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To Precision Chop or Forage Wagon Harvest - That is the Question?



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To Precision Chop or Forage Wagon Harvest?

WHEN deciding whether to precision chop or harvest with a forage wagon, the cost of the silage harvesting process is not the only consideration. There are many factors which should be considered before concluding which method is best for you and your farm, and your decision may change from season to season or even cut to cut. The term forage wagon will be used in this factsheet, but other common names are self-loading wagon, forage box and pick-up wagon.

The purpose of this factsheet is not to tell you which is the cheapest method, but to give you the facts that will help you consider the **'Value'** of each decision you make and assess these when considering **your** silage making practices with reference to **your** farming enterprise. The very real emphasis on **'Value'** and **'Your'** will then help you identify the most cost effective approach for **You**.



Costs of Production

Quoting figures for the cost of production of silage can raise many issues. The three biggest variables that are often, or sometimes never considered are:

1. Nutritive value of the silage.
2. The value of the timing of silage making as part of grassland management.
3. The value of losses incurred between harvest and feeding, which on many farms account for 25% of the total costs.

Nix Farm Management Pocketbook (2017) lists contracting costs for precision chop harvesting only are £64.99/hectare for first cut. The costs for precision chop harvesting (1st cut), carting and clamping are £130.42/hectare. However, the costs for forage wagon harvesting are £101.25/hour. So even on a simple cost of production basis it is difficult to compare the two as the forage wagon will obviously cart, but the proximity of the field to the clamp is a big variable.



Silage Nutritive Value

All farmers should maximise the nutritive value of their silages to match the nutritive requirements of the stock they are feeding. The biggest factor affecting nutritive value is the stage of growth at harvest. If the stock to be fed the silage are either early/mid-lactation cows, pregnant ewes or finishing beef, then the minimum ME should be 11.5, which is approximately 72 D and a crude protein content of 16%. Hitting this target has a huge implication on winter feed costs, productivity and potentially health and vet costs. If a dairy farm produces 500 tonnes of silage with a DM of 30%, then the difference between an ME of 10.5 and 11.5 is 150,000 MJ of energy, which is worth 30,000 litres of milk from forage. To replace the lost energy from the silage with concentrate will require an additional 11.5 tonnes of concentrate at extra cost.

The second lesser, but important factor affecting the ME are losses between cutting and ensiling and feeding out. With a bulkier, lower D-value crop the field losses during wilting will be greater, thus reducing the value further. Also, lower D value silages have a lower intake, further reducing the total nutrition received from forage. This is particularly important in late pregnancy ewes. Do not forget that ruminants evolved to eat forage, not concentrates, and supplying more of their nutrients as forage maintains a healthier rumen. Forage fed animals chew their cud, reducing the risks of acidosis and therefore improving overall animal health.

So why is this important when considering which harvesting method to employ when making clamp silage? If choosing one of the options above gives you better control over cutting time, then this can have a significant effect on farm profitability and therefore cost effective silage production.

Forage Chop Length and Silage

Silage clamp density has a major effect on silage quality and therefore losses, intake and potential disease-causing micro-organisms or their toxic end-products. Silage density is therefore the second most important key target of silage making after the quality of the forage at harvest. Every silage clamp should have a target density of 250kg of dry matter/m³ (see *FC Best Clamp Management Factsheet for information on how to measure silage density*).

¹ Reference: PO'Kiely and A.V.Flynn (1990). 'Comparison of un wilted grass silages made using the pick-up wagon and the double-chop harvester system' in *Canadian Agricultural Engineering* P.120 - 125

² Reference: Pakkala, J. and Marley, G. (2015). 'The effect of harvester type (self propelled, trailed or forage wagon) and storage method (bunker or drive over pile) on forage density of grass silage across Finland' in *XVII International Silage Conference Piracicaba, Sao Paulo Brazil July 1-3 2015*, Pp 324-325.

Poor silage density results in a number of negative effects on silage quality:-

1. More oxygen

More oxygen is trapped at the start, allowing more plant respiration of sugars, thus reducing the rapidly available energy and increasing the risk of secondary clostridial fermentation, resulting in higher concentrations of ammonia-N and butyric acid in the silage.

2. More microorganisms

More microorganisms can grow, including Enterobacteria and yeasts. These again reduce the available nutrients in the silage and some can also survive the storage period and cause disease such as E.coli, Listeria and Bacillus. The yeasts, which also grow when oxygen is present, initiate aerobic spoilage when the clamp is opened. As well as further reducing the available nutrients to the animal, it also reduces the degradability of the feed in the rumen by having a negative effect on the rumen microflora.

3. Increasing the ingress of air

Increasing the ingress of air, from any damaged covers during storage and at feed-out increases the risks of moulds growing, decreasing the nutrients available. It also increases the risks of mycotoxins production in the silage, which can have a negative effect on animal health and performance.

Chop length can have a significant effect on silage density as the longer the particle length, the more difficult it is to compact the fresh forage entering the silo. This can result in a greater risk of problems during storage and feed-out, as highlighted above. This would suggest that the forage wagon made silage clamps would have a lower silage density than precision chop clamp silage. Research from trials from Ireland have shown that silage made from the same fields of grass with forage harvesters compared to forage wagons had no differences in their fermentation characteristics, suggesting that providing management is adapted for the harvesting techniques employed, good silage can be made¹. However, a survey of commercial farms in Finland, which assessed 213 precision chopped silages and 110 forage wagon silages showed that the average density for the precision chopped silage clamps was 190 kg DM/m³, compared to 169 kg DM/m³ for the wagon clamp, indicating that in practice there was a potential difference².

In Practice

The Challenges

Many factors come in to play when making silage, and being in control of as many of those factors as possible will have the biggest effect on the quality of silage fed on your farm. Altering your management depending on the silage system is a crucial piece of the jigsaw. One of the main problems with precision chop harvested material is that the forage is delivered to the clamp at such a speed that silage compaction suffers. However managing the speed of delivery can overcome this problem. The second problem is that if harvesting begins later than expected, or the work is rushed, quality can be reduced.

The risk from the forage wagon system is that the chop length is too long, resulting in reduced silage density, if not compacted sufficiently. Also, the longer chop and the way the forage wagon is filled makes placing even layers in the clamp more challenging.

The Solutions

However you decide to harvest your silage there are always a few key rules to follow. Whilst there are many guides for precision chopped harvested grass, there is less information for forage wagon prepared silage.

- 1. Grass should be spread immediately after mowing and not left in a narrow swath.** Tedding under most conditions is recommended (except when the risk of soil contamination is too great), and then rowing up. These activities are essential with forage wagon made silage as they move more of the grass so that it is lying perpendicular to the forage wagon at pick up. This will ensure that more of the forage passes across the knives and is cut, rather than flowing un-cut between the knives.
- 2. The target dry matter should be 30%.** Lower than this increases the losses due to effluent and fermentation and can reduce livestock intake. Higher DM increases field losses and aerobic spoilage losses at feed-out and DM above 35% can also reduce intake. With forage wagon silage and a more mature crop consider a lower target of 28% DM as this type of crop is more difficult to consolidate due to having more stem which resists compaction. Making it drier exacerbates the problem.
- 3. All the knives should be sharp and left in.** Forage wagon knives should be sharpened at least twice during the day - at the beginning and half-way through. Most new machines now have self-sharpening and reversible knives, so this is relatively easy, but to maintain a good chop length this practice is essential in the forage wagon.
- 4. Fill the clamp with even layers no more than 15 cm/6 inches deep and roll every layer, starting with the very first load.** For more mature, low D (62%) grass this can be reduced to 10cm/4 inches, especially with forage wagon harvested grass. With high D grass (75%) and providing the DM is 28% or lower, a layer of 20 cm/ 8 inches is better.
- 5. At feed-out, use a good sharp cutting implement that keeps a tight face and doesn't tear or rip the silage from the clamp, as this increases the surface area of the clamp face and increases the penetration of oxygen into the clamp.** Oxygen penetrating the clamp face increases the aerobic spoilage losses and the risks of infectious and production diseases. Again it is even more essential to employ this good clamp management when using forage-wagon made silage.
- 6. Ensure the feed-out rate is rapid enough to avoid aerobically deteriorating silage,** ideally crossing the entire clamp face every three to four days as a maximum.

And Finally

Whichever system you choose remember that making silage cheaply doesn't necessarily make it the most cost effective. However, making the correct nutritive value silage for your livestock and managing the whole process can improve grassland management, animal performance from both grazed and conserved forages, and reduce your livestock health issues.

When making your silage, always remember:

1. It is the most important winter feed on your farm, so it needs to be done correctly to maximise the potential from it.
2. You are paying the bill so take charge and oversee the job.

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