Grassland Toolkit

Your essential guide to grassland management

March 2018

Including 15-page Best Practice Guide

RETURN ON INVESTMENT

Key facts & figures

Farmer focus

Five farmers share their grassland management benefits

Cost of bad silage

How much is bad silage costing you?

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DAIRY FARMER

A Dairy Farmer publication in association with: KRONE, Nufarm, volac, WYNNSTAY, YARA

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Big opportunities to increase productivity of grassland

Uncertainty about the future is something every business in the UK is having to live with as the country approaches Brexit. For farming, as the industry looks towards a whole new support regime post-Common Agricultural Policy, the uncertainty is particularly pronounced.

Dr Debbie McConnell is a dairy grassland scientist at the Agri-Food and Biosciences Institute in Northern Ireland. As someone who spends all her time looking at grasslands and ways to improve productivity and profitability, she is well placed to take an overview of the industry and the challenges it faces.

Dr McConnell describes a mixed picture for grassland farming with major opportunities to increase the productivity and profitability of livestock enterprises, and the greater use of technology providing more data and better management. However, she also believes there are real challenges in delivering these benefits.

> **"We need to think of grass as a crop**
> DEBBIE McCONNELL

"There is a very wide range of efficiency in the industry," she says, "with the genetics available in current seed varieties, there is the potential to produce on-farm yields in excess of 15 tonnes dry matter per hectare, as opposed to the current 7.5t DM/ha average. Given an extra tonne of dry matter per hectare represents an increase of £334/ha in net margin, you can see this is a real loss to the sector.

"The tools and the information to deliver these improvements are there, but we seem to lack the focus to do so."

Dr Debbie McConnell

Education agenda

Dr McConnell would like to see grassland management higher up the agenda in agricultural education, plus an increased focus on-farm to include more detailed planning and measurement, something she believes few grassland farmers are doing.

She says: "We need to think of grass as a crop and apply the same level of detail and attention we would when growing an arable crop."

One area where she believes grassland management may benefit from the work done in arable farming, is the use of technology for data capture.

"I think these are really exciting times to be involved with grassland. The use of technology such as drones and satellites should enable us to make much smarter decisions. We can start to look at data on a sub-field basis and make decisions such as variable seed rates and fertiliser applications. I think we will benefit from the fact many of the bugs in this technology have been ironed out by the arable industry," she says.

Lack of planning

Dr George Fisher, an independent consultant to the grassland sector with many years' experience including time at AHDB and Reaseheath, believes a lack of planning is holding the sector back – both in general terms, but also specifically when it comes to the milk price.

"It is possible to plan for changes in the milk price, as there is a three-year cycle of the UK Actual Milk Price Equivalent as recently demonstrated by AHDB Dairy," he says. "Rather than worrying about what we cannot predict, producers can plan for these changes. One way of responding is by ensuring at least 4,000 litres per cow per year is produced from home-grown grass and forage. Doing that will put a profitable base into any system."


Dr George Fisher

For Dr Fisher, the most successful grassland farmers are those who have a plan and know what they want to achieve, whether it is turnover or margin. Having set their objectives, farmers can then look at the detail of managing their grassland and their herd.

Unfortunately, he believes many farmers do not have a plan and have not laid out their objectives before making decisions.

A clearer understanding of 'return on investment' would also help, says Dr Fisher, and this is also where information on the 'milk price cycle' can help – ensuring investments will continue to pay, no matter what happens to the milk price.

The final point he makes is ensuring farmers are in control at every stage of implementing the plan. "It's up to the farmer to make sure the details are right throughout the process, delegating to others will simply not be as effective."

Case study

We spoke to five farmers for whom grassland management is already a primary focus to see what kind of benefits they are achieving.

Move to 60% forage creates big savings

Dairy farmer Steve Cox has not only made substantial savings on his feed bill by increasing the amount of silage he feeds his cows, but also believes the herd is healthier and the quality of the milk has improved as a result.

Based at Manor Farm, Marston in Staffordshire, Mr Cox started the farm about 45 years ago with his father. He and his family now farm 346 hectares. They have a 530-strong dairy herd, breed their own replacements and also sell store cattle.

They have taken a conscious decision to move to a more forage-based diet for the dairy herd, with silage now making up 60% of the ration.

Saving

He says: "The main driver for the change was financial. With the recent dip in the milk price, we had to make changes. Moving to 60% forage has certainly met our objectives as we are now saving about £17,000 in feed costs every month. I also think the cows actually look healthier as a result and the quality of the milk is better – we are getting 4.2% butterfat and 3.48% protein. At the same time our yields, which are about 11,200 litres per cow per year, have not altered with the change in feed regime."

> **"The main driver for the change was financial. With the recent dip in the milk price, we had to make changes**
> STEVE COX

In order to provide sufficient forage to make the change, Mr Cox moved his first cut date forward and is now cutting roughly every five weeks. He aims to produce high energy silage and says an ME of at least 11.5 is required to produce milk.

"Fortunately, we have the store cattle business as well," he says, "and that has proved useful as they take up any silage with a lower ME. It has also proved to be a good hedge for us when the price of milk has gone down."

Getting the final part of the process right is also critical for Mr Cox. Good clamp management and using an additive are viewed as integral to maximising silage quality and quantity, and an Ecosyl treatment is already planned in for this year's grass harvest as he believes the cost of an additive is relatively minor compared to the overall cost of producing silage.

The business has invested in its own silage-making equipment and he says this is the best investment they have made as it enables them to turn around silage much quicker.

Steve Cox is based at Manor Farm in Staffordshire.

They don't understand the science but they do know fine forage when they're fed it

Containing MTD/1, the world's most proven *Lactobacillus* strain, Ecosyl ensures more consistently reliable silage, whatever the weather.

- Reduces fermentation dry matter losses by 50%
- Enhanced milk production (average 1.2 litres/cow/day over 15 trials)
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For consistently better silage

Case study

Yara area manager Greg Dall advises Willie Watson.

Treat grass like an arable crop

Grassland farmer Willie Watson has 300 cows and 220 breeding ewes on 243 hectares at Muir Farm, in Mauchline, Ayrshire. He advocates a grassland management system firmly focused on maintaining soil nutrient levels and the quality of grass leys, and approaches grass in the same way as growing an arable crop.

"I know it is vitally important to keep soil pH in excess of 6 to give rye-grass the chance to fulfil its genetic potential. I also work hard to maintain the right nutrient levels, particularly potash and phosphate," says Mr Watson.

> **"I also work hard to maintain the right nutrient levels, particularly potash and phosphate**
> WILLIE WATSON

"Each year we do soil analysis on sections of the farm, more recently using GPS testing and mapping on some areas, and we also analyse slurry and grass."

In 2014 Mr Watson topped the leader board in Yara's Grass Prix – delivering the best value of grass per hectare at £2,943. That year the silage fields received 45,000 litres of slurry per hectare applied around the last week in February, followed by 314kg/ha YaraMila Sulphur Cut (22-4-14+7.5SO_3) fertiliser in mid-March.

Greg Dall, Yara area manager, who advises Mr Watson, says: "Ten days after that base dressing of 22-4-14 we applied YaraBela Prilled N. Then after the first cut, as soon as the grass was off the field, 39,000 litres/ha of slurry was applied, injected to give a better uptake of nutrients, and YaraMila Sulphur Cut at 375kg/ha."

Nutrients

Over the first two cuts the nutrients applied as mineral fertiliser were 194kg N, 28kg P_2O_5 and 97kg K_2O at a cost of £247/ha. This compares to average values in Scotland of 117kg N, 32kg P_2O_5 and 46kg K_2O at a cost of £124/ha.

Looking at the value of the crop, compared to buying-in the same amount of ME as brewer's grains, Mr Watson achieved £2,943/ha. This gave him a margin over fertiliser of £2,695 compared to the average farm practice which achieved £1,408/ha and a margin of £1,283.

A key insight was the importance of treating grass as an arable crop, not least by completing a nutrition management plan ensuring all nutrient requirements are met and balanced.

Another strong learning point was the benefit of reseeding.

"We also take a rigorous approach to reseeding," says Mr Watson.

"Quality and young grasses perform better and so we keep up a good rotation, monitoring every field in terms of yield. As soon as one underperforms we ask for specialist advice on the best variety choice available."

Knowledge grows

Grass, still the cheapest feed!

Feed your grass with Yara's Booster range of fertilizers:

- Contains Selenium for healthier livestock
- Sodium enrichment encourages longer grazing times
- Additional sulphur increases yield by 10-15% in first and second cut
- True uniform fertilizer – every granule contains every nutrient
- No nutrient segregation – achieves an even spread

For more information please contact the Anglia Farmers fertilizer desk on 01603 881825 or www.yara.co.uk/crop-nutrition/features/booster-fertilizers

@Yara_UK agronomy.uk@yara.com Yara UK www.yara.co.uk

Case study

Maximising yield from forage

For dairy farmer Chris Shingler, from Much Wenlock, Shropshire, the priority is to maximise milk yields through the use of home-grown forage. As a result, the grassland management programme is a major priority, with reseeding considered to be an investment rather than a cost.

He says: "I aim to reseed 35 acres out of our 80 acres of grassland annually and use grass as a break crop in the arable rotation, following second winter wheat. I want to keep fields as productive as possible, and therefore choose both long-term grass mixes for cattle grazing and short-term mixes for bulky silage cuts, which will grow quickly and will be ready to cut in early May.

"To break the arable rotation, I use short-term grass mix Wynnstay Tower which produces a high-quality silage and take three to four cuts a year. In 2017, our first cut silage, taken on May 7, produced a D value of 72.1%, 14.7% crude protein and 11.5 MJ/kg ME. Producing high-quality silage has enabled me to continue to push yields and milk constituents, meaning we can reduce our reliance on concentrates."

A further two cuts were taken in mid-June and mid-July, and then fields were used as late summer grazing. As the mix is made up of 100% Italian rye-grass, the grass grows very rapidly. Mr Shingler walks the fields weekly during the summer months to monitor growth, often increasing to every two to three days as harvesting approaches to make sure the grass is not going too 'stemmy'.

Chris Shingler's priority is to maximise milk yields through the use of home-grown forage.

For the permanent pastures, Mr Shingler aims for a long-lasting mix with clover such as Wynnstay Sovereign which will be the platform for his grazing land. When moving cows between fields, he walks the fields weekly to check sward height and moves the cows to the next pasture when covers are grazed down to 1,500kg/DM/hectare.

These fields are ploughed and reseeded every five to seven years, meaning the most up-to-date grass varieties are used and this helps to maximise forage quality and quantity.

Fertiliser policy

Mr Shingler soil tests the whole farm every three years, looking at N, P, K and Mg levels and he uses the results to create a bespoke fertiliser plan for each field.

He says: "Using the RB209 nutrient management guide, I'm able to decide on the nutritional requirements of each field dependent on the previous and following crops, and account for any deficiencies highlighted by the testing. This way, no fertiliser is wasted, and no nitrates are left in the soil post-harvest."

Farmyard manure and fertiliser are applied to all fields, with the quantities applied dependent on individual field requirements.

A nitrogen-sulphate fertiliser is also included and applied to new leys in spring, to compensate for the lower atmospheric sulphur levels, followed by a straight nitrogen application a few weeks later. After cutting, he uses any dirty water or slurry applied directly to the fields.

With the aim of reseeding 30-40% of the grassland area each year, rotationally fields are planted with grass every few years, which is helping to keep on top of weeds.

With feed costs remaining high, it is important to make the most of home-grown feed. By investing in new leys, Mr Shingler ensures the whole farm remains productive, reducing reliance on bought-in concentrates and improving the business' bottom-line.

Weed control is critical to success

»Lower Westcombe Farm is one of three supplying milk to Westcombe Dairy. It has 380 dairy cows on 202ha averaging 9,000 litres per annum, 3,500 litres of which are from forage.

Richard Calver is one of Westcombe Dairy's directors, he says: "I'm attempting to improve one aspect of our farming operations every day and having a targeted spring weed control programme in place is among the tools in the box. Good grazing leys with about 20% clover and minimal weed content are really important to us, since they have a huge impact on milk quality and ultimately the bottom line, since each day we rely on the entire supply of milk to make into unpasteurised traditional cheeses on the farm.

"To keep on top of the

Increasing dairy herd size requires forage production upgrade

»Doubling of the dairy herd at J.F. Cobb and Sons, Newburgh Farm, near Dorchester, coupled with a fourfold increase in the amount of grass being mown and ensiled, has meant some significant changes in management strategy to keep the same levels of efficiency.

The decision to expand the dairy enterprise meant reducing the arable land from 485ha to 101ha to grow more grass to support the two large dairy herds on the farm. The farm now grows 485ha of grass – an increase from the 141ha grown two years ago – producing up to four cuts of grass, ensiling up to 1,415ha each year. First and second cuts yield up to 19t and 14t/ha respectively, with third and fourth cuts yielding between 10t and 7t/ha. Cow numbers have doubled across the farm over the same period.

David Cobb says: "The secret to achieving the best out of a dairy cow is to ensure it has the best quality feed, so when it comes to silage-making getting quality in the pit at the right time without increasing production costs is critical.

"It's all about timeliness of operation," he says. "We took the decision to take the silage-making process back in-house having relied on contractors in the past. It also coincided with a decision to improve the efficiency of the grass-cutting."

Forage harvester

This meant purchasing a self-propelled forage harvester and replacing two mowing rigs with one much larger set up, freeing up a tractor and driver to manage the pit or run a forage trailer.

"We have cut out a tractor and an operator, although we have kept one of the old mowers to help with third and fourth cut and/or be used in the event of breakdown.

David Cobb

Effectively one man is now doing twice the workload," explains Mr Cobb.

The mower of choice is a Krone EasyCut 9140 CV triple mower with conditioner units, which replaces two sets of Kverneland side and front mounted mowers. Working alongside this is a Krone KW 7.82 four-rotor tedder.

Mr Cobb says: "Now we are relying on one set of mowers to cut most of the grass; we might change it after three seasons depending on what trade-in value we are offered. It should easily do six seasons without too much maintenance, but with only one set we have to have reliability at all times.

"Although the EasyCut is quite lightweight for its size we increased horsepower from 225hp to 280hp supplied from a Fendt 828 which replaces a Massey 6499. We find the triple mowers balance the tractor and because the mower conditioners are quite heavy greater stability is achieved, especially on slopes. While the front-mounted mower prevents the tractor from running in standing crops the overall set up allows up and down operation, improving efficiency."

game, I depend on specialist advice from our agronomist, Keith Hallett. We walk the grazing and silage swards at the beginning of each growing season and identify common weeds. Keith presents me with a comprehensive plan of each field, then we discuss the economic response of a herbicide application – I need to know the costs and what I'm likely to get in return. Any field with a weed infestation above the 10% threshold we are confident will achieve an economic response.

"It's also important to use the right herbicide. We used to find it difficult to keep clover in the sward, however we've since discovered there are clover-safe products on the market and they really do work.

"Then it's down to good communication. Having identified which fields to treat, product is ordered and I liaise with the spray contractor to use the boom or spot spray. Critical to success is catching the weeds at the right time, not too early and not too far forward, so timing is dependent on the weather, it's different every spring."

Return on investment

RESEEDING

Reseeding typically costs
£593/ha
including the cost of taking land out of production and lime application

A newly sown ley can deliver a
15% increase
in DM yield and a 0.5 improvement in ME, which can increase annual litres produced /ha by
3,064 litres

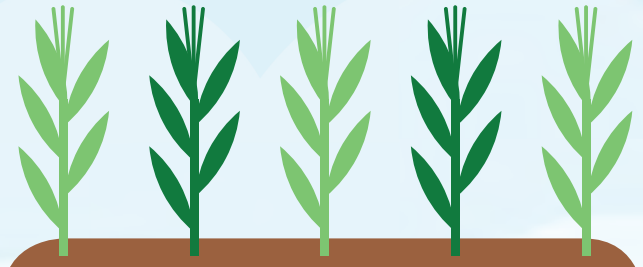
Assuming a milk price of
30ppl,
giving £919/ha, and after deducting £198/ha for reseeding costs (over three years), this still delivers a
£721/ha/year
financial gain

VARIETIES

Spending time to choose the right grass variety from the RL makes just as much sense for grassland as it does for arable

WINTER WHEAT YIELD (AHDB RL 2018/19)
Highest yielding: 11,342kg/ha
Lowest yielding: 10,486kg/ha
Difference: 856kg @ £140/t
£119.84/ha

LATE TET GRASS CUTTING TOTAL YIELD FIRST YEAR (E&W RL 2017/18)
Highest yielding: 19,116kg DM/ha
Lowest yielding: 16,992kg DM/ha
Difference: 2,124kg DM @ £120/t
£255/ha



The right grass varieties can deliver twice the return on investment when compared to arable crops

SULPHUR

Sulphur returns
£90
for every £10 spent

For a silage value of
£25/t FW
at 27.5% DM, with extra grass at 3.6t/ha, this would be worth
£90

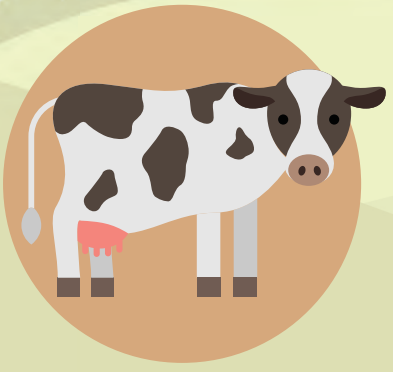
On light to medium soils, there is a
10-15%
increase in grass DM yields where sulphur is applied; on a sward producing 10t DM/ha, this equates to an extra
1 tonne
of grass per ha

At a typical annual N rate of 250kg N/ha, the £10/ha extra cost for the farmer to apply a fertiliser containing sulphur gives a return of **9 to 1**

SELENIUM

Selenium plays a fundamental role in reproductive health and the immune system

Dairy cow infertility costs an average of
£227/cow
and is the single biggest reason for culling cows on UK dairy farms



A case of mastitis will cost **£290**
while retained foetal membranes will cost **£347**
} PER CASE

For a £7.50/ha investment in a selenium-fortified fertiliser, you can ensure all, or a significant portion, of your cows' selenium requirements will be met by grass forage

Key facts & figures

WEED CONTROL

Controlling weeds from a

10% infestation level

pays back throughout milk production

Using the extra silage energy to produce milk produces a

10 to 1

return on investment

Controlling docks/spear thistles and selling extra silage produces

3 to 1

return on investment

Using the extra grazing energy to produce milk gives a

14 to 1

return on investment**

Using the extra grazing energy to replace concentrate gives a

5 to 1

return on investment*

*Notes: Return on investment *calculated with a concentrate feed cost of £210/t; **milk price of 28ppl*

LIME

Research shows average grass production response of at least

1t DM/ha

annually from lime alone

Silage value of

£25/t FW

at 27.5% DM

Typical maintenance of lime of

4t/ha

once every five years

Extra grass at 3.6t/ha is worth

£90

With a lime cost of £25/t, annual lime cost per ha is

£20

Return on investment

4.5 to 1

NITROGEN

NITROGEN RETURNS ON FIRST AND SECOND CUT:

FIRST CUT (120kg N/HA)

This will produce: 5.5t DM/ha

Cost of nitrogen (AN at £255/t): £88/ha

This will produce: 20t FW/ha of silage; valued at £25/t FW is

£500/ha

Return on investment

5.7 to 1

FIRST CUT (90kg N/HA)

This will produce: 2.5t DM/ha

Cost of nitrogen (AN at £255/t): £66/ha

This will produce: 9t FW/ha of silage; valued at £25/t FW is

£225/ha

Return on investment

3.4 to 1

These calculations are based on all applied nitrogen coming from mineral N; the other variable and fixed costs associated with growing silage have not been factored in

USING A SILAGE ADDITIVE

MTD/1 is the strain of

beneficial bacteria

in Ecosyl silage additives

Across 15 trials (various forages), MTD/1-treated silage has been shown to improve milk yield by an average of

1.2 litres /cow/day

Assuming 200 days feeding silage, this is an extra

240 litres /cow

which, at 20ppl, is an extra

£48 income

If a cow eats 10 tonnes of silage, the cost of the additive is

£13

Common mistakes made on-farm

Having outlined the benefits of grassland management, what are the common mistakes made on-farm?

1 Not using or under applying of sulphur on grassland

Sulphur's importance as a plant nutrient is under-estimated on grassland. Where sulphur is applied:

- Nitrogen is used more efficiently by the plant.
- There are consistent increases in grass yields of between 10% on clay soils and 35% on sandy soils, where sulphur has been applied on intensive grazing and silage systems.
- It increases silage protein, sugars and digestibility.
- Nitrogen leaching is reduced on sandy soils.

If a 10% yield increase on a 10-tonne DM/hectare silage crop was assumed, this could potentially give you an extra 11,500 MJ of ME per ha, enough to produce an extra 2,100 litres of milk. Recommended application rates are 30-50kg SO_3/ha per cut.

> **"You need to compact as you go along**
> JACKIE BRADLEY

2 Delaying harvesting first cut

Cut earlier rather than later if required. Harvest date is the most important factor affecting grass silage quality and yield. Yield increases as harvest date is delayed, but quality declines. When harvest date is delayed by two weeks in May, it can result in silage with:

- 3-4% lower crude protein.
- 4-6% lower D-value.
- Lower potential dry matter intakes.

A 1% increase in silage protein can save a dairy farmer 6p/cow/day in feed costs.

3 Soil fertility is not adequate

- **Soil pH:** 52% of grassland soil samples have a pH below 6, when the target range for grassland is 6.3-6.7.
- **Soil phosphorus:** 36% of grassland soil samples are index 0 or 1 and only 30% of samples are at target index 2.
- **Soil potassium:** 42% of grassland soil samples are index 0 or 1 and 41% of samples are at target index 2.
- Only 9% of all UK soil samples are at target index for both P and K.

Source: Professional Agricultural Analysis Group Collation of data from routine soil analysis in the UK 2015/2016 (www.nutrientmanagement.org/paag-report-2015-16/)

The correct soil pH is fundamental for the efficient utilisation of both organic and mineral fertilisers.

"At farm level every €100 investment in lime equates to about €700 in extra grass production annually" – Teagasc, Johnstown Castle.

4 Not controlling weeds during the seedling stage as new leys establish

By leaving weed control until the following spring, control will not be as complete. The costs of a timely application during early establishment are no higher, but the benefit of eliminating weed competition and providing a 'clean-start' for the new ley is significant.

5 Poor timing of herbicide applications

Timing of application is critical. Weeds must be treated while they are in active growth and still within the size/growth stage limits stated on the product label.

6 Application of non-clover safe products

Choice of product is vital to maintaining clover-rich swards. Clover safe options are available such as CloverMaster and Squire Ultra. And again, the timing of the clover safe application is equally crucial.

7 Not soil sampling and understanding what nutrition the crop requires and what has been removed each season

The soil is the basis of everything which happens in grassland. It is not just about Ps and Ks but every aspect of the soil. Unless you get your soil right, you may be wasting your time and money on getting the latest varieties of grass, fertilisers and crop protection.

8 Following the same fertiliser regime across the farm

Proper soil analysis, carried out at different sites across the farm, can enable you to develop a plan for fertiliser which will allow you to take into account the differences and apply different regimes – making the most of your fertiliser.

Harvest date is the most important factor affecting grass silage quality and yield.

9 Not fully utilising slurry and farmyard manure efficiently

By using soil analysis which looks at all aspects of the soil – not just Ps and Ks – it is possible to make much better use of slurry and farmyard manure to improve the overall quality of the soil.

10 Not asking if the varieties within the mix are on the Recommended List

Many farmers do not challenge their supplier to ensure the varieties they are using are on the Recommended List and also understanding the characteristics of the seed to make sure it suits their needs.

11 Not soil sampling individual fields prior to re-seeding

If you do not know what you are starting with, then you can't expect to maximise your forage production.

12 Failure to prepare and maintain machinery

After you've taken the final cut of the year make sure any harvesting equipment is cleaned and made ready for winter storage in accordance with the manufacturer's guidelines. Ideally all machines should be winter serviced and any damage repaired. This should be done before winter and not left until the following spring.

13 Using old and unreliable machinery

Unreliable machinery can soon become very costly, not just in terms of repair bills, but also in lost time and forage quality. As soon as the decision has been made to mow the grass, the clock is ticking. If a piece of equipment lets you down then your grass may be mown after the optimum time, left to wilt for too long or not harvested soon enough, it can result in lower sugar levels and poorer quality silage.

14 Using machinery not suitable for the task

Are you or your contractor using the appropriate harvesting machinery? Is it doing the job it was designed for? Do all machines match in terms of productivity?

Using a dedicated tedder and rake, instead of a combination machine like a 'hay-bob', can speed up the wilting time by 24 hours and will produce a uniform swath, resulting in a more efficient harvest. Furthermore, machines with a lower productivity will create bottle necks, slowing down the harvest.

15 Only using a silage additive in poorer weather

The key to treating silage is conserving as much of the nutrient value as possible. The more nutrient you start with, the more an MTD/1 silage additive will conserve. While it is clearly important to conserve the nutrient value of silage with a lower nutrient score, it is just as valuable to conserve high-quality silage, so it delivers nutrients, increases production and saves money. In fact, high-quality silage will give a better return on investment when using an additive than lower quality silage.

16 Not consolidating the clamp well enough

Until you remove the air from the clamp it will not ferment, as oxygen is a barrier to the fermentation process starting. Jackie Bradley, product manager at Volac, points out the difference between producing silage from grass and turning it into compost is oxygen.

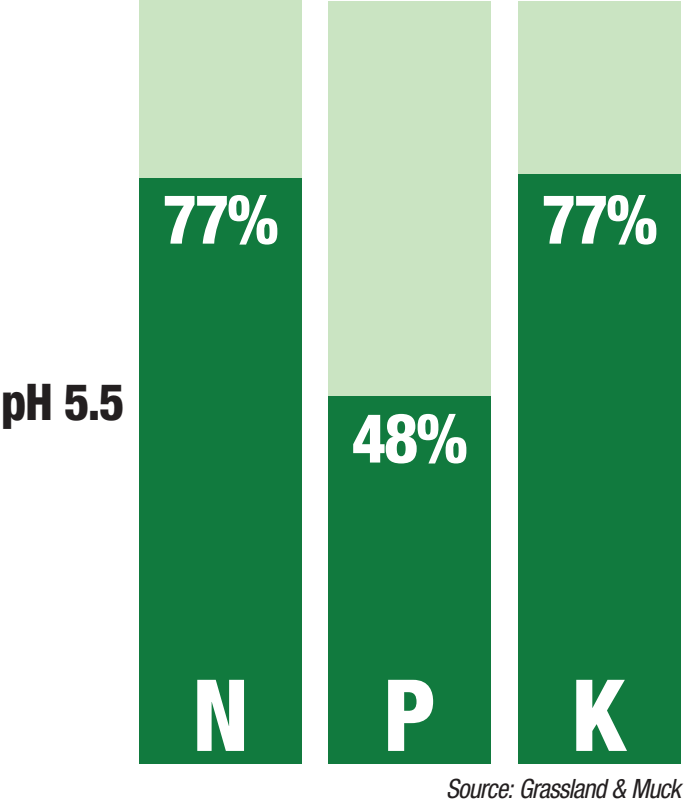
She says: "People tend to spend a lot of time compacting when they've finished. If you compact at the end, you're really only compacting the top 15 centimetres. You need to compact as you go along to eliminate air pockets and improve the fermentation."

17 Leaving old silage at the front of the clamp which can lead to contamination

Once the clamp is opened it becomes exposed to oxygen, and 'bad' bacteria and yeasts and moulds start to multiply. These use up nutrients, reducing the silage's feed value. To reduce exposure to oxygen, keep the face clean and tidy using a shear grab or facer.

At ground level, remove old, mouldy silage that falls on the floor promptly to prevent it contaminating the rest of the clamp. Also, don't put the sheet back over the face at feedout, as this encourages yeasts and moulds, increasing the risk of spoilage and heating.

pH impact on NPK usage efficiency



Source: Grassland & Muck

Cost of bad silage

Bad silage is costing farmers a lot of money

Wesley Habershon is a dairy consultant and nutritionist with the Farm Consultancy Group, he was commissioned by Yara to look at the cost of making bad silage. Mr Habershon estimates this could be as much as £32,000 for a 120-cow herd producing 9,000 litres per cow per annum.

Table 1 illustrates two current grass silage analysis and their key characteristics. The poor grass silage was cut three weeks after the good silage and suffered from some inadequate management and weather issues. While much importance is given to the top three characteristics in the table, as much importance should be given to the others given their role in influencing palatability, fermentation, energy and protein values.

Table 1

	Poor silage	Good silage
Dry matter (%)	32	28
Crude protein (%)	11	14.5
ME (MJ/kg)	10	11.5
pH	5.5	4
NH3-N (%)	5.5	1.2
Sugar (%)	8	4
Ash (%)	10.5	3.8
NDF (%)	512	440
Volatile fatty acids (g/kg)	50	11
Lactic acid (g/kg)	15	75

Palatability is key to dry matter intake. Dry matter, ammonia (NH3-N), volatile fatty acids (VFAs), ash and sugar all influence how attracted a cow is to a silage. Ammonia, for instance, reduces intake, as do VFAs which include the unpalatable butyric and acetic acids. Table 1 demonstrates how a good silage has lower levels of ammonia, ash and VFAs.

The objective of good silage-making is to achieve a stable forage (pH 3.8-4.2), transformation of sugars into lactic acid (70g/kg+), digestible fibre (NDF 40-45% DM), maximise utilisable protein available to the cow and, most importantly, to maximise energy values (11ME+). The issue with the poor forage is not just assigned to the energy and protein values but how much the cow wants to eat, how much she can effectively digest and produce in yield and milk constituents.

Table 2

	Poor silage Kg	Good silage Kg
Good grass silage		34.5
Poor grass silage	28.5	
Maize silage	9.5	11.5
Molasses	1.75	
Caustic wheat	2	2.4
Feed grade urea	0.03	
UFAC Dynalac	0.4	
Protein blend*	4	2.4
Dairy HDF 18%	2.2	2.4

**Soya meal 67% and rape meal 33%*

Late applications

High ammonia results can be the result of late fertiliser applications (ammonia reduces the fall in pH), insufficient wilt, inadequate fermentation (pH 4.4+) and secondary fermentation. Protein is particularly susceptible to degradation from inadequate pH (pH 4.4+) and forms ammonia, amines and amides. This issue occurred in the poor grass silage meaning more protein is needed to supplement the ration and this was achieved through more soya/rape meal and some feed grade urea.

Wesley Habershon

Poor silages need more concentrate, fats and improved palatability and even then, cows will never perform as well as with a well digested high energy grass silage.

I have applied both these forages to a typical farm situation based on 9,000-litre cows. The forage element was based on 25% maize silage

Cutting earlier, managing nutrient requirements, investing in new leys and attention to detail are key to regularly achieving high-quality forage.

Improve grass silage quality

»To improve grass silage quality we should aim for:
➔<250mg/kg nitrogen levels before cutting
➔Mow from early afternoon (3pm optimum sugar levels)
➔Spread crop wide to aid wilt and reduce plant respiration
➔24-hour field wilt (but at least seven hours+)
➔Frequent cutting reduces lignin build-up and boosts energy values
➔Avoid soil contact
➔30% target dry matter at harvest
➔4-8cm target chop length
➔pH 3.8-4.2
➔Consider additive application as an integral part of the process, for example, to improve digestibility
➔Consolidate, consolidate, consolidate
➔Clean silage pits before to avoid contamination and avoid soil on silage trailer wheels
➔Sheet rapidly and cover when made over multiple days
➔Use non-porous cling film to help reduce aerobic spoilage
➔Manage silage face with a shear grab or equivalent after sufficient fermentation (six weeks+)

and 75% grass silage. The poorer silage needs a palatability driver to encourage appetite and I have chosen 1.75kg of molasses *(see Table 2)*.

Fermentable starch from caustic wheat and bypass protein from the soya/rape blend are also required to boost intake, while fat is needed to boost the energy density to sufficient levels. As a result, a 30-litre cow requires 10.85kg of concentrate to achieve production, whereas a cow fed the better silage requires 7.54kg. If we assumed for simplicity that these cows were housed all-year-round the additional feed cost would translate into £32,000, with a potential additional increase in £13,000 of improved milk yield if cows were fed a better grass silage *(see Table 3)*.

Feed efficiency

The feed efficiency translated from 0.35kg/litre to 0.24kg/litre between both forages with a purchased feed cost saving of 3.19ppl. If we incorporated the forage cost there would be a 2.43ppl difference between the diets (12.13ppl for the poor forage and 9.7ppl for the better forage), this difference is less than the purchased feed cost because we are gaining more milk from forage and so must feed more forage per cow.

Table 3

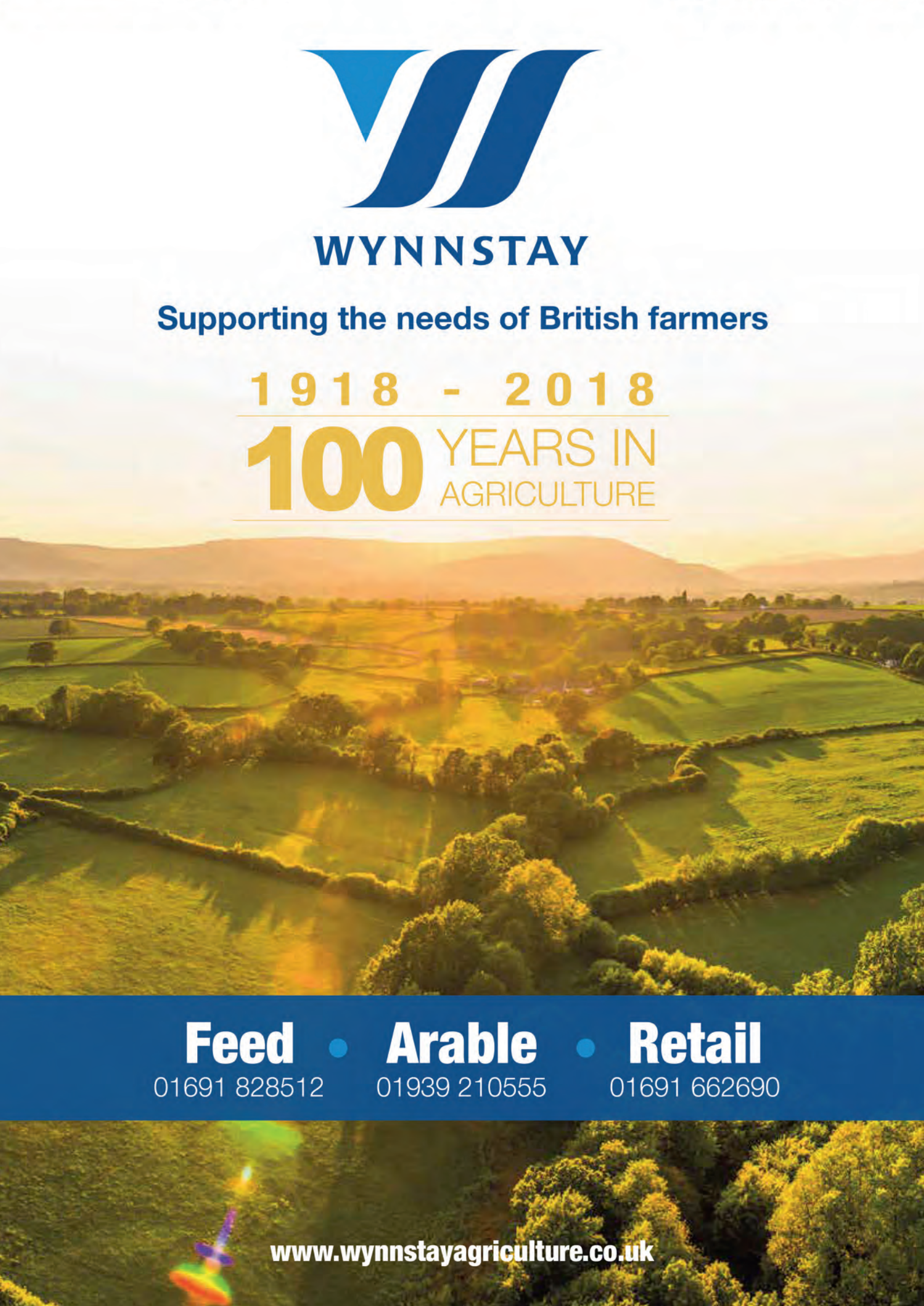
Key financials	Poor silage	Good silage
Concentrates use/litre	0.35kg	0.24kg
Purchased feed cost/litre	8.48ppl	5.29ppl
Annual feed cost	£169,352	£136,979
Average ration cost	£3.62	£3.12

The forage figures above were based on market costs, correct nutrient application and good farming practice both a poor and high-quality grass silage should cost in the region of £27.50/tonne, albeit a poorer forage maybe slightly cheaper due to some shortcuts. Significant figures include £247/hectare land rent, £9.53/tonne fertiliser and application cost and £1.67/t attributed to the cost of instalment of a silage clamp over 50 years.

We would expect a four-year perennial grass ley to produce on average of 56t/ha grass silage across the year with at least 22t/ha of quality first cut grass silage taken before the second week of May. However, such figures are based on good fertiliser management, mowing at optimum sugars, sufficient grass wilting, significant compaction and attention to detail.

In summary, cutting earlier, managing nutrient requirements, investing in new leys and attention to detail are key to regularly achieving high-quality forage. As the financials indicate the financial benefit over a 9,000-litre, 120-cow milking herd can mean a £32,000 saving and the potential for a further £13,000 in increased milk performance.

Cutting earlier will also boost yield per hectare and reduce the lignin (no nutritional benefit) content. Weather will always impact our decisions, however, even in the wet years good silage-makers always make better forages and this is due to timing, application and detail.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Best Practice Guide

A step-by-step guide to optimising your grassland production

Soil is the foundation of grassland success

Greater use of soil analysis, more detail in what is analysed and the need to carry it out across a range of fields, are all top of the agenda as far as the experts are concerned. Wynnstay fertiliser manager, Dave Mitchell makes the point soil is the foundation of everything which is done on a grassland farm.

He says: "Soil is the 'engine' of everything you do and it affects everything further down the line. You can spend as much as you like on fertiliser, but if the soil isn't right, you are not going to achieve what you want. It isn't just a matter of looking at your Ps and Ks. You have to look at the overall health of the soil."

> **"Soil sampling should be taken as an opportunity to look at more than the basic soil [P, K, Mg and pH]**
> MARK TRIPNEY

The success of the grass may not be an indication of good soil health either. Mr Mitchell points to an example of digging a trench on a successful arable farm only to discover horrendous problems with the soil.

"The farmer was successful in growing his crop, but it was all coming from the applied fertiliser, not using the natural resource of the soil."

Greater use of analysis

Mark Tripney is an independent consultant providing advice on soil and nutrient management to farmers and landowners. He also has experience of running a dairy herd and understands the day-to-day challenges of livestock farming. He is keen to emphasise the need for greater use of analysis in planning – not just for grass production but across the board, including the effect on herd health and productivity.

He says: "There's a tendency when grassland farmers get to the end of the season to shut the gate and leave it until into the new year. There needs to be more planning. Soil management starts with inspection post use and then asking 'what do we need to do for next season – do we need to sub-soil, do we need to aerate, or add lime?'.

"You need to look at broader spectrum analysis as this may highlight issues such as soil structure. Soil structure is not just a physical thing, it is chemistry, biology and physics. All of these things are interrelated and if the chemistry is wrong it's very likely the physics is wrong too. If the physics is wrong, you have no biology because soil needs to be aerobic.

"We can push metal through and there's no doubt this assists in getting the biology moving again, but if we don't treat the chemistry then we don't get the physical structure sorted. Get the chemistry right and then you get soil flocculation, air space, root development and drainage and the biology will thrive. Most of the problems with grassland are to do with a lack of soil biology.

"There's a belief we need to re-seed every five years. This is only necessary if you do not manage the soil properly. If we over-apply slurries and under-apply calcium – which is fantastic for soil structure – then we will need to re-seed regularly. With good soil management, we can ensure our grassland lasts longer.

Regular sampling

Mr Tripney says all fields on-farm should be regularly sampled in order to understand how previous decisions have impacted and how things have changed. Grass has the potential to remove a massive amount of nutrient annually.

Dave Mitchell

For instance, over the season a 50-tonne/hectare crop of silage will remove 300kg/ha of potash.

He says: "Soil sampling should be taken as an opportunity to look at more than the basic soil [P, K,Mg and pH] and explore the levels of all the nutrients which have the potential to have an effect on the health of the soil, plants and animals.

All fields on-farm should be regularly sampled, says Mark Tripney.

BASIS

BASIS

»When seeking advice on grassland agronomy it is worth bearing in mind that the industry's training and accreditation organisation BASIS provides training to agronomists on grassland and forage. As well as a specific course, the BASIS Certificate in Crop Protection – Grassland and Forage Crops, is a statutory requirement for any person selling or supplying pesticides for use on agricultural crops such as grassland and forage crops. Grassland and forage are also included in its main BASIS Certificate in Crop Protection (Agriculture).

"Broader spectrum soil analysis in several formats is available from many labs in the UK, and these provide useful data which can indicate deficiencies and excesses which can impact on health on the farm.

"Data from Lancrop – one of the labs providing broad spectrum analysis – has, for example, shown over several years 60% of grassland soils tested are short on calcium. This element, while important in the management of a soil's pH and its structure, is also vital in the development of cells.

"A soil which is short of calcium will show poor structural qualities as this element is crucial to its flocculation, which promotes the pore space which allows it to function aerobically, drain and allow root penetration. If a soil has good reserves of calcium the crop grown will be of much higher quality producing better yields which have increased digestibility, better storage and ensiling qualities.

> **"We need to see the big picture and have a proper nutrient management plan in place**
> DAVE MITCHELL

"We need proper nutrient management planning which carries on throughout the year. Farmers need to know which is the right fertiliser to use, whether it's straight nitrogen, urea, single top, which includes calcium. Then we need to monitor throughout the season and if necessary aerate if the soil is damaged. Grass is a crop and needs to be monitored."

Mr Tripney believes planning should go beyond soil and fertiliser to a holistic approach which involves the feed adviser and even the vet. Grassland management, herd health and productivity are all just different aspects of the same overall plan.

Soil health equals cow health

Yara's country agronomist Philip Cosgrave agrees decisions taken on soil health can influence cow health as well. In particular, he highlights the role of selenium. He points out something like 75% of soil samples submitted to Yara Analytical Services – Lancrop Laboratories – have insufficient levels of selenium.

"Selenium has a number of important roles of cow health including reproductive health, the cow's immune system and help it to fight diseases such as mastitis, and low levels affect the vigour of new-born calves. Providing selenium in forage is cheaper and more effective than supplementation. Most samples of forage have something like 0.04 parts per million of selenium, where they need to be around 0.2 parts/m."

For Wynnstay's Mr Mitchell another area of concern is the use of farmyard manures and slurries. He believes better use of these should all be part of the broader plan.

"If we understand their value we can include them in the overall fertiliser regime and make sure they are used effectively and efficiently.

"People ask me 'what is the most important nutrient?', and the answer is 'the one you are short of'. We need to see the big picture and have a proper nutrient management plan in place."

Mark Tripney

Choose seeds wisely

Choosing seed mixes containing varieties from the Recommended List is the first step towards producing great grassland, according to Wynnstay's grass and root seed product manager Adam Simper.

He says: "Grassland farmers need to ensure they are choosing varieties from the Recommended List which provides the most up-to-date varieties available, and will allow you to specify whether you are looking at better yield, increases in D value, disease resistance, good cover, or winter hardiness.

"The main thing is to specify they come from the Recommended List and to challenge your supplier to ensure you are getting the best possible varieties and mix for your needs. There are varieties being sold which have been dropped from the Recommended List and that has happened for a reason, they may be a few pounds cheaper, but they are not going to give you a return on your money.

Adam Simper

> **"You need to be aware that even on the RL there is quite a big difference between the lowest and highest yielding varieties**
> ADAM SIMPER

"You wouldn't get an arable farmer using varieties which are not on the Recommended List. They are always looking for new varieties to keep boosting production.

"You need to be aware that even on the Recommended List there is quite a big difference between the lowest and highest yielding varieties. Ultimately this can make quite a lot of difference in pounds per hectare to your productivity.

"At Wynnstay we ask key questions to the farmer to ensure we suggest the most suitable mixture, such as are they cutting, grazing or both; is the soil type heavy or light; how long do you want the ley to last; do you require early spring growth; do you want clover in the mix? These answers then allow a recommendation to be given which will suit the farm needs."

Have a plan

Mr Simper says it all fits in with having an overall plan and understanding your needs.

"You have to make sure the mixture you are getting is 'fit for purpose'," he says, "if you want something long-term which is going to last you seven to eight years then you need a mixture which has got mainly late perennial rye-grasses.

You can get cheaper mixes, but they will include early and intermediate rye-grasses which are not suitable.

He adds: "By identifying the fields which need re-seeding and then looking at the way each is managed, you can decide exactly what you need. For instance, if it's a field which is some way from the farmyard and it is only going to be used for cutting, then you need a designated cutting mixture. On the other hand, fields closer to home will need seed which takes into account a mixed regime of cutting and grazing."

Choosing the right mixture for the right fields comes from having an in-depth knowledge of your pasture which can only come from walking the fields on a regular basis, according to Mr Simper.

"An intimate knowledge of the performance of each field will help farmers to develop a plan and to determine which ones need re-seeding," says Mr Simper. "If the silage cut is quite a bit lower than other fields, or if there's a lot of docks, thistles and other weeds then it is worth considering reseeding. The same applies if there are a lot of weed grasses such as Yorkshire fog, annual meadow-grass, etc. These grasses are lower yielding, lower quality and they don't respond to artificial fertilisers as well as perennial rye-grasses."

Grassland farmers need to ensure they are choosing varieties from the Recommended List, says Adam Simper.

Get the most from each field

Like a lot of contributors Mr Simper believes grassland farmers need to take an approach much more akin to arable farmers in order to get the most from their pastures. He says: "Increasingly the top grassland farmers are taking an approach which is closer to

that adopted in arable farming – walking fields, monitoring soil and grass growth and checking on quality. When you consider 50-60% of the energy requirement in dairy farming is coming from grass, then you can see how important it is.

"If you are not monitoring and measuring and investing in re-seeding when it is necessary, then you can't expect to make the returns when it comes to productivity. There is sometimes a reluctance to invest in re-seeding given the cost at around £240 per acre, particularly when the milk price is low.

> **"As a rule, farmers should be looking to re-seed around 10-15% of their grassland every year**
> ADAM SIMPER

"People tend to see it as a cost rather than an investment. If you invest in re-seeding when the milk price is lower, then you have newer, higher yielding grasses when the price goes back up, and you can capitalise on this.

"If you put off re-seeding, you may be having to add extra fertiliser and, even then, not get the results, which means you are wasting money on other inputs. You may not be getting the quality of grass. So the cost of re-seeding has to be considered as part of your overall budget. It may represent value for money and a good investment as part of an overall plan.

"As a rule, farmers should be looking to re-seed around 10-15% of their grassland every year. By doing this, you will be reseeding the whole farm within six years. After five to six years with poaching and other degradation, research shows you are only left with around half the original grass species. So that kind of cycle of re-seeding makes sense.

"If you look after your grass and treat it like a crop and manage it carefully, you may be able to extend these cycles and make the leys last longer. Equally you can use the best possible seed mixture, but if you don't manage throughout the cycle, you won't produce good grassland.

"By and large this 10-15% per year rule will provide a safety net and make sure you keep on top of the quality of your grassland."

The use of sulphur and selenium are valuable additions to the grassland farmers' toolbox.

Are grassland farmers missing a fertiliser trick?

Many grassland farmers could be missing a number of tricks when it comes to the application of fertiliser, according to Philip Cosgrave, country agronomist with Yara.

Among other things, he says the use of sulphur and selenium are valuable additions to the grassland farmers' toolbox, and it is important to supplement the use of slurry with NPKs.

Mr Cosgrave says sulphur has a key role to play in conjunction with nitrogen and will provide a return on investment. Despite good evidence for the use of sulphur, research suggests the minority of grassland farmers are taking advantage of it. Results from the British Survey of Fertiliser Practice for 2016 show less than one-tenth of grassland – 9% – received a sulphur dressing, although this figure rose slightly to 16% for grassland cut for silage.

Even then, according to Mr Cosgrave, the applications recorded are about half what they need to be across the year.

Wynnstay fertiliser manager Dave Mitchell agrees too few farmers are using sulphur as part of their fertiliser regime and he encourages his clients to use grass analysis to understand the value of the forage and make adjustments, either before the second cut or for the following season.

Absence of sulphur limits nitrogen effectiveness

As Mr Cosgrave says, applying nitrogen without sulphur will limit the effectiveness of the nitrogen.

"When it comes to grass the sulphur helps the nitrogen to do its job and to be successfully converted to protein. The more nitrogen you apply, the more sulphur you should apply. On grassland for grazing, you should be applying 2-2.5kg of SO_3 for every 10kg of applied nitrogen.

"For first cut silage you would be looking at about 120kg nitrogen with 35-45kg SO_3 and for second cut a SO_3 rate of 35-35kg. The British Survey figures showed even on farms which are using sulphur

the application rates are only about 35kg/hectare over the two cuts.

"Our research shows one-tonne of ensiled grass silage is costing £27.48 to produce, with sulphur making up only 21p of this overall cost."

Sulphur plays a key role in enabling the assimilation of nitrogen and its conversion into protein. Lack of sulphur can result in a number of undesirable consequences, including a reduction in the yield potential and grass protein; high nitrate levels reducing palatability; increased leaching of nitrates – a real environmental concern at the present time; and lower silage quality.

In some conditions this may affect the timing of harvesting, as the grass analysis may show it is high in nitrates at the point when you want to cut. In turn this can affect the preservation quality of the silage as a result of an increase in the 'non-protein' in the plant, including nitrates and amino acids. Ultimately, this will affect the performance of your animals.

Mr Cosgrave says the role played by sulphur in organic manures is negligible as it needs to be mineralised, and it will not be mineralised in time to make a difference to this year's first cut grass crop.

> **"It's a matter of managing the critical areas and continually monitoring the crop, rather than just setting a date for cutting and aiming for it**
> PHILIP COSGRAVE

Use NPKs with your organic manure

Mr Cosgrave's second area of concern is the use of NPKs where farmers are using organic manure or slurry.

He says: "Typically, where farmers are using organic manure or slurry they would use a nitrogen product or nitrogen and sulphur to balance the nutrient input. This isn't necessarily best practice as it assumes the organic nutrients in the slurry are going to become available when the plant needs them, and unfortunately that's not the case.

"There is a great deal of research which shows there is poor correlation between the soil index and dry matter yields. This is because nutrient availability varies according to soil characteristics.

"It's not just whether you have a light soil or a heavy soil, but other variables such as soil temperature which can influence the mineralisation of applied manures into plant available nutrients. All of this adds a layer of complexity when it comes to deciding exactly what is available to the crop.

"By applying an NPK fertiliser as well as the organic manures, you are reducing the risk of not having the P and K you need for the grass and ensuring it is 100% available. The cost of providing this 'insurance policy' compared to using straight nitrogen or nitrogen and sulphur is minimal.

"Trials and farmer experience have proven the benefits of using NPKs to insure against the unpredictable nature of slurries and if we could measure grass yields routinely we would see this."

Health benefits from selenium

Selenium is clearly an important element with benefits in the important area of reproductive health, during the dry period, for the cow's immune system and also for the vigour of calves. An option now available to farmers is to use a fertiliser which has had selenium added which can boost normal grass selenium levels.

Mr Cosgrave says: "A cow requires 0.3mg of selenium for every 1kg of DM consumed. Data from our analytical services shows more than 90% of grass silage samples tested have below 0.1mg/kg. By using a fertiliser with selenium, you are insuring the grass forage component of the diet is meeting more of the cows' daily requirement with highly effective organic selenium. It's something which should be considered, particularly in producing dry cow silages.

"Sodium selenate is the selenium source which Yara uses to fortify its products, because it's proven to be a fast and reliable means of increasing the selenium levels in grass"

Sources of nitrogen

His final point is with regards to different forms of nitrogen.

He says: "What we've found with regards to ammonium nitrate and calcium ammonium nitrate is that they are consistent in delivering yields in comparison to urea, particularly in second cut silages. This makes sense because we know urea

Philip Cosgrave

is prone to volatilisation and applications to second cuts tends to be at warmer and dryer periods.

"For first cut silage we need to look at optimum nitrogen application rates of between 120 and 130kg/ha. Some people might be tempted to use lower application rates, but there is a clear positive correlation between optimum nitrogen rates and protein in grass. By optimising your nitrogen application rates, you are optimising the protein levels in your silage.

"Furthermore, depending on how you manage the crop, it is possible to achieve both quality and quantity. It shouldn't be a matter of balancing one with the other. Regardless of weather conditions if you get the management right you will make better silage.

"It's a matter of managing the critical areas and continually monitoring the crop, rather than just setting a date for cutting and aiming for it. It's important to continually assess and walk the fields, exactly as you would with an arable crop."


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Get more from grass through weed control

Successful weed control can deliver clear benefits in grassland yield, according to Simon Bishop, business manager at Nufarm. However, weed control is often not at the top of grassland farmers' agenda.

He says: "Dairy, beef and sheep farmers already believe they can get more from their grass – the cheapest form of feed. However, they are not sure how to. The yield benefits of weed management are not yet widely understood by growers, but we know that having clover safe options is important. Controlling common weeds such as docks and thistles from a 10% infestation level will deliver an extra 10% of grass dry matter."

Simon Bishop

Not at the top of the agenda

An independent survey recently commissioned by Nufarm highlighted the fact weed control is not at the top of livestock farmers' minds as being essential to producing good quality grass cover, compared to fertiliser and seed.

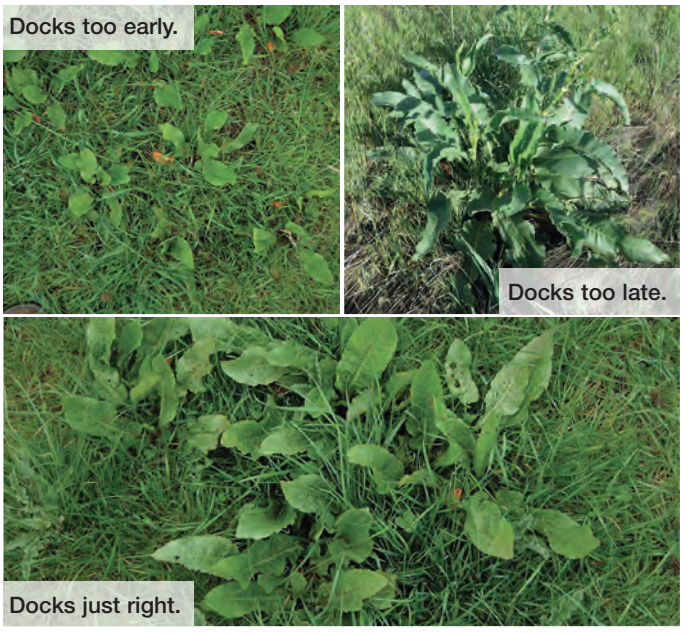
Mr Bishop says: "While only half of all grassland farmers had done some form of weed control in the last year, 80% of those had a general feeling it was about 'tidying up weeds'; just 20% considered crop protection as improving grass production.

"Consequently, little more than 5% of UK grassland has a herbicide application in any given year, and few grassland farmers treat more than 10% of their pasture in any season. This is why we have launched a new comprehensive programme in 'Grassmanship' to help farmers manage their grassland better and benefit from increased production and yield."

Weed control is a key element of productive grassland farming and it is important herbicide applications are effective, made safely and with care for the environment.

Return on investment

Introducing a planned control programme for common weeds such as docks and thistles will easily pay for itself with a return on investment of up to 14 to one, says Mr Bishop.



However, timing of herbicide is critical to achieving return on investment, along with choice of product to maintain clover-rich swards. Herbicides applied too early or too late will not work as effectively, if at all.

"Generally, herbicides should be applied when weeds are healthy and the leaves actively growing. Once stem extension starts, leaf growth is insufficient for the herbicide to work effectively.

> "Docks and chickweed are the two most critical weeds to control in re-seeds and must be controlled at the seedling stage"
> SIMON BISHOP

"Weeds in re-seeds are best controlled when the grass is at the 2 to 3 leaf stage. Docks and chickweed are the two most critical weeds to control in re-seeds and must be controlled at the seedling stage. Herbicide application is essential before the first grazing. Clover safe options are available such as CloverMaster and Squire Ultra, but again, timing of application is crucial – before the first grazing.

"In established and permanent grassland, it is important farmers assess weed pressure as soon as grass starts to grow in spring. If they are to achieve a significant return on investment, then early assessment allows time to prepare, choose the right product and plan for timely application, either using on-farm resources or getting in a contractor to do the job."

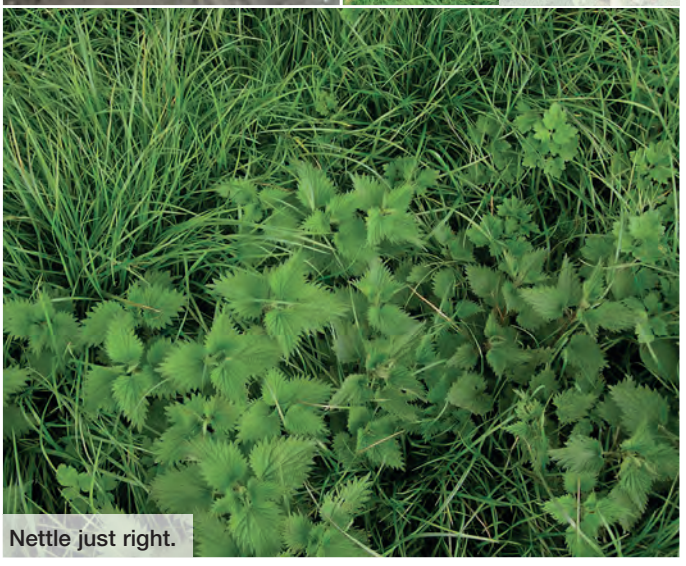
Attention to detail

Planning and attention to detail are also top of the agenda for weed control as far as Dr Simon Pope, Wynnstay crop

Weed control


Nettle too early.


Nettle too late.


Nettle just right.


Thistle too early.


Thistle too late.


Thistle just right.

protection manager, is concerned.

He says: "Attention to detail is critical. In many of the cases where farmers have concerns about a lack of efficacy, it's about getting the basics right, reading the label and following the recommendation for application. When you get the details right you will get more benefit and, of course, the product costs the same whether it's applied well or badly."

Planning ahead is another key consideration as far as Dr Pope is concerned. He says: "Waiting until weeds become a problem is too late to ensure effective control. By knowing where the problems are on the farm, getting everything lined up ready and applying once conditions are right it is possible to achieve the appropriate level of control."

One of the fundamental principles for control of perennial weeds which is not always appreciated as far as he is concerned is the need to make sure that a lethal dose is applied which kills-off the root system. Many grassland weeds have large root systems, if the dose applied is sub-lethal then they will simply re-generate and the whole process will have been a waste of time.

Dr Pope says: "To be successful you need to apply the right product at the right rate under appropriate conditions. There needs to be sufficient leaf area on the target weed, for instance docks need to be 10 inches across. In terms of the right conditions, the plant needs to be in active growth so it will absorb the product and pump it to the root system. This means you are looking for a period of good conditions both before and after the treatment."


Dr Simon Pope

Another important area flagged up by Dr Pope is the need for weed control in new leys.

"I don't think enough thought is given to planning weed control ahead of time when re-seeding," he says.

"When the conditions are right for grass seeds to germinate, then they are also right for weeds to flourish. Often the best time for herbicide application is during establishment. If weeds are sprayed at the 2 to 4 leaf stage it is possible to achieve 100% control, something which becomes increasingly difficult as the weeds become more established."

> **"In many of the cases where farmers have concerns about a lack of efficacy, it's about getting the basics right**
> SIMON POPE

Harvesting – it's all in the timing

Harvesting good quality, cost-effective forage is about timing, writes James Duggleby, of Krone.

That includes when to mow the crop, how long it should be left to wilt and how to present the crop ready for harvesting. The two factors which dictate timings are weather and output. If you want to ensure you are in control of productivity, it is important to own and use suitable forage harvesting equipment.

When it comes to harvesting, preparation is everything. Make sure equipment is well maintained and ready to go to avoid costly breakdowns at critical times. There are a number of different factors to consider when it comes to mowing, tedding, raking and harvesting, so it's important to assess the farm needs, labour availability and handling capacity to maximise efficiencies and silage quality.

Preparation

The growth stage of the crop will determine the type of silage produced. Young, leafy grass will be higher in energy and lower in bulk, as the crop matures, the digestibility (D value) will decrease as the yield increases – a trade-off between yield and D value is required to suit the livestock being fed. Mowing timing should be dictated by the plant's growth stage and not the calendar.

Mowing

The best time to mow is in the afternoon as grass sugar levels will be peaking. Exposure to the midday sun will allow the grass to photosynthesise, resulting in higher energy levels and the ley should be free from rain or dew.

The use of a conditioner is often debated. With the waxy cuticle being broken by the conditioner, wilting can be increased by up to 20%. The problem is if it rains the conditioned leaves will then reabsorb water more quickly.

When it comes to harvesting, preparation is everything, says James Duggleby.

If you do use conditioner it is important to ensure it is set correctly – too harsh and it will pulp the grass and increase fuel usage – too light and it will be ineffective.

The mower should be set to achieve a stubble height of about 5cm – cutting too low will impede grass regrowth and add little nutritional quality to the silage, as the base of the plant is low in D value. Mower blades will also be blunted and the risk of contamination from soil and stones will increase.

It is important to carry out regular in-field checks to make sure you are getting the best from your harvesting machinery. They do not take long and can have huge benefits. Mower blades should be regularly changed as blunt blades will not cut the grass cleanly, dramatically slowing regrowth.

Setting your mower to

Machinery

1 **Forage harvester:** Whether using a trailed or self-propelled it is important the chop length is adjusted to suit different crop dry matters. Typically with a DM of >30% the chop length should be between 15-25mm, although this will depend on the overall feeding regime. A forage harvester ensures a uniform chop length and gets the crop into the clamp quickly. Having been chopped, it can also be consolidated quickly. Having a higher capital cost, this option is best suited for contractors and large scale farmers.

2 **Forage wagon:** Although it does not give a precision chop length, a forage wagon is cheaper to run than a harvester. However, the less uniform silage can mean more attention needs to be paid to buck raking and consolidating in the clamp, although there is an argument that longer chop lengths are good at slowing the cows' digestion process. Modern forage wagon design now means work rates of 1.8 hectares an hour are achievable in typical first cut conditions within a 1.5-mile haul to the clamp.

3 **Baler:** Choices will depend on whether you want bales wrapped or not. Round combi-balers wrap on-the-move, saving labour, but they are more expensive to buy. Square bales have to be wrapped separately but can be stacked and stored more easily.

Cut

Tedding will help to achieve a rapid wilt and ensure the grass is evenly mixed.

spread or swath is down to conditions on the day, but this basic rule can help. If the ground is dry, set the mower to spread full width to maximise the surface area of the crop for rapid wilting. If the ground is wet, leave the grass in a swath, allowing the ground to dry out either side before tedding.

Tedding

Tedding will help to achieve a rapid wilt and ensure the grass is evenly mixed, ensuring a uniform wilt and therefore more uniform quality, with fewer hot/wet spots in the clamp or bale. The tedder tines must be set to 2-4cm above the ground, and this should be set in the field.

To check the correct working height, drive forward slowly and check if the tines are scraping the soil or leaving grass behind. Too low and you will contaminate the silage and increase machinery wear, too high and you will leave a mat of grass behind. It is also important to match the forward speed of the tractor with the RPM of the pto shaft – if you need to cover more ground go for a wider spread; do not drive faster as it will affect silage quality.

The diameter of the tedder rotors and the number of tines will play an important role in the quality of the spread; different tedders have different sized rotors. Generally speaking there are three rotor diameters, suited to different applications.

Large diameters (seven tine arms) are typically suited for silage, where one pass is required tedding out the mower swaths. When sizing a silage tedder each swath should fit between each pair of rotors. The smaller the diameter (five tine arms), the finer the spread and the more consistent the wilt, ideal for tedding hay. However, many tedders are required to spread a variety of crops behind a range of mowers; a medium diameter rotor (six tine arms) will provide the best all-round solution.

Raking

Presentation of the swath to the subsequent harvesting machine has a big impact on efficiencies and quality – an even, box-shaped swath for a smooth, consistent flow is required. Row up just before harvest so the grass quality remains uniform – too long in the swath and the top will wilt more than the bottom, producing an inconsistent dry matter.

Correct working height of the rake is important, otherwise you will either pick up stones and soil, or leave grass on the ground which will rot and damage the subsequent cuts. Ideally a rake with electric height adjustment should be used as the rotor working height can be adjusted on-the-move to suit varying conditions.

Again, as with tedding, match the tractor forward speed to the RPM of the pto shaft; higher dry matter crops will take less moving then wetter crops, so you risk throwing it too far or leaving some behind.

Harvesting

The type of silage required will influence which harvesting technique is used. Commonly a forage harvester or wagon is used for high-quality silage, with lower energy crops being baled for feeding to dry cows.

When choosing equipment, ensure there is enough capacity to manage the crop in the clamp at the same time as harvesting, so that every stage of the silage-making process can be undertaken at the correct time. The same is true of using a contractor – ensure they can do what you want, when you want, to achieve the right quality silage. Savings on contractor fees can quickly be lost through reduced quality forage.

Silage is made by pickling the grass, which is the result of good bacteria fermenting some of the grass sugars into lactic acid, which in turn prevents the growth of bad bacteria and preserves the nutrients.

The fermentation process is anaerobic, and will therefore only happen once all the air is excluded from the clamp or bale. Furthermore, soil introduced into the grass as a result of poor harvesting techniques can introduce harmful bacteria which will spoil the silage and pose as a potential health risk to the livestock. When collecting grass from the swath make sure the pick-up height is set correctly preventing the tines from collecting soil or stones.

Whichever harvesting technique you have chosen, all knives should be kept sharp as this will produce a cleaner cut and reduce fuel consumption. Many people wrongly think that giving the knives an occasional ‘good’ sharpen is best practice, when actually sharpening a little and often will save time and fuel while helping to prolong the life of the knifes.

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Take a closer look at why Forage Matters at www.krone-uk.com

Cut to clamp – getting it right

An initiative entitled 'Cut to Clamp' has been launched by Volac to help grassland farmers to make the most of silage and improve their efficiency and profitability. We feature extracts from the Cut to Clamp website.

Cut to Clamp will help grassland farmers to make the most of their silage.

The cut

As grass approaches heading, yield increases. However, leave it too late and protein, digestibility and metabolisable energy all decline. After heading, the digestibility of grass falls by about 0.5% a day. Delaying cutting may produce a heavier crop, but its nutritional value will be lower. For good quality silage at an acceptable yield, cut just before heading.

Similarly, although it might be tempting to cut low as this increases yield, the stem base is the part of the plant with the lowest digestibility. So again, overall quality will be improved by cutting higher. On top of that, dead material in the sward base contains higher levels of undesirable micro-organisms which hinder fermentation and increase aerobic spoilage.

Wilting

Wilting increases the per cent dry matter and reduces losses from effluent. It also means the silage will stabilise at a higher pH so less acid, hence sugars, will be required. The problem is, as soon as grass is cut, sugars start declining because they are being used up by the plant, since it is still living, and by undesirable bacteria. A higher DM will also inhibit undesirable clostridia bacteria.

The aim should be to wilt as rapidly as possible to an ideal target DM of 28-32%, but no longer.

Chop length

Using the optimum chop length is crucial when harvesting grass because it has a big impact on how good a consolidation you can ultimately achieve in the clamp.

Silage is produced when beneficial bacteria ferment some of the sugars in grass to lactic acid. This 'pickles' the grass, preventing the growth of spoilage micro-organisms and so preserving nutrients. However, fermentation only starts once there is no air left in the clamp. So, the quicker you can achieve this, the better.

Too long a chop makes it more difficult to squeeze all the air out of the spaces between the grass, particularly at higher dry matters, but too short a chop can also cause problems. As well as keeping knives sharp, ensure they are correctly adjusted according to the crop's per cent dry matter.

As a guide, if grass is >30% DM, chop to 1.5-2.5cm length to improve consolidation (though if grass silage is being fed as part of a high maize diet, chop length should be increased to ensure sufficient effective fibre in the complete diet). If grass is at 20-30% DM, use a chop length of 2.5-5cm.

If grass is <20% DM, you may need to increase up to 10cm to reduce effluent and prevent clamp slippage.

Using an additive

Trials across a range of forages have shown that treating with a proven additive, such as the MTD/1 strain of Lactobacillus plantarum found in Ecosyl, can do much more than just act as a preservative. Across 15 grass silage trials, dry matter recovery with MTD/1 was boosted from 91.8% to 95.5% of the original material ensiled.

Correct silage density

Achieving the correct silage clamp density and effective sealing are critical factors in producing a successful clamp. Good consolidation to squeeze out as much air as possible is key.

For grass at 30% DM, aim for a target silage density of 250kg of DM/cu.m (750kg fresh weight/cu.m). If you trap too much air in the clamp when you ensile the grass, you reduce fermentation quality and increase aerobic instability problems at feed-out. Often, silage is not consolidated enough simply because trailers are arriving at the clamp too quickly and grass is not spread properly.

You can only really efficiently consolidate the top 15cm. Layers should be even and no greater than this depth, before being compacted and the process repeated with the next layer.

For effective consolidation, consider using a compacter which equals the full width of the tractor, so you are not just consolidating beneath the tractor wheels. Pay particular attention to the edges which are more difficult to consolidate. Also, avoid over-filling the clamp. Once clamps are filled above the walls, density drops.

Sealing

Once consolidated, sealing the clamp will stop air/oxygen ingress, which is essential for fermentation and aerobic stability. Use side sheets and leave a good overlap with the top sheet of 1.5 metres.

Once the clamp is filled, the side sheet should be folded in, an oxygen barrier film placed on top and then a top sheet. Always put as much weight on top of the clamp as possible. That top weight maintains
better density in the weakest part of the clamp, which is the top.

Dairy farmers not in control of silage, says survey

»A survey of 100 dairy farmers conducted ahead of last season showed many felt they were not in control when it came to producing grass silage. In the survey nearly four out of five (78%) farmers questioned said they thought they could make better silage. Only one in five (19%) said they felt completely in control of how well their grass silage turned out once they had sealed the clamp.

The survey was conducted by the manufacturers of silage additive Ecosyl. Product manager Jackie Bradley says: "It was only when we dug deeper into silage-making practices we uncovered fermentation as providing some key opportunities for improvement. For example, only half of respondents realised that crop dry matter at harvest has a big impact on grass silage fermentation, while some aspects of the forage 'pickling' process which takes place as a result of fermentation also seemed poorly understood.

"During fermentation, beneficial bacteria convert some of the crop's sugars into acids, which pickle the forage," says Mrs Bradley. "Yet only 20% of respondents recognised fermentation as a process whereby forage is pickled in acid. Also, 28% of respondents thought a good silage fermentation was largely dependent on the bacteria naturally present on grass.

"Relying solely on the bacteria on grass effectively reduces your control of preservation – because you don't know if you have enough of the best type of bacteria for a fast and efficient fermentation."

Looking at other aspects of clamp management from the survey, Mrs Bradley says although 90% of respondents did roll continuously when consolidating, only 38% said they normally filled the clamp in layers no more than 15cm thick, which is the maximum depth which can be consolidated effectively.

She says: "Only 17% said they achieved a grass dry matter density of 250kg/cu.m when consolidating, which is the optimum for grass at 30% dry matter. If you want to maximise self-sufficiency in home-produced forage, good grass silage is a valuable asset. However, producing it is a joined-up process."

Remember to pay attention to the ramp. If carbon dioxide is allowed to seep out of the bottom of the clamp (because it is heavier than air), it creates a vacuum, which sucks oxygen in. So, as well as sheeting the rest of the clamp correctly, ensure there is at least half-a-metre of extra silage sheet at the front of the clamp, and weight it down well all around the edge.

Avoid simple errors

The cleaner the clamp area, the better. Mouldy silage or dirt in front of the clamp will contaminate the silage with undesirable bugs, reducing quality and reducing intake.

Do everything you can to avoid producing spoiled silage. If you have got it, discard it. Never mix it in with good silage. As well as being of poorer quality, it also adversely affects the rumen fermentation. To take silage out of the clamp, use a shear grab. This maintains a smooth clamp face with a lower surface area and a better face density than simply ripping it out. This reduces the amount of air which gets in so there is less risk of aerobic spoilage (heating) causing losses of nutrients and potentially production of mycotoxins.

For the same reason, move across the face quickly to reduce the time silage is exposed to air. It is important to avoid pulling or cutting the top sheet back too far once the clamp is opened and to keep the front edge weighted down. Avoid pulling the sheet back down over the clamp face. This is because it creates a microclimate, which encourages yeasts and moulds, increasing the risk of spoilage and heating.

Finally, get a silage analysis done and pay attention to it. It will tell you how good a job you made of silage-making last season and help you to pinpoint ways in which this year's silage production can be improved.

▸▸Full details including videos are available at www.cuttoclamp.com

Top tips from grassland farmers

PLANNING FOR BETTER ROTATION

STEVE Brandon, Hopton in Stafford, is involved with two spring block calving herds using an intensive grazing-based system. He says rotational paddock grazing is the most important factor for him.

"By using a rotational paddock system it ensures we get an early turnout and are feeding good quality grass at all times. It's very rare we need to supplement the feed during the summer months and we can limit the use of concentrates."

DO NOT ABUSE YOUR GRASS

MIKE Hawking is an intensive dairy farmer who produces about 9,500 litres/cow/annum from his 165-cow herd based in Beaworthy, Devon.

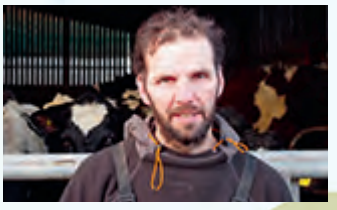
He says: "It's about not abusing your grassland. By avoiding poaching and ruts, we find it prevents the weeds coming in. Once you get weeds in then you get lower production from the grass. Once it gets wet we bring our cows in and prevent damage to the grass."

RAPID WILT IMPROVES NUTRIENT QUALITY

REDUCING the time to wilt can improve silage quality according to Hugh Bevan, Pembrokeshire, who farms 120 dairy cows with followers as well as 100-head of beef cattle.

"We used to take anything from 36 to 48 hours to wilt our grass, but have now cut down to 24 hours. Our silage analysis has shown this results in less loss of nutrients and better energy content. We use an additive with the silage which we find improves the stability in the clamp and encourages greater intake by the cows."

SPRAY WEEDS ASAP AFTER RE-SEEDING



ROGER Thomas is based at Carmathen and has 250 Holstein milking cows.

He says: "Spraying weeds as early as possible following grass re-seeding is one of the best pieces of advice I have received.

"Doing this allows us to get complete control at the early growth stages before the weed becomes competitive and impacts grass quality. It's also cost-effective as we usually only have to spray once in the year."

INVEST IN RE-SEEDING

MERV Attwell, Coxley, Somerset, milks 250 Holstein Friesian cows.

He says: "Advice which I've highly valued is to treat re-seeding as an investment rather than a cost. Long-term, my leys remain productive producing high-quality silage and grazing, and the benefit this has on cow performance far outweighs the cost."

TAKE FIRST CUT EARLY

MIKE Ellicott, from Bridgwater, Somerset, has 150 Holstein Friesians.

He says: "Something which has helped improve utilisation of grass on our farm is to take the first cut earlier. Not only has this improved silage quality, it has allowed us to take five cuts, five weeks apart, with the first cut taken in April."

WATCH YOUR PS AND KS

HEFIN Wilson, farms at Cardigan, South Wales, and has 80 Holsteins and 15 Jerseys.

He says: "The best bit of advice I've received is to make sure P and K levels are correct, as they're the foundations for good root growth. We now do regular soil testing to check the levels which allow us to create a bespoke fertiliser plan and we have definitely seen a positive impact on the quality of our grass."

> **"Make sure P and K levels are correct**
> HEFIN WILSON