agriculture
& rural development
Department:
agriculture
& rural development
PROVINCE OF KWAZULU-NATAL

PASTURES IN KWAZULU-NATAL

Pasture Utilisation

PASTURE SILAGE

P E Bartholomew, T M du Plessis and C I Macdonald

INTRODUCTION

It is usual to conserve forages in regions where the winters are cold and dry. Forages may be conserved in the form of hay, silage, foggage and spared veld. These types of stored feed may complement each other. Some farmers are equipped to make either hay or silage. However, a number of farmers have sufficient machinery on hand to make both. Pasture silage is usually made from seasonal surpluses which occur on most intensively farmed farms. If such surpluses were not ensiled they might be wasted. This leaflet is aimed at providing guidelines for making pasture silage.

ADVANTAGES AND DISADVANTAGES OF PASTURE SILAGE

Before embarking on a pasture silage programme it is necessary to consider the advantages and disadvantages of making pasture silage. Since the making of silage is often the only alternative to making hay, the advantages and disadvantages of making silage are compared with those of making hay.

Advantages

- **The making of silage is less dependent on the weather than is haymaking.**

The making of silage is less dependent on the weather than is haymaking.

- With silage there is less bleaching by the sun (bleaching, associated with making hay, results in the loss of carotene, *i.e*., vitamin A).

- There is no fire hazard with silage.

- Silage quality is maintained for longer than is hay quality, because hay oxidises during storage. Thus silage is better as a fodder bank than is hay.

Disadvantages

- There is a poorer intake of dry matter with silage than there is with good quality hay.

- Transportation and storage costs for silage are higher than for hay.
- Hay is more acceptable to young livestock.

SILOS

The silo space required for silage is calculated from the known density of well compacted pasture silage *viz*. 1,4 m^3/t of 30 % dry matter silage.

It is important to plan the silo in relation to the harvesting and feeding out machinery available, or envisaged.

There are five common "types of silo" in use in South Africa.

- Tower silos. These are very good for making silage because the height of the ensiled material aids compaction and the exclusion of air. However, tower silos are expensive to construct and the removal of silage for feeding is a difficult operation.
- Clamp or stack silos. No structure is necessary. The silage is dumped on a convenient surface to a height of at least 2,0 m and sealed within 3 days. It is important that the ensiled material is well sealed and drained to allow for surface run off.
- Trench or pit silos. These consist of trenches or pits dug into the soil. They have earthen walls or the walls may be lined with brick or concrete. It is difficult to prevent rain from entering and a drainage problem is often experienced. These silos are not very satisfactory for pasture silage.
- Bunker or walled surface silos. These are constructed above ground and are most suited to pasture silage. If possible these silos should be made to be portable. They should have slightly outward sloping sides and should have a minimum width of 3 m. For practical purposes a 4 m width is the most satisfactory since this width allows for compaction with a tractor.
- Big bale silage. This involves conserving grass as silage in big round bales. The size of the bale required to suit most handling and feeding situations is 1,2 m in diameter and 1,2 m in width, with a mass of 500 kg at 30 % dry matter of the herbage. There are two commonly used storage systems with big bale silage. The first involves sealing each bale in its own polythene bag. The second involves stacking several bales on a polythene sheet and covering the stacked bales with a second polythene sheet, which is sealed at the edges with soil.

PASTURE SPECIES

In the summer rainfall areas surpluses of forage can be expected during spring and mid-summer.

Spring surpluses occur when temperate species such as Italian ryegrass, tall fescue, cocksfoot and clover reach a peak of growth and the sub-tropical species are commencing their growth, usually from October to November.

Mid-summer surpluses occur when the sub-tropical species such as kikuyu, coast cross II, star grass and Paspalum reach a peak of growth, usually about January to mid-February.

Temperate species are higher in soluble carbohydrates than are sub-tropical species, and therefore the temperate species make better silage when additives are not used.

Silage made from legumes (*e.g*. clovers and lucerne) requires an energy additive which results in an improved intake of silage by livestock.

Although *Eragrostis curvula* is essentially a hay grass and only produces a medium quality silage, it is sometimes expedient, due to inclement weather, to make silage rather than poor quality hay.

TIME TO CUT

The longer the pasture is left before it is cut the poorer will be the quality, although a greater bulk of material will be harvested. It is preferable to sacrifice quantity for quality. The following are some guidelines for time of cutting and expected yields for some of the more important pasture species. It is assumed that fertilisation is adequate.

- Kikuyu, coast cross II, star grass and Paspalum cut before 5 weeks of growth could yield up to 3,5 t dry matter or 11,6 t of 30 % dry matter silage per ha.

- Italian ryegrass, cocksfoot and tall fescue cut after 5 weeks of growth could yield more than 2,9 t of dry matter or 9,6 t of 30 % dry matter silage per ha.

- *Eragrostis curvula* at the hay stage could yield up to 3,2 t of dry matter or 10,6 t of 30 % dry matter silage per ha.

- Irrigated lucerne at 10 % flowering could yield up to 3,2 t of dry matter or 8,3 t of 30 % dry matter silage per ha.

The more mature the pasture the higher is the dry matter content of the cut material. Mature pastures may be "direct chopped" without prior wilting since the dry matter content would already be of the order of 25 %.

Young, high quality pastures containing about 15 % dry matter need to be wilted or additives, which help with the fermentation process, must be used when making silage from them.

FERTILISATION

Once it has been decided to make silage from a land, the full potential of the pasture should be realised to justify the expense of making silage.

Firstly, the base status of the soil should be corrected as indicated by a soil analysis. There is a linear yield response to nitrogen (N) applications up to about 375 kg/N ha/annum for both kikuyu and Italian ryegrass. This response depends largely on site and climate. The timing of N applications is important. Smaller quantities applied often allow for more efficient use of N than does one application in spring. Usually between 40 and 75 kg N/ha is applied per dressing.

Potash (K) comes second only to N as the most important plant nutrient for pastures wherever the material is removed in the form of silage or hay. Potash (and phosphorus) fertilisation should be based on soil analysis recommendations.

PRINCIPLES AND SUGGESTIONS FOR MAKING GOOD PASTURE SILAGE

- **Realise the full potential of the pasture by optimum fertilisation.**

Realise the full potential of the pasture by optimum fertilisation.

- Before closing off a pasture for silage, graze it heavily, or remove any build-up of herbage, to ensure new growth is of a high quality and not "diluted" by old herbage.
- Top-dress with N after herbage removal at closing off.
- Although some field losses will occur, most pastures should be wilted to 30 to 35 % dry matter content before ensiling. The losses that occur in the silo when wet material is ensiled are far greater than the field losses.
- Legumes and grasses (especially the sub-tropical species) that are low in soluble carbohydrates (less than 10 %) will require a carbohydrate additive such as molasses. This should be applied at a rate of 4 % molasses by weight (*i.e*. 100 tons silage will require 4 tons of molasses).
- Pastures high in soluble carbohydrate and wilted to 30 % to 35 % dry matter do not require additives.
- Pasture that is chopped into short lengths (approximately 2,5 cm) when ensiling, is easy to compact and easy to feed out.
- Plan to fill the silo as quickly as possible. Ensure that at least one metre of new fill covers the previous day's fill.
- Good compaction is necessary, particularly with wilted material, to control temperature and exclude air. High temperatures and air are the biggest causes of nutrient losses in the silo.
- Cover each day's fill to reduce air movement.
- Seal the silo within 3 days of filling. Fermentation takes 3 to 6 weeks. Access of water or air after fermentation destroys preserving acids and allows fungal development.
- Allowance must be made for shrinkage of the silage by building up a crown in the centre of the silo.

SEALING THE SILO

Probably the most effective way of sealing the silo is by using a sheet of black polythene 250 microns thick. The sheet is spread over the top of the silage and gullied at the sides to prevent rainwater from entering. The sheeting should then be covered with old motor car tyres touching each other to prevent the plastic from billowing, and to help the silage settle.

Another method of sealing the silo is to cover the silage with old hay which, in turn, is covered with about 15 cm of soil. The main disadvantage of this method is the possibility of soil contamination of the silage and the difficulty in removing the soil when feeding the silage.

Opened up fertiliser bags, covered with old tyres, have sometimes been used, but this results in a great deal of wastage since it is difficult to seal all the edges of the fertiliser bags.

CHARACTERISTICS OF GOOD PASTURE SILAGE

Characteristics of good pasture silage are that it has a pleasant aroma, a slightly acid and fruity flavour, and the smell does not linger on one's hand after having handled the silage. Good silage is pale green in colour.

Other indicators of good pasture silage are:

- dry matter in the silage from 30 % to 35 %;
- pH from 4,0 to 4,5;
- lactic acid content greater than 6 % of the wet material;
- acetic acid content about 3 % of the wet material;
- no butyric acid;
- density, approximately 1,4 m^3/t;
- fermentation temperature, 105EF, or 40EC;
- water soluble carbohydrate content of the green material 12 % to 18 %.

SILAGE MAKING EQUIPMENT

Provided the principles of silage making are understood, good silage can be made with any forage harvesting equipment. This may vary from self-loading wagons to the largest self-propelled precision chop machines. Good after-sales service and availability of spare parts are essential because silage making machinery is relatively complex and expensive.

Three possible combinations of machinery, together with the work rate of each, are given below.

System 1: for **wilted** high quality pasture silage.

- Three to four tractors, depending on distance from the silo;
- Two reciprocating mowers (1,8 m) or 1 mower conditioner (2,7 m);
- One side delivery rake (optional);
- One precision chop forage harvester (interchangeable head allows for use with row crops);
- Two high-sided tip trailers; the sides should be wider apart at the delivery end to allow the cut pasture to slide off easily;
- One buck rake or front end loader, to spread the cut pasture in the bunker.

Work rate: 4 ha/10 hour day, ensiling 43 t of 30 % dry matter silage.

System 2: more mature pasture or pasture with additives, direct chopped.

- Three or four tractors as above;
- One forage harvester (flail or double chop);
- Two high-sided trailers, as above;
- One buck rake/front end loader, as above.

Work rate: 7,3 ha/10 hour day, ensiling 80 t of 20 % dry matter silage.

System 3: for **big bale** silage.

Where big bale hay is already being made small quantities of big bale silage can be made, in addition to the main silage programme, in a good year when surpluses occur.

- Two tractors;
- One mower conditioner which makes an even windrow necessary for big baling;
- One big baler with a variable size bale chamber;
- One spike adapter for buckrake/front end loader;
- One flat bed 4-wheel trailer, 8 to 12 big bale capacity.

Work rate: 6,5 ha/10 hour day ensiling 72 t of 30 % dry matter silage or 150 bales stored.

Notes

- Flail or double chop forage harvesters should be correctly set to avoid soil and dung contaminating the silage. A level pasture is an advantage.

- Two-wheel trailers attached to the forage harvesters tend to damage the harvester's wheel bearings.

FEEDING THE SILAGE

Pasture silage that is made in bunkers is easily self-fed and, provided enough space is allowed per animal, there should be no restriction on intake. The width of face allowed per animal with 24 hour access is 110 mm. Where all animals must be fed at the same time a face width of 760 mm is required per animal. In order to avoid the development of mould and secondary fermentation, at least 200 mm of the face should be used daily.

If bunker silos are filled to 2,0 m or more, then there is a risk that the silage face will collapse when animals burrow into it. In such cases a barrier is recommended to prevent animals from burrowing. The most satisfactory barrier is an electric fence strung across the face 1,0 m above the floor. The silage face of a self-fed bunker should be trimmed daily and any old dry silage that is left on the floor of the silo should be removed to discourage animals from lying down and thus denying access to the more timid animals.

Silage that is not being self-fed can be loaded mechanically or by hand onto forage wagons or trailers. A mechanical grab fitted to a front end loader is often used. In Europe a hydraulically operated guillotine fitted to a buckrake is common. The latter machine is able to cut out a block

of silage weighing up to one ton. For hand unloading, a silage knife or sharpened spade can be used but both must always be kept sharp.

It is wasteful and expensive to feed silage by spreading it in the field. Silage should be fed in troughs.

Pasture silage intake by ruminants is reputed to be relatively poor. Evidence suggests that the intake of pasture silage high in dry matter and with a legume component is no different from any other silage. However, there is poor intake when wet silage that has a pH of less than 4,0 is fed. A high energy supplement will usually correct the poor intake of well fermented pasture silage.

SUMMARY

- **Plan your silage operation.**

Plan your silage operation.

- Sacrifice quantity for quality.
- Utilize seasonal pasture surpluses.
- Wilt to a 30 % dry matter content before ensiling.
- Use additives only when necessary.
- Chop the material finely to ensure good compaction and ease of feeding out.
- Seal silos within 3 days (seal big bale silage within 12 hours).
- Supplement with energy for good animal production.