DEPARTMENT OF
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Self Feeding Silage

Silage is a common feed on many dairy, beef and sheep farms. Silage may be stored in pits, bunkers, stacks or as large round or large square bales. The way in which it is stored and fed will depend on the size of the enterprise, layout of the farm and the number and type of stock.

Regardless of which feed out system is used the fodder should be fed so that animal intake is not restricted below the desired level, while avoiding wastage, deterioration of the silage (aerobic spoilage) and to prevent environmental damage.

Self feeding silage is a cheap and efficient feed out option for many farmers. It is particularly suited to small farms but must be carefully managed to avoid waste and animal health problems..

Introduction

Expensive machinery including front-end loaders, block cutters, shear grabs and feed-out wagons are needed to feed out large amounts of silage from silage pits, concrete bunkers or stacks. Baled silage feed out systems, although cheaper in equipment terms, usually require extensive labour and time resources for large herds.

The most common method of self feeding silage is to allow animals to access the face of a silage stack (pit or bunker). Self feeding of silage has the advantage that expensive equipment is not required and labour is reduced as the animals remove the silage themselves. Self feeding can be cheap, efficient and convenient, but careful planning and operation is essential to avoid a potential disaster.

A successful self feeding system needs to control dry matter intake, minimise wastage of silage and minimize or avoid environmental damage.

Controlling dry matter intake

The stock manager must know what the animals silage dry matter (DM) intakes and nutritive requirements are to meet the desired production targets.

In a self feeding system, feed intake can be unduly restricted by having too many animals trying to gain access to the stack face in a given time period. Restricted intake can also be caused by long material being to difficult for animals to remove, inadequate barrier type, poor stack face management, inadequate base or poor slurry management.

Stock access will depend on the intake desired for the particular class of stock and the target live weight to be reached. Intakes can be increased by allowing stock extra time at the stack face if not ad-lib feeding. It can also be achieved by opening both ends of a stack or feeding along the long side(s) for above ground stacks. Pits and bunkers will generally only have one end accessible to stock and machinery.

Daily removal rate of silage

Silage requires anaerobic storage conditions so a certain depth of silage must be removed per day to avoid excessive spoilage when the silage is exposed to the air. A minimum of 15 to 20 cm depth should be removed from the face of “stable” silage stacks each day. Stable silage is one which will not deteriorate too quickly as it has undergone a desirable fermentation. The stack should not start heating or showing signs of mould growth in the next section to be removed for at least 2 or 3 days after a new face is produced.

Ensiled maize and whole crop cereals are inherently “unstable” and deteriorate quickly, so the face removal should be least 30 to 40 cm day.

Nutritive quality losses for moderately stable to very unstable silage can range from 8 to 16% for silage removed at approximately 4 cm per day if air can penetrate back into the stack to about 1 m. This loss is reduced to 1 to 4% if 30 cm per day is removed.

Using a silage fork or grab loosens material further back into the stack than self feeding animals. This allows more air in which leads to spoilage and heating.

Silage density in stacks

Silage density is the weight of fresh (as fed) silage in a certain area of the stack. It is measured in kilograms per cubic metre (kg/m^3). The top and ends of a stack are less dense than along the walls, but density increases with vertical depth (greater than 1 m).

Silage density varies greatly depending on silage DM, length of cut, extent of rolling and stack height. It is best to calculate the actual stack density being self fed but if not, the following average densities are better than no estimate:

- Precision chopped wilted pasture is approximately 550 to 590 kg/m^3
- Long chopped (e.g. Loader wagon) is approximately 450 to 500 kg/m^3
- Maize silage is approximately 650 to 700 kg/m^3

NOTE: Low DM (i.e. wetter) silages or very long chopped material may have less DM density but heavier fresh wet density.

Calculation of removal rate to minimise aerobic spoilage

Three ways of calculating the rate of silage removal are discussed below.

1. To calculate the area of stack face to be removed at a minimum depth of 0.2 m

Area of feeding face in square metres ($m^{2)}$

$$= \frac{\text{Amount of silage fed per day (kg fresh wt)}}{\text{Silage density (kg/) x Removal rate (m/day)}}$$

E.g. 200 cows are fed 7 kg DM/cow/day of a stable pasture silage of 35% DM and assume a density of 590 kg/m^3. Rate of removal from the stack face is about 0.20 m/day.

Silage fed per day (kg fresh wt) = (200 x 7) x (100 35)

= 4000 kg/day

Required area of feeding face (m^2) = 4000 x 0.20)

= 34 m^2

Also the area of feeding face = width (m) x height (m)

The area should be less than 34 m^2. If the stack height is 2.5 m, maximum width of stack would be 34 m^2 ÷ 2.5 m = 13.6 m.

Usually the width and height of a stack are known and set so using the information provided above, the depth of removal can be calculated in two ways.

2. To calculate the depth of removal using the full stack width and height.

Step 1. kg fresh weight silage density = cubic metre (m^3) of silage to be removed

Eg. 4000 kg fresh weight ÷ 590 = 6.78

Step 2. $m^3$of silage to remove ÷ Stack width x height = Depth of silage to remove

Eg. If stack width is 12 m and height is 2.5 m then

6.78 ÷ (12 x 2.5) = 0.23 m depth of removal is required

If only 2000 kg fresh silage needed to be fed, then only 3.39 $m^3$of silage is required to be fed out. Therefore

3.39 ÷ (12 x 2.5) = 0.11 m depth of removal is required. This is not enough depth removed each day as approximately 0.2 m removal is required to avoid spoilage.

So a common situation on many farms is to ensure that the required depth of removal is achieved for the full height of the stack but not using the entire stack width.

3. To calculate the width of removal using the full stack height and known depth of removal.

So 2000 kg ÷ 590 = 3.39 m^3 of silage to be removed at full 2.5 m height and 0.2 m depth but what width will be needed to achieve this?

3.39 ÷ (2.5 x 0.2) = 6.78 m width of removal is required

Optimum stack height for self feeding

Stack height should be less than 1.5 times the height of the animals being self fed. This avoids the silage being eaten out at the base which would cause the stack to collapse onto the stock and barrier. So stack heights should be no more than about 2 m for mature cattle, 1.5 m for weaner cattle and 1.2 m for adult sheep.

Also the density of very high stacks will reduce intakes due to difficulty in silage removal by the cattle, especially older cattle with poorer teeth and can occasionally cause teeth damage in younger animals. This problem is compounded by longer material.

Spacing

Little research is available to indicate recommended spacing for various classes of stock over varying periods of access. Following are some rough guidelines:

Under *ad lib* feeding conditions, when stock can access silage anytime, only about 20 to 40% of the herd will be eating at any one time. If stock have 24 hour access to the stack face(s) the following face widths are advised per animal:

- 9 to 11 cm for mature sheep
- 15 cm for lambs or pregnant ewes
- 15 cm for young beef cattle
- 20 cm for adult beef cattle
- 20 to 25 cm for dairy cows
- 30 to 45 cm for dairy cows for restricted access after milking
- 80 cm for dairy cows if all cows need access at once

Stack bases

A concrete base is best for self feeding. This minimises bogging and contamination of the feed and is easier to maintain than a crushed rock base. Floor slope on an earthen (not recommended) or crushed rock base should be about 1 in 30, and about 1 in 40 for concrete to provide adequate drainage. Concrete should be finished with a non-slip surface, and the animals should also have access to a paddock or

loafing area. Some farmers slope the stack floor from the middle in both directions if self feeding of large numbers of stock is likely.

Shade, shelter and water should be provided a short distance from the silage so that animals are not continuously crowding the feeding area, or do not have to go far for these needs.

Minimising wastage

The correct design of barrier, its movement and management of the stack face will ensure adequate silage intake and avoid wastage and deterioration of the silage behind the stack face.

Wastage can be due to:

- aerobic spoilage (air penetration into the stack causing heating and mould growth). This waste represents both DM and quality losses, therefore lost production.
- silage being trampled and fouled (faeces and urine) by animals needs to be regularly removed.
- slurry near the feeding face needs to be removed regularly also.
- refusal to eat silage due to presence of deteriorated silage on the stack top or sides, mould pockets throughout the stack, silage spoiling ahead of the feeding animals, poor quality silage and low palatability silage due poor fermentation or over wet layers within a stack at ensiling. Only roll back the plastic seal for one or two days feeding to reduce silage deterioration on the stack top (Figure 1).

Figure 1. A stack with plastic rolled back for one to two days feeding

Barrier types

Barrier types are usually an electrified wire, tombstone (vertical bars) or horizontal bars or weldmesh. The latter three are usually mounted on a frame which is attached at right angles to a floor on which the animals stand. A tractor is usually needed to keep pushing the barrier forward as required.

Electrified wire

The easiest barrier to manage the animals at the feeding face is an electrified wire (Figure 2). The electric shock should not be too severe as this will greatly reduce the intake of young/nervous stock.

Figure 2. Electrified wire controlling self feeding cows

The wire should be mounted on steel posts pushed horizontally into the stack face. Secure the insulators and wire clear of the post ends to allow hammering of the posts.

The wire height should allow the animals to feed both over and under it without difficulty. For cattle this is about 0.8 to 1 m above the floor and offset from the stack face by 0.3 to 0.5 m.

A shallow barrier (e.g. railway sleeper, small light poles) placed on the floor, just out from the stack face, will help to catch any silage dropped and prevent contamination by poop and piddle.

Vertical bars

Vertical bars are more robust than an electrified wire but are also more expensive. Bars tend to reduce the aggressive or dominant animals from monopolising the stack face. Their positioning also controls intakes and collects most of any dropped silage.

Designs can be vertical bars or pipes or a tombstone design which is two vertical bars with a hoop on the top. This design creates extra space between the heads of the feeding animals.

Horizontal Barrier

Horizontal barriers are preferable for sheep to allow sheep to move sideways to accommodate other sheep coming to the face. This design also reduces back jumping and dominant behaviour.

Weldmesh

Weld mesh (200 × 200 mm gap) welded to moveable pipe frames can be used, although some wool may be rubbed off from around the neck area.

Spacings are the same as mentioned above. Feeder diameter may affect the intakes of younger or smaller animals due to

difficulty accessing the inner portion of the bale. A skirt around the perimeter base will reduce losses somewhat as will bales made with a chopper baler.

Self feeding baled silage

Round and large rectangular bales of silage can also be self fed, generally from ring feeders (Figure 3) or long rectangular feed troughs (Figure 4) with vertical bars or tombstone type design. Chop length of the silage, silage fermentation, mouldy sections as mentioned above will all affect intakes.

Figure 3. Cows at ring feeder with tombstones.

Baled silage should be completely consumed by the third day to avoid aerobic deterioration. Spoilage at the base of the feeders should also be removed to avoid moulds and yeasts in the deteriorating silage affecting the new silage being placed on top.

Figure4. Cows feeding from long feeder with tombstone spacers

Minimise/avoid environmental damage

Recently, many farmers have begun to incorporate feed pads and stand off areas near their dairy sheds and fodder storages. Similar design criteria are essential for self fed silage stacks. Slurry, possibly silage effluent from the stack itself, and contaminated rainfall falling on the stack area, must all be managed to avoid contaminating waterways and streams.

Consider the stack location and proximity to neighbours and township borders if there is a possibility of unpleasant odours being produced.

Obtain expert advice on the correct design and positioning of stacks to be self fed and any loafing areas associated with the self fed stack.

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