TRENDS IN PASTURE CONSERVATION

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Problems of storing pasture from periods of ample growth to periods of little or no growth, whether it be in winter or a droughty summer, have always been with farming communities all over the world. Haymaking, for example, goes back to antiquity when the origin of natural drying has been lost in the mists of the past; maybe in the same way as it is often lost in the mists of today.

The three main methods of preservation, or conservation as we call it, are: natural drying (haymaking), artificial drying, and the making of silage. Though from time to time haymaking is condemned, it still remains a necessary part of our farming make-up. Though far from an efficient process of preserving our pasture, it has the advantage of being a simple method. Grass drying by artificial means can be done when the material is at a younger growth stage, and though the method is expensive, it is a most efficient way of preservation in that it provides a protein-rich food almost in its natural state and most suitable for stock. Silage making, however, differs from the two previous methods in that fermentation by bacteria brings about preservation and the method is not as limited by weather or time of year as haymaking.

Artificial Drying

In 1926 Wood and Woodham of Cambridge, England, showed that short, young grass dried quickly could be preserved and could replace the highly concentrated stock foods for beef and milk production. Steam ovens were used by Imperial Chemical Industries Ltd. and the material was compressed into cakes. From then on attention was turned to designing equipment and testing the product. In the 1930's grass drying on a commercial basis developed despite high costs. Advances since then with more efficient hot air driers have brought grass drying to larger farms and even to New Zealand in 1956. In the last five years four driers have been installed in New Zealand, two of them this year. This method at present appears to have limited application to the small farmer, but, like other things, will no doubt develop as its efficiency and economical operation allow. Dried grass is the ideal method of conservation and the closer we can approach this system the lower our nutrient losses will be, Silage making on the other hand retains the which in dried grass and haymaking is enemy No. 1. However, enemy No. I in silagc making is ***air.*** Though perhaps silage making can offer simple and cheap ways of storing surplus growth during more unfavourable weather, it is fraught with many more unseen complicating problems.

The origin of silage making dates back to about 1840 in Germany. The word itself is said to have come from the Latin *sirus,* a pit. From very early ages pits were used for the storage of food, particularly grain. Silage making began by filling pits with grass as quickly as possible, excluding the air by careful trampling, and covering with boards and a foot of soil. Towards the end of last century there was much silage making, the method spreading to Britain and elsewhere. During this period recommendations tended toward the usc of mature pasturc and high temperature sweet silage was the result. This caused a greater loss of nutrient and lower digestibility. For a period silage was out of favour until the development at the beginning of this century of above-ground structures, mainly towers or silos, into which chopped material was blown. This method cut down wastage and improved the product, and it remains a popular system in the U.S.A. and elsewhere to this day.

In New Zealand, however, we have relied in the past on stacks or cheap pits and this has been moderately successful. The advent of the buckrake cut down on thc labour required and enabled silage making to expand on a greater scale than ever before. Through inexperience and failure to appreciate the necessity for careful building of stacks, wedges, or clamps, wastage of material rose considerably and still remains a problem. The resulting material, though mainly a maintenance ration, has been fed as a production ration with questionable results.

Now the forage harvester enters the scene and brings a new approach to silage making. The implications of this mcthod are more far reaching than was at first imagined. Not only does the forage harvcster prepare the herbage for better cnsiling and easier feeding out, but it enables better control of cutting height of the pasture. There is no doubt that the New Zealand farmer is second to none in exploiting the full use of such a machine, even for haymaking, topping, and weed control. Though forage harvesters and additional equipment require large capital outlay, they are not beyond the reach of the larger farmer, nor is the modified tractor-mounted harvcster and hopper type beyond the small farmer. In their present form they demand a high horsepower, particularly for long, mature pasture; they are capable of handling efficiently and easily shorter growth if necessary. A separately mounted motor to power the forage harvester could with some types avoid the purchase of a higher horsepower tractor. More research into reducing the horsepower requirements for cutting and blowing is needed.

Haymaking as distinct from silage making is so dependent on weather for natural drying that there has really been no modification of this age-old system of preserving pasture. Delay in cutting beyond the flowering stage of the pasture species lowers the quality of hay appreciably to give lower protein and higher fibre, a poor product of low feeding value. Waiting for good weather so often gives greater bulk but a poor, stalky, fibrous material of much less value to any animal.

Past methods of haymaking called on much manpower, but with mechanisation the trend has been toward a greater output per unit of labour. Over the last 20 years this mechanisation, particularly with the baler, has in no way improved the quality of hay; in fact, on the whole the effect has been the reverse. There is nothing like a flood to bring to light reserves of this so-called good hay around the countryside to help stranded livestock! It does appear that the basic principles of haymaking have been forgotten. Hay has to be *made;* it is not bleached grass just picked up and baled! The whole basis of making good hay has been laid down over the centuries and one need only look at literature of over 50 years ago to see that the secret is to get rid of the moisture as quickly as possible; that is, apart from the cutting of the pasture at the flowering stage, as far as the weather allows. How often is the swath, for instance, turned over immediately after cutting so that the cut ends are lying uppermost to allow the moisture from the stems to get away? In many districts the baling contractor generally has been the one who dictates when the hay should be tedded or turned, and is 'it any wonder we find bleached hay and potential silage in the bales. Though fears of wet weather lurk in our minds, and hesitation to touch the swath is pardonable, closer attention to weather forecasts would help greatly.

This brings me to the point I wish to make. Where are we getting to in our efforts to conserve our best crop of all, pasture? From what I have said it does look as though mechanisation to date has given a greater output per unit of labour and at higher cost, but with more waste and a very poor product. Does this not indicate perhaps one of the reasons why we could be having so many metabolic diseases in our stock today? If this is so, what can we do about it? Let me put it this way. Science and mechanisation have brought us to the crossroads in pasture conservation.

Modern trends in agricultural engineering clearly indicate rapid changes in design of equipment to the extent that almost anything can be accomplished. Looking to the forage harvester, we see a potential haymaking piece of equipment capable of cutting and conditioning the material by lacerating it so that rapid dehydration takes place; just what is wanted to preserve the nutrients and keep that high protein and low fibre ratio for a production diet rather than a maintenance diet for the animal.

This I feel points the way to the designing of better equipment for cutting and conditioning the material to shorten the drying period. This enables hay to be made earlier in the season when short periods of fine weather can be taken advantage of. Of course the principle still holds good for the later and longer good periods.

Because the broader leaves of clover or other legumes are easily broken off or lost in drying, gentle treatment in cutting and conditioning is most essential to preserve them intact on the stem. On the other hand, grasses can stand rougher treatment. On this basis lies the difference between systems that are employed or should be employed in securing good hay crops. This then raises the question: Should we turn our attention to the hay conditioner (the fluted roller type or power driven tedder type) now on the market? These machines have suddenly found favour in Britain and more attention could be given to them as a reasonably economical means for both conditioning and placement of swaths if this could be done. Some work along these lines is to be initiated at Ruakura Animal Research Station this season.

Much work has been done in the U.S.A. on pasture conservation, particularly with conditioning equipment to shorten the curing time. Conditioning treatments are very close to the forage harvester technique in quality and have less loss of leaf. Up to 30 per cent or more leaf losses are liable to occur with the forage harvester and this clearly indicates a weakness in that method.

In the U.S.A. pellets can be made from a compact and expensive pelleter drawn behind a flail type harvester on material already cut and reasonably dried. Under pressures from 3,000 to 10,000 lb per sq. inch pellets are turned out and handled in bulk. This type of fodder is preferred by cattle, but there does not yet appear to be a place in New Zealand for this system.

Another recent development is "haylage". Lacerated pasture is wilted to about 40 to SO per cent moisture, then blown into a silo and held under air sealed conditions. More will be heard of this in the near future in New Zealand.

Under our varying conditions of climate and material in New Zealand there appears ample room for a diversity of systems. If good hay was a certainty there would be less silage made, and I feel that as we perfect our haymaking techniques and produce better quality hay, less silage will be made. It takes little to imagine that if by good machinery and methods we can vastly improve our conserved pasture and in particular increase its nutrient content, we will have gone a long way in providing a production ration for our stock, not to mention the possible reduction in incidence of ill-thrift in stock.

From the diversity of makes and types of equipment in New Zealand and the amount of experiment by farmers and manufacturers there must be a very large sum of money wasted in trying to achieve ideal machines or methods in pasture conservation. As it is, we largely rely on overseas machinery to fill our needs, but how much of it is not being put to full and good use on methods that should be used to conserve our pasture properly?

How often we hear the cry that because our conditions in New Zealand differ from those general overseas it is so essential to carry out research to suit our needs on all aspects of agriculture. Much of the research we do on the pasture itself and the little we do on conserved material is going to be wasted if we do not have agricultural engineering research to link the two. As grassland scientists in New Zealand we should take a lead and indicate to the agricultural engineer or machinery designer what is wanted for our conditions. To many of us this calls for an agricultural engineering research and machinery testing station probably attached to an existing research or agricultural college and unbiased in its outlook. I hope that some day we will see this gap tilled in New Zealand in much the same way as it has been in other countries for many years.

DISCUSSION

Q. Has Mr Hopewell or Mr Murray taken out any comparative costs of harvesting machinery?

A. No work has been done but it is suggested that some research work could be done.

Comment (Dr Sears): The Department of Agriculture has done some work on this subject.

Q. Has the advent of the forage harvester increased the ease of silage making?

A. I agree that the silage is improved and is much better when made with a forage harvester, but there is need for further work at the pit.

Comment: The forage harvester is adaptable and is revolutionising the making of silage.

Q. To Mr Jackson (England): Is hay a better product made by the forage harvester as compared with that made by the usual conventional method'?

A. (Mr Jackson, England) : I have no actual figures but I have found the forage harvester does allow earlier haying.