numbers match this extra grass you might as well forget the fences.

Mr Mayall and Mr Platt have shown us that our targets for livestock output have been too low.

The fact that grass productivity soon passes from surplus to shortage means that no simple grazing system can fully utilise the grass potential when it is pushed to maximum.—I. V. HUNT.

SOUTH WEST SCOTLAND GRASSLAND SOCIETY

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I. V. Hunt, Grassland Consultant, West of Scotland Agricultural College, Auchincruive.

1. THE FEED CRISIS

This conference was arranged by the South West Scotland Grassland Society at Belleisle Hotel, Ayr on 22nd November, 1973, immediately following the XIIth Annual General Meeting of the Society. Mr Robert Graham, elected chairman for a second year was in the chair.

Supply and Demand

Andrew L. Howie, Dunlop, Ayrshire

When I was approached by Mr Hunt, your secretary, way back in August, to open this meeting of short talks, at which " Feed Crisis " would be discussed, I replied, that perhaps by the end of November there would be no crisis, and that everything could have resolved itself. Sadly however, as we all know to our cost, this is not the case, although the emphasis may have changed a little in these months.

My remit was to present the reason for the sharp increases in the price of feeds, — What the supply position is likely to be in the near future, and what farmers can do with regard to getting through the period, from the point of view of concentrate feeds.

First of all, I would like to make it clear how I see the position of the animal food compounder in relation to the livestock farmer — and in particular to you, gentlemen, who have a special interest in grass, its growing and conservation, to achieve the maximum output and economy in your livestock ventures.

When a friend heard where I was going, he said, " You're not frightened, going into that lion's den, they eat feed merchants for breakfast, that crowd ! ". Nervous I may be, but not frightened, and perhaps the tale of the college adviser being shown round an improved dairy unit will help explain why. Their first stop on the tour of inspection was the new rotary parlour, where the farmer proudly extolled its benefits, but as they moved off, the farmer's wife said, " If it wasn't for my money, it wouldn't have been there." And at the haylage tower, where the same thing happened, " If it wasn't for my money, it wouldn't have been there." And so on, round all the improvements, till the long suffering farmer could stand it no longer and exploded. " Shut up, you stupid woman, if it wasn't for your money, **you** wouldn't be here either."

Gentlemen, if it wasn't for your money, I wouldn't be here either, and neither would any of your suppliers. Both sides are trying to make some honest profit, and so long as we appreciate this basic fact, then it is apparent that it is in all our interests to have a prosperous livestock industry and a healthy, if not prosperous enough supply industry!

However to return to the reason why these supplies of feeding stuffs have risen to such astronomical prices, I will have to take you back in time about eighteen months, to the summer of 1972

when it all began. I would ask you to keep the title of this talk— **"Supply and Demand"** — at the back of your mind all the time. In any commodity market, it is the ultimate reason for price changes — and the balance is very fine. Market manipulation there may be, speculation there will be, but given a 101% continuing supply there is a surplus, and given a 99% continuing supply, there is a shortage.

Sometimes, the balance is as delicate as that, and you can appreciate that it doesn't take much to tip it one way or the other, and that is exactly where we were in midsummer 1972, without quite realising it! It took a sudden rise in the temperature of the Humboldt current in the Pacific, off Peru, causing the shoals of anchoveta, which provide raw material for fish meal production, to move down to deeper water, further away from the shore, and out of range of the normal coastal fishing boats. This upset the balance and triggered off a world shortage of protein. Up to that point, Peru had been supplying about 2,000,000 of the total 3,000,000 tons of world fish meal exports. U.K. production in a normal year is 90,000 tons, and the usage in the British animal feed industry about 400,000 tons. You can see, with hindsight, that we were eventually going to be around 300,000 tons of fish meal short, if we make the assumption that it all came from Peru, which it didn't. That really is not relevant as that tonnage of supplies disappeared from the world market and has not as yet been replaced. The fishing industry in Peru is still at a standstill today, in spite of various attempts to restart.

You may be thinking that all this is history, but I make no excuse for dwelling on that period of time when it all began, because the situation is still with us today, with some significant variations, and will continue to affect our supply position for some considerable time yet, perhaps for years.

The effect on the home supply market was not immediately felt or appreciated. After all, what was a mere 300,000 tons in a compound feeding market of 11,000,000 tons, plus the considerable tonnage of home mixed feeds. There had always been a plentiful supply of other proteins in local and world markets to substitute for any temporary shortages. To be even more parochial, we didn't use much fish meal in cattle foods, so why should it affect us here in the West of Scotland. But the chips, I'm afraid, were stacking up against us!

The majority of users looked around for the alternative substitute protein, namely meat and bone meal, which with soya meal, are the first choices. Here again, raw materials were increasingly difficult to come by.

The main reasons for this, briefly, were the restrictions on imports of bone — in meat from overseas, because of foot and mouth in the Argentine, a reduction in the slaughter weight of beef animals, and an increase in the uptake from pet-food industry, which with it's higher margins, could afford, generally, to pay more than compounders.

Still no panic, but non-traditional buyers like Eastern Europe, China and Cuba, who were all beginning to feel the effect of the protein shortage entered the market on a large scale. At this stage, no real mention of the cereal shortage, which was to hit us later when we were well and truly down.

The buying pressure then shifted to soya meal, and here there are only two major suppliers to the U.K., the United States and Canada, who, at that point, had fairly adequate stocks to satisfy a temporary substitution, — as we then thought, — but the increased demand naturally stiffened prices. We had now reached early August, 1972 when along came the dock strike to add to our troubles. Many of the normal protein purchases for our winter needs were on the high seas, — namely, groundnut and cotton cake, etc. from Burma, India and Africa.

Every shipper claimed "force majeure," as was his right, and took the supplies to the nearest strike free Port, which was always on the Continent, — dumped them there and left them at our expense. The only outlet, — facing a strike of unknown length, — was to sell them to buyers over there at knock down prices, thus creating a further vacuum in the supply pipeline for the United Kingdom, — but more important, for the first time that I can remember in peace time, — there was talk of rationing feeding stuffs, with stocks down to two or three weeks cover, — and this in the summer time when the demand from the cattle sector was practically nil. By the end of August, of course, the strike was settled, — we felt we could regard it as a short term set-back. With the sudden arrival of a back log of ships which had been holding off in anticipation of the settlement, there could be an over supply which would force down some prices, in particular, cereals. After all, there were tremendous stock-piles in America and Canada. Both were trying desperately to obtain orders from China and Russia to reduce a record carry-over tonnage.

By the end of September, the cereal pendulum had swung again, — Russia had bought 20 million tons of wheat from America, China had also made large purchases. There were rumours and denials of, floods, droughts, volcanic eruptions, etc. in almost every exporting country in the world, and by the end of the year, demand for seemingly inadequate supplies of protein and cereals had caused prices to rise to levels no one had ever dreamed of, but even at that, some compounders had to put sales onto a quota basis.

That was the pattern as we joined E.E.C. in the early months of this year, and as events have shown, that also has brought its list of uncertainties and unknowns to confuse the issue.

However, we saw the winter through at these high price levels, always with the fond hope that it was to be a "once of" set of circumstances, and that a good harvest in 1973 would fill the stores again and all would be well. Luckily, the prices of surplus live-stock also rose over that period to help compensate.

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CIRCLE LEYS

NICKERSONS KNOW ABOUT GRASS

Nickersons of Rothwell, Scientific Seedsmen

It was not to be. After a very short steadying, the protein market took off again, with soya meal being the most under pressure. Even there, the issue was confused. America brought back into production 25 million acres from their land bank, which should have had the effect of increasing supplies, and reducing prices, but the market was very slow to react. At this time, in early June 1973, I attended a conference in London, when one or two interesting facts came to light which may help explain why. Expert statisticians claimed that at the end of that cereal year, there would only be four weeks stock of cereals left in the world. To my mind, that is a very sobering thought, especially if our four weeks supply happened to be on the other side of the Atlantic, with a possible labour strike anywhere along the line. The American Agricultural Attache told us that their silos were empty, intentionally at that time. They hope to build up reserve stocks again, to ward off a possible repeat of this year's panic.

He also said that they expected to have record yields of wheat, maize and soya, but doubted if even that would be enough to satisfy world demand. He told me something afterwards that I had never considered, — that America was the world's second largest importer of meat. It only amounted to $7\frac{1}{2}\%$ of their requirements, but it left them far from self sufficient, and this position they were trying improve quickly, — but again time has shown the effect that that had on our agriculture over here.

World demand for their surplus grains and soya had forced their home prices up, — even by a larger percentage than ours, — with the result that the cost of farm produce pushed the cost of living index up so high that at the end of June, President Nixon banned the export of all soya beans and meal, — even where there were legally binding contracts. After a day or two, they relented a little and allowed instead a quota of 40% of meal, and 50% of beans to be shipped, — but Canada maintained a 100% restriction for many weeks, —a further distortion of the supply pipeline.

By September, all soya contracts were being fulfilled, but confidence in the market had been shaken. The currency crisis which we seem to be always having here began to bite. The strong German Mark was able to outbuy the weaker British pound, and increased barley exports forced the home price up by at least £10.00 per ton, — to the joy of the cereal grower and the dismay of the livestock farmer!

That pretty well brings us up to the present. I hope to have managed to pick out the salient points, to give the background behind the sharp price increases, and I make no apologies for delving back into the past.

What is the position today, and what of the near future? This is when the crystal ball becomes very cloudy, and where decisions taken really cost money.

Because of one or two factors, the very open autumn weather,

the destroying by the government of confidence in the dairy sector, by refusing to finance increased costs, and so on, the demand for cattle feeding has not been bouyant. What is the effect on our trade?

As I explained earlier, twice in the last eighteen months, we have almost been in the position that we were not able to supply the demand of our customers as they decided they needed deliveries. -- Remember, we have to anticipate your demands, — which will probably come at short notice! Being a responsible industry, this is the last thing we wanted to see repeated. We have all made efforts to ensure that the supply pipeline would be full, at prices which take considerable financing. What happens? The demand slackens off and there is no shortage, for the present!

In other words, we are back to the 99% demand, with an apparent surplus of raw materials. Certainly, there have been some dramatic drops in prices, with £100,00 plus coming off soya, groundnut and fish — but are these real prices, or merely because no one is needing to buy at present.

Personally, I think that the real level lies somewhere between the top, and todays level. There doesn't appear to be genuine world surplus of anything, — the energy crisis surely emphasises this, — and it doesn't take much to upset the balance. We are told that Russia has had a record harvest, but this hasn't had the effect of breaking cereal prices, — instead they are strengthening! Indeed, in the last ten days, with demand for feed improving, prices of protein also have risen by £15.00 per ton, — which is not much compared to a drop of £100.00, but is too much of a fluctuation to stimulate a healthy supply and demand position.

Finally I would like to read you some passages from a report issued by our trade association, following a series of meetings with the Fertiliser Manufacturers Association, twelve months ago, to explore the opportunities for expansion in livestock production, afforded to U.K. farmers, which I think have a particular bearing on today's topic.

1. The efforts of both industries should be aimed at maximum economic production from the individual farm.

2. Improved utilisation and conservation of grass, leading to increased stocking density, should be the main objective of both industries. This would lead to increased use of fertilisers on grassland, to compensate for increased stock numbers, and/or any reduction in acreage due to increased cereal production. While improved utilisation and conservation of grass might lead to a marginal decrease in consumption of compounds per head of livestock, overall consumption should be greater due to the increased numbers of stock.

There are other paragraphs, but that is sufficient to demonstrate the philosophy of our members, then and even more so now. A vested interest definitely, but without a prosperous livestock industry we will all suffer.

Livestock Management to beat the Crisis

Robert Laird, The West of Scotland Agricultural College.

With feed costs up by 50-60% and price of milk only slightly advanced, there is no possibility of a return to the profitability of the last 2 or 3 years.

Four possibilities are open to us

(a) Do nothing.

(b) Cut down on or cut out concentrate — i.e. Over-react.

(c) Re-allocate feed by careful evaluation of roughages.

(d) Change type of feed e.g. use N.P.N. (Non Protein Nitrogen) instead of proteins.

(a) The effect of taking no action will be a drastic reduction in profitability.

(b) The first reaction to the situation has been to cut down more or less severely the levels of concentrate feeding. The low yield which follows is not serious in the short term but can have dangerous long term effects which result in dramatic falls in butter fat content and, of considerable importance in succeeding years, changes in the calving pattern due to excessive liveweight losses in early lactation. In the short run, yields can be sustained off the back but ultimately the milk yield collapses.

(c) Making better use of silage and hay depends on analyses. No one can tell the value by looking at it. The policy is to use a low protein cake with roughages of high protein content and vice versa. The effects should be checked against official or unofficial milk records with, if possible, an increase in the frequency of recording. Weekly or fortnightly records are necessary as a guide for feeding. The re-allocation of feed in terms of the roughage/concentrate balance must be matched by re-allocation of feed level through the lactation of the cow so that when response is high, feed level is relatively high and when response is low, feed level is reduced. Response can be measured in terms of milk yield, milk composition and regular calving.

Re-allocation through the lactation will pay special attention to 4 periods:—

i **Steaming up.** Cows must be fit at calving and the level of steaming up must be such as to achieve this. Too often, cows are either under-fed during this period or are fed the wrong type of feed. Major ration changes should be avoided after calving. The same feeding stuffs should be fed for 3-4 weeks before calving as will be fed after calving.

ii **The first 100 days of lactation.** It is during this period that a cow's whole lactation yield is made or marred. Particular

care must be taken during the first 14 days to ensure that the cow receives adequate feed without overfeeding and putting off her feed. "Lead or challenge" feeding should be practised by giving concentrates for ½ to 1 gallon above current production to achieve high peak yield. An increase of 1 gallon in peak yield means an extra 150 gallons per lactation. This practice will also result in improved milk composition and a better calving index.

iii **After 100 days.** Feeding should be economised and given strictly according to production. When such economies are made in summer, the cow will take in more grass. In winter, care is necessary to ensure more roughage is available to replace the cut back in concentrate. Self-feed silage set-ups will do this without special measures but byre feeding means that more silage or hay or turnips need to be put before the cow.

iv Switching the type of feed means mainly replacing high cost protein by N.P.N. or non protein nitrogen. The principal source is Urea which can replace 5-6 times its own weight of protein. There are two disadvantages. Firstly, at high concentration in the feed, it is poisonous. No more than 1¼% should be included in the concentrate ration. This is a small proportion and pre-mixing of the urea must be adopted to ensure good mixing. If there are doubts about the ability to mix the urea, then a commercial urea mix or supplement should be bought. Because of the decline in milk yield, urea rations are not recommended for cows giving more than 3 gallons per day. Secondly, the replacement of protein by urea would be useless if the gain in cost of feed were offset by a fall in productivity.

Grassland Management to beat the feed crisis.

Dr M. E. Castle, The Hannah Research Institute.

It is necessary to become more confident in the capability of grass and in the ability of the cow to use grass. Farmers seem to overlook the fact that the cow is built to use a fibrous feed. The three requirements to beat the crisis are (a) to put on enough stock at summer grass; (b) to cut back or eliminate completely concentrates at grass, and (c), to improve the quality of the conserved product.

Self sufficiency is not the complete answer since it results in low yields per cow but as near self sufficiency as possible to make maximum use of resources.

It has never been profitable to feed concentrates at grass even when concentrates were cheaper and now at double the cost it is even less attractive. Over the years, we have shown that to get one extra gallon of milk at grass you need to feed 31lb. of concentrate and at £60/ton that means 83p for a gallon of milk. Sugar beet

pulp or home grown barley cost less than £60/ton but even these do not make the business profitable.

The reasons given for continuing the feeding of concentrates are well known. At steaming up or as stock move out to grass in spring, there must be a gradual change from winter feed to spring grass but that is no reason for prolonging the feed throughout the summer.

I am appalled by one of the figures emerging from David Sargent's M.P.S.I. report that the average production obtained from grass by his specially selected group of dairy farmers was only M + 1.7 gal. In the grazing trial running at the Hannah Institute comparing the Wye College system with the daily paddock system, the average value of grass over 4 years was M + 3.9 gallons from May to October.

The stocking rate is ½ acre per cow from May to October and no supplementary feed is given at all once the spring change is completed.

Concentrates have their place in the winter but this should not be an excuse for making poor quality hay and silage.

The most important index is the digestibility or 'D' value.

In experiments with silage of different D values we found that silage with a D value of 62 produced 34lb/cow/day. With a D value of 72 it was 39lb/cow/day. Over the years, taking all available results it is shown that every extra unit of 'D' value means an extra 1¼lb milk/day/cow. I agree with the previous speaker, the analysis of silage or hay is essential to plan its best use.

Improvement in the quality of silage requires attention to three things:—

1. Cut earlier.
2. Use an additive.
3. Seal the silage.

Some farmers believe that once they have covered the silage with a polythene sheet to keep out the rain, all is well. A polythene sheet can act as a wind tunnel and allow too much air in. The seal will keep out water and also keep out air.

The evidence in favour of using an additive is crystal clear. A vast number of experiments have shown formic acid to be effective and profitable. The question of protein level of cake has been referred to. One of the important requirements is to ensure that the winter feed is not too low in protein, or the intake of silage can be restricted and milk production will be reduced.

Discussion

The discussion covered many aspects. Only a selection of the questions are reported.

Q.1: How long is the feed crisis likely to last?

A: The price is never going to drop back to the level prevailing a year or two ago. We must look more and more to our own resources. There is plenty of room for improvement especially in Ayrshire. Dried grass is not a likely solution since it depends too much on fuel. We have had a taste of the results of the dependence on Arab oil. Our dependence on feed grain could also be used as a weapon. We have an excellent opportunity in Scotland. Grass grows well, our farmers are good stock men, the units are large. The right action is to maximise these advantages against our E.E.C. competitors and expand our units.

Q.2: Price of our products and the supply are intricately connected. If all our intermediate farmers put up their performance to the top 25% and the lower group put their performance also up — the overall price will be depressed and nobody will be any better off. How do we break out of this?

A: The price of milk is negotiable within E.E.C. which is still a net importer of dairy produce. We must see to it that our own market is supplied by our own farmers.

Q.3: Can you distinguish between digestibility and D value? Are they the same thing?

A: 'D' value is the percentage of digestible organic matter in the dry matter. D value is slightly lower (90%), than the digestibility of the organic matter. For example, a silage with a 70% digestibility of the organic matter will have a D value of 63%.

Q.4: To what extent can kales and turnips fill the feed crisis gap?

A: Many farmers find drilled kale helps to shorten the winter by providing late autumn grazing. However, the cows come in dirty. The crop could be cut and carted in for feeding but this is costly. When grazed, it is doubtful if the production targets are reached since much of the crop is uneaten. It must be cut to be used efficiently.
High proportions of kale in the diet may result in fertility problems.

Q.5: The need for protein has been referred to. What is the correct concentration?

A: Traditionally, the West of Scotland has used high protein cakes and 22% was common. This has been cut back generally because of high costs and 16% is now common. The traditional grazing cake used to be 16%.
Nowadays the use of N on grass and fodder crops has led to a substantial rise in the protein content of roughages and a 13-14% cake should suffice where good quality silage is being fed.

Q.6: We are continually told that energy is an important part of the Starch Equivalent value of the dairy concentrates.

A: The term Starch Equivalent is being phased out, its place being taken by metabolisable energy. High values of starch equivalent could be calculated for some feeds doctored with oils which would not mean extra available energy for livestock.

Q.7: A member said that he had no faith in additives because he had compared two very big clamps with and without additive.
The one with the additive was rotten and a dead loss. The other was perfect and as good as he had ever made.

A: This caused quite a spate of questions and comments. Dr Castle defended his recommendation of formic acid additives by reference to his own and other peoples experimental results. Dr Harkess of the college has just completed a survey of world wide reports and considered the case for additives was proved.
Various solutions were offered to explain the member's unfortunate experience but he was not convinced, except possibly by the suggestion that his supply of additive had been faulty. There were additives sold which contained very little formic acid. This could well be so but the treated silage could hardly be worse than the untreated. At worst, it could be poorer than aiticipated.

2. VISIT TO ELDERSLIE ESTATES, RENFREWSHIRE.

Over 40 members of the Central Scotland Grassland Society visited Elderslie Estates at Houston, Renfrewshire, where, the company was welcomed by the owner, Major D. Crichton Maitland and thereafter the group was conducted on a tour of the dairy facilities by the farms' manager Mr Ian Simpson. The herd of 145 cows is cubicle housed, self-fed and parlour milked. The herd average is over 1000 galls. and is fed on a concentrate level of 2.6 lbs. per gall. and had a margin over concentrates of £182 per cow for the year 72/73. In the summer, the herd is paddock grazed on 66 acres and the equivalent of 70 acres is cut twice for silage. The grazing mixtures are normally laid down for seven years and the cutting mixtures for five years.

Dr Harkess from the Agronomy Department, Auchincruive, discussed the various aspects of making quality silage and in particular the need for cutting at the proper stage of growth to give the best levels of digestibility.

The rearing and fattening unit at Gryffewraes was also visited where 150 young dairy stock are being reared and 100 dairy cross and suckled calves are being fattened.

Following high tea in the Crosslee Inn, Houston, members had a most lively and enjoyable address from Mr W. Steele, Principal, Cumberland and Westmorland College of Agriculture and Forestry, Newton Rigg, Penrith. He stated that he never ceased to be amazed at the way farmers were prepared to share their experiences. We should look critically at what we had seen and see what lessons could be learnt from the visit. Greater pressure was being put on our breeding cow, our beef animal, our ewe and our sow. This was especially true in that farmers had increased stock numbers and in many cases stock had outgrown the building accommodation. Cows should be given every opportunity to express their potential and the division of a dairy herd into two groups, high yielders and low yielders, was often advisable.

At Newton Rigg, 40 freshly calved cows are kept together on an easy-feed system. 40 heifers are separated and 80 cows are run together at the stale stage of lactation. He reckoned that such a system was worth an extra 100 galls. per cow due to the creation of a better environment for the cows. With reference to silage he said that the quality of silage makes or breaks a mill production system. A shorter chop helps to reduce losses even if it means sheeting up at night. Self efficiency, not self sufficiency, should be the aim.

In dealing with labour, Mr Steele stated that a good man is still the cheapest commodity which a farmer can buy. He must invest in cowmanship, and pay particular attention not only to buildings for stock but also to buildings which would ease the manual tasks of the stockmen. A most excellent and lively discussion followed the address and the members appreciation was voiced by the incoming Chairman, Mr Jim Brown, Gaindykehead, Airdrie.

Before Lex Smith demitted office he was warmly thanked for his most competent chairmanship during his two year period of office.

3. HERBAGE VARIETIES FOR THE WEST OF SCOTLAND

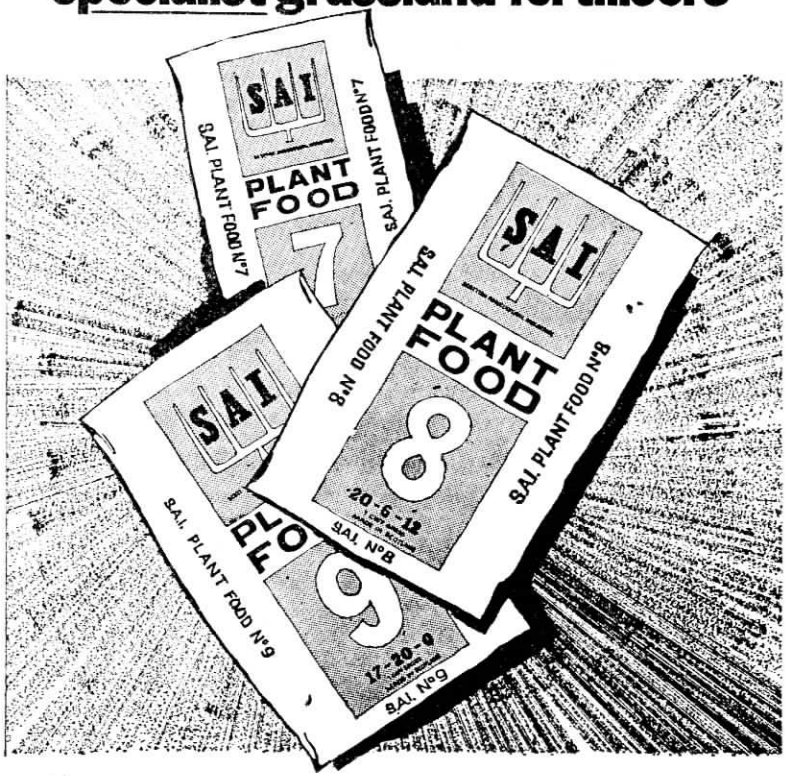
Angus Rae, Sinclair McGill Ltd., Ayr

Talk presented to Central Scotland Grassland Society, 10th January, 1974 at East Kilbride.

The views expressed here are those of a grass breeder, not of a practising grassland farmer, and are intended as a general survey preceeding Mr Hunt's more specific remarks concerning the choice of suitable varieties.

The Ideal Sward: We can accept that the varieties chosen should be as productive as possible and sufficiently persistent in terms of the length of the ley. They should also have good water tolerance, since rainfall in the West is above the

Cash in on grass with these specialist grassland fertilisers



Tailor made for the Scottish farmer

For Grazing
SAI PLANT FOOD No7 27:7:5½

For Cutting
SAI PLANT FOOD No8 20:6:12

For Upland Grazing
SAI PLANT FOOD No9 17:20:0

For a more profitable grassland programme

Scottish Agricultural Industries

The recent introduction of tetraploid red clovers is, however, of great interest since these show considerable improvements in persistency over most of the diploid varieties. Any doubts over their ability to withstand long, dry spells of weather, are of little importance in the West of the country.

In the near future, varieties of grass showing potential production levels well in advance of what is currently possible, can be expected. The advantage of these may, however, prove largely illusory, since the use made of the existing range of varieties does not exploit their full potential.

In my own breeding work at Ayr, I am currently attempting to develop varieties which are adapted to well established management practices which often do not coincide with current variety evauation techniques. For example, does a trial system based on either 4 'conservation' cuts or 9 'grazing' cuts, the standard N.I.A.B. test procedure, show up those varieties which will best suit farmers who graze in the spring and then put up the field for a single silage or hay cut?

4. CHOOSING AND USING HERBAGE VARIETIES

I. V. Hunt: The West of Scotland Agricultural College

Talk presented to Central Scotland Grassland Society, 10th January, 1974 at East Kilbride. Over 250 varieties of grass and clover are available to the British farmer today.

Breeders are very active in all countries and another 250 varieties are in the pipeline and within 5 years will be launched onto the British market. About 200 of these newer varieties are under test at the moment at Auchincruive.

The day when a farmer could hope to know the advantages and disadvantages of all herbage varieties is long past. No sooner does he become familiar with the name of some well publicised continental variety than its name is changed or it is off the market, or it suddenly is found susceptible to some disease or other and has lost its glamour. Despite the hosts of new varieties, we still have most of the older varieties such as the Aberystwych varieties bred at the Welsh Plant Breeding Station during the late 1920's such as Aberystwyth S23 perennial ryegrass, Aberystwyth S48 timothy and Aberystwyth S123 red clover with a few which became prominent after the last war such as Aberystwyth S24 perennial ryegrass.

For the period 1925 up to 1960, the number of varieties remained fairly stable. Then we had the tremendous influx from Denmark and Holland and a new crop of varieties from Aberystwyth including S321 perennial ryegrass. Holland tends to dominate the market at the moment with a national breeding station and a dozen or more private breeding stations working full time producing grass varieties for all purposes with a wide eye on the very big British market for grass and clover seeds.

Some idea of the dominating position of Holland can be gained from the following table of sources of origin of varieties on the U.K. National List of Herbage Varieties.

	1	2	3	4	5	6	7	8	
United Kingdom	6	14	8	9	3	2	17	8	67
Holland	21	38	15	4	11	1	5	7	102
Denmark	6	9	1	5	4	—	1	3	29
Germany	5	—	—	—	—	—	—	—	5
Belgium	1	2	1	—	—	—	2	1	7
Poland	2	2	—	—	—	—	—	—	4
New Zealand	2	2	1	1	—	—	2	2	10
Switzerland	1	—	—	—	—	—	—	—	1
France	2	1	1	1	—	—	—	1	6
Canada	—	—	4	—	1	1	2	—	8
Ireland	—	2	1	1	—	—	—	—	4
Sweden	—	1	4	1	1	—	3	2	12
Hungary	—	—	—	—	—	—	1	1	2
	—	—	—	—	—	—	—	—	—
Total	46	71	36	22	20	4	33	25	257
	—	—	—	—	—	—	—	—	—

1. Italian and other short lived ryegrasses; 2. Perennial ryegrass; 3. Timothy; 4. Cocksfoot; 5. Meadow Fescue; 6. Tall Fescue; 7. Red Clover; 8. White Clover.

Thus, Netherlands varieties account for 40% whilst British varieties account for only 26% of the varieties available.

Some years ago, Dutch grass varieties were grown in Holland but the world wide demand is so high that the seeds are now grown in Denmark, USA and in Britain. One of the main results of the upsurge of Dutch varieties has been a decline in demand for the Aberystwyth and Danish varieties. An unfortunate effect has been the loss of stability in the supply of varieties.

For many years it has been possible to provide the farmer with complete information on the potentiality of available varieties. Nowadays, by the time the information has been gathered about variety X it has been replaced by Y, hailed by the breeder as vastly superior to X.

The truth of the matter is that as far as 90% of farmers are concerned, the variety of grass used makes not the slightest difference to his grassland production. Once the species and the maturity group have been chosen and a few of the worst varieties eliminated, the output from grassland will depend largely on the livestock management and on the method of using the grass.

There are two reasons for making this statement. Firstly, the majority of seed mixtures are blends of many species and many varieties each with good and bad characteristics. It is foolishly optimistic to expect that the final result of such a mixture will be a combination of all the best features when the most likely result will be an average of the good and bad characteristics of all the

constituents of the mixture. One variety will dominate the mixture. The companion varieties will have a negligible effect on the sward. Secondly, varieties differ very much in yield, in quality and in pattern of seasonal productivity, i.e. how early or how late it grows in the spring and autumn. Most of the difference in productivity comes in late May and June when grass is surplus to requirements. A high yielding grass will merely tend to produce more surplus or wasted grass and not lead to higher animal production unless the system of management, the grazing and mowing schedule, the area of grass allowed per head of stock, etc., are carefully chosen to match grass growth.

We hear from all quarters that Aberystwyth S24 and Aberystwyth S23 perennial ryegrass are now outclassed by the newer Dutch varieties. Yet, no one has yet shown greater animal production from the newer varieties.

One of the most interesting demonstrations of the continuing value of Aberystwyth S23 has been the grazing system experiment at the Hannah Research Institute, comparing the Wye College system and the 21-paddock system. Well over 1,000 gallons of milk was produced per acre during the summer grazing season at a stocking rate of 2 cows per acre in each of 3 successive years. Very slight differences were observed between the two systems of grazing and one of the conclusions of the experiment was that the simpler Wye College system of grazing was as productive as the more costly 21-day paddock system. A second equally valid conclusion is that since the output from both these systems is double that from most dairy farms, differences between grazing systems do not matter until farmers raise their output to at least 1,000 gallons/acre from grass.

There is a third conclusion concerning the subject of grass varieties. S23 perennial ryegrass is shown to be capable of high output of milk per acre provided the stocking rate is raised to make such a yield possible. Some of the credit for the high livestock output from the sward will come from the lateness of S23 and its ability to provide grazing at a time when earlier grass varieties would be past their prime.

Choice of Species

The choice lies among the following ten species of grass and clover:—

The most important Grasses	**Less important Grasses**	**Clovers**
Italian ryegrass	Westerwold ryegrass	Red Clover
Perennial ryegrass	Hybrid ryegrass	White Clover
Timothy	Tall Fescue	
Cocksfoot	Meadow Fescue	

Perennial ryegrass is by far the most important species. 71 of the varieties available are perennial ryegrass. It is high yielding and of high quality, standing up equally well to grazing or mowing. It is persistent if not allowed to grow too rank over winter and provided it is supplied with N and K in fertiliser or from accompanying clovers and farmyard manure or slurry. Its main disadvantage is its liability to disappear from a sward over winter. Sometimes low temperatures, sometimes fungus diseases, and in some instances overgrowth in the autumn are responsible. This poor overwintering becomes worse at higher altitude, or further north. In such circumstances, resistant varieties should be chosen or it may be necessary to replace ryegrass by timothy or meadow fescue. Quite satisfactory all-purpose leys can be produced by sowing just perennial ryegrass or perennial ryegrass along with white clover. Most farmers sow some timothy along with the perennial ryegrass.

Timothy stands up to lower fertility, higher altitude or more northerly conditions than perennial ryegrass. It soon disappears under grazing or frequent cutting but can produce heavy crops for hay or silage for many years with no more than 150-180 units N/acre per year. Quality is slightly poorer than perennial ryegrass. It does best when sown alone or along with meadow fescue. However, when sown with ryegrass and harvested annually for hay it can outlive the ryegrass. Sown in a grazing mixture with ryegrass it can improve the chance of sward survival through winterkill conditions.

Cocksfoot. This species has gone out of favour because under present levels of use of fertiliser nitrogen it becomes very coarse. It has lower quality than other grasses but since it can survive when ryegrass or timothy fails, its low quality is not important in those circumstances. It can be mown frequently, survives on light dry gravelly soils and in contrast to ryegrass can be saved for winter use without risk of loss of plant. It is still important in N.E. Scotland and could be important in other parts of Scotland in general purpose mixtures for upland farms.

Meadow Fescue. This species has gone out of favour. It was suitable as a companion to timothy in general purpose mixtures at moderate inputs of N fertiliser or sown along with white clover and no fertiliser nitrogen. With present thoughts on the high cost of fertiliser nitrogen, meadow fescue could come back into favour, but it should be used only in mixtures with timothy and never along with ryegrass.

Tall Fescue. This species has also become less interesting. Its special virtue is very early spring growth and ability to stand up to frequent mowing for grass drying or silage. Unfortunately, quality remains low.

Red Clover. Interest in red clover is reviving mainly because it can provide high yields for silage over 2 or 3 seasons. High costs of fertiliser nitrogen makes this attractive. It was formerly used in all seed mixture at 2 or 3lb/acre to improve the first year hay crop and to provide winter foggage with low inputs of fertiliser N up to 20 units/acre each year.

Many of the varieties which were satisfactory in these general purpose mixtures are not suitable for the modern long term conservation ley. If the conserved crop is to form a large part of the diet of livestock, it is essential to use varieties which have low oestrogen contents. Some varieties could upset lambing percentages of ewes and fertility of cows.

White Clover. Farmers are divided into those who use white clover despite high rates of applications of fertiliser nitrogen and those who leave it out because N fertiliser smothers it out anyway. Careful measurement has shown that it is worthwhile including in all seed mixtures at a low seeding rate.

Choice of Maturity Group

Choosing the correct maturity group of grass is more important than choosing the correct variety.

Grass does not grow uniformly through the growing season and this changing amount of growth and quality of herbage is the main factor responsible for poor conversion of grass to livestock product, i.e. its low utilisation efficiency.

One effective method of combating this difficulty is to make use of the differing growth patterns of species and varieties.

In the past, grass varieties have been put into early, medium and late groups according to their date of flowering. For example, among the Aberystwyth grass varieties we have S24, S101 and S23 in the early, medium and late group. During the last 10 years, a more precise knowledge of growth patterns has been needed because the quality of conserved products can be linked to dates of flowering. The digestibility of grass falls by 0.5 units per day during the flowering period and within a week it can pass from a milk production ration to a maintenance ration. High quality, high yielding silage can be made more economically by using grass swards with different dates of flowering. Flowering date in grasses is a long drawn out and not easily defined process. The date when 50% of the shoots are in flower, called 50% Ear Emergence, has been recorded for every variety. For example, the date of 50% EE for S24 perennial ryegrass in the West of Scotland lies between 18th May and 9th June. It changes according to year, latitude and altitude but the 50% EE of other varieties changes correspondingly. A sward of S24 will be fit for silage 3 weeks ahead of S23 perennial ryegrass in all years and places.

The difference between dates of 50% EE is constant and the difference between S24 perennial ryegrass and other varieties

provides us with a figure called Relative Ear Emergence or REE value.

Taking S24 perennial ryegrass at 0, the REE of other varieties of grass range from −5 to +42 i.e. from 5 days earlier than S24 to 42 days later than S24. New varieties coming along will extend this range at either end.

In order to cater for the more precise needs for modern conservation of fodder, all varieties have been grouped into 6 groups of ten day intervals in REE (Relative Ear Emergence) as follows:—

I	Very Early	REE (up to −5) More than 5 days earlier than S24.
II	Early	REE −4 to +5. This includes S24 and varieties from 4 days earlier to 5 days later than S24.
III	Medium Early	REE +6 to +15.
IV	Medium Late	REE +16 to +25.
V	Late	REE +26 to +35.
VI	Very Late	REE over +35.

The perennial ryegrasses span all these groups. Generally earliness of spring growth matches earliness of flowering but whilst this holds for any one species, it does not hold for all species. Timothy has spring growth earlier than would be expected from its rather late flowering habit whilst cocksfoot generally has late spring growth plus extremely early flowering dates.

Two uses of maturity groups are practised. Firstly, mixtures can be designed to give maximum yields of high quality silage on chosen dates and two or three mixtures chosen with REE at 10 day intervals i.e. from different maturity groups will spread the load for harvesting silage. It is important then to either sow single varieties or mixtures containing varieties and species which flower at the same time and belong to the same maturity group.

The second arises when the object is to spread growth of a single sward more uniformly. Then varieties from different maturity groups are blended together.

The Most Productive Varieties

Once the decision has been made on species and maturity group, then one should choose among the varieties of that group for (a) The highest yielder, (b) the most persistent, (c) the variety that stands up to the winter, (d) the cheapest available. Experimental work at Auchincruive has shown that whilst it is possible to name one single variety as the best, on the available figures, the results show some variation from year to year and place to place. There are probably 3 or 4 other varieties which are as good or better than the best one in some years or in some places and choice among the top 5 or in some cases the top ten would not make any difference to the average output of a field.

In the following table, I have selected one top variety within each maturity group and within each species.

The Top Variety in each Maturity Group

SPECIES	Maturity Group I	II	III	IV	V	VI
Italian Ryegrass	—	Romo (T)	RVP	S22	—	—
Hybrid Ryegrass	—	Sabrina (T)	Itermo	—	—	—
Perennial Ryegrass	Stormont Zephyr	Gremie	RVP Hay/ pasture	Animo	Pelo	Endura
Timothy	—	—	S352	Scots	Timo	S48
Cocksfoot	S345	Trifolium	Norton	S143	—	—
Meadow Fescue	—	Fero	Garanta	S53	—	—
Tall Fescue	—	Rozelle	—	—	—	—
Red Clover	—	Hungaropoly	Norseman	—	—	—
White Clover	—	S100	—	—	—	—

Varieties to avoid are probably more important than choosing the best variety and it does not really matter what maturity group they are in. They are to be avoided because of low yield, poor persistence or proneness to disease and are summarised as follows:—

Italian ryegrass — Fat, Tur, Mocca, Vejrup M.B., Dilana.

Perennial ryegrass — S321, Agresso, Argo, Atempo, Bocage, Glasnevin Leafy, Grasslands Ruanui, Hunsballe, Massa, Mito Daehnfeldt, Naki, Northern Irish, Omar, Oriel, Palaver, Scotia, Tonga.

Timothy — Comet, Drummond, Glasnevin Gem, Heidimij, King, Lofar, Murra, Pastimo, Vanadis.

Cocksfoot — None.

Meadow Fescue — Dufa.

Red Clover — Essex Broad Red, Essex Single Cut, Cotswold Red, Grasslands Hamua, Grasslands Turoa, Altaswede, Maris Leda.

All these varieties have behaved badly in trials at Auchincruive. It may be that after further trials, opinion may change but to date it is certain that any other variety selected will be better than these.

Perennial ryegrass is the most important grass and a little more information about choice of variety is justified.

Taking the annual yield of Aberystwyth S24 perennial ryegrass at 100, the range of yields at Auchincruive shown by all available perennial ryegrass varieties runs from 104 down to 79. Gremie is top at 104; Premo another well fancied variety in the same maturity group is 102. Grasslands Ruanui is 101. Aberystwyth S23 lies at 88. It is lower yielding partly because it is a late variety and because some of its energies are diverted from stem production which results in high yields to prostrate tiller production which ensures longevity.

The difference of 4 units between S24 and Gremie may vary depending on N level, method of harvesting, climate, etc. Gremie is subject to a disease called Crown Rust which is not generally found on ryegrasses in the North and West of Britain but in a favourable year Gremie may prove worse than S24. S24 is more liable to winterkill than Gremie and about 1 year in 10, this could be troublesome resulting in reduced spring bite. A reasonable compromise would be to blend Gremie and S24. Grasslands Ruanui is highly placed in terms of yield but is much less reliable than S24 in terms of winter tolerance.

Supplies of grass varieties are becoming more and more difficult and it is often necessary to accept a variety which is not the best. As mentioned at the beginning of my talk, this is not a serious matter since very few farmers manage their grass so well that the variety is a deciding factor. Quite certainly in the 57 variety mixture which many farmers sow, the presence of the best or worst variety is unimportant. A complete list of all available varieties, their maturity group and their merit is available under the title "Classification of grass varieties for Scotland from the librarian of any of the Scottish Agricultural Colleges.

5. SILAGE NIGHT

S.W.S.G.S. meeting held 21st February, 1974, at Ernespie Hotel, Castle Douglas

The Silage Competition:

A tremendous crowd attended this meeting at which the result of our society's first silage making competition was announced. Before dealing with the events of the night it is worth recording the progress of the competition itself.

The decision to hold a competition was taken by the committee on 8th February, 1973. Over 12 months previously, John Watson, Farm Manager of the Hannah Research Institute and Dr. Malcolm Castle of the Institutes' Applied Studies Department were responsible for urging the committee into this venture. John had been judging a silage competition at the Cumberland and Westmorland Grassland Society and was keen that we, in the S.W. of Scotland should "Have a Go." It is universally accepted that high quality conserved grass has an extremely important part to play in North West Britain and there is an impression that farmers in the S.W. area are not too good at either silage or hay making. This competition should do a lot to lead farmers into a better product.

Rules and entry forms were sent out to farmers during early summer, 1973.

The rules were as follows:—

1. Entry is open to farmers operating in the South West of Scotland.
2. There will be separate classes for Tower Silage and Clamp Silage.
3. Competitors will be allowed to submit one or two entries provided each is accompanied by the entry fee of £4.00.
4. The entry fee will cover the cost of sampling the silo and chemical analyses and preparation of an advisory report under the scheme operated by the West of Scotland Agricultural College. Completed entry forms together with a cheque for £4.00 (1 entry) or £8.00 (2 entries) should be sent to the Secretary, South West Scotland Grassland Society, Auchincruive, Ayr KA6 5HW. The cheque should be made payable to the "South West Scotland Grassland Society." Entries should be in the secretary's hands by 30th September, 1973.
5. The choice of sample will be left to the official sampler who will adopt the normal procedure to establish the value of the silage in a silo. Sampling will take place before 31st December, 1973, the preferred date to be stated in the entry form.
6. A copy of the analysis and the advisory report will be sent to the secretary of the Society for the use of the competition judges. The silage sample will be judged on the basis of the schedule shown below.
7. The 12 best entries of clamp silage and the 6 best entries of tower silage judged on the basis of the analysis will form a short leet for judgement on the farm during January-March, 1974 by guest judges along with a farmer member of the committee.
8. This second judging will be based on the appearance and smell of the silage and on the amount of waste. The points awarded for analysis and farm judgement will be added together to decide the 4 best clamp silages and the 2 best tower silages.
9. These will be awarded prizes and certificates according to the schedules:—

Clamp Silage	**Tower Silage**
1 — £12	1 — £12
2 — £8	2 — £8
3 — £4	
4 — £2	

10. The farmer with the best silage will be presented with the Society's trophy which he will hold for 1 year and a miniature replica which he will retain.

Mark Allocation

1. **Primary Mark Allocation**

Judges appraisal at silo (short leet only)	40
Evaluation by chemical analysis	100
	140

2. **Allocation of marks for analytical findings**
   (a) **Maximum possible scores**

	Pit Silos	**Tower Silos**
% Dig. Org. Matter in DM (in vitro)	50	50
% Dry matter	25	25
% Crude Protein in DM	15	15
pH	10	—
		(T x 100/90)
Total	100	100

(b) **Distribution of marks for quality**

(i) %DM (Pits)	Score	%DM (Towers)
14 and below	0	20 and below
16	4	23
18	8	26
20	12	29
22	15	32
24	18	35
26	21	38
28	23	42
30 and above	25	45 and above

(ii) %CP (Pits and Towers)

%CP	Score	%CP	Score
8 and below	0	16	11
10	3	18	13
12	6	20 and over	15
14	9		

(iii) **Digestible Organic Matter (in vitro) (Pits and Towers)**

D%	Score	D%	Score
45 and below	0	57.5	15
47.5	2	60.0	20
50	4	62.5	27
52.5	7	65.0	34
55	10	67.5	50
		70.0 and more	50

(iv) **Pits only**

pH	Score	pH	Score
3.5 and below	8	4.5	8
3.7	9	4.7	6
3.9	10	4.9	3
4.1	10	5.1 and above	0
4.3	9		

These rules were drawn up by a small committee of Dr Castle and John Watson of the Hannah and Dr Harkess, Alistair Campbell and I V. Hunt of the College.

Tht marks allocation is a tricky business and a real expert, R. H. Alexander of the College Chemistry Division was responsible.

The emphasis in the marking allocation lies with quality especially the %digestibility, 50 out of the total of 140 marks going to this single feature.

Full mark tables are not shown but it is easy to calculate the proportions of marks to be given to the intermediate figures. For example, a silage with %DM of 17 would get 6 marks.

Experience may suggest changes in the rules and marking system, but at the moment the only change is likely to be in the numbers of farms put on the short leet. It happened that there were only 3 entries in the Tower silage class but had there been a fuller entry the judges inspection might have necessitated a trip round 18 farms. As it was the short leet was just 13 farms.

The guest judge, Mr David Marshall of High Lea, Humbie, East Lothian, thought that a higher proportion of total marks should have been left to the inspection and less to the chemical analysis instead of the 40 and 100 actually allocated. This will be considered by the committee in preparation for next year's competition.

39 entries were received of which 3 were tower silages.

Sampling took a long time since it was left to the farmer to state when he would prefer the samples to be collected. The last of the samples was taken in mid-December.

By that time most of the analyses were completed but the final batch including entries A32T, A34a, D/1b, and D37T were caught by the '3-day' electricity restrictions. The method for measuring digestibility takes 5 days to complete and the College was put on 3 day use of electricity until mid-February.

Fortunately, Ron Alexander arrived back from Spain where he had been setting up laboratory techniques for the Spanish Government Agricultural Advisory Service. He solved the difficulty by using a small paraffin-motored generator and the full analyses were available for the selection of the short leet.

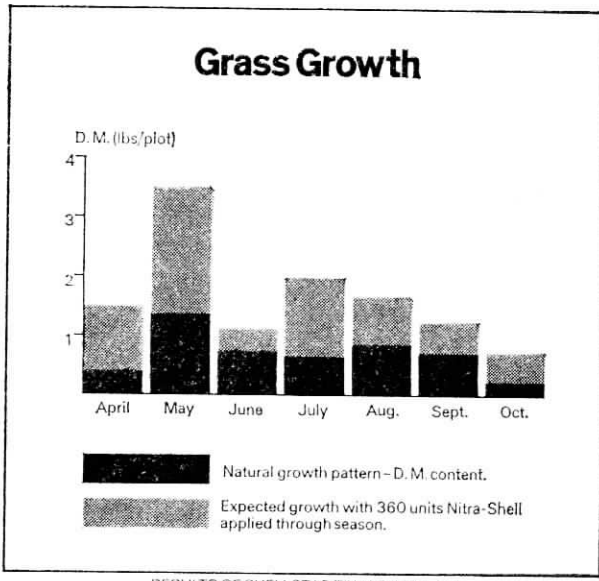
The full list of chemical analyses together with the marks awarded and the total given out of 100 are shown in table 1. Farmers' names are not given in this list but they are given for the short leeted farms which went forward for inspection by Mr David Marshall and his party.

S.W.S.G.S. Silage Competition

Analyses (and Marks)

Entry	No.	%DM	Mark	%CP	Mark	%DOM	Mark	pH	Mark	Total
	Maximum		25		15		50		10	100
A	**1a**	34.4	25	12.8	7	58.5	17	4.6	7	56
	1b	36.5	25	10.6	4	57.3	14½	4.4	8½	52
	4a	22.7	16	17.1	12	57.2	14½	4.8	4½	47.0
	4b	21.2	14	14.7	9½	53.3	8	4.7	6	37.5
	5a	33.9	25	12.9	7½	63.6	30	4.5	8	70.5*
	6	20.3	12½	17.2	12	62.8	28	4.9	3	55.5
	7	27.6	22½	12.7	7	62.7	27½	4.5	8	65.0
D	1a	42.2	25	16.5	11½	69.6	49	4.6	7	92.5
	1b	23.7	17½	21.8	15	66.9	40	4.1	10	82.5
	2a	33.5	25	18.7	13½	61.8	25	4.7	6	69.5
	2b	22.3	15½	19.1	14	61.4	24	5.1	0	53.5
	3	21.2	14	14.9	10	55.7	11½	4.3	9	44.5
	4a	27.3	22½	18.4	13½	56.9	14	5.0	1½	51.5
	4b	27.8	23	17.4	12½	55.6	11	4.8	4½	51.0
	4c	33.4	25	15.8	11	60.1	20	4.4	8½	64.5
	5a	23.5	17½	15.4	10½	58.7	17½	4.1	10	55.5
	5b	21.6	14½	18.0	13	59.9	20	4.4	8½	56.0
	5c	19.2	10½	15.8	11	66.4	38½	4.1	10	70.0*
	5d	23.1	16½	17.8	13	57.6	15	4.9	3	47.5
	6	22.4	15½	20.0	15	62.8	28	4.6	7	65.5
	8	24.4	18½	14.4	9½	61.1	23	4.6	7	58.0
K	1a	29.6	24½	18.1	13	64.2	32	4.3	9	78.5*
	1b	32.7	25	17.9	13	61.5	24	4.4	8½	70.5*
	2	22.9	16½	17.0	12	70.8	50	3.9	10	88.5*
	3	31.5	25	11.4	5½	62.3	26	4.4	8½	65.0
W	1a	36.1	25	13.7	8½	58.7	17½	4.3	9	60.0
	1b	34.9	25	13.3	8	61.9	25	4.5	8	66.0
	2a	31.3	25	13.9	9	63.4	29½	4.4	8½	72.0*
	2b	28.3	23½	21.8	15	59.0	18	4.4	8½	65.0
	3a	25.2	20	14.9	10	61.0	23	4.2	9½	62.5
	3b	30.3	25	15.0	10	61.4	24	4.0	10	69.0*
	4a	21.8	14½	14.4	9½	55.9	12	4.9	3	39.0
	4b	32.1	25	15.1	10	55.9	12	4.4	8½	55.5
	5a	25.9	21	21.8	15	61.2	23	4.4	8½	67.5*
	5b	22.2	15½	14.7	9½	64.7	33	4.4	8½	66.4
T	A/2T	49.5	25	14.4	9½	69.7	49	4.5		92.8
	A/3T	45.7	25	12.7	7	65.6	36	4.6		75.6
	D/7	40.9	22½	11.5	5½	69.4	48	4.2		84.4

Is your grassland a wasteland?



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It will be noted that slightly different standards of marking were used for clamps and towers. Towers are designed to hold high dry matter silage and a different scale was used. The pH of Tower silage is not critical and no marks were given. The Tower marks totalled 90 and were adjusted to 100.

The short leet was inspected and marks awarded as follows:—

Tower Silage		**Clamp Silage**	
Feeding efficiency	20	Lack of waste	8
Mechanical efficiency	15	Feeding efficiency	7
Smell/appearance	5	Uniformity	10
		Smell/appearance	5
Total	40	Total	40

The short leeted entries and the marks awarded by Mr David Marshall to the prize-winning entries when he inspected the silages is given below. These are set out in order of the analytical results for clamps and then for towers.

Code No.	**Name**	**Marks Analysis**	**Inspection**	**Total**	**Awards**
Clamps					
D/1a	Charles Gibb, Auchencrieff, Dumfries.	92.5	withdrawn on inspection		
K/2	M. Milligan, Culvennan, Castle Douglas.	88.5	34	122.5	1st Prize Trophy
D/1b	C. Gibb.	82.5	29.5	112.0	2nd Prize
K/1a	R. Irving, Meikle Knox Castle Douglas.	78.5	24.5	103.0	4th Prize
W/2a	T. McCreath, Garlieston, Wigtownshire.	72.0			
A/5a	J. Rennie, Brocklehill, Annbank, Ayrshire.	70.5			
K/1b	R. Irving.	70.5	withdrawn on inspection		
D/5c	J. M. Mathewson, Castlemilk Est., Lockerbie, Dumfries.	70.0			
D/2	A. Smith, Gotterbie, Lockerbie, Dumfries.	69.5			
W/3b	W. Sloan, Mains of Dhuloch, Leswalt, Stranraer Wigtownshire.	69	35.5	104.5	3rd Prize
W/5a	R. Fleming, South Milton, Auchenmalg, Wigtownshire.	67.5			
W/5b	R. Fleming.	66.5			

Code No.	Name	Marks Analysis	Inspection	Total	Awards
Clamps Towers					
A/2T	Ian Gilmour, Humeston, Maybole, Ayrshire.	92.8	29	121.8	1st Prize
D/7T	J. Marshall, Hardgrove, Carrutherstown, Dumfries.	84.4	36	120.4	2nd Prize
A/3T	H. Limond, Drummore, Kirkmichael, Ayrshire.	75.6			

The inspection took two days. Dr Harkess accompanied Mr Marshall on both days. Michael Bannister, Carseminnoch, Newton Stewart, was steward on 20th and Andrew Brown, Roberton, Borgue, was steward on 21st February.

Wigtownshire and Ayrshire farms were inspected on the 20th, a rather wet day whilst Dumfries and Kirkcudbright were inspected on 21st.

The adjudication was presented by Mr Marshall, after a suitable introduction by Mr Robert Graham, Chairman.

David Marshall farms at Highlea, Humbie, and out of 300 acres has 200 acres barley and some potatoes, with about 80 acres of grass. He specialises in 18 month beef, carrying 100 cows and a total of 250 cattle. The cows are zero grazed in the early part of the season and then paddock grazed.

Mr Marshall, a beef man, is nevertheless interested in high quality silage.

Among his comments were the following:—

1. The standard among the short leet was high and he looked especially at the uniformity of the silage left in the clamp and at evidence of wastage either due to the making or feeding of the silage.
2. The degree of chop was closely associated with good silage and only 2 out of the short leet were without a precision chop forage harvester. The extra cost of such a machine is well worth while.
3. High dry matter clamp silage is not necessarily a good thing. Sample D/1a was over dry and became mouldy on the face.
4. Soil contamination was an important contributor to poor utilisation of silage. This was very evident where the swaths had been pulled together (2 into 1).
5. pH values were generally satisfactory with more acid silages where additives had been used.
6. Digestibility of the entries was high and one or two extremely satisfying.
7. Most of the short leeted farms had used additives (only 2 without). Add F, Kylage Extra, Silage Shield were favourites but Dr Harkess would elaborate.

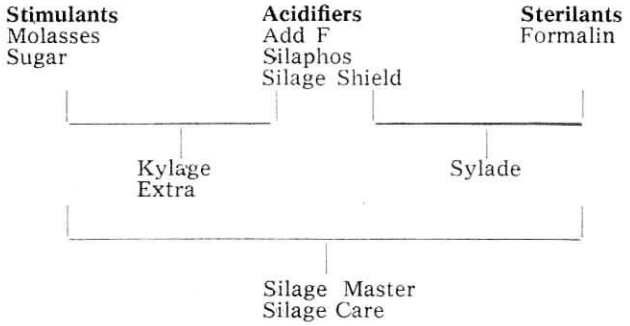
THE TRUTH ABOUT ADDITIVES

Ronald D. Harkess
The West of Scotland Agricultural College

Why ? What ? How ? Where ? When ? Who ? Which ? This talk sets out to answer these questions in relation to the use of additives for silage making.

Why ? We are continually reminded that the loss of dry matter from date of cutting until the moment when the stock consume the silage can range from 20-35%. This loss occurs in four main ways: (a) field losses, (b) oxidation/respiration losses, (c) fermentation process. Manufacturers are not obliged to disclose help in reducing all these. Wilting the crop prior to ensiling can lead to losses particularly if wet weather lengthens the wilting period. An additive can reduce the need to wilt for clamp silage. In the silo, additives help to restrict the growth and development of undesirable bacteria, and encourage rapid acidification. These factors help to retain the nutritive value of the conserved forage. If secondary fermentation problems occur at feeding, a suitable additive will help to control this. Thus, additives are an aid to overcoming the vagaries of the weather, to reducing losses and retaining herbage nutritive value and enabling a regular production of good silage year after year. At the present time, silage additives are not being recommended for use in high dry matter tower silage.

What ? Additives are chemicals of various types applied pure or in mixture in order to offer some control over the in-silo fermentation process. Manufacturers are not obliged to disclose quantitative analyses of their additives but most supply a list of the contents. Basically, there are stimulants e.g. sugars and molasses; acidifiers based on acids e.g. formic acid or phosphoric acid, and finally, the sterilants e.g. formalin. There are mixtures of two of these basic types, Kylage and Sylade being examples and others contain a proportion of all three types e.g. Silage Master and Silage Care.



How ? How much to apply, how much do they cost ? Table 1 summarises these two factors and gives the cost per ton of settled

silage allowing for a 20% shrinkage. Remember that VAT is charged on additives and the costs below do not allow for such arrangements as early delivery dates, cash discounts, prompt payment allowances, bulk order discounts, etc.

Table 1. Costs of additives

Additives	Application Rate per ton	Cost/gl or /lb (p)	Cost/ton silage (p)	Applicator Cost (£)
Molasses	1.5-4 gls.	28-38	52	—
Add F	0.5-0.75 gls.	72	45	28
Silaphos	3 lb	12	45	39
Silage Shield	3 lb	20	75	40
Kylage Extra	3-4 lb	7.5	28	46
Sylade	0.5-1 gl.	65	41	28
Silage Master	2 lb	20	50	39

Where ? The benefits from additives are illustrated in Table 2. The data summarised from many different experiments and are provided only to show the mode of action of the principle types of additives.

Formalin, the sterilant, should stop all bacterial activity. Hence, the pH should be high compared to a no additive control. There should also be more soluble sugars and less ammonia and butyric acid. Molasses and acids stimulate the lactobacilli so some bacterial activity losses are likely but these should be less severe than where no additive is applied. However, feeding problems have arisen with sterilants. 1½-2 gls. of formalin are required to ensure a good "pickle" and lower digestibility values have been recorded with this product. Secondary fermentation can also be a problem since there is no preserving acid present to stabilise the silage once it is opened for feeding. Acid additives can produce a silage with a low pH i.e. 3.7-3.9 and it is believed that too acid a silage can upset intake. The additives which are mixtures are striving for the typical British compromise but care is necessary because being weak in any one ingredient can lead to a falling between the two stools.

Table 2. Effects of Additives on Silage Analysis

	No additive	Molasses	Acid	Formalin
Temp °F	82	88	78	72
pH	4.7	4.6	4.1	5.1
% Soluble carbohydrate	1.17	0.6	3.26	4.5
Ammonia N (% of total N)	10.29	7.7	6.1	3.5
Butyric acid (% of dry matter)	1.18	0.14	0.23	0.7
Digestibility (%)	67	67	68	65
Dry matter content %	18	18.6	20	19
Dry matter loss %	23	20	18	20

Animal feeding studies have shown improved feed intakes and hence milk production and liveweight gains from additive treated silage, but further studies on the feeding aspects are still in progress at many experimental stations.

When ? Good silage can be made without additives provided the weather is suitable, that some wilting is possible and that the crop itself is of suitable silage-making material. Adequate sugars are necessary for good lactobacilli activity. Hence such crops as cocksfoot, timothy and red and white clovers which can be low in sugars or high in protein can be problem crops. The ryegrasses are high in sugars but increasing levels of N fertiliser can give wet crops with a less favourable sugar to nitrogen balance and hence fermentation troubles can arise. The conditions when an additive is likely to be of more use are as follows:—Low soluble sugars, high protein contents, leguminous crops; low dry matter crops; poor weather conditions.

In addition, the aims and objectives of the farming system or type of stock being fed should be considered. Additives are expensive and with a low output system it may be difficult to justify the costs. On the other hand, a dairy herd depending on a large throughput of highly digestible silage should consider any technique to assist in producing top quality silage. The rate of additive applied can be varied according to conditions at the time of lifting, but to be safe in a self-feeding system, all the herbage ensiled should receive at least a trace of additive, in order to offer an even silage face and discourage selective feeding.

Who ? Who is to be advised to use an additive ? There are many ways in which silage quality can be improved, additive application is only one of them: If you can answer ' yes ' to each of the following questions then you should consider trying an additive—

1. Are you using the best varieties in your seeds mixtures ?
2. Are you cutting your swards at the correct stage of growth ?
3. Are you equipped and organized to cut, lift and ensile the grass quickly and with minimum delays ?
4. Are you maintaining a minimum surface area at the silo during filling ?
5. Are you using plastic sheets during filling and for final sealing?
6. Are you having your silage analysed to assist your feeding plan and to record the success or otherwise of you silage making efforts ?
7. Are you producing a fairly good silage fairly regularly but are not quite satisfied ?

If you answer yes to all of them you could benefit from an effective additive.

If you answer ' no ' to these questions I suggest that you make fuller use of the grass varieties available and exploit their inherent quality and yield characteristics by more timeous cutting. Check that your forage harvester is not worn out. A new and better one will only cost you 2/3 years additive if you are making 1000 tons

plus per annum. Check too that your whole silage team matches up e.g. correct tractor HP, sufficient trailers of the best capacity in order not to hold up the harvester, automatic rear doors on the silage trailer and automatic hitches for rapid turn round of trailers. Use the plastic sheets correctly — each night or when filling stops for longer than 6 to 8 hours. When sealing, ensure close and complete contact between sheet and silage in order to eliminate air pockets. You cannot formulate a sensible winter feeding programme without a knowledge of the value of the silage. All these factors can aid silage quality without recourse to the use of additive. Remember additives are not the salvation of poor silage makers, they are icing on the cake of the good silage producers.

Which ? In theory, the order of effectiveness of additives should be sterilants, acidifiers and stimulants. Unfortunately, problems in the use of formalin as an additive are not as yet completely solved. Molasses has become too expensive and is difficult to apply. Ease and thoroughness of incorporation is particularly important if the additive is to do its work. So the organic acid additive appears at the moment to be the best buy. The powdered product Kylage if properly applied is one of the least expensive on the market.

DISCUSSION

Panel: Dr R. D. Harkess—'The College.'
Mr David Marshall—Guest Judge.
J. N. Watson, Esq.—'The Hannah.'
Michael Milligan—The Champion.

Q.1: Do acid additives eat into concrete silos ?

A. Yes they do, but not much more than good silage prepared without additive. It should have a pH of 4 to 4.5 and the acid additive merely makes sure that the pH gets down to this level.

Q.2: What does the champion think of Dr Harkess's reasons for not using additives i.e. making sure that all other actions have been attended to ?

A. M. Milligan agreed broadly but considered that there were positive reasons also which could be considered. He was making a vast amount of silage and speed of operation was vital. He needed uniform and predictable silage and used Add F on everything in order to give this reassurance. Without it he would not reach his target quantity.

Q.3: Do acid additives affect intake ?

A. They increase intake by making possible higher D values (digestibility) and reducing losses by reducing breakdown of protein and reducing formation of butyric acid and by increasing palatability.

Q.4: How do you recoup the extra cost of additive—by economies in other feeds ?

A. Michael Milligan considered that losses were reduced and he obtained a higher yield of stock feed per acre. This was followed by a higher intake and consequent reductions in use of other feeds which finally resulted in higher milk production from a cheaper feed. His own winter feed policy averaged 2.5 lb concentrate per gallon through the winter made up of three phases in feeding. Over the first 90 days of lactation, he was generous. Then he cut back on the next 90 days with token feeding on the 3rd 90 day period.

Improved intake was not peculiar to Add F. John Watson of the Hannah Research Institute, described an experiment in which super silage was made from grass in the grazing stage. It had the following vital statistics, 71.8 D value equivalent offered. Given as the sole feed 3 times a day, cows took in 108 lb. The %DM was 19.5 so that they were eating 21 lb DM per day or 15 lb DOM (digestible organic matter). Production through the winter averaged M + $3\frac{1}{2}$ gallons/day.

Q.5: How important is % DM ?

A. (a) A high DM content and high SE value are important for beef fattening so that silage can replace barley.

(b) DM is less important than DOM. To get high D.M. speed of stacking is important and it is not worthwhile waiting to wilt the herbage in the field and certainly not worthwhile letting the crop grow on to maturity to get a higher dry matter content.

(c) DM % is important in making and feeding silage. For example, at 25% DM there is no effluent loss unless the silage is built to a height of 12 feet or more when pressure will squeeze out the juice.

Better fermentation occurs after wilting because wilting increases the sugar content.

(d) Large Friesian cows grazing fresh grass manage to consume 200 lb grass per day even though it has only 10% DM.

(e) Low DM herbage treated with acid additive could have such a concentration of additive that intake of the herbage is reduced. This is a problem recognised at the Grassland Research Institute and was the reason why they began to experiment with formalin and the basis of the additive Sylade, a mixture of Sulphuric acid plus Formalin to damp down this acidity.

Q.6: Among sterilants isn't Co_2 gas the most valuable, and this is cheaper than any additive.

A. Co_2 gas is produced by the cut herbage itself as it respires—taking oxygen and breathing out Co_2. If this process

continues, the herbage will heat up and losses will be astronomical. If the supply of oxygen is cut off and the CO_2 trapped in the herbage, it builds up and completely cuts off the fermentation and cuts down all losses. This is exactly what happens when you smother a fire.

This principle is used in the construction of sealed towers for herbage or moist grain.

However, it is not necessary to go to the expense of a tower to get this advantage but it is necessary to make the fullest possible use of **Plastic Sheet Covers.**

Rolling to consolidate the mass was and is widely recommended but the modern fine chop crop will consolidate itself and will complete the job of preservation if properly covered early and continuously.

The sum of advice on this was to build silage with as narrow a working face as possible. Get height of up to 12 ft and use fine chop material. Cover with a close fitting weighted plastic sheet every night during filling. Standard black sheeting was O.K. 2-3 layers were better still using older torn sheets along with a new sheet.

Butyl rubber sheets could be more long lasting but they were very heavy to pull on and off, very dear (1 butyl sheet costs as much as 13 plastic sheets) and after a season, the rats would gnaw several holes through them.

Q.7: What dates were the top silages cut ?

A. Michael Milligan's hay was harvested 25th May, after two dressings of N, early and late. A second cut was taken first fortnight in July and a third crop after corn harvest, each given about 100-120 units N/acre.

Ian Gilmour, top tower silage maker and, incidentally, winner of the Barn Dried Hay Trophy for Scotland took his first crop on June 4th.

6. FARMING WITHOUT FERTILISER NITROGEN

Talk given at Newbridge, Dumfries, by S. Mayall, Esq., Lea Hall, Shropshire

The wheel has turned a complete circle. I visited this area before the war and was struck by the high value placed by the local farmer on the muck-heap. A farm was judged by its handling of muck. After all, in those days dung was the only source of fertility.

Shortly after the war, I visited the Hannah Research Institute when they were aiming to demonstrate how much could be produced on the basis of grass alone. They were using enormous quantities of fertiliser N. Experimentally, levels were beyond reason as is proper in experimental work. From about that date,

farmers have turned more and more to fertiliser nitrogen to the extent that more of them think it is impossible to farm without fertiliser N. Yet for 25 years, I have farmed in Shropshire without N, without P and without K.

Today, with the prospect of increased cost of fertiliser and restricted supply, farmers are once more turning to systems which are less dependent on fertilisers.

Lea Hall Farm. Along with my son, I farm about 1,300 acres on organic principles. Lea Hall Farm is just under 600 acres on sandstone with varying soil depth from just a skin down to 3 ft. We keep 250 cows in milk and rear all our own females. We have 85 sows and take all their offspring to bacon weight. Since stepping up the cow numbers we have given up the sheep flock but take sheep in for wintering. At the moment, there are 400 ewes on the land. In return, I graze some of my yearling cattle away. All in all, our stocking rate is 1.05 forage acres per livestock unit.

The cropping is based on 4 years in grass followed by 2 cereal crops. All the produce of the cereal crop is sold as flour. I even send oatmeal to Scotland.

Why did I give up using fertiliser ? Twenty-five years ago, I had a bout of infertility in my herd of cows. Advisers came from all sources and concluded that there was no disease or infection in the stock. It was ' metabolic delayed ovulation ' brought about by mineral deficiency. It was actually cured by liberal feeding with fish meal.

I came to the conclusion that the cause of the trouble was neglect of our basic resource—soil fertility. Farming was following the wrong signpost. Most farmers and their scientific advisers look on the soil as merely a medium in which to place artificial nutrients as fertilisers according to the amount of crop required. The natural ability of soil to produce a crop is ignored. All you need to produce the maximum crop is a really fertile soil which by definition is deep, well drained, has a satisfactory pH and is capable of producing high yields of highly nutritious crops. Most farmers add three words to this definition " when adequately fertilised " but I have proved that when soil is really fertile, no other additions are needed. Our farming system must be designed to ensure that soil becomes fertile and remains fertile.

A fertile soil is a living world—teeming with life. On average, there will be two or more tons of living matter in the top nine inches of soil and you can't maintain two tons of cattle/acre on the surface. You can see the worms and leatherjacks but there is much you can't see — down to the uncountable bacteria. It is a world similar to our own, which demands food and experiences competition between life forms and is all part of a chain which breaks down vegetable matter into humus — and it is humus which provides the structure necessary for a fertile soil. The art of husbandry is to maintain the activities of soil life.

Imbalance. A fertile soil is a finely balanced world. The balance is easily upset. We have had many instances recently of the dangers which can arise when a small apparently unimportant action is taken and how the effects can persist and ramify along various life chains. There was the case of the hysterical fox hounds. This started with farmers dressing seed wheat with an insecticide to overcome damage by Wheat Bulb Fly. The wheat grains were eaten by pheasants—died—and were in turn eaten by foxes. The foxes became dopey and an easy prey for fox hounds who developed hysteria because the insecticide damages nerves. There are many other instances of similar chain effects which are not immediately apparent.

Promiscuous use of modern fertilisers introduces imbalance into the soil. Even when a complete fertiliser and lime are added to a soil—we are only putting in N.P.K. Ca and possible S. (Sulphur) out of the 24 minerals essential to life. The net effect is often that trace elements which can be as important to soil fertility as the major elements are locked up.

In all the years we have followed organic farming principles, we have had only four cases of hypomagnesaemia and those in related animals.

The organic principles. Most people have a vague idea that ' organic farming ' is negative farming. It is full of " don'ts." Don't use fertiliser. Don't use insecticides. Don't use seed dressings. Don't use fungicides. Following all this negative advice without also taking positive actions to raise soil fertility is useless.

The necessary positive action is to ensure a continuous flow of vegetable matter to the soil and to assist its decay in the right direction by first turning it into compost. It seems at first to be a rather cumbersome, time consuming job but with modern equipment can easily be fitted into the farm routine.

Only three things are necessary to produce good compost. Air, Water and Vegetable matter. Our climate is wet enough. Air is ensured by turning the heap of vegetable matter over. The vegetable matter is largely straw, dung, urine and any waste organic matter.

Our normal practice at Lea Hall is to take the waste material to the field where it will eventually be used and set it up with a power take-off spreader in a long heap about four or five feet high. Aeration of the heap is speeded up by driving 3″ stakes into it at approximately 1 yard intervals. Dry straw is not really suitable, we use well dunged straw. After a short interval, steam will be seen and the temperature will be found up to about 160°. When the temperature falls back to about 90°, it is time to turn it again by pushing it over with a fore-loader. Alternatively, it can be picked up again with a fore-loader and re-spread with the P.T.O. Spreader. The bulk of such a compost will come from straw. It is our practice to make a different type of compost in August when

there is more green matter available. This is more like garden compost. Small quantities only are possible but this is added to the winter compost heap as a starter. All the compost produced goes onto the grass crop. No other fertiliser is used for the grass. The two corn crops grow on what is left from the four years in grass.

Seed Mixtures. I used to sow complicated mixtures but most of my leys are now conventional ryegrass/timothy/white clover mixtures. Only 1 lb of white clover is used because the system encourages vigorous development of the clover. Herbs are added to all mixtures. There are many herbs which could be used but most of them are suitable to chalky soils. The most reliable are chicory and ribgrass. Both these are rich in minerals, palatable to stock and because their deep roots help to manufacture soil structure.

I don't like using herbs in a herbal strip because although in that way they provide a mineral supplement for livestock, they do not assist in the maintenance of soil structure.

I would like to use a wide range of herbage plants. My outlying fields have meadow fescue and tall fescue in the mixtures. I believe that mixed cropping and mixed livestock enterprises are the ideal from a good husbandry point of view but there is a conflict between good husbandry and good economics. Economically, it is necessary to specialise but it is for each individual to work out for himself what compromise he adopts between the demands of husbandry and economics.

This principle applies to all aspects of the organic principles of farming. There are circumstances where fertiliser may be necessary to correct a major deficiency and raise the level of stocking but the principle to be followed is to use such circumstances as a supplementary exercise and to rely more on improving the natural fertility of the soil.

DISCUSSION

Q.1: Can you enlarge on your system of dairy herd management ?

A.1: The 250 cows are in two lots kept in loose housing and a herring bone parlour. Milk yields average 1185 gallons for the cows and 985 gallons for the heifers with an overall average of 1050 gallons sold per cow and heifer. Normal winter feed consists of ad lib silage with 4-5 lb hay and some brewers' grains. Up to three years ago, all the cereal feed was home grown but nowadays all our cereal goes for flour and I buy in concentrate. I get M + 1 or M + 1½ from my bulk feeds and feed the cake at 4 lb/gallon. In the summer, I use a form of strip grazing. My fields are 20 to 30 acres in size and are divided into 3 long strips with semi-permanent fencing. The strips are then rationed by daily moving an electric fence, with a back fence to avoid regrazing more than 3 days regrowth.

After every grazing except the first spring grazing, I top the strips immediately the cows leave them. The fields may also be harrowed. If I put slurry out, it goes on immediately the cows have finished grazing. It is rarely put onto grazings during the summer but when it must go on, it is important not to delay the application.

Q.2: How do your cereals fare without fertiliser ?

A.2: Yields over 200 acres have averaged 35-38 cwt. for Wheat, Oats, Barley and Rye. My top yield has been 47 cwt. I envy my neighbours with their 40-60 cwt/acre, but understand from NAAS that the West Midland average is 29 cwt. There must be many with lower yields than I have. In comparing my yields, allowance should be made for the fact that I must use a milling variety and that I need straw. Contrary to most expectations I have surplus straw to dispose of. I hitch a chopper behind the combine which spreads the straw over the full width of cut. I then slurry this at double my normal dose. The normal dose would be 1000-1200 gallons (undiluted) per acre. This is rotavated shallowly 2 to 3 times before sowing.

Q.3: How do you manage to secure big crops of hay and silage without fertiliser ?

A.3: We don't use a lot of hay and I usually take a rather light hay crop after a spring grazing. Silage is the main winter bulk feed. This is shut up in early winter.
All the grass is given 2 loads/acre approximately i.e. 5-6 tons, of compost. I used to bring in poultry manure but find that I can easily run into difficulties from too much N — this is possible from organic farming as well as from bag fertiliser farming.

Q.4: Do you use lime ?

A.4: Of course. If required by soil analysis, we will apply lime. In fact, only 1 field has been limed since 1948. Regular tests have not shown any lime deficiency. Our lowest pH was 5.8 in 1940. That field has never been limed and now has no deficiency.
Calculations of the amounts of calcium that have gone off our fields as milk, livestock, crops, etc. would lead one to expect that a deficiency would arise but there is no sign — in fact, our pH is rising.

Q.5: How about P and K on your soil analyses ?

A.5: In preparation for a visit by the British Grassland Society, three summers ago, NAAS did a complete soil sampling and came up with evidence that about 100 acres was desperately short of K. Search as they might, there were no signs that crops were suffering. Our top yield of cereal came from this

same land. Our clover shows no sign of potash deficiency and it is far more sensitive than grass.

The fact is that soil analyses for P and K by the normal methods can be misleading. They depend on imitating the action of the plant not in sorting out how much P and K is available in the soil.

All are agreed that within most of our soils, there is enough P and K to provide maximum crops for 100 years. I believe that my system of farming makes these readily available to crops whilst other people's systems fix them.

Q.6: How much supplementary feeding do you give at summer grass ?

A.6: My overall concentrate usage is 3.55 lb/gallon. In early summer, I feed at over 5 gallons, in mid-summer at over 3 gallons and from August on at over 2 gallons.

Q.7: How would you change over to the organic farming principle —suddenly or gradually ?

A.7; My advice would be to proceed to change as each ley is sown down—with no fertiliser applied to that field thereafter.

Q.8: (a) How much staff does the farm carry ?
(b) What is your seasonal milk pattern ?
(c) Calving Index ?
(d) Financial Index ?

A.8: 11 plus 6 on flour preparation.
Mainly calving in Autumn.
387 days.
Margin over concentrate. £151/cow.

7. CHEAP MILK FROM SUMMER GRASS

Charles Platt,
Woore Hall, Woore, Nr. Crewe.

Talk given at Glenluce, 17th January, 1974, to South West Scotland Grassland Society.

Mr Platts farm was visited by the British Grassland Society in summer 1971 and by the British Animal Production Society in 1972, but his talk to our Society was largely concerned with a development since those visits. He spoke of a meeting in mid Wales at which Dr Castle was describing his experiences of 'Set Stocking" dairy cows and was so impressed with the possibilities that he tried it out this year with considerable success. Earlier, in fact, in 1963, he had changed to 'Summer Milk.' The first essential in achieving this system is to ensure calving within a few weeks in spring. Last season, calving took place over seven weeks with about half in the first fortnight. 180 cows calved in suc-

cessive weeks as follows:—33, 53, 35 and from 10 to 20 per week for a further four weeks.

This was the most important requirement and most hectic period of the system. It was essential to plan for it and adopt any measure available to simplify the work. The work starts at about Xmas Day when the cows are put on once a day milking and completely dried on New Years Day. Six weeks before calving, the 'steaming up' begins. The '33' to calve first are fed 2lb/day/head concentrate and their ration is raised each week until calving to 4, 6, 8, 10 and 12lb/head/day. In the second week, the next batch of 53 begin their feeding at 2lb/head/day.

By the seventh week, there will be cows in all stages, some calving, getting their maximum of 12lb/head/day and other groups at 10, 8, 6, 4 or 2lb/day. It could be rather confusing but is made easier by using different coloured paint to dab on top of the neck of each group. They are calved in a loose box and then given a dab of paint on the tail and moved into a communal yard until fit for the scramble at the silo face. They are milked ahead of the rest of the herd. For the 14 days, they get a rather low concentrate feed and then, whilst still on silage, a full 4 lb. cake per gallon milk produced.

Grassland Management. During 1973, he 'set stocked' cows at 2 per acre of grass the whole season. The herd was split into two lots of about 80 cows each, the quick and the slow milkers. Each of these grazed two fields, a day field and a night field. All four fields are based on late perennial ryegrasses — Aberystwyth S23 and Melle. In addition, there are fields set aside for silage — based on the early perennial ryegrass — Aberystwyth S24.

When the S24 is ready for grazing, the cows are put out to it, erring on the early side when there is 3" or 4" growth. As soon as the late ryegrass fields are ready, the cows are moved in and set stocked — i.e. grazed without a fence over the whole grazing area with just the change over each day from day paddock to night paddock. The conservation area is mown 3 times for silage but could be used as a reserve grazing area if grass gets too tight after midsummer.

Manuring. All the grass was given 70 units N/acre in March. A further 70 was given in mid April and 50 units five times thereafter at monthly intervals making a total input of 390 units N/acre. The silage fields were given two further doses of 100 units N/acre. This is a simple manuring plan. The trouble with paddocks was that the tractor driver seemed to be forever on the job. Now he is working on the grassland 1 day a month.

Results

The cows responded well to the system. There have been no ill effects of applying fertiliser N whilst the stock were grazing. Production of milk reached 930 gallons/day and 1000 gallons/day is expected. Throughout the summer, concentrates were fed for

every gallon above 6 gallons/head per day. This was certainly only a grass replacement and will be cut out altogether in 1974. Grass was short in July and it was necessary to bring in some of the silage aftermath.

This year, the stocking rate at the beginning of the season will be raised to 0.46 acres/cow and eased off from mid July to 0.55 acres/cow. The cows seemed to be very contented and after milking went out to the grass and lay down (maybe because there was nothing to graze!). They never roared (maybe they were too weak!).

Calving. Nominated AI is used aiming to calve at 2 years old or under. The calves are left on the cow for 3 or 4 days to get as much colostrum as they can and then put on milk substitute in a lean-to calf house. They are weaned to a larger shed and finally get 7 lb/conc./day before they are put out to graze the silage aftermath. They get 2 lb barley and then none for 6-8 weeks. They are wintered on silage and 6 lb conc./head and go out to the bull on May 15th.

Conservation. Silage is the basis and in spite of being a summer milker, silage quality is still important. It is made in a bunker silo on the wedge principle with the 3rd cut at the open face ready for use first. The 1st cut crop becomes available when it is most needed.

With just one boy and a tractor driver to milk about 900 gallons a day, all the silage-making is contracted out to 2 contractors who between them cut and clear 110 acres in a week.

In a mad moment, 2 big trailers were purchased with a view to doing the job himself in 1974.

Figures	**1972**	**1973**
Gallons milk	168000	165045
Average No. cows in milk ...	162	162
Gallons/cow	1,047	1,013
Concentrates/cow	24 cwt.	16½ cwt.
Margin over conc.	£169	£178
Gross margin/acre	£127	£130

With concentrates at £80/ton, he must produce 20 gallons per cwt. fed. He can afford to drop 100 gallons milk/cow by cutting concentrates and still maintain his margin.

Discussion. Mr Platt was closely grilled for two hours. Summer milking was a traditional system in Glenluce but based on clovery swards and relatively extensive management. Variations on his 'set stocking system' were considered. Mr Platt thought that 3 or 4-weekly paddocks were the worst of all worlds but was prepared to concede that using his 4 fields for a daily shift with 3 day rest periods might be as productive as his own version of set stocking but it would be less simple to operate.

Nitrate poisoning is one of the hazards we all expect when a sward is grazed too soon after applying fertiliser N. There is

no explanation why Mr Platt's cows were immune and why Dr Castle's dairy cows were also immune. The nitrate is there alright.

P and K are not applied to the set stocked area but the whole area was heavily slagged in the winter and the mowing area given 70 units K. Slurry is collected in a lagoon and put out on the fields to be ploughed. Last summer was perhaps not typical, and if a dry spell came, then he would feed silage, or more supplementary feed or use the conservation areas.

The silage is calculated to provide 2-3 gallons milk in November. Some of this comes off the cows back. The cows are dry through the winter and only need maintenance from the silage. In spring they reckon to get 4 gallons from the silage.

8. INTENSIVE GRASSLAND FARMING

A discussion meeting of S.W.S.G.S. held at Balscastle Hotel, Thursday, 14th March, 1974.

Openers: Jack Rennie, Brocklehill, Annbank.
Ian Mitchell, Commonside (now Shacklehill), Annbank.
Alistair Morison, Dumfries House Home Farm, Cumnock.

1. Jack Rennie — Brocklehill, Annbank.

Jack is a leading breeder of Ayrshires carrying 100 cows and 150 followers on 170 acres grass with 40 acres barley. The bull calves are all retained for stock or beef.

Grazing System. Six years ago, when cow numbers were increased from 66, the system changed from rotational grazing of 10-acre paddocks to strip grazing within 10 acre paddocks. None of the grass is grazed through the winter from November to April. There have been no sheep kept for some years. Grazing and silage making generally alternate through the season.

The grazing land gets 60 units N every grazing. Total N application is 250-350 units per year. In spite of this, there have only been 3 cases of staggers in 10 years and no cases of bloat.

A perennial ryegrass/timothy mixture is used with no clover but this year because of possible high cost of fertiliser, some clover will be included in the mixture to provide the option of cutting down fertiliser N later. Grazing is not tight and 4″-6″ is made available at every grazing.

Silage cutting has changed from the Lundell Flail to a Double chop and this year to Precision chop. 1st and 2nd cut silage go into two separate sides of a covered silo with 9′ high walls and finished silage to 7′0″. Polythene sheets are used to

cover the silage. All silage is wilted in the field and an additive used. The silage crop is given 100 units N per crop. Soil analyses are checked. Slurry is applied to all grasses but not to grazing land after February. No K fertiliser is used.

N usage has gradually been raised over the years. If there is to be a change in the cost relationship of N, N will be cut back gradually to 80 units for each silage crop and to 40 units for each grazing.

Forage quality is very important. The cows average 1,200 gallons milk at 13.0% total solids with a low input of concentrates. For the winter, a mix based on home grown barley with 16% protein is used. In summer, a 12% protein mix is used for over 5 gallons/day. This averages 23 cwt. concentrate per cow per year. More than 9 or 10 lb. per head per feed is impossible in a herringbone parlour. More could be used in winter but it will be necessary to arrange some additional outside feeding area.

Top returns have been £286 sales per cow with margin over concentrates of £240 per cow.

2. **Ian Mitchell, 'Commonside' (now Shacklehill), Annbank.**

Ian Mitchell has been in the news for many years and is known widely as from 'Commonside.' He, with the guidance of David Metcalfe of S.A.I. stepped up productivity tremendously by being the first man in Scotland to use the 21 paddock system of grazing originally developed in Wales and Cheshire.

A filming of the system was widely shown. Since that time, Ian has moved to Shacklehill, taking his acreage up from 70 to 230. Both farms are alongside each other and easily managed. Commonside continues in the daily paddocks. They are now long and narrow of 3-4 acres each and can easily be shortened to $\frac{1}{2}$ size or $\frac{3}{4}$ size if the amount of grass is too much for the stock or the paddocks can be made to last $\frac{1}{2}$ day up to 2 days. The system has lost its rigidity. The swards at Commonside remain good. Originally, they were fairly old pasture possible 10-12 years old. Regular close grazing has improved the amount of ryegrass. The basis was probably S23, which has developed into a very tight sward resistant to poaching. Some more productive Italian ryegrass mixtures have been introduced at Shacklehill and to guard against loss through winterkill, some early perennial ryegrass has been mixed in. These swards give massive cuts per year for silage and late grazing. The quality seems good and the product palatable. This Italian ryegrass has enabled Ian to bring his stocking down to 0.8 acres per cow.

He has diversified and fattens 350 ewes on Kale direct reseeded into barley stubble. The sheep have been used to graze down swards in the back end and prevent them opening

up as is usually found with high N. Silage is made in outdoor clamps with sides of sleepers. One silo 130ft. x 35 has old 'prefab' floors as the sides and holds 500 tons of silage. It is self fed.

3. **Alistair Morison — Farm manager, Dumfries House Home Farm (Marquess of Bute), Cumnock.**

Alistair is a newcomer and has brought in a number of ideas from across the border. He is a beef man in contrast to the two dairy men and farms 1000 acres largely for a single suckled beef herd. Stock numbers are down to 150 cows at the moment because they are going accredited. Purchased store cattle are fattened until cow numbers grow. At present, there are 810 fattening beef animals and 650 ewes for fat lamb production. There are also 200 acres of cereals used to feed the cattle. The remaining 800 acres is grass, of which 120 acres are sown to RVP Italian ryegrass for silage and autumn grazing. The Italian ryegrass is part of the arable rotation. The remaining grass is permanent grass which has not been ploughed within living memory.

Rainfall is high and heavy crops easily become laid and difficult to harvest. The RVP is sown at 16 to 20 lb/acre. Each cut is given 100 units N. P and K are supplied partly as slurry totalling 180 units K and 100 units P per acre per year.

3,000 tons of silage are made taking 250 acres at the first cut at 30 acres per day on a good day and down to 10 acres on difficult days. Punctures in trailers have been troublesome due to scuffing the tyres on the concrete roads. When trailers are loaded with 5 tons of silage, the tyres readily pick up lumps of iron. Two spare wheels are carried ready so that no time is wasted repairing punctures. Silage is made from wilted grass bulk raked into clamps and covered with polythene sheeting. High quality silage is essential and additives well worth while. The cost is covered by the reduction in waste at the sides and top and from the improved performance of the silage. Final cuts of RVP have been taken in October. Such grass is very wet, has no ears and must be treated with additives. 30 acres of this type of silage finished 100 heifers eating 34 lb. silage + 3 lb. barley per day. This cost, 7½p for barley at £56 per ton and 6½p for the silage per day. Without silage, 20p worth of concentrate would be needed to just maintain the stock.

Instead of Hereford/Friesian crosses, a South Devon bull has been tried and gives an extra 2 cwt. per head.

Discussion

Q.1 Which additives are used?

A. Ian Mitchell used Add F 4 years ago, but was not satisfied that it was worth while. Last year, he used Sylade at ½ gallon per ton on especially wet herbage and was very satisfied with the feeding of the silage.
J. Rennie — It is very difficult for a farmer to decide which additive is the best. He tried half of the silage with, and half without additive and is convinced of the value of additives. He used 'FSL' but believes that Add-F would be the better value. It is important to know what is the composition of additives. Some are better buys than others.
Alistair Morison — He is convinced of the value of additives and will be changing to Add-F from Silage Shield.

Q.2 Mr Rennie's margin over concentrates of £240 per cow is amazing. What was the secret of such a high figure?

A. **J. Rennie** — It was the top figure produced in 1971. The 1973 figure will be down and the future looks worse. To reach these figures it is necessary to grow your own barley, prepare a home mix.

Q.3 What plans have the speakers made for the future?

A. **Alistair Morison —** The price of beef was rising but reached a peak in June and thereafter fell. Cattle are selling now at the same price as was obtained 12 months ago but costs are up 30%.
With 200 acres of cereals, 150 tons of barley can be sold at a high price. The full effects of the increase in oil and fertiliser prices has yet to come and there must be increased prices for beef.
J. Rennie — Foretelling the future is difficult. There is only one method of putting matters right and that is a shortage of milk and a boost in price to restore production. With a plentiful supply of milk, the farmer suffers every time.
I am sorry for farmers who have completed big development schemes on borrowed money. There is no prospect of feed costs coming down and the only solution is to cut back on yields towards self sufficiency. There will be more profit in lower outputs per cow and per acre.
Ian Mitchell — So far increased stock numbers has been profitable but the peak has been reached at 0.8 acre per cow. This might be raised by going in for zero grazing but this would create its own problems.

Q.4 What rotation do the speakers follow?

A. **Ian Mitchell** — My Italian ryegrass/perennial ryegrass mixture is sown after barley and cut twice a year for two seasons

and then put back to barley and undersown with a 4 year ley.
J. Rennie — I have followed 2 years barley with 5 years grass using a perennial ryegrass/timothy mixture. This has been generally cut or grazed alternately giving 3 or 4 grazings per year. I have never used Italian ryegrass.
A. Morison — The furthest fields are in cereal followed by Italian ryegrass in rotation.

Q.5 Have the speakers considered turning to clovers now that the price of nitrogenous fertilisers is rising?

A. **J. Rennie** — I am trying it this year and proposing to cut back on N fertiliser.
Ian Mitchell — So far, I have not required clover. The continuously grazed swards are beginning to show some white clover which appears to improve palatability of the grass.
A. Morison — Clover has been sown in the permanent mixtures. I am interested because white clover can be equivalent to 150 units N/acre.

Q.6 October can be wet and grass can be lush. How do the speakers cope?

A. **A. Mitchell** — I rely on my 200-300 ewes to graze off, otherwise I believe I would suffer winterkill.
J. Rennie — No experience of this problem.

Q.7 Have the speakers any experience of Kale or rape?

A. Soil is too wet for strip grazing kale and the cows get too dirty.
Robert Graham has been drilling kale into paraquated grass for some years. A poor crop resulted when seed was sown 20th July, 1972. This year it was sown 10th June and grew to 6ft. and was blown flat by gales and frosted.
Canson kale was suggested as a useful variety capable of standing up to frost.

9. VISIT TO SCOTBEEF: THE CENTRAL SCOTLAND GRASSLAND SOCIETY, 24th APRIL, 1974

Thirty-eight members of the Central Scotland Grassland Society visited Scotbeef Limited at East Kilbride, on Tuesday, 24th April, 1973. On this occasion, they were also joined by three members of the South of Scotland Grassland Society who had travelled from Dumfries and a few members of the Lanarkshire Agricultural Discussion Society. Mr Lex Smith, Chairman of the Society, welcomed the company and made fitting reference to the death of the treasurer, Mr John Waddell. The members paid their respects by observing a minute's silence.

Mr Alec Wilson, the manager of Scotbeef, was introduced, who in turn introduced two of his colleagues, Messrs Ferguson and McKnight. The members thereafter divided and each of these gentlemen took their group through the plant. The members were much impressed with the layout and the equipment, much of which was of Scandinavian manufacture. The animals are processed from the live lairage area right through to finishing as corned beef, mince or stew in various sized tins. All meat, however, is not canned since there is a substantial fresh meat trade to the retail chain of shops as well as to supermarkets and other outlets. It was unfortunate that the plant was not operating since although one could appreciate the hive of activity which occurred during the day, static machinery has less appeal. The demonstrators did an excellent job to explain the various processes which took place. Quality control is exercised throughout the production line and a fully equipped laboratory is maintained, also a sick bay with its own doctor and nurses.

Following the tour of the plant, members of the MLC staff, Messrs Martin and Hart gave an excellent demonstration on a range of carcases on the new carcase classification scheme. Mr W. B. R. Elder voiced the appreciation of the members to all who contributed to this novel and successful visit of a Grassland Society.

10. TOMMY DALE ON FARMING

(An address to the Central Scotland Grassland Society by Mr Tommy Dale, Scoughall, North Berwick, and his manager, Mr Neil Fox).

Buildings and Management

The cows are housed in cubicles which were built 8 years ago to house 230. All the stock are fully accredited. The cows, approximately 200 Friesians, are autumn calvers with an additional 120 bulling heifers being kept. Milking is done through a 10 unit Alfa Laval herringbone parlour. All the cows are served by A.I. The top 25% being put to a nominated sire, the middle 50% take the bull of the day, whereas the bottom 25% are served by a Hereford. A calving index of 372 days is achieved with all calves being reared to 12 weeks, at which point the bulls and poorer heifers are sold. For the young stock, a leader/follower grazing system is employed with the yearlings getting first bite, followed by the 2-year-olds. 45-50 dairy replacements are kept and are calved down at 2-2½ years. The dairying business is worked by 3 men on a 5-day week though a tractorman works at the slurry and silage.

All the feeding is done by the dairyman and during the winter consists of 10 lbs draff, 15 lbs potatoes and 40-70 lbs of silage. This gives Maintenance + 2 gallons. High yielders are fed a 73% S.E., 15% D.C.P. cake for the remaining gallons. In addition an acreage of kale is grown and cut and carted with a forage harvester.

Brussels sprout stalks are also fed. The cows are zero grazed during the early season and again in late summer, this being made much easier as a good road passes straight through the farm. Irrigation is practised to achieve the remarkably good 0.7 acre requirement for grazing and silage.

Silage

Two types of forage harvester are used on the farms. The silage is made using a precision chop machine whilst a double chop is retained for zero grazing. The silage fields are split into blocks of 35 acres, grass varieties being mainly Premo and Gremie perennial ryegrass with tetraploids included in grazing swards. Slurry from the cubicles is applied to grass during the winter with high levels of N following in the spring, upwards of 300 units. Cutting for silage starts towards the end of May. A rotary mower is used and the crop then wilted for up to two days in order to raise the dry matter to 28 - 30%. The grass is put into clamps to a settled depth of 6 - 8 ft using a push off buckrake. The clamps are sheeted temporarily each night and when full are fully sealed with polythene weighted down with old car tyres. The aim is to make silage with a 15% S.E. and a 2.5% D.C.P. Additives are not generally used unless damp, lush conditions prevail.

The grassland management allows only 0.7 acres per cow for grazing and silage with most useful results, namely from 191 cows an average of 1190 gallons of milk were sold using 22 cwts of cake and 5 cwts of propionic acid treated barley. Milk sales per cow were £261 with a margin over feed of £182.

During question time the growing of maize for feed was raised and if possible 5 acres may be sown this year as a look see. On the use of A.I. a firm belief in proven sires was expressed, though bulls continue to be used on heifers. In relation to the so called exotic breeds, Simmentals are being used on the Hereford x Friesian beef cows. Mr Dale thought there was a good future for beef produced economically with the hill cows fed 60 - 70 lbs of late made silage with 2 - 3 lbs of oats, now replaced with brock potatoes. The need to store slurry was expressed as this would become an increasingly valuable commodity. All grass seeds in the spring are undersown under barley, though autumn direct reseeds follow a second early potato crop.

11. GRASSLAND SPRAYING: PROFIT OR PITFALLS

A. B. Wright, Fisons Limited

Grass is the largest single crop in the United Kingdom, amounting to approximately 18 million acres with about 13.5 million classed as permanent grass or long leys. Although grass is the largest single crop, the percentage which is sprayed for weed control is very small, and most of this is sprayed when the ley is

sown down. Why is so little grassland sprayed whereas in other crops, most of the acreage is treated ?

Weed control in established grassland is more complex than with arable crops. Usually the type of weed and degree of infestation are closely connected with management factors such as drainage, fertility levels, under or over-grazing and cutting intervals. Lasting improvements cannot be achieved on wet land until it has been well drained, as weeds are better able to withstand acidity or low nutrient levels than are good grass species. Until such factors are put right, the level of weed control obtained by a herbicide will either be disappointing or very short lived.

The main weeds present in grassland are often governed by the management of that particular field. Where high nitrogen applications are used, or slurry is applied to intensively stocked fields, docks are liable to become a problem, and if paddocks are badly poached chickweed can soon invade these areas. Under-grazed fields can become infested with the more colourful weeds such as buttercups, ragwort and thistles, while over-grazing or cutting can result in an invasion of annual weeds, particularly chickweed and annual grasses.

Spraying for perennial, broad leaf, weed control is best carried out during periods of maximum growth, when the majority of the weeds are beginning to form flower buds. This differs from annual weed control, where the aim is to spray when they are small. Best results are obtained, if crop growth is encouraged by an application of fertiliser.

If grass is to be cut for hay or silage, a herbicide may be applied before or after cutting, but clover will be checked more if spraying is done before cutting, because of the extra competition from the grasses as they grow.

The choice of chemical to use on established grass depends chiefly on whether clover is an essential part of the sward. Where it is important, one must use a herbicide which is safe to the clovers, that is, one of the type of products for undersown crops. MCPA is often used on permanent pasture but the clovers can be checked. However, indigenous clovers soon return if they are encouraged with some basic slag or complete fertiliser. This herbicide is good against annual weeds but the kill of perennial weeds is not 100% and a repeat spray may be necessary for heavy infestation.

Docks are rapidly becoming the number one weed problem in established grass. Where clovers are not important a specific herbicide such as Razol Dock Killer should be used. Best results are obtained when the docks are 6″ - 8″ in size and growing actively; spraying in summer under dry conditions can result in reduced control.

This herbicide will give control of other broad leaved weeds, including chickweed. When spraying tough perennial weeds in grass, a water volume of 20-40 gallons per acre will give better results than the 10-15 gallons so often used on cereals.

Not all permanent grass has a serious dock problem, but a large acreage is infested to a greater or less degree with a mixed weed problem—buttercups, thistles, seeding perennial nettles and a few docks, plus probably patches of chickweed. For situations like this, where clover is possibly not an important part of the sward, a specially formulated grassland herbicide such as Pasturclene Grassland Weedkiller should be used. This may be applied to established grass and young leys from early spring until the middle of October and is ideal for the control of those mixed weed problems seen on thousands of acres of pasture during the early summer. It may also be used to clean up fields where chickweed has built up in the sward over winter, or even where it is invading a new ley in late summer.

Established perennial nettles are usually found in clumps in a grass field, which means that spot treatment with a hand lance or knapsack sprayer is all that is necessary. A specific scrub and nettle killer based on 24.5-T such as Phortox gives a quicker and better control than the general purpose type of grassland herbicide.

In certain parts of the country, rushes are a major weed especially on wet land, but they can also be found on reasonably well drained fields in areas of high rainfall, especially if the fertility level is low or the sward is poor. Improving the drainage is a necessary first step, and where the main problem is soft rush, useful control can be obtained with an MCPA herbicide, particularly if this is combined with a fertilizer and rush cutting programme.

What are the advantages of removing weeds from established grassland ? Under a grazing system, docks and thistles are usually untouched by stock and the grass below is uneaten or smothered; considerable amounts of herbage are wasted. Under a cutting system, docks and other weeds do contribute to the total yield of dry matter, but some weeds are unpalatable and can, in fact, be harmful when eaten by stock. Little work has been done on determining increases in grass yields where weeds have been sprayed out, but limited evidence indicates that where docks have been removed, grasses are soon able to compensate for the loss in weight of the docks. Where dock control has been good, grass yields have increased by up to 50 per cent in the season following treatment. Therefore on the profit side, herbicides can prolong the productive life of a sward as well as improve the quality and yield of the crop.

What about the pitfalls ? It is essential to use the correct chemical for the job and in this context the importance of clover will have to be considered. Otherwise if the chemical is applied at the correct time, volume and dose, then there really should be no pitfalls. Up to about £4 per acre is not a lot to pay when the crop being treated is in the ground for a number of years, and, depending on the weed problem, it may only be necessary to spend £1 or £2 per acre.

When a new ley is sown down, there will usually be a weed problem during establishment. This will vary depending on whether the ley is sown in the spring or the autumn. Weeds tend to germinate more readily in the spring, and for an undersowing or a direct reseed in the spring, a herbicide will invariably be needed. It is easier to control some weeds before a ley is sown, for instance, if there is a couch or 'quicken' problem, a better establishment of the ley will be obtained if these weed grasses are removed first by means of a pre-sowing treatment such as TCA.

For a spring reseed (undersown or direct) the choice of herbicide depends on whether clover is included in the seeds mixture, and which weeds are present. Where grasses only are being sown, a normal cereal herbicide may be used once the grasses have two leaves, but if the mixture contains clover, one of the undersowing type of chemicals must be used. If only the simple weeds are present, an MCPA/MCPB herbicide is all that is needed, but nowadays most arable fields have other weeds present. Where there are polygonums (redshank, knotgrass and black bindweed) an MCPA/2.4-DB chemical must be used to control these weeds. Today chickweed and, to a lesser extent, cleavers are becoming problem weeds in undersown cereals. If this is the case, they must be controlled, because, otherwise, the young seeds will be smothered. This means using a benazolin based herbicide, such as Legumex Extra.

For an autumn reseed, the use of a herbicide becomes more difficult because products like Legumex and 2.4-DB should not be used after the end of August. However, there is usually less weed growth at that time of the year, and soil temperatures are higher so that seeds often get away more rapidly making a herbicide treatment unnecessary. During the winter months, chickweed may build up in the new ley but this can be controlled in the spring.

Mayweed can become a problem when establishing a new ley. Legumex Extra will control Scentless Mayweed up to three leaves but for control between the 3 leaf to 2″ stage, DNBP is needed. This may be used on undersown and direct reseeds but must be applied at 40 or more gallons of water per acre.

What are the benefits of spraying new leys ? A good ley is costly to put down when you consider seeds, fertilisers and cultivations. It has got to produce a crop for conservation or grazing at the required time, and then continue to produce good crops for several years. It cannot do this, if half the sown seeds are smothered by weeds, and replaced by grasses like annual meadow grass.

Good establishment of the seeds mixture is vital. Grass and clover seeds take longer to get established than other crops and they are very susceptible to weed competition in the early stages.

Where a ley is to be grazed, are weeds not as good as grasses ? After all, weeds are supposed to be rich in minerals. Many weeds are readily eaten, but the digestibility of some is suspect. There

have been cases of chickweed poisoning of stock, while other weeds can cause milk taints. The alternative to spraying is to top over with a mower. This cuts down the taller weeds but the smothering ones like chickweed and knotgrass are usually below the mower blade level. Topping over therefore is not as good as chemical weed control and certainly no cheaper.

When all aspects are considered, spraying either new or established grassland is not as expensive as spraying most other crops; the advantages in better crops and prolonged life of the ley is worthwhile. In some farmers' minds there has been a certain reservation about the use of herbicides on grassland because of a fear of damaging the clover. However, if the right chemical is used and put on at the right time, and most important of all, at the correct volume, the weeds can be killed without harming the clovers. Today, a sprayer is a small essential piece of equipment on any grassland farm.

12. HYPOMAGNESAEMIA: TACKLING THE ROOTS OF THE PROBLEM

H. Sandford, Shellstar Limited

Knowledge of hypomagnesaemia (grass staggers) and the conditions which are associated with it are still not fully understood but recent research on grassland, particularly in The Netherlands, has provided some of the answers. A better understanding of the physiology of magnesium uptake by grass has helped to explain why some pastures are tetany-prone whilst others are safe. Field experiments on different soil have shown that magnesium fertiliser increases the concentration of magnesium in grazed herbage and raises the magnesium level in the blood of cattle.

There is a close relationship between the magnesium content of grazed herbage and the incidence of hypomagnesaemia. The threshold value of 0.2% magnesium in the herbage dry matter is regarded as critical; above this level, hypomagnesaemia seldom occurs, but it may develop below it. In the spring, the magnesium level of pasture is nearly always below this level, and dairy farmers are normally advised to take preventative measures. But none of the methods of oral supplementation are a complete safeguard, and there are good reasons for correcting the source of the trouble by raising the magnesium content of the grazed herbage with applications of magnesium fertiliser.

The most dangerous period for hypomagnesaemia occurs during the first few weeks of grazing in the spring. When the grass is growing rapidly at this time of year, nitrogen and potassium will be taken up from the soil in preference to magnesium with the result that the herbage will be rich in crude protein and potassium

but low in magnesium. The disorder may also occur during the autumn when the grass is again naturally rich in crude protein. Research in The Netherlands has shown that the incidence of hypomagnesaemia increases as the magnesium content of grass falls and as the potassium and crude protein levels increase. The likelihood of hypomagnesaemia occurring can thus be assessed by plotting the percentage magnesium, potassium and crude protein in the herbage against the magnesium concentration in the blood serum. From the results, it can then be decided whether the grass is safe to graze without magnesium supplementation. In general, provided the cows intake of dry matter is adequate, it will be safe to graze without such supplementation with herbage levels of at least 0.2% magnesium, provided there is less than 20% crude protein and less than 3% potassium.

Soil Treatments

It is as an additional aid in the prevention of hypomagnesaemia that Shellstar have introduced Nitra-Shell + Magnesium. This fertiliser contains 20% N as ammonium nitrate and 10% magnesium oxide (MgO). Half the MgO content is present as magnesium sulphate which is soluble in water and therefore readily available for plant uptake. The other half is present as magnesium carbonate which is insoluble and available over a longer period of time. This nitrogen plus magnesium fertiliser is most suitable for use as a routine maintenance dressing on grassland; it should not be used to correct a severe soil deficiency for which larger quantities of magnesium are required. On farms where hypomagnesaemia has occurred, soil analysis for magnesium, potassium and pH should be carried out. Where there is a large magnesium deficiency, the ADAS index is 0 or 1, and the soil is acid, ground magnesium limestone may be applied. Because this limestone is slow to react it required several years to raise the magnesium level in the soil. For quick remedial action for the correction of a severe deficiency, a soluble salt of magnesium, such as Keiserite, should be applied and magnesium limestone used when the field is due for liming again. Where the soil is not acid, the sward should be dusted with 20-50 lbs per acre of calcined magnesite. On alkaline soils it is difficult and costly to raise the magnesium level in the soil (and ultimately in the herbage) by means of fertiliser applications because of antagonism between calcium and magnesium in the soil complex.

Effects of Soil Type

To maintain magnesium levels in the grass, the nitrogen plus magnesium fertiliser should be used as a routine dressing instead of straight nitrogen. It is more effective on light soils with a pH of less than 6.5 than on heavy alkaline soils. Three series of 20 field experiments were carried out in The Netherlands over a period of 3 years on different soil types, sands, peats and clays. Annual applications of Mg0 at 80 units per acre applied in the early spring

increased the magnesium content of the herbage above the critical level of 0.2% in all years on all soil types. Levels in the spring of each year were higher than in the autumn. Annual applications also ensured a progressive increase in herbage magnesium levels and the average residual effect was about 60%. MgO at 80 units per acre applied in the first year only, also raised the herbage magnesium content above the critical limit but there were no residual effects except on the sandy soils where it persisted until the following spring.

Interactions with Magnesium

Although the treatments successfully raised herbage magesium contents above the critical limit on all three soil types, the effect was greatest on the sandy soils which attained over 0.3% magesium in the dry matter in the spring of the third year following annual treatments of 80 units per acre. Additional treatments in these experiments included the annual application of 80 units per acre of potash; in many cases, this reduced the effectiveness of the MgO treatments and the magesium content of the herbage was sometimes below the critical limit of 0.2% unless regular applications of MgO were made each year.

As potash depresses the uptake of magesium, the safest time to apply potash is in June or July, when herbage potassium levels are low, and applications for grazing should be restricted to 25 units per acre annually. Potash applications on cut swards should not be restricted lest yields are affected and, as a rough guide, the potash dressing per cut should be about half that of the nitrogen applied.

Heavy nitrogen dressings increase the risk of hypomagnesaemia by raising the crude protein content of the herbage. In the early spring, and to a lesser extent in the autumn, very high crude protein contents occur following high rates of nitrogen application, especially when intervals between application and grazing are short. Nevertheless, there are no grounds whatsoever for restricting output by reducing the amount of nitrogen applied; to do so would certainly be a retrograde step and the best solution is to take additional preventative measures.

When routine dressings of magnesium fertilisers are applied there will be a gradual build up of magnesium in the herbage. On light or peaty soils which are neutral or slightly acid at least 100 units per acre MgO are needed annually under intensive grazing conditions on all grass swards. Straight nitrogen applications should be replaced by nitrogen plus magnesium fertiliser, particularly early in the year when the magnesium content of the grass is low and the danger of hypomagnesaemia is greatest. The extra cost for the inclusion of magnesium in the fertiliser is negligible.

Clover is rich in magnesium and a general figure for the content in white clover during the spring is 0.25% in the dry

matter, compared with 0.15% for grasses. Where an appreciable amount of clover is present under less intensive grazing, lower rates of nitrogen plus magnesium fertiliser will suffice to maintain the magnesium concentration above the critical limit. On clay soils, especially when they are alkaline, higher rates of MgO are required and under extreme conditions it is doubtful whether large dressings can be justified economically.

Types of Hypomagnesaemia

Clinical tetany is caused by a severe depletion of magnesium in the blood. There are also two chronic forms of hypomagnesaemia — pre-clinical and subclinical — which are probably of dietary origin resulting from a gradual depletion of magnesium in the blood serum. The preclinical type sometimes occurs in animals which subsequently develop the main clinical syndrome; the symptoms are reduced milk yield, poor condition and excitability. Subclinical symptoms may occur in animals either before or after the main syndrome, or in animals which never develop classic tetany.

Both in The Netherlands and in this country, clinical tetany only occurs in a small proportion of animals. In contrast, subclinical hypo magnesaemia is much more common and it has been reported that at certain times of the year the incidence in dairy herds may be up to 90%. As a result, milk yields may be reduced by as much as 20% and abnormalities of the heart may reduce the life span of affected animals. Additionally, animals will be in poor condition, excitable and may lose weight rapidly. Signs of preclinical and subclinical hypomagnesaemia are difficult to detect and may be missed by a farmer or vet who does not give a thorough examination, especially where accurate records of milk yields and liveweights are not kept. Most practising vets and research workers recognise that such signs are serious disorders which justify the feeding of diets rich in magnesium throughout the year. Because of the adverse effects on milk yields and heart functions, it is common practice for many farmers in The Netherlands to apply nitrogen plus magnesium fertiliser as routine dressings in place of straight nitrogen to aid prevention of the subclinical condition in particular.

RESEARCH REVIEWS

Both the College and the Hannah have been responsible for a number of research publications in the last 12 months and a summary of their main implications to farmers are presented below. First, research work published in the Journal of the British Grassland Society and then that in other media. Copies of the original publications can be obtained from the Librarian of the College or Hannah or from the editor.

159. Paddock V 'Wye College' grazing system

A comparison between a paddock system and a 'Wye College' system of grazing for milk production, M. E. Castle and J. N. Watson. Journal British Grassland Society. Vol. 28, 1973, pp. 7-12.

Many of our members have seen this experiment in which 2 swards sown in 1969 to S23 perennial ryegrass without white clover or any other grass were divided off to give 4 plots to provide 4 successive weeks grazing for each system.

The plots of the paddock system were further divided to provide 28 daily paddocks. A single electrified fence was used to further ration the plots of the Wye College system providing a fresh bite every day with no back fence.

The 'advantage' of the Paddock system is that grazed areas get more resting time than in the Wye College System. It is also possible in the 'Paddock System' to shut off a paddock if there is too much for grazing and possible to take the surplus grass for hay or silage. In the Wye College System, no surplus grass is mown.

In the first season, both systems were grazed at about 2 cows to the acre (actually 1 cow per 0.49 acres). In the second year, stocking rate was tightened to 1 cow per 0.40 acres.

Summarized Results	**Paddocks**		**Wye College**	
	1970	**1971**	**1970**	**1971**
Average daily Milk yield (1lb)	35.7	39.9	33.7	40.6
Average annual Milk yield/ gals per system	1200		1170	

The conclusions were that the 'Wye College' system which is simpler to operate and less expensive than the paddock system reached the same milk output. This output is much higher than is general. The amount of surplus grass carried over in the Wye College system produced an unkempt appearance and in the 1971/72 winter, the paddock system showed 40% winterkill compared to just 20% on the Wye College system. There was noticeably more dead herbage carried into the winter on the Wye College System.

The problems of the system are regarded as minor compared to the advantages, and merit further investigation.—I.V.H.

160. Silage and Milk Production. A comparison between wilted grass silages made with and without formic acid. M. E. Castle and **J. N. Watson.**

J. Brit. Grassld. Soc. Vol. 28, 1973, pp. 73-80.

Four grass silages made in May from S24 perennial ryegrass differing as follows:—

W1 + Wilted for 1 day + $\frac{1}{2}$ gallon formic acid.
W2 + Wilted for 2 days + 6 gallon formic acid additive.
W1 — Wilted for 1 day no additive.
W2 — Wilted for 2 days no additive.

These four silages were fed ad lib to 12 cows over 16 winter months with supplements of barley and groundnut cake.

Results

Herbage	**W1+**	**W2+**	**W1−**	**W2−**
%OMD	68.3	67.8	68.4	68.2
%TSS/DM	14.4	14.3	14.2	15.0
%CP/DM	8.9	7.6	8.4	7.8
Silage				
%DM	24.5	24.8	23.9	23.3
%CP/DM	13.6	13.1	12.9	11.7
%NFE/DM	43.8	43.7	42.0	41.0
%TSS/DM	1.1	1.3	0.9	1.1
%OMD	65.2	64.1	64.2	61.9
%Lactic Acid	5.8	4.0	3.0	2.3
pH	4.2	4.7	4.9	5.1
Maximum Temperature °C	23	28	28	33
Feed Intake				
lb/cow/day				
Silage	20.9	19.2	18.8	17.3
Barley	11.1	11.1	11.1	11.2
Groundnut Cake	0.9	0.9	0.9	0.9
Milk Yield				
(corrected) gals/day	3.84	3.74	3.67	3.62
Livestock (lb) weight	1125	1120	1099	1101

Explanatory Notes:

%DM	Dry matter content.	%CP/DM	Crude protein in dry matter.
%OMD	Digestibility of organic matter.	%NFE	Nitrogen free extractives.
%TSS	Total soluble sugars.		

Conclusions. For both wilted and unwilted silages, the additive increased daily milk yield by about 0.2 gallons per day with out significantly affecting milk composition. The advantages from the additive come from higher quality of silage. It had lower pH, higher lactic acid content, higher DM content, higher digestibility. These resulted in higher intake of silage which along with a standard supplement provided the additional milk yield.

This increased output more than repaid for the additional cost of additive, but it is stressed that **additives** cannot be considered an alternative to good silage making practise. The advantages will only be realised if care is taken in other aspects of silage making.—I.V.H.

161. Studies in response to fertilizer nitrogen. Part 3. The development of response to fertilizer nitrogen in primary growth of ryegrass.

J. Brit. Grassld Soc. 28, pp. 109-118.

162. Part 4. The effects of fertilizer nitrogen on the chemical composition of primary growth of perennial ryegrass.
J. Brit. Grassld Soc. 28, pp. 171-180.

163. Part 5. Residual response as fresh matter, dry matter and digestible organic matter.
J. Brit. Grassld Soc. 28, pp. 257-262.

164. Part 6. Residual responses as nitrogen uptake.
J. Brit. Grassld Soc. Vol. 29, pp. 69-74.
(161 to 164 by I. V. HUNT).

It is convenient to review all four parts of this series which are concerned with the results of a single experiment carried out at the college in 1962 following a similar experiment in 1961. The main conclusions of this series of papers have been as follows:—

(a) Application of more than about 100 units of N per acre to spring grass brings no advantage in yield of herbage dry matter in the first crop alhtough it may increase the yield of fresh grass, reduce the digestibility of the herbage, increase its protein, potash phosphate, calcium and magnesium content.

(b) The second and third crops continue to show the effects of the spring dressings of N and to a limited extent loss of effectiveness of N in the first growth is made up in these late regrowths.

(c) Balance sheets of amount of fertilizer N applied and the amounts taken off in the herbage show the surprising fact that when over 100 units of N are applied in the spring the growths and regrowths taken off can recover more than 100% of this N. This extra N comes from the soil since applying a heavy dressing of fertilizer N upsets the relationship between fixed and available N in the soil.

(d) A later effect of this exploitation of soil N is that the availability of soil N is lowered and herbage shows lower crude protein contents and less vigour.

This really confirms the oft noted fact that once you are using large amounts of fertilizer N, you dare not cut off the supply or you will have an extremely poor crop of grass. —I.V.H.

165. The Relationship between DM content of herbage for silage making and effluent production.—M. E. CASTLE and J. N. WATSON.

J. Brit. Grassld Soc. Vol. 28, 1973, pp. 135-138.

Comparison of the effluent production from 16 silages made at the Hannah along with 22 made at the Grassland Research Institute, shows that the amount of effluent produced is very closely related to the %DM of the crop ensiled.

Effluent is normally an embarrassment and any measures which reduce it or eliminate it altogether could be worthwhile. By comparing all the silages a formula was derived which will predict the %DM of silage provided we know the %DM of the crop as ensiled. The point at which these remain the same is the %DM of the crop which produce no effluent. The crops at the Hannah and at GRI gave practically the same answer namely 22.8 and 22.9% respectively. Allowing for the natural variability of conditions, a crop at 24.6% at the Hannah or 24.8% at GRI should produce no effluent.

In the S.W. Scotland, such a crop would normally follow just 1 day's wilting.—I.V.H.

166. The yield response of a tall fescue/white clover sward to nitrogen rate and harvesting frequency.—J. FRAME.

J. Brit. Grassld Soc., Vol. 28, 1973, pp. 139-148.

Tall fescue is not an important grass in the West of Scotland but has been the subject of intensive study at the college. Some of the results obtained in this experiment are equally applicable to other grasses.

The basis of the experiment was the comparison of eight different rates of application of N from nil to 336 lb/acre N at intervals of 48 lb N/acre (equivalent to 0 to 300 units N/acre). The grass crop was harvested 4 times at 6 week intervals, 6 times at 4 week intervals or 8 times at 3 week intervals. The nitrogen was split into 4, 6 or 8 doses for these 3 harvesting patterns.

The sward had been sown to 30 lb S170 tall fescue and 1 lb S100 white clover. The main results were:—

(a) Up to 96 lb N(86 units N) there was no effect of fertilizer nitrogen on yield because extra grass and declining white clover balanced out.

(b) From 96 lb to 288 lb/acre, the effect of each addition of N was the same, with a fall in the response at higher levels of N.

(c) The maximum response in the first year i.e. the best return for N came at 202, 168 and 149 lb N/acre depending on the system of harvesting.

In the second year, this came at 187, 173 and 163/lb N/acre. Yields of tall herbage were highest with the 4 x 6 week cuts. The ratio of production for 6, 4 and 3 weekly cutting systems were 120:108:100 in the first year and 131:111:100 in the second year.—I. V. H.

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