Teagasc
Agriculture and Food Development Authority

Grass10
Grassland Excellence for Irish Livestock

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine

Grassland Farmer of the Year 2017

Overall Winner

Farm Open Day at O'Donnell's Farm, Golden, Co. Tipperary.

Wednesday 18th April, 2018

AIB

FBD Insurance

Grassland Agro

The voice of Ireland's farming industry
Irish Farmers Journal

Grassland Farmer of the Year 2017 Overall Winner

Farm Open Day at O'Donnell's Farm

Golden, Co. Tipperary

Wednesday 18th April, 2018
Time: 10.30am - 12.30pm

eagasc
Agriculture and Food Development Authority

Table of Contents

Foreword

Padraig Walsh

Chairman of the Grass 10 steering committee

In January 2017, the Grass 10 campaign was started. This four year campaign is focussed on increasing grass production and utilisation at farm level, by getting farmers to achieve 10 grazings over the season added to achieving 10 t DM/ha utilised. This is an ambitious grassland campaign welcomed by the entire industry and applies across all ruminant enterprises, dairy, beef and sheep. We are delighted that the campaign is sponsored by FBD Trust, Grassland Agro, AIB, Department of Agriculture, Food and Marine, and the Irish Farmers Journal. One of the many grassland initiatives as part of the Grass 10 campaign was the establishment of the Grassland Farmer of the Year competition in 2017. The Department of Agriculture, Food and the Marine came on board as the main sponsor of the competition in 2017. Over 100 farmers entered the competition; this number was eventually reduced to 15 shortlisted finalists. The standard of grassland farmer in the competition was exceptional, the finalists and the winners are leaders in the field of grassland, and have plenty of knowledge to share with the industry.

Eddie and Denis O'Donnell are exceptional grassland farmers, and have been for many years, their success in the competition sets a very high standard for us all to follow. I'm delighted that this Open Day is taking place in April. This is a vital month to get grazing right on our farms, especially this spring which has thrown a lot of challenging grass growth and grazing conditions our way. I look forward to this Open Day and the other open days on the provincial winner's farms. We are getting through a tough spring for grass growth and fodder availability, the only way of learning how to manage grass is to learn from the farmers who are doing a good job. Let's hope we can get to the levels of grass production achieved last year again this year.

Grass10 Campaign

John Maher

Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Introduction

Grazed grass is the cheapest and most available feed for milk production systems in Ireland. Grass enables low-cost animal production and promotes a sustainable, high quality green image of milk production across the world. Recent industry reports (*FoodHarvest 2020 and FoodWise 2025*) have highlighted the important role grass can play in an expanding milk production industry. Through a combination of climate and soil type, Ireland possesses the ability to grow large quantities of high quality grass and convert it through the grazing animals into high quality grass based milk products.

Our competitive advantage in milk production can be explained by the relative cost of grass, silage and concentrate feeds. Therefore, increased focus on grass production and efficient utilisation of that grass should be the main driver for expansion of the livestock sector. An analysis of farms completing both grassland measurement in PastureBase Ireland and a Profit Monitor demonstrated increased profit of €181/ha for every 1 tonne DM/ha increase in grass utilised. It should be noted that issues such as environmental sustainability (*carbon footprint, nutrient use efficiency, etc.*) are also improved by increased grass utilisation.

Future growth in pasture based milk production in Ireland will depend on an effective grass-based system. However, at present Irish farmers are not using grass to best effect and there is a need to (1) increase grass production and (2) ensure efficient utilisation of that grass.

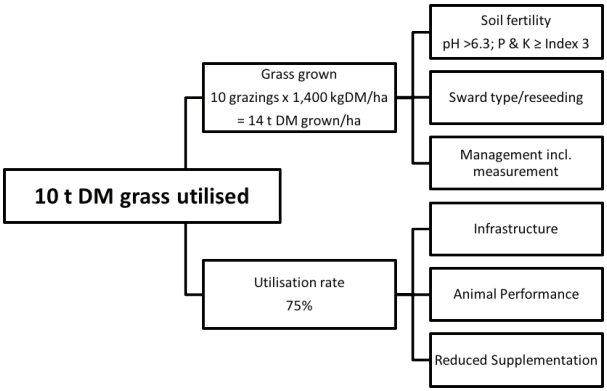
Current grazing performance on dairy farms

Currently, it is estimated that about 8 t grass DM/ha are utilised nationally on dairy farms (*Dillon, 2016*). There are major improvements required in areas of pasture production and utilisation. Data from the best commercial grassland farms and research farms indicate that the current level of grass utilised can be increased significantly on dairy farms (*greater than 10 t DM/ha utilised – i.e. 14 t DM/ha grown and 75% utilisation rate*).

It is important to recognise that improvements in soil fertility, grazing infrastructure and level of re-seeding are required to achieve higher levels of grass production and utilisation. To achieve greater change in the level of grass utilised, farmers will need to upskill their grazing management practices. This means regular measurement of grass cover, using specialised grassland focused software to analyse grass production and, making and implementing grazing management decisions. These are key drivers to increasing grass production on the farm. New technologies are now available which make grass cover assessment and the decision making process much easier.

Grass10 campaign

Grass10 is a four-year campaign launched by Teagasc in 2017 to promote sustainable grassland excellence. The Grass10 campaign will play an important part in increasing grass growth and utilisation on Irish grassland farms, thereby improving profitability at producer level and helping to ensure the long term sustainability of Irish beef, dairy and sheep production. Significantly, it can provide the platform or framework to enable various industry stakeholders to collaborate for collective action. Given the current performance in terms of grass growth and utilisation, the need for 'collective action' should be clear.



Objective

The objective of the campaign is to achieve 10 grazings/paddock/year utilising 10 tonnes grass DM/ha. In order to achieve this objective, we will need to achieve significant changes in on-farm practices, specifically:

- Improved grassland management skills
- Improved soil fertility
- Improved grazing infrastructure
- Improved sward composition
- Increased grass measurement and usage of PastureBase Ireland

Grassland Farmer of the Year competition

There is a proven link between increased grass utilisation and increased profitability in grass based production systems. In addition, Teagasc research indicates that grass utilisation can be significantly increased on farms. With this background Grass10, in conjunction with the Department of Agriculture, Food and the Marine, launched a grassland competition to recognise those farmers who are achieving high levels of grass utilisation in a sustainable manner. Practises used by these famers to increase grass production and utilisation, include soil fertility management, sward renewal, grassland measurement and improving grazing infrastructure.

Introduction and welcome to the O'Donnell Farm

The O'Donnell family

Athassel Abbey, Golden, Co. Tipperary

The Mission statement of our farm business is as follows:

"*To run a highly efficient, profitable and sustainable dairy business while also enjoying a good family life*".

I am farming with my wife Fiona and parents Denis and Nora, near Golden, Co. Tipperary. Fiona and I have three children - Muireann (4), Méabh (2) and Eddie (*7 months*). We milked 318 cows in 2017, supplying milk to Dairygold Co-op and Kerry Group, and we currently farm a total of 160 hectares. We are operating from 2 milking parlours since 2006.

116 ha of our land holding relates to our two milking platforms split as follows:

- 74 adjusted ha: Home Farm (*43 owned, 31 leased*)
- 42 adjusted ha: Out Farm (*all leased and located 6 miles from home farm*).

The remaining 44 ha are divided into two blocks as follows:

- 20 adjusted ha: (*All owned and located 12 miles from Home Farm*)
- 24 adjusted ha: (*4 owned, 20 Leased and located 2 miles from Home Farm*)

These farms are used predominantly for grazing the replacements and for silage production.

We have two employees, Jeremy Furlong and Philip Roche. Philip works on the home farm with me, while Jeremy runs the out farm milking platform.

Background

Having grown up on a dairy and beef farm enterprise, I was passionate about farming from an early age, and I never considered any other career choice apart from farming. After finishing secondary school in 2000, I went to Rockwell Agricultural College for one year to complete my Certificate in Agriculture. I subsequently achieved my Certificate in Farming in Pallaskenry Agricultural College. As part of my studies, I completed my practical placement through the Farm Relief Services. From 2002 to 2005, I managed a 90 cow farm located six miles from home. Having gained good experience from my time away, I returned home to set up a partnership with my parents in late 2005.

I travelled to New Zealand in August 2005 with a number of experienced progressive farmers and researchers from Moorepark. This trip proved to be very beneficial in my development and opened my mind to the vast array of opportunities that exist. Also as a result of this trip, my parents and I began to complete our five year farm plans, which we continue to review and revise annually. This planning has been the catalyst of our significant farm growth to date (*50 ha and 70 milking cows in 2005 vs 160 ha and 318 milking cows in 2017*).

Grassland

Grassland management for us is based around a number of cornerstones; soil fertility, re-seeding, infrastructure, grass measurement and management.

Soil fertility

It is an essential part of grassland farming to have the correct pH and have the soil index for P and K at index 3 or 4, so for this reason we soil sample the farm every two years and this helps us keep on top of what changes are occurring. We have noticed K levels dropping off in paddocks that are removed for surplus bales so we try and avoid taking bales or silage off lower K index paddocks. We put a fertiliser plan in place annually, and stick to it by spreading fertiliser when it has to be spread and spreading the right amount of it. We have colour coded maps up in the dairy which indicate the soil index of the paddocks so we can target more parlour washings and slurry to the lower ones, and this map also helps us avoid taking bales from them by making sure the cows hit those paddocks at the correct pre grazing yield thus leaving at the right post-grazing height.

Reseeding

We have re-seeded all the milking platform and one of the young stock farms over the past seven years. We select the paddocks for re-seeding from the cumulative growth chart on PastureBase Ireland at the end of the year, and we aim to do our re-seeding in spring time as we find this the quickest turnaround time with the least risk. We are part of the grass variety monoculture trial in Moorepark and have set all monocultures on the milking platform over the past five years and three way mixes on the out farm. We have many different varieties across the farm.

Infrastructure

There is no point in growing lots of grass if it can't be consumed by the cow. We have put in extra roadways and extra water tanks on the farms over the last five years. As cow numbers have increased demand for water obviously increased, so we had to install bigger piping from the yard and extra tanks in the paddocks. The infrastructure plays a big part in grass utilisation especially in spring by helping us get out at almost every milking from when cows start to calve. We also use reels to create single file spurs off these roadways at the shoulders of the year to get the cows in and out of paddocks if conditions are wet.

Grass measurement

We began grass measuring on the farm in 2004. We walk the farm weekly during the grazing season and twice weekly during the main season when growth is high. There are several reasons for grass measuring. We aim to use grass well, we need to know how much we have, it gives us higher milk solids, it helps to lower the cost of milk production, and ease of management in a simple system. As we know what the farm is growing we can establish the correct stocking rate for our farm. It also identifies underperforming paddocks and we can predict when a surplus or a deficit is arising which helps us to avoid wasting grass by keeping the quality of grass in front of the cow consistent. We will complete up to 50 walks on PastureBase Ireland this

year. Everyone on the farm can complete a grass cover, the most important part of the process is the decisions that are made from producing the grass wedge or average farm cover figure on the shoulders.

Management

The management is all about timing on our farm, we have set cover targets for different stages of the year, e.g. Closing farm cover of 700 kg DM/ha on December 1st. We have targets for percentage of the farm grazed in spring and autumn, we want to start the second rotation on April 1st in order to do that we require 40% of the farm grazed March 1st to have enough paddocks growing back for April 1st. A week can make a big difference on a grass based farm from running into a surplus or into deficit quickly so when you have information one needs to react by pulling out surplus or putting in supplement depending on the situation. We had over 10 grazings per paddock and one silage cut in 2017, and the only way our farm can do this is by having a number of 16-18 day rotations during the main season.

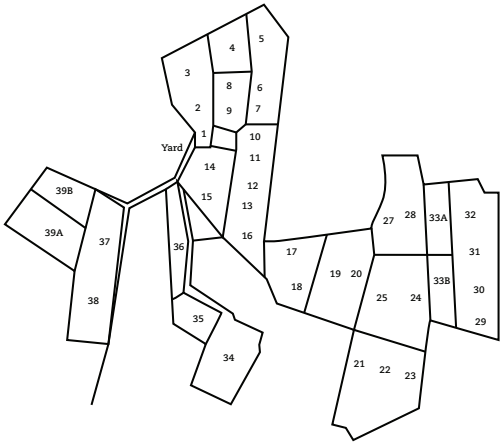
Conclusion

Our farm jigsaw is simply made up of three critical pieces - grass, people and cows. There is nothing fancy to what we do, but what we do we try to do right, and to make sure that we review and set achievable targets for ourselves. A consistent approach to grassland management, as well as having the right team of people working with us, has always been and will continue to be a pivotal part of our business strategy. The importance of choosing the correct type of cow for our farming enterprise cannot be underestimated. We feel that we are not doing many things differently to most farmers. I'd like to thank our Teagasc Advisor Sandra Hayes who is always there if we have a question or query on anything. Discussion groups play a big part on our farm and we're involved in four of them, and we try to learn something through all of them. We are very lucky in Ireland to have a world class facility in Moorepark demonstrating and researching best practice.

No	Area
1	0.8
2	0.8
3	2
4	1.75
5	2.1
6	1.1
7	1.1
8	1
9	1.1
10	1
11	1
12	0.95
13	0.95
14	1.5

No	Area
15	1.5
16	0.6
17	2
18	2
19	2
20	2
21	2
22	2
23	2
24	2
25	2
26	1.8
27	1.8
28	1

No	Area
29	2
30	2
31	2
32	2
33A	2
33B	2
34	3.4
35	2
36	2
37	2.75
38	2.75
39A	3.5
39B	2



Farm Map

Farm grassland performance

Eddie O'Donnell

Athassel Abbey, Golden, Co. Tipperary

Summary

- Grassland production on the farm was 18.6 t DM/ha with 10 grazings and one silage cut per paddock in 2017
- 50 grass walks were completed on the farm last year, this is crucial to our grassland management
- Soil fertility is at index 4 for P and index 3 for K, soil pH is 5.9
- During the mid-season we try to match grass supply with grass demand
- We will continue to reduce the variation in DM production between paddocks, with better soil fertility and re-seeding the lower producing paddocks.
- We will not increase the number of grazings from the farm by reducing pre-grazing yields any further than where we are now.

Farm production

Overall the last five years this farm has produced, on average, 17.6 t DM/ha, so the farm has huge capacity to grow. Our job is really to manage what is growing and to make sure that we utilise it as grazed grass. So in the past number of years we have focussed more and more on getting more grazings from the paddocks, increasing paddock grazings will reduce the level of silage harvested on the milking block, and we really don't cut any silage off the grazing platform. Given our stocking rate it makes it difficult to cut main silage cuts, so the strategy is to take surpluses off as round bale silage.

Spring grazing

In general, we start grazing from early February (*first week*), ground conditions on this farm are usually not limiting so we can send the cows to grass as they calve. In recent years we have been trying to lift the opening farm cover to >900 kg DM/ha at turnout, the compactness of calving and higher stocking rate is pushing us in that direction. Given that we have two farms working, we generally try to have a higher cover here in the Golden farm, ultimately because we calve all the cows at home, the Golden farm takes more grazing in February than the Dundrum farm. The spring grazing target is to have 40% grazed by March 1st, this has been difficult this year with grazing conditions (*snow and rainfall*).

The grass growth rate for the farm for the past five years is shown in Figure 1. The farm is productive in spring but our strategy is to have at least 70 units/ac of nitrogen spread by April 1st, we believe this is key to having a productive farm in early spring. The mean DM production is 1.8 t DM/ha from January 1st to April 10th. We always plan to finish the first round by April 1st to 3rd; that will be a lot later in 2018, closer to April 11th, given that spring growth is so poor.

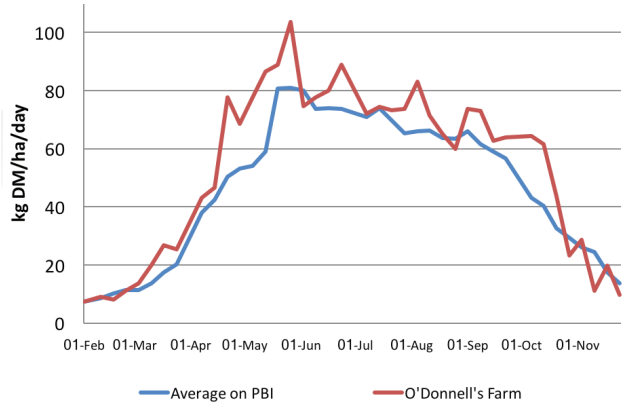


Figure 1. *The O'Donnell Farm grass growth curve compared to the Pasturebase Ireland average curve (2013-2017)*

We are now getting to the magic figure of 10 grazings on the farm (*see Figure 2*), with one silage cut. As I said previously this would not be possible without having shorter rotations in the mid-season, but also our focus to finish the first rotation early in April. We are usually well into the third rotation by May 1st in a normal year. The number of grazings per paddock is a great way of profiling the performance of the paddocks from a grazing perpective.

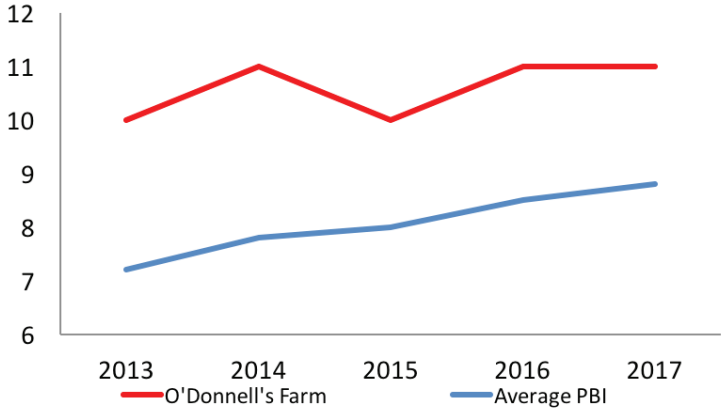


Figure 2. *The number of grazing and silage cuts on the farm from 2013 to 2017*

Mid-season

The daily grass demand on the farm mid-season is approximately 68 kg DM/ha (*4 cows/ha × 17 kg daily herbage allowance*), so we aim to keep grass supply as consistent as possible, the farm is walked regularly which keeps us on our guard to monitor grass supply. We have no problem taking rotation length down to 16 days mid-season and this has helped us increase the number of grazings per paddock. We have a target of 160 kg DM/cow during this period, our mid-season growth rate helps us to achieve this. We don't

top paddocks on the farm, we try to let the cows graze at the appropriate pre-grazing yields and this helps to keep topping out of the equation. If a paddock is badly grazed we will earmark it for round bale silage on the next round. Our grazing regime is to graze to on average to 4 cm during the season.

Autumn

Generally in autumn, we build to pre-grazing covers of 2000 kg DM/ha, we find it hard to go beyond that with the grazing platform stocking rate, so 350-400 kg DM/cow is our target in mid-September. We try to start closing in early October and will aim for 70% closed by the end of the first week of November. We have to have grass on the farm at turnout and will be aiming for higher spring turnout covers given this spring.

Individual paddock DM yields

We have worked very hard over the past number of years on increasing grass DM production on individual paddocks. Focussing on our soil fertility to improve this has been essential; we now have a reasonably good soil fertility profile across the farm, soil pH 5.9 (*range 6.2 – 5.6*), (*we have spread 700 t of lime since August 2017*), soil K - 131 mg/l (*range 65 – 206 mg/l*), soil P - 9.7 mg/l (*range 4.2 - 26.1 mg/l*). We don't cut bales from paddocks with low K. Each year we will look at the individual paddock performance and see what paddocks are doing well, especially from a grazing viewpoint. The farm is targeting more grazings, but we don't want to drop pre-grazing yields any further than where they are, the year average is 1,700 kg DM/ha, but mid season we are going into covers of 1200-1400 kg DM/ha. We want varieties that have good graze out, so far this focus hasn't compromised DM production. Tetraploids have worked well here and we have no problem grazing 100% tetraploid on the farm. Figure 3 (*and Table 1*) shows the DM production of individual paddocks for 2017. We will continue to try and minimise the variation in DM production between paddocks and will continue to re-seed the lower performing paddocks. Measuring grass is the basis for this decision making; having this data built up over years is now beginning to position us better as a grassland farm.

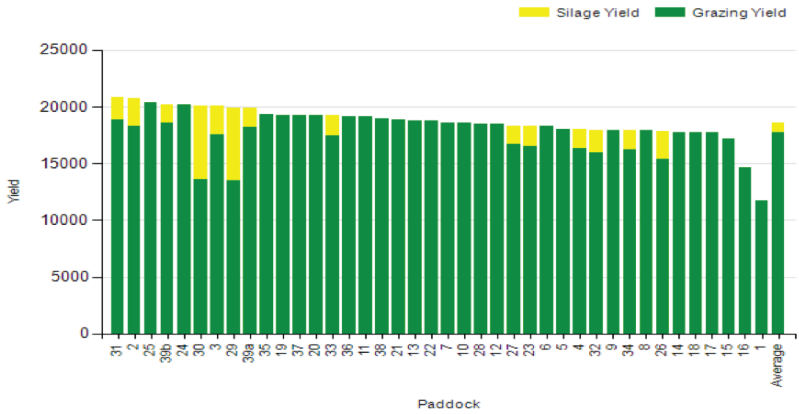


Figure 3. *Paddock DM yield profile for 2017*

Table 1. Individual Paddock Details for 2017 grass DM production

Paddock	Cultivars	Last Reseed	Area	No. of Grazings	Silage Cuts	Grazing *(t DM/ha)*	Silage *(t DM/ha)*	Total *(t DM/ha)*
1	Astonenergy (T), Tyrella	28/03/2010	0.8	11		11.7		11.7
2		11/09/1989	0.9	9	1	18.2	2.5	20.7
3	Tyrella	08/08/2008	2	9	1	17.5	2.5	20.0
4	Bealey (T), Portstewart , Tyrella	08/08/2008	1.75	9	1	16.3	1.7	18.0
5		10/09/1994	2.15	10		18.0		18.0
6	Tyrella	10/04/2008	1.1	10		18.3		18.3
7		10/09/1994	1.2	10		18.6		18.6
8	Tyrella	16/04/2009	1.05	10		17.8		17.8
9	Astonenergy (T)	16/04/2009	1.05	10		17.9		17.9
10	Navan (T), Portstewart	08/08/2007	1.2	11		18.6		18.6
11	Navan (T), Portstewart	08/08/2007	1.2	11		19.1		19.1
12	Tyrella	03/04/2012	1.1	11		18.5		18.5
13	Tyrella	03/04/2012	1.1	11		18.8		18.8
14	Kintyre (T)	17/04/2012	1.45	11		17.7		17.7
15	Kintyre (T)	17/04/2012	1.45	11		17.1		17.1
16	Kintyre (T)	19/04/2014	0.6	7		14.6		14.6
17	Astonenergy (T), Tyrella	24/04/2009	2	10		17.7		17.7
18	Astonenergy (T) , Tyrella	24/04/2009	2	10		17.7		17.7
19	Astonenergy (T), Tyrella	24/04/2009	2.05	10		19.2		19.2
20	Astonenergy (T), Tyrella	24/04/2009	2.05	10		19.2		19.2
21	Astonenergy (T), Tyrella	18/04/2010	2	10		18.9		18.9
22	Astonenergy (T), Tyrella	18/04/2010	2	10		18.		18.8
23	Astonenergy (T), Tyrella	18/04/2010	2	9	1	16.5	1.750	18.25
24	Astonenergy (T), Tyrella	26/05/2010	2	11		20.2		20.2
25	Astonenergy (T), Tyrella	26/05/2010	2	11		20.4		20.4
26	Astonenergy (T), Tyrella	06/08/2011	2	9	1	15.3	2.5	17.8
27	Astonenergy (T), Tyrella	06/08/2011	2	9	1	16.6	1.7	18.3
28			1.5	10		18.5		18.5
29	Astonenergy (T), Tyrella	08/04/2011	2	7	1	13.5	6.4	19.9
30	Astonenergy (T), Tyrella	08/04/2011	2	7	1	13.6	6.4	20.0
31	Astonenergy (T), Tyrella	08/04/2011	2	9	1	18.9	2.0	20.9
32	Astonenergy (T), Tyrella	08/04/2011	2	8	1	15.9	2.0	17.9
33		01/09/2016	4.1	10	1	17.5	1.75	19.25
34			3.6	9	1	16.3	1.6	17.9
35	Astonenergy (T), Drumbo, AberGain(T)	28/08/2013	1.8	11		19.4		19.4
36	AberMagic	28/08/2013	2.2	11		19.1		19.1
37	Drumbo	28/08/2013	2.55	11		19.3		19.3
38	Twymax (T)	19/04/2014	2.7	11		18.9		18.9
39a	AberGain(T)	08/08/2013	3	10	1	18.2	1.7	19.9
39b	AberGain(T)	08/08/2013	2.5	10	1	18.6	1.7	20.3
Averages				**10**	**1**	**17.7**	**.900**	**18.6**

O'Donnell dairy herd and breeding policy

Eddie O'Donnell

Athassel Abbey, Golden, Co. Tipperary

The dairy herd is high performing and in the top 5% EBI herds in the country. This performance is due in no small measure to having an appropriate breeding plan in place for our farm. Our breeding policy is an important part of the jigsaw that feeds in to our mission statement as we require a cow that:

- Calves every 365 days
- Produces a good level of milk solids from a grass based system
- Has the ability to walk distances

In order to attain the attributes mentioned above we made the decision in 2007 to cross the existing commercial pedigree Holstein Friesian herd with pure Jersey semen. For the first two years we adopted a cautious approach and dipped our toe into cross breeding, "*testing the waters*". Given the length of time it would take to change the herd, we decided to cross the entire herd in 2009 to attain the results as quickly as possible from the heterosis that was available.

From 2017 to 2022, we have set ourselves the target of improving the following four main Key Performance Indicators:

- Increase the EBI of the herd from €116 to €180
- Increase the fertility sub index from €46 to €90
- Increase the PTA's namely the fat and protein percentage from 0.2% and 0.12% to over 0.3% and 0.18%, respectively
- Increase the kilos of fat and protein from 9.7 kg to 20 kg in the herd

The herd produced 478 kg of milk solids per cow in 2017 and empty rate after 12 weeks of breeding was 7%. We are very close to achieving our target of 1,500 kg of milk solids per hectare – 500 kg cows, with cows fed a maximum of 500 kg of meal, and stocked at 3 cows/ha. The herd EBI is €139, with a Milk Sub Index of €50 and fertility sub index of €46. The EBI of the 0-1 year olds is €181 and the current first calvers €174.

How do we get cows in calf?

The method of breeding we adopt is fairly standard and common to most farmers. The breeding season lasts for 12 weeks in total for the cows and heifers. We use a combination of eight weeks A.I. and four weeks of bulls. The bulls we use every year have been bred from the previous year's cows. Given that these are one year old bulls they have a smaller stature so we feel the need to use AI short gestation sires with them for insurance purposes.

Cow and Heifer management timeline

Our cow and heifer management timelines are outlined below. For 2017, the mating start date was 29th of April for the heifers and the 30th of April for the cows. It will be similar for 2018.

In relation to heifer management, we synchronise the heifers using the 7 day PG programme. The main purpose for the synchronisation of the heifers is to facilitate ease of management of the herd the following spring and to ensure heifers get calved and back in heat as soon as possible.

Cow management timeline

April 1st	External expert condition scores all cows and any cow that is below 2.8 is put on Once-A-Day milking until bred.
April 15th	Tail paint all cows red.
April 16th - 28th	Top up red tail paint on the cows twice weekly that haven't shown heat.
April 28th	Record all cows that have not shown heat, i.e. the ones that still have red tail paint on them.
April 29th	Tail paint all of the cows which have shown signs of heat green. For the remaining cows which have not yet shown signs of heat, top up with red paint.
April 30th	AI all cows shown in heat once daily. After they are bred, they are tail painted blue and all cows are topped up with their respective tail paint colour (*red/blue/green*) two to three times a week.
May 7th	Vet checks any cow that has not shown heat (*red paint*) in advance of or in the first week of breeding commencing.
May 25th	Vasectomised bulls put in with cows.
June 20th	Vasectomised bulls are removed from the herd. Bulls put in with cows while we continue to AI.
July 23rd	End of breeding. Take out bulls and stop AI.

Heifer management timeline

March 1st	5 yearling bulls are vasectomised.
April 5th	Heifers come back to home milking platform.
April 28th	Put scratch cards on all the heifers. Watch all heifers for heat 5 times daily. Vasectomised bulls are put in with heifers.
April 29th	AI all heifers shown in heat once daily. Make sure scratch cards are on heifers which have not been bred.
May 6th	Inject heifers that have not shown heat with 2cc of Estrumate.
May 7th - 10th	AI heifers that come in heat.
May 11th	Any heifer that does not come in to standing heat (*approx.* 5%) are left to run with the cows for ease of management until they are bred.
May 12th	All heifers that have been bred successfully (*approx.* 95%) are put in with stock bulls.
July 23rd	End of breeding season. Take out bulls from the heifers.

August 1st Move heifers back to out-farm.

2017 Breeding performance

As a result of implementing the breeding policy described above, the breeding season results outlined above in Table 1 have been achieved.

Table 1. Fertility performance of dairy herd and maiden heifers in 2017

	Cows	Heifers
Empty rate	7% (12 weeks)	2% (10 weeks)
Submission rate 21 days	93%	100%
6 Week in-calf rate	75%	98%
Replacement rate	17%	N/A
6 week calving rate (Spring 2018)	86%	N/A

Bull choice

We adopt a different approach for straw selection depending on the breed, age and size of the cow.

- Large Friesian Cow - Pure Jersey Straw
- Medium Cow - Kiwi Cross Straw
- Small Jersey Cow - Friesian Straw
- Heifer - Jersey Straw

This should result in a cow type composing of 60% Friesian/40% Jersey across the herd.

In order to achieve the 2022 targets, the bulls selected in 2018 will all have strong performances across the three categories of fat percentage, protein percentage and combined fat & protein kilos rather than the traditional route of choosing the highest EBI bull available.

How has our herd been performing?

The performance of our cows year on year has increased since 2014 with the quantity of milk solids per cow rising from 428 kg milk solids/cow sold in 2014 up to 479 kg milk solids/cow in 2017.

This steady improvement in performance is due to an increase in the % of fat and protein from 4.49% and 3.72% in 2014 to 4.73% and 3.90%, respectively, in 2017, along with an increase from 2.9 lactations in 2014 to 3.5 lactations in 2017.

This increase in milk solids/cow coupled with the increase in cow numbers has resulted in the total milk solids sold off the farm increasing from 107,856 kg milk solids in 2014 to in excess of 152,322 kg milk solids in 2017.

Other advantages that we see from cross breeding our herd include:

- Ease of herd management in relation to manpower required per cow
- Reduction in the use of medicine and antibiotics
- Ease of calving for heifers

Report Date: 22/01/2018 (Dec 2017 Evaluation)
Herd Owner: EDDIE O'DONNELL
Herd No: V2380179

1. EBI Herd Summary

Average EBI for all dairy cows with; (i) a known sire (or milk recorded progeny with a known sire) and (ii) are currently on your farm.

* Number of animals that are missing an EBI result

Animal Group	Num of Cows	Milk Kg	Fat %	Prot %	Surv%	CI Days	Milk % Cont	Fertility % Cont	Calv % Cont	Beef % Cont	Maint % Cont	Mgmt % Cont	Health % Cont	EBI €
Cows with EBI	305	-27					€ 50	€ 46	€ 33	€ -19	€ 23	€ 4	€ 1	€ 139
Missing EBI*	0	9.0	0.17		1.6		28.3%	26.2%	18.7%	-10.7%	13.2%	2.1%	0.7%	
Total Cows	305	4.9	0.1		-2.1									
1st Lactation	63	-6					€ 57	€ 45	€ 32	€ -19	€ 20	€ 3	€ 1	€ 139
		9.7	0.17		1.5		32.2%	25.3%	18.1%	-10.6%	11.3%	1.7%	0.7%	
		6.1	0.11		-2.0									
2nd Lactation	53	22					€ 65	€ 45	€ 33	€ -19	€ 20	€ 4	€ 2	€ 150
		11.9	0.18		1.5		34.8%	24.1%	17.4%	-10%	10.8%	1.9%	0.8%	
		7.2	0.11		-2.1									
3rd Lactation	75	-46					€ 50	€ 43	€ 36	€ -23	€ 27	€ 5	€ 1	€ 138
		8.7	0.18		1.5		27.3%	23%	19.5%	-12.6%	14.6%	2.5%	0.6%	
		4.8	0.11		-1.9									
4th Lactation	37	-91					€ 50	€ 49	€ 36	€ -21	€ 29	€ 5	€ 0	€ 147
		9.0	0.21		1.9		26.2%	26%	18.8%	-11.1%	15.1%	2.7%	-0.2%	
		3.9	0.12		-2.0									
5th Lactation (+)	77	-29					€ 34	€ 51	€ 31	€ -15	€ 22	€ 3	€ 2	€ 128
		6.8	0.13		1.5		21.9%	32.5%	19.4%	-9.2%	13.9%	1.9%	1.2%	
		3.0	0.07		-2.6									

2. Dairy Youngstock

2017 Calves	87	18					€ 68	€ 62	€ 42	€ -21	€ 24	€ 6	€ 2	€ 181
Missing EBI*	0	12.0	0.19		2.1		30.3%	27.5%	18.5%	-9.5%	10.7%	2.5%	0.9%	
Total Calves	87	7.6	0.12		-2.8									
2016 Calves	78	23					€ 62	€ 65	€ 39	€ -19	€ 21	€ 5	€ 2	€ 174
Missing EBI*	0	10.8	0.17		2.1		28.9%	30.7%	18.3%	-9%	9.7%	2.5%	0.8%	
Total Calves	78	7.0	0.11		-3.1									

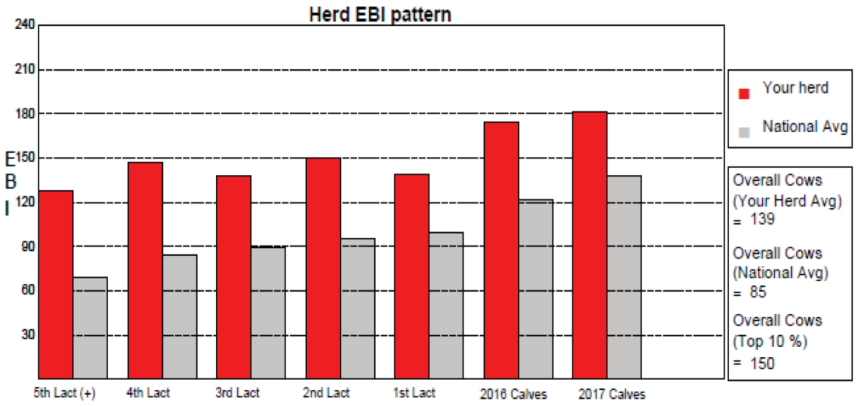


Figure 1. *Economic Breeding Index (EBI 17) Herd Summary*

Feeding the herd at grass – can we do better?

Michael O'Donovan and Michael Egan

Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Summary

- Dairy farms will have to increase both grass production and utilisation substantially to support higher stocking rates
- Autumn closing management and targeting the correct closing cover are vital to ensure adequate spring grass availability
- The importance of early turnout and spring grazing management is underestimated. For every 1% of the grazing area grazed in February, an additional 14 kg DM/ha is grown by 10th April
- The first rotation needs to be finished by early-April in order to achieve 2.5 grazing rotations by early May and 10 grazing rotations in the year
- Post grazing sward height and pasture quality are key drivers of the feeding status of the herd during mid-season
- Grazing management requires continuous improvement

Introduction

There are major improvements needed in the areas of grazing management and the conversion of grass into milk. While every farm situation is unique with varying soil types, local climatic conditions, stocking rates and farmer management capabilities, grass production is limiting on most farms. Irish farms have expanded rapidly over the last number of years. Average herd size is now approximately 82 cows/farm, which requires farms to increase the amount of grass grown to meet an increasing herd feed demand. Increasing stocking rates and more compact calving has resulted in increased spring feed demand on dairy farms. Extra grass must be grown and utilised in this period to avoid increases in supplementary feed use. It is clear from Profit Monitor results in the last two years that farms targeting high levels of grass utilisation are more profitable (*+€261/ha higher net profit*). The farms achieving the highest grass utilisation are, however, still only utilising 10 t DM/ha. This paper examines where Irish dairy farms can improve the feeding management of the dairy herd at grass, to further increase output and lower farm costs.

Current grass DM production performance

The optimum stocking rate for an individual farm is that which gives sustainable profitability, and is dependent on the individual farm's grass growth and utilisation capability. Many Irish farms are only producing 50-60% of their grass growth capability, and substantial increases in grass production need to be achieved. Other dairy nations that have expanded without growing and utilising more grass have lost their competitive advantage. Many farmers in Ireland will fall into the same trap if grass production is not increased. Sustainable dairy expansion must come from

utilising more grass, and not at the cost of importing supplementary feed. Improved feeding of the dairy herd will only come from better grazing management skills being employed. This means regularly measuring pasture cover, using specialized grassland management software to analyse grass production data, and making decisive grazing management decisions. These are the key drivers of grass growth capacity on the farm. A recent survey of high performing grassland farmers reported that all the farmers agreed that they were completing more farm walks, grazing their cows tighter and re-seeding more than they were five years ago. This underlines the importance of continuous improvement in grassland management practices.

At present, Irish dairy farmers are growing on average 9.1 t DM/ha (*National Farm Survey data*), which is utilised during a grazing season that averages 210 days. This poor performance is a result of inadequate (*or zero*) routine grassland measurements being completed on most farms. Across all the farms that are routinely recording farm cover in PastureBase Ireland (*PBI*), the bottom 20 farms, the average of all farms, and the top 20 farms are growing 11.0, 13.8 and 16.7 t DM/ha, respectively (*Figure 1*). Variation in the amount of grass grown in the top 20 versus the bottom 20 farms in PBI is evident across the seasons: 1199 versus 816 kg DM/ha in spring; 4932 versus 4462 kg DM/ha during mid-season; and 6442 versus 5937 kg DM/ha in autumn. An extra grazing rotation is achieved on the top farms compared to the bottom farms (*7.7 versus 6.8 grazings per paddock per year*). This extra grazing results in a greater proportion of grazed grass in the cows' diet.

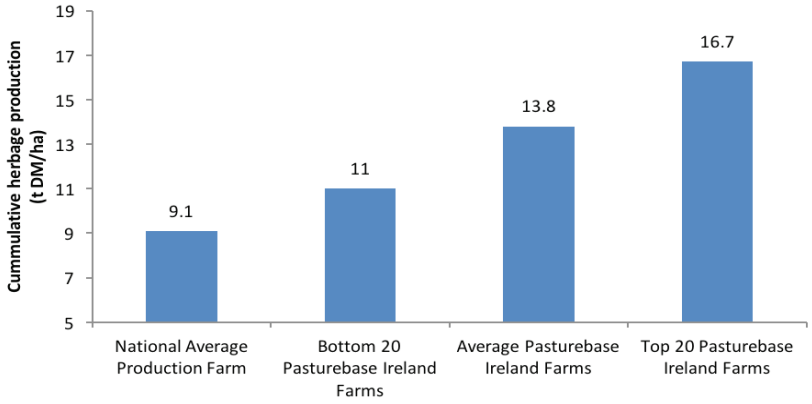


Figure 1. *Comparison of national average dairy farm DM production and that of farms participating in PastureBase Ireland*

Grass allocation

On many farms, the grass grown on the milking platform is prioritised for the grazing cows, as it reduces the levels of imported supplementary feed required. Pasturebase Ireland now provides the tools to determine how much grass is grown and utilised for grazing on farms. Figure 2 shows the relationship between grazing DM production and total grass DM production on farms during 2016. On average, for every extra 1 t DM/ha grown, 0.88 t DM/ha was allocated to the grazing herd.

The relationship between grass allocation and stocking rate in grazing herds is summarized in Table 1. Farms that are not producing sufficient grass to meet the stocking rate requirement cannot allocate enough grazed grass to their herd and are forced to increase supplementation levels. Many farms in the country are facing this prospect if they do not improve grassland management to increase farm grass DM production across the year.

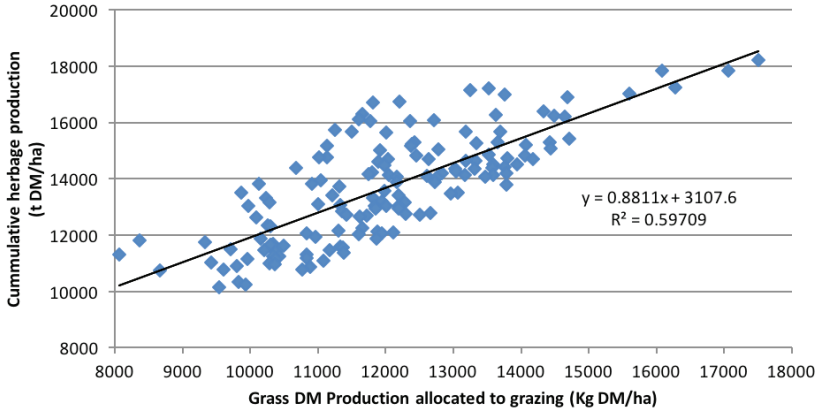


Figure 2. *The relationship between farm total grass DM production and the amount of grass allocated to grazing*

Table 1. The differences in grass DM availability for the herd given different levels of DM production

Grass DM Production *(t DM/ha)*	Grass availability @80% allocated to grazing *(t DM/ha)*	Stocking rate required to feed 1 cow *(requiring 4 t DM allowance)* per annum
9	7.2	1.8
11	8.8	2.2
13	10.4	2.6
15	12	3
17	13.6	3.4

Spring grazing management

Grazing management in the first two months post-calving determines spring grass growth and cumulative growth for the remainder of the year. Data from PBI (*n*=65 *farms*) from 2015 and 2016 shows that, on average, 22% (*range* 0 to 52%) of the grazing platform was grazed in February. These figures are well below the target minimum of 30% grazed by March 1st. The same dataset showed that for every 1% of the grazing area grazed in February, an additional 14 kg DM/ha was grown by 10th April. This equates to an additional 125 kg DM/ha grown on those farms. A target of 1450 kg DM/ha must be grown from the 1st January to 10th April to meet the majority of the cow requirements from grazed grass. The first rotation end date

can have a large impact on spring DM production. For example, PBI data indicates mean spring grass production from January 1st to April 10th was 1239 kg DM/ha on farms completing the first grazing rotation on or before April 10th compared to 994 kg DM/ha for farms completing the first grazing rotation after April 10th. This 20% difference clearly shows that some farms are finishing the first rotation too late.

Given that most farms are increasing both stocking rate and six-week calving rate, the opening farm cover has a large impact on spring grazing and herbage allocation. Opening with a low average farm cover means there is less available grass to graze. Targeting an opening farm cover of 900 kg DM/ha for highly stocked farms can be achieved to keep supplementation low. An experiment to establish the effect of opening farm cover commenced at Moorepark in spring 2017. This trial is investigating the effect of opening farm cover on animal performance and herbage production. Table 2 below shows preliminary results for animal performance during the first rotation (*February 6th to April 8th 2017*). Commencing grazing with a greater opening farm cover (*1040 versus 650 kg DM/ha*) resulted in more grass available for lactating cows (*12.9 versus 9.5 kg DM/cow/day*) over that 60 day period. The higher grass allocation resulted in an additional 13 kg MS/cow produced by April 8th (*9% increase in milk output per cow*). Each additional 100 kg DM/ha increase in opening farm cover resulted in an additional 9 kg milk solids/ha.

Ensuring a high opening farm cover and maintaining it so it does not drop below 500 kg DM/ha in late March/early April is a crucial aspect of spring grazing. During the spring period the farm should be walked a minimum of 4 times during February and March to ensure adequate grass is available and regrowth's are recovering to target levels. If average farm cover drops, the level of grass available for grazing animals is reduced, and levels of supplementation will increase. It is important that adequate nitrogen is spread on the farm by April 1st to stimulate early grass growth (*70 units/acre, 56 kg/ha*).

Table 2. The effect of high and low opening farm covers on grazing and animal performance for the first rotation *(February 6th to April 8th)*

	High Grass	Low Grass	Difference
Opening farm cover (kg DM/ha)	1040	650	+ 390
Grass allocation (kg DM/cow/day)	12.9	9.5	+ 3.4
Concentrate feed (kg DM/cow/day)	2.8	2.8	0
Pre-grazing herbage mass (kg DM/ha)	1533	1091	+ 442
Post-grazing sward height (cm)	3.7	3.3	+ 0.4
Cumulative milk solids (kg/cow)	151	138	+ 13

Mid-season management

The primary objective during the main grazing season is to maintain high animal performance from an all-grass diet, while at the same time maintaining pasture quality. In general, from late April onwards, grass supply exceeds demand. Pre-grazing herbage mass should be maintained

at 1300 to 1600 kg DM/ha, with a grazing residual of 50 kg DM/ha (*4 cm post-grazing height*). One of the biggest issues in mid-season is not stocking the farm appropriately to match grass growth, resulting in large surpluses (*understocked*) or large deficits (*overstocked*). Farm cover should be maintained between 150 to 180 kg DM/cow from mid-April to mid-August with a rotation length of 18-21 days. In order to maintain this, average farm cover should be monitored weekly and three times every two weeks during peak grass growth. Paddocks with surplus grass should be removed as identified. Improving pasture quality offers the potential to achieve further increases in animal performance from pasture. Grass quality varies across the season; however, some of these changes can be negated by good management practices. The current measure of how well grass is utilised in the field is the post-grazing sward height. In 2016, 33 farms were monitored for post-grazing height from April to September. On average, the results achieved were reasonable, but still showed that grass is being underutilised on farms. For example, post-grazing sward height increased by close to 0.5 cm in May and stayed at >4.4 cm for the remainder of the year (*Figure 3*). This has adverse consequences for sward quality and regrowth capacity in subsequent rotations.

Maintaining high quality grazed grass has the ability to maintain milk production of 2 kg milk solids/cow/day. For each one-unit increase in organic matter digestibility (*OMD*), grass dry matter intake can be increased by 0.20 kg, which can result in an increase of 0.24 kg milk/cow/day. Well grazed swards (*grazed to 4.0 cm*) will contain a high (80%+) proportion of leaf in the mid-grazing horizon (*4 to 10 cm*). The proportion of leaf in the grazing horizon has a strong influence on the grass DM intake achieved by the dairy cow, so it is imperative that swards are leafy to the base. This can be achieved by good grazing management practices. Poorly managed swards (*grazed >4.5 cm*) can fall to 65% leaf during the reproductive period, resulting in more stem and reducing overall sward quality.

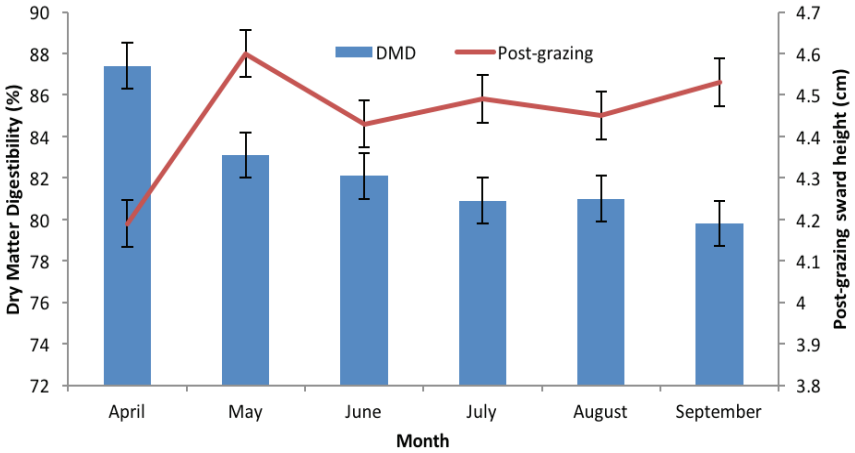


Figure 3. *Post grazing sward height (red line) and grass dry matter digestibility (blue bars) measured on 30 farms participating in Pasturebase Ireland in 2016*

The corresponding grass quality assessments (*Figure* 4) show a consistent decline in grass quality from April through to September, with no increase in any month. The big rise in the May post-grazing height was most likely due to the doubling of grass growth from the first week of May to the third week of May in 2016. The mean grass growth figures for May, June, July, and August in 2016 were 70, 76, 74 and 68 kg DM/ha/day, respectively. The increase in post-grazing height highlights the difficulty of managing grass quality when grass growth increases mid-season.

Autumn grazing management

Autumn closing date is one of the most important management factors influencing the supply of grass in early spring. To ensure adequate quantities of grass are available at the start of calving in spring on highly stocked farms, farmers must ensure an average farm cover of ≥600 kg DM/ha is achieved at closing (*December 1st*). To achieve these targets, farmers should use the autumn planner, which allocates the area of ground to be closed from October to November. The closing of paddocks should start between 5th and 10th October, and 60% of the paddocks should be grazed by 7th November. In highly stocked farms, which have greater demand for early spring grass, this target should be 70% grazed by 7th November, with 100% grazed by the end of November. Farms with heavy soils or farms with low autumn growth rates should close approximately one week earlier. If average farm cover does drop due to poor autumn growth rates, farmers should house or increase silage supplementation to prioritise grass for early spring grazing.

Conclusion

All farms can grow more grass through improved grassland management. Managing a farm to produce more grass requires attention to detail and better grazing management. The farms that are monitoring farm cover regularly are more likely to feed their cows better at grass, achieve more grazings per paddock, improve grass production, and increase farm profit, irrespective of milk price.

PastureBase Ireland – Capturing grassland data on commercial Irish farms

Mícheál O'Leary, Anne Geoghegan, Michael O'Donovan

Teagasc, Animal and Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Summary

- Dairy farms recording farm cover regularly on PastureBase Ireland have grown between 12-14.4 t DM/ha/year over the past five years (2013-17)
- There was large variation between farms for grass DM production ranging from 9.1 t DM/ha to 18.8 t DM/ha
- The Spring Rotation Planner is not being adhered to; in spring 2015 and 2016 dairy farms were 10% behind target. Every 1% of the grazing platform grazed in February results in an additional 14 kg DM/ha grown by 10th April.
- March grass growth increased by 3 kg DM/day for every 100 kg DM/ha increase in average opening farm cover on PBI dairy farms
- Weekly measurement is key to achieve six grazing rotations during the mid-season period, while offering dairy cows the best quality feed available
- Autumn closing date has a very significant impact on the level of grass that is available the following spring. Each week delay in closing in autumn, spring grass accumulation is reduced by 77 kg DM/ha.

Introduction

PastureBase Ireland (*PBI*) is an internet-based grassland management tool. In operation since 2013, it offers farmers 'grassland decision support' and stores a vast quantity of grassland data from dairy, beef and sheep farmers in a central national database. In the last two years PBI and AgriNet Grass, owned by Progressive Genetics, have merged thereby doubling the number of farms on the programme which will significantly add to the national database.

The Food Wise 2025 strategy has set ambitious targets for Irish agriculture, including an explicit target relating to grass utilisation on all livestock farms. Specifically, it targets an increase in grass utilisation of two tonnes dry matter (*DM*) per hectare (*ha*). While it makes sense to increase the utilisation of our biggest natural resource, achievement of the target will not be straight forward. In fact, significant changes will be required in how farmers manage and use grass if this target is to be achieved.

What PBI is telling us is that farmers must have a good handle on current grass supply in order to manage grass well. If you don't know your farm covers, grass demand and grass growth it is virtually impossible to operate a high-output grass-based system. A key factor in the profitability of any farm is to make use of the feed resource produced inside the farm gate.

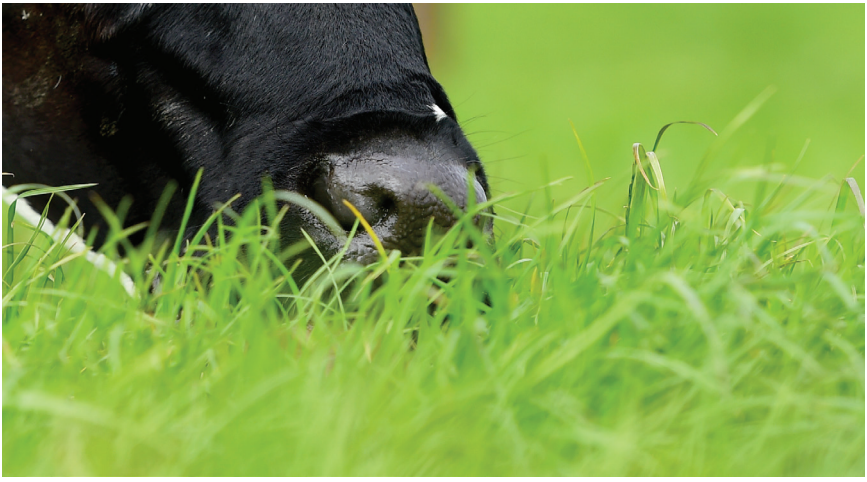
Relying on imported feed leaves you very exposed in the current volatile environment. Unfortunately, only ~10% of dairy farmers in Ireland measure grass on a programme like PBI which is disappointing as one extra tonne of grass utilised per hectare is worth €181/ha in extra profit.

What are the advantages of PBI over other grassland programmes?

PastureBase Ireland is the world's first National Grassland Database. can see the level of grass production in any part of Ireland at any time. There is a lot of valuable data in the AgriNet Grass database that is not being analysed effectively from a national or industry point of view that can now be analysed through the merger with PBI. The centralisation of bovine data in ICBF over the past 20 years has created significant gains for farmers. Centralisation of grass data in PBI will help create similar gains in terms of breeding and evaluation of new grass varieties and the management of grassland. The database stores all grassland measurements within a common structure. This will allow the quantification of grass growth and DM production (*total and seasonal*) across different enterprises, grassland management systems, regions, and soil types using a common measurement protocol and methodology. The background data such as paddock soil fertility, grass/clover cultivar, aspect, altitude, re-seeding history, soil type, drainage characteristics and fertiliser applications are also recorded. PastureBase Ireland will also, for the first time, link grass growth on farms to reliable Met Eireann local weather station data.

Grass DM production on dairy farms - PastureBase Ireland data *(2013-17)*

It is obvious that there is huge variation in grass DM production on farms. High grass DM production can be achieved on dairy farms with good grazing and soil fertility management, irrespective of location. This is one of the key early findings already emerging from PastureBase Ireland in 2014. There are many reasons for this, including differences in stocking rate, soil fertility and grazing management practices. If soil fertility and grazing management can be improved, many farms are very capable of increasing their DM production substantially.



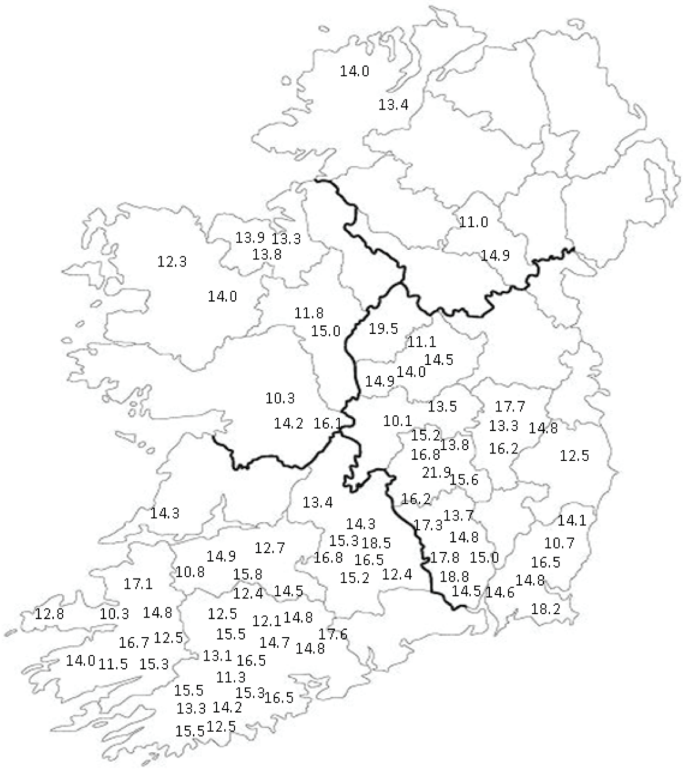


Figure 1. *Grass dry matter production (t DM/ha) from PastureBase Ireland dairy farms across the country in 2017*

Figure 1 shows the annual DM production data from farms across the country in 2017. These farms have >30 weekly farm walks completed. In 2013, these farms produced an average of 12.2 t DM/ha. This increased to 13.5 t DM/ha in 2014, highlighting the large year effect on grass output. The variation between farms is very high, the difference between the lowest and highest producing farms was 9.4 t DM/ha. An important aspect of the grass production data is that the highest producing farms are growing >16.0 t DM/ha, with little variation between paddocks. The lower producing farms have much greater variation between individual paddocks. In 2015, again there was an increase of 0.6 t DM/ha compared to the previous year when, on average, dairy farms grew 14.1 t DM/ha. Much of the extra DM produced in 2015 was grown by April, and the mid-year grass growth profile was consistent with 2014. After a slow spring in 2016 growth recovered well in May, however, there was 0.3 t DM/ha reduction in DM production with the average dairy farm producing 13.8 t DM/ha. Again in 2017 we experienced an increase in DM production with the average dairy farmer producing 14.4 t DM/ha.

Table 1. Total dry matter production *(t DM/ha)* **from dairy farms from PastureBase Ireland grass recordings from 2013 to 2017.**

	Mean	Max.	Min.	Range
2013				
Total DM production (t DM/ha)	12.2	18.0	7.3	10.7
Grazing DM production (t DM/ha)	10.3	16.8	6.2	10.6
Silage DM production (t DM/ha)	1.89	5.0	0	5.0
No. of grazings per paddock	6.2	9.1	4.5	4.6
2014				
Total DM production (t DM/ha)	13.5	18.8	9.4	9.4
Grazing DM production (t DM/ha)	11.1	17.8	7.2	10.6
Silage DM production (t DM/ha)	2.4	6.1	0.2	5.9
No. of grazings per paddock	7.8	12.0	5.3	6.7
2015				
Total DM production (t DM/ha)	14.1	18.7	7.5	11.2
Grazing DM production (t DM/ha)	11.9	18.6	6.4	12.2
Silage DM production (t DM/ha)	2.2	4.9	0.2	4.7
No. of grazings per paddock	7.0	11.0	4.9	6.1
2016				
Total DM production (t DM/ha)	13.8	18.2	10.2	8.0
Grazing DM production (t DM/ha)	12.0	17.5	7.7	9.7
Silage DM production (t DM/ha)	1.7	8.8	0.0	8.8
No. of grazings per paddock	7.5	10.1	3.9	6.2
2017				
Total DM production (t DM/ha)	14.4	21.5	9.2	12.3
Grazing DM production (t DM/ha)	12.4	19.2	6.5	12.7
Silage DM production (t DM/ha)	2.0	5.7	0.0	5.7
No. of grazings per paddock	7.8	11.0	5.0	6.0

2017 – Good year for grass growth on dairy farms

In 2017 dairy farms grew 650 kg DM/ha more grass compared to 2016 (*14.4 vs. 13.7 t DM/ha*) (*see Figure 2*). However, while grass production was good, it was not without its challenges. Weather conditions in August and September became very difficult, especially on the western sea board. Where in the east of the country drought was not an issue and this lead to steady growth throughout the summer and autumn.

Spring growth (*1st January – 10th April*) was up 30% in 2017 when compared with the same period in 2016. This was largely driven by the mild winter and favourable growing conditions, especially in March. In the main grazing season (*11th April – 10th August*) growth in 2017 was 10% greater than 2016. Autumn grass production (*11th August – 31st December*) in 2017 was down 12%, however, we cannot forget the excellent autumn we had in 2016.

In 2017 there was an increase in the number of grazings per paddock. It is

well known that the number of grazings achieved per paddock is a major driver of grass production; every extra grazing is worth 1,385 kg DM/ha. In 2016, dairy farms achieved 7.2 grazings per paddock while in 2017 this increased to 7.8 grazings.

This analysis was extracted from PBI dairy farms who recorded 30+ measurements on PBI in 2016 and 2017. Also please note that the pool of farmers in 2017 was bigger than 2016 (+35 *farms*).

Why and how does this amount of variation in grass production occur on farms? From the data we have been collating in PBI over the last five years trends are beginning to be seen in growth rates which are directly related to grazing management. While soil type has an impact, PBI data can show farms in the midlands and northwest producing higher quantities of grass DM than those in the south. Obviously, good grazing management can overcome many issues when we are discussing grass production on farms, this is a trend also evident from dairy farms.

Taking a more in-depth look of why some farms are able to produce high quantities of grass it was clear from the analysis that, delivering more grazings from each paddock during the season is key driver of success. The relationship between the number of grazings achieved per paddock and the associated DM production (*dairy data*). This highlights that every extra grazing achieved per paddock will increase DM production by 1,385 kg DM/ha. It is critical that all dairy farm paddocks are used to graze cows. The ideal paddock residency is 36 hours during the mid-season. Any period longer than this will result in underperforming swards and poor milk solid production.

Reseeding low producing paddocks and expecting every paddock to produce equal quantities of grass are also key aspects for a farm to grow more grass. On high grass producing farms, variation in grass DM production between paddocks tends to be small. One of the strengths of PBI is that on farm grass DM production can be quantified and classified into the different seasons for each paddock. This data enables farmers to target paddocks that have the greatest potential to increase grass growth.

Why are some farms producing high quantities of grass?

- Rotational grazing system – paddock system
- Good farm infrastructure, i.e. adequate size paddocks
- Maximising spring grazing – early turnout and finishing the first rotation on time
- Addressing soil fertility annually
- Records a farm cover weekly (>25 *walks/year*)
- Making decisions weekly on the information generated after each farm cover
- Achieving a high number of grazings per paddock per year – top farms achieving >8 grazings per paddock per year.

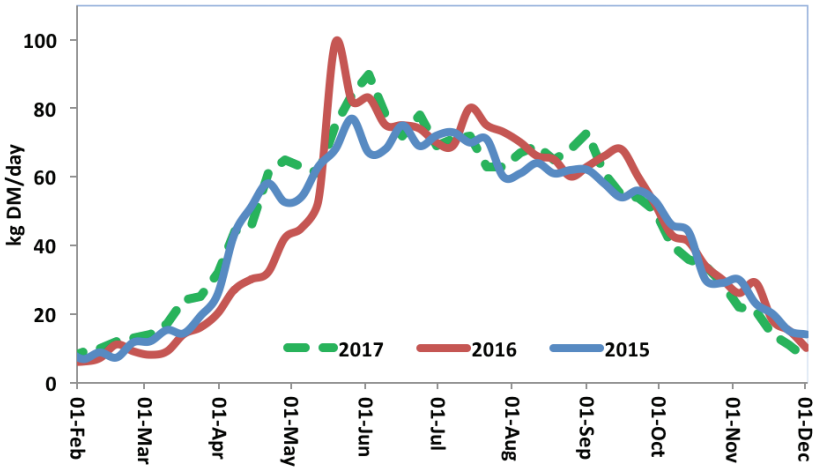


Figure 2. *Mean daily growth rates (kg DM/ha/day) for PastureBase Ireland farms for 2015 to 2017.*

Looking to the future

PastureBase Ireland is continually in development to meet the requirements of the farmer. One exciting new development is a grass growth model decision support tool to predict growth rates over the next seven days. This model will include parameters from the local weather station, level of nitrogen applied and soil fertility This new model is currently being validated. We also are going to connect to other grass measuring tools to make the process easier for the farmer to upload their data from the field.

Conclusions

It is clear that Ireland has incredible potential to increase annual DM production with a better focus on grazing management. PastureBase Ireland, the national database, will allow the industry to move forward with better understanding of the performance of grassland farms. PastureBase Ireland has highlighted that all farms need to focus more on early spring grazing. Farms that graze early in the season will stimulate higher grass growth rates earlier (*late February/March*) and will achieve higher annual DM production, increased milk solids, increase liveweight gain and overall farm profitability.

Grazing Infrastructure – the key points

Pat Tuohy, John Maher and Fergus Bogue

Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Summary

- Investment should be prioritised into areas that will give the maximum return based on current performance, investment costs and profit response
- Proper subdivision of grazing land into paddocks is essential to be able to successfully manage pastures and achieve desirable rotation intervals
- The roadways from the parlour/farmyard to the paddocks should be wide, smooth and as short a distance as is practical.
- Put in two gateways to paddocks to reduce gateway wear and tear

Introduction

The guiding principal of good dairy farm infrastructure is that it's safe, produces quality milk from healthy animals using management practices that are sustainable from an animal welfare, labour efficient, economic and environmental perspective. Grazing infrastructure in relation to roadways, paddock layout and water system will be important in terms of overall herd performance as it can allow more days at grass, and therefore greater profitability.

Prioritising investment

In order for expansion and better grass utilisation to take place, there will be a requirement for significant investment in many farms. The available capital for this investment will be scarce as expansion happens. It is important that investment is prioritised into areas that will give the maximum return. Investment should be targeted at areas that increase efficiency and reduce the expose of the business to external shocks of one form or another.

Table 1 summarises the potential return on investment for different investments in the dairy farm business. The potential benefit and return from these investments can only be determined by measuring the performance on the farm before the investment takes place. This performance information coupled with the potential increased performance following the investment will determine overall returns from one investment or another. The most important investment will be improving the skill set of the farmer (*financial and technical*) and this should then be used to prioritise further investment within the farm. The investments to be prioritised on the farm can only be determined after detailed analysis of current farm physical performance and farm infrastructure using baseline information on areas such as individual paddock yield, paddock nutrient status, etc. All planned investments should be based on current performance and expected returns. Investments that give the highest returns should be prioritised.

Table 1. Potential return on investments for various investments in the dairy farm business based on initial performance, response and investment costs

Investment	Cost	Impact	Annual Return (%)
Increase soil P & K levels	P & K application of 20 and 50 kg/ha	+1.5 t DM/ha/year herbage growth	152
Reseed full farm in eight year cycle	€650/ha	+1.5 t DM/ha/year herbage growth	96
Improving grazing infrastructure	€1000/ha for roads, fencing and water	+1.0 t DM/ha/year herbage utilisation	58
Increased supplementation to increase milk yield/cow	€250/t DM of concentrate	Additional 0.8 l of milk/kg of concentrate	3.2

Grazing infrastructure

Paddock layout

Proper subdivision of grazing land into paddocks is essential to be able to successfully manage pastures and achieve desirable rotation intervals. Paddocks must be connected with an efficient roadway system so that the herd can move from one paddock to any other paddock on the farm. An accurate map of the farm is essential; preferably developed with GPS.

The ideal paddock system should include:

- About 20 to 23 full sized paddocks and a few small paddocks near the parlour for sick cows, etc.
- The roadways from the parlour/farmyard to the paddocks should be wide, smooth and as short a distance as is practical
- The paddocks should be big enough so that there is sufficient pasture for the full herd for 24 hours when the pre-grazing cover does not exceed 1200-1400 kg DM/ha and on a 21 day grazing rotation
- Paddocks to be rectangle to square in shape and wetter paddocks should have longest sides running adjacent to the roadways to avoid poaching in wet weather
- Alter paddock shape to facilitate stock movement into and out of the paddock, i.e. stock move down-hill to exit paddocks
- Roadways to follow contour where extreme and be wide with gentle sweeping bends
- Locate roadways on the sunny windy side of a ditch, hedge or tree line

- Avoid putting roadways directly through springs or swampy ground
- Plan underpasses carefully to allow for gentle slopes into and out of the underpass and for drainage
- Main paddock gateways to be angled to the roadway with at least two gateways for each paddock
- Plan for multiple gateways from the roadway for paddocks on wet ground or for paddocks to be grazed by small mobs near the parlour
- Have several gateways between adjacent paddocks
- One wire (*electrified*) fences between paddocks with interconnecting gateways
- Electrified fences divided into sections with easy to access cut-off switches
- Number the paddocks with a tag on the gate and on a map of the farm

Creating paddocks

- Use farm maps to consider several different ways of laying out the farm and consider the positives and negatives of each one
- Decide on the number of paddocks required; this will depend on whether the paddock will be used for one, two, three or four grazings
- Determine most suitable road layout to service each paddock
- Determine most appropriate water trough(s) position in each paddock
- Allow for multiple entrances into each paddock
- Ideally keep paddocks square/rectangular, ideally depth:width ratio should be 2:1
- Chose the option which ticks the most positives and the least negatives
- Mark the layout on the ground with marker pegs. Use different colours for roadway edges and paddock boundaries.
- Re-consider the layout both from the practicality of construction and operation and from the perspective of the cow. Does this actually make sense?
  - » *Are the paddock entrances in dry ground?*
  - » *Are the paddock entrances in the down-hill corner of the paddock?*
  - » *Is the slope of the roadway less than 10%?*
  - » *Will the roadway disrupt normal flow of water down a slope?*
- Re-align the markers on the ground to correct for the issues identified in four above
- Record the final layout on an accurate map and make lots of copies. Get a very large one made that is suitable to put on a wall at the milking parlour.

Paddock size

Long narrow paddocks result in too much walking over ground to graze the end of the paddocks creating an excessive risk of poaching. In excessively large paddocks grass re-growths are grazed if there are over three grazings

per paddock. Using a strip wire to divide the paddock requires extra labour during the main grazing season. If paddocks are too small there will be insufficient grass for one grazing and a requirement for additional water troughs. The maximum depth of a paddock should be 250 metres (*m*) from the access roadway reducing to 100 m in wet areas more prone to poaching.

Calculate paddock size: *(April–June)*

Step 1: Establish cow numbers (*plan for long term*)

Step 2: Establish daily demand. e.g. 100 cows × 17 kg DM= 1,700 kg DM for 24 hours.

Step 3: Ideal pre-grazing yield is 1,400 kg DM/ha in mid-season.

Step 4: To calculate paddock size, divide herd demand by ideal pre-grazing yield.

- Two grazing 1,700/1,400
  - » *= 1.2 ha for 100 cows in 24 hours.*
- Three grazing 1,700 × 1.5 days/1,400
  - » *= 1.8 ha for 100 cows in 36 hours.*

The remaining area is normally closed for silage during this period. It could also be divided into similar paddocks.

Peak grass growing months, April/May/June, will normally determine paddock numbers (*see Table 2*). A number of commercial companies specialise in farm mapping. They use GPS to get exact paddock sizes and will lay out paddock, water and road systems to meet individual requirements.

Project management

- If the conversion involves re-seeding, it is recommended that the cultivation and re-seeding are done before putting in water reticulation, paddock fencing and constructing roadways.
- Department rules require that where existing ditches are to be removed, new hedgerows have to be created before the old ditches are removed. The legislation also allows a farmer who is expanding his herd size to apply for the permanent removal of existing ditches without erecting a replacement. That is if the existing ditches would interfere badly with the operation of the new larger farming operation.
- Accurately detail all the work that is to be done (*widths, distances, design*), and get several quotes.
- Select the contractor/supplier on the basis of price, quality of work, and reputation for getting the work done on time.

Table 2. Number of grazings per paddock in mid-season			
Grazing/ paddock	Pros	Cons	Recommendation
1	• Good grass utilisation • Regrowths not affected • Better in wet weather • Easy to identify surplus/ deficit of grass	• Cows could be underfed • Heifers tend to suffer • More water troughs required	Least Recommended
2-3	• Regrowths protected • Cows less restricted • Easier machinery access	• More difficult to manage in first and last rotation	Most Recommended
4+	• Fewer water troughs required • Fewer paddocks required • Allows for future expansion	• Regrowths affected • More difficult to graze out • Harder to get cows out of larger paddocks	

Roadways

The milking process really starts when the cows leave the paddock. A well-designed, carefully built and properly maintained farm roadway system has many benefits, including, less lameness, less mastitis and better general animal health, faster and easier stock movement, cleaner cows and milk, less roadway maintenance and more efficient paddock access.

Assessing roadway condition

Take a quick look at the condition of your farm roadways for defects that may be causing problems. These defects can include potholes, a roadway that is level or almost level, wheel track depressions, a raised hump of soil under the fence at either side and cow tracks made between the fence and the roadway or on the roadway.

Problems are caused by pebbles and loose stones on the surface, a bumpy surface with secure stones, lodged/trapped water on the surface, very dirty

section near the farmyard, and a roadway level with or lower than the field. The reasons for these defects are many but may be due to flawed construction methods, unsuitable materials and lack of maintenance. The appearance of the roadway now bears little resemblance to what it looked like when it was initially constructed.

Cow behavior

Cows like to walk with their heads down so they can see where to put their front feet. The hind foot is also placed on ground that the cow has seen. When cows cannot place their feet safely they will slow down. It could be because the roadway surface is poor or because they are being forced to move on from behind. If forced to move on from behind cows become bunched and they lift up their heads and shorten their stride. Now they cannot see where to put their front feet and they lose control of where to place their hind feet. Given time a cow that is left to move along quietly will seldom misplace a foot, even on a poor surface.

Cows have an average walking speed of 2-3 km per hour (*0.6 to 0.8 m per second*). On a good farm roadway they can walk at speeds over 4 km per hour (*up to 1.2 m per second*).

There is a social hierarchy and dominance within the herd. Cows like to stick to their social groups as they walk along to the parlour. Cows don't like too much physical contact with other cows as they walk along. When dominant cows slow or stop the rest of the herd will do likewise. Cows have a slightly different milking order to their walking order, so they need space and time to re-organise themselves in the collecting yard before milking. Pushing them in too tight will only lead to stress and lameness.

Roadway width

The width of roadways depends on the number of cows in the herd. Typical widths of 3.7 m to 5 m are suggested for herds up to 150 cows with wider roadways needed for bigger herds. A rule of thumb is an extra 0.5 m wide for each extra 100 cows in the herd.

The fence should be positioned about 0.5 m (*20 inches*) from the edge of the roadway. This will allow cows to utilise the full width of the roadway while at the same time prevent them from walking along the grass margin. A cow track in the grass margin usually means that the fence is too far out and the surface of the roadway is likely to be poor also.

The length of the roadway required will depend on the size and general layout of the farm. On farms with heavy soils a more intensive roadway system makes grazing management easier. The intensity of land area devoted to farm roadways ranges from 1-2% of the grazing area. Most paddock systems aim to have a roadway intensity of between 1.2 - 1.5% of the grazing area.

Lameness

The surface of the roadway has a big influence on the level of lameness in the herd. The surface needs to be smooth, fine and strong enough to support animals but with a little give in it also. Ideally, the footprints from the cows should be visible across the roadway, but not so much to damage the surface when the weather is wet. Rough surfaces with protruding

stones, loose gravel or pebbles (*either sharp or round*) lying on the surface are a major lameness factor. Moorepark research on 14 commercial dairy farms found that on average between 12 and 16 cows per 100 became lame in a six month period (*either Janurary-June or July-December*). On individual farms the figure could be as high as 31 cows per 100 during any six month period. White line disease was the most common cause of lameness followed by sole ulceration. Poor maintenance of roads with little use of top dressing with fine material increased the incidence of lameness. Thus, prevention of lameness at pasture must entail maintaining roads in good condition.

The presence of concrete roadways on farms increased the incidence of lameness. Therefore, if concrete roads are used for cows, care must be taken to ensure; that the junction between the concrete and the roadway is maintained in good condition, that the concrete is kept free of grit, and run-off from the concrete should be diverted away from the roadway. A kerb or nib wall, close to the end of the concrete where it meets the roadway may be useful. If the kerb is a bit back from the edge of the concrete (*about 0.5 m*), there will be less wear and tear on the roadway where the two meet. Regular brushing/cleaning of the concrete is required. Holding cows for long periods on concrete before and after milking should be avoided.

A kerb is also recommenced between the roadway and the entrance to the collecting yard. This will force cows to lift their feet dropping off stones before the entrance. The kerb also prevents soiled water from the collecting yard running onto the roadway or rainfall run-off from the roadway flowing onto the collecting yard. The gradients in this area could be in four different directions depending on the lie of the land, the way it was planned or built, etc. The collecting yard could be sloping to or away from the parlour and the farm roadway could be sloping to or away from the collecting yard. Suitable arrangements must be made for collecting effluent/washings from the soiled yards and the drainage away of rainfall from the roadway. Deepening the fine surface layer and ensuring good drainage in the stretch of roadway near the collecting yard will mean cleaner cows, less lameness and lower cell counts.

Roadway construction

New farm roadways must be laid in good weather when soil conditions are dry. This is primarily to ensure that the roadway material does not mix or get pressed into soft soil. Ideally remove a thin layer of topsoil before placing the roadway material. Topsoil contains pores, organic matter, is generally weak and is likely to deflect and shear under load. Be careful not to remove too much topsoil as the depth of the roadway will have to be increased to bring the roadway surface above field level. If too much soil is removed the finished roadway may end up being too low. The finished level of the roadway must be above the level of the field, otherwise drainage will be onto the roadway instead of off it.

A wide variety of locally sourced materials may be used as the main road material. If this material is available on the farm, so much the better. However, the cost of using it should be weighed up against the cost purchased material.

This foundation layer is made up of granular fill material. The usual depth is

about 200-300 mm (8-12 *inches*). The biggest stones should be no bigger than about one third of the thickness of this layer. The intended slope should be formed in the foundation layer. This means that the surface layer will have the same slope and an even thickness.

Generally, 75 or 100 mm (3 *or 4 inch*) down material is used. This is a graded mixture of different sized stones from 75 or 100 mm down to dust. Crushed rubble can also be used.

Compact with a vibrating road roller before the surface layer is spread. Compaction interlocks the material to give a stronger roadway and helps prevent loose stones from mixing with the surface layer.

Crossfalls

Getting water off the roadway quickly will extend the life of the surface and reduce the cost of maintenance. Potholes will also be less likely to develop. To remove water quickly from roadways they should slope to one or both sides. A roadway that slopes to one side is easier to construct and machinery runs better on it. Cows apparently spread out better on a roadway that slopes to both sides. A crossfall of between 1 in 15 and 1 in 20 is about right. A 4.5 m (15 *ft*) wide roadway with the fall to one side would have a height difference of from 225-300 mm (9-12 *inches*), or if the fall is to both sides, the centre would be 112-150 mm (4½-6 *inches*) higher than the sides. Water must not be trapped at the edge of the roadway or in wheel tracks; it must be shed completely and allowed to soak away in the soil or drained along by the side of the roadway and piped out under the roadway at the lowest point.

Roadways on steeply sloping ground can be subjected to a stream of water running the length of a section of roadway during heavy rain. The one in 15-20 crossfall should be enough to divert this water away to the sides in many cases. Where the ground falls considerably along the roadway crossfalls may be insufficient to prevent this scouring, so, low ridges, shallow channels or cut-off drains at intervals across the roadway will divert water before it builds up volume and momentum. Do not allow water to flow off at gaps, gaps are difficult enough to keep right, as it is, without adding to their problems.

Surface layer

The roadway should be completed with about 50-75 mm (2-3 *inches*) of a fine material on the surface (*Table 3*). If the surface is poor most of the benefits of having a farm roadway are gone. The surface layer needs to be laid evenly and compacted. Spread it out to the slope formed in the foundation layer. Many different types of fine material can be used for the surface layer.

Table 3. Key specifications	
Cross fall/ slope	1:20 one sided slope, 1:15 two sided slope
Construction	Geotextile (optional) 200 – 300 mm hard core plus 50-75 mm fine material
Cow walking speed	2-3 km on good road surface
Road slope	Max of 3:1
Fencing	50 cm from edge of road
Approx. cost	€18 – 30 / metre

Costs

A 4.3 m wide roadway, with 0.3 m depth of material, will need one 25 tonne load to cover a length of 9-10 metres. This assumes a density of about two tonnes per m3 for the material used. A similar sized load would cover 45 metres with a 63 mm (*2½ inch*) thick surface layer. The price of road making material, both crushed stone and dust for the surface, is typically €7-10 per tonne plus VAT. As the construction material amounts to over 80% of the overall cost, strict control over the depth and width of the roadway, in line with needs and good construction practice, is essential. Farm roadway costs range between €4 and €7.5 per square metre. Calculate costs in advance and monitor progress. This will avoid surprises and cost overruns. VAT is refundable on new farm roadways but not on repairs.

Repairing an existing roadway

Roadways should be repaired as necessary - probably needing some attention every year. Pay particular attention to the most used part of the roadway, especially the first 50-100 m near the parlour. This area can get very dirty, worn and low. This dirties cows coming in and going out, leading to increased somatic cell count (*SCC*) levels, udder washing, raised total bacteria count (*TBC*) and sediment levels. It also predisposes cows to foot disorders.

Typical areas that require on-going attention are drainage outlets, water diversion ramps/channels, filling potholes and adding extra surface material to rough areas. Roadways that are in a bad state will need a major repair job to get them right. Remove any grass and clay from the edges and the centre. If the roadway is lower than the level of the field it will have to be raised. If there is no crossfall, one will have to be created.

Generally, 40 or 50 mm (*1½ or 2 inch*) down granular fill material is used to raise the level. If it has to be raised a lot you may have to use 75 mm (*3 inch*) down. This granular fill should be laid to the falls of the finished surface. Finish off with a suitable surface material and compact.

Cow tracks

Cow tracks can be installed as extra roadways, as spur roadways off normal wider roadways or at the end of the main farm roadway. They are generally only suitable for short runs. They are useful for getting access to out of the way paddocks, to silage ground and making grazing management easier early and late in the season.

A depth of about 150 mm of material is laid on the surface of the ground. This should be compacted and topped off with a fine surface layer and the surface layer should be compacted also. The width should range between 1.8 m and 2.5 m, costing €8-€11 per metre run.

Some key points

- Put in two gateways to paddocks to reduce gateway wear and tear
- Do not site water troughs on farm roadways or near paddock gateways
- Carry out regular roadway repairs. Aim to maintain the surface layer
- Avoid sharp bends; have swept bends at corners and T junctions to avoid bottlenecks

- Critically watch the cow movement and remove restrictions and distractions to cow-flow
- Remove trees that shade the roadway causing dirty wet surfaces
- On steep roadways; use ramps or channels to divert water at intervals otherwise flowing water will create tracks and wash away the surface layer.
- Get cows to enter collecting yards towards the rear. This lines-up the cows for milking makes it easier for them to adjust their social order for milking
- Keep pebbles and stones off concrete yards/roadways
- If stones on the collecting yard are a problem consider installing a kerb at the roadway. Yard junction and an extra depth of fine surface material on the lead-in roadway.
- Allow cows to move along roadways at their own pace to minimise lameness. This also keeps the cows calm.
- Slow down with farm machinery and keep tractor and heavy machinery use on roadways to a minimum
- If cows slow down on a farm roadway they do so for a reason
- If the surface is poor cows will take longer to walk along it
- Repair potholes in good time and with fine material
- Avoid holding cows on the roadway before letting them off, say to cross a public road; dung/dirt builds up on the roadway, leading to difficulty in controlling SCC, dirty clusters, open teats after milking, etc.

Don't let soil fertility curtail your diary business

David Wall, Mark Plunkett and Patrick Forrestal

Teagasc, Crops Environment and Land Use Programme, Johnstown Castle, Wexford.

Summary

- Lime and fertiliser phosphorus (*P*) and potassium (*K*) use on Irish farms has been low over the past decades
- Currently over 55% of soils on dairy farms have below target soil pH and regular lime applications are required
- Soil test results indicate that 90% of soils have suboptimal fertility to maximise grass growth (*target soil pH = 6.3, target soil P & K index = 3*)
- Low soil fertility (*e.g. soil P index 1*) equates to a loss of in excess of 1.5 t grass DM/ha per year, which is worth €275 /ha per year
- Higher yielding swards require higher nutrient application rates to replace nutrients removed during grazing and silage cutting
- Soil testing and fertiliser planning are key requirements for any successful farm
- Slurry is a valuable resource and should be targeted at soils with the highest requirement for P & K to help offset fertiliser costs

Introduction

Soil fertility levels have declined on dairy farms coinciding with a reduction in fertiliser usage in the last decade (*Figure 1*). Of the dairy farm soil samples analysed by Teagasc in 2015, only 10% had optimal soil fertility levels as indicated by soil pH, P and K. Forty four percent of soils sampled had soil pH at the optimal level > pH 6.2.

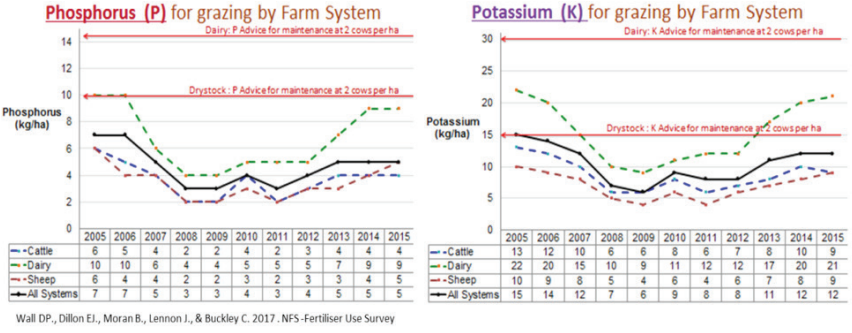


Figure 1. *Phosphorus (P) and Potassium (K) use on cattle, dairy and sheep farms, surveyed by Teagasc National Farm Survey. Typical P and K maintenance fertiliser rates for dairy and drystock are shown by the red lines.*

With up to 90% of soils currently deficient in at least one of these critical elements, poor soil fertility poses a significant threat to productivity and profitability improvement on dairy farms.

Nutrient requirements for grass swards

Grass requires a continuous and balanced nutrient supply from the soil to achieve its production potential. Some well managed and fertile farms are capable of growing in excess of 16 t grass DM/ha annually. This level of grass production requires large quantities of nutrients, such as the major nutrients nitrogen (N), P, K, and sulphur (S) (*Table 1*). However, only a fraction of these nutrient requirements are provided as fertiliser inputs due to the continuous recycling of nutrients within the soil. These high rates of nutrient uptake by high yielding grass swards show the importance of having soils in optimum condition to deliver the quantities of nutrients required.

Table 1. Typical concentrations of N, P, K and S in 1 tonne of grass DM, and the total uptake of each nutrient required in a 1 year by swards growing 16 t grass DM/ha

Nutrient	Typical concentration in grass *(kg/t DM)*	Total uptake required for 16 t grass DM/ha *(kg)*
N	34.9	558
P	4.1	67
K	29.7	475
S	2.9	46

Lime & fertiliser advice

The starting point when building soil fertility is to apply lime according to the soil test recommendations. The nutrient application advice for P and K for dairy grassland is shown in Tables 2 and 3. The advice for both P and K applications shown includes P and K from both chemical fertiliser and slurry sources. In addition, the P application rates should also be adjusted to account for the P coming onto the farm as concentrate.

Table 2. Simplified P requirements *(kg/ha)* of grazed and cut swards for dairy farms *(These total P requirements should be adjusted for concentrate feeds or organic manures applied)*

Soil P Index	Grazed Swards				Silage Swards	
	Farm Stocking Rate *(LU/ha)*				Cut Once	Cut Twice
	<1.5	1.5-2.0	2.0-2.5	>2.5		
1	30	34	39	43	+20	+30
2	20	24	29	33	+20	+30
3	10	14	19	23	+20	+30
4	0	0	0	0	0	0

Table 3. Simplified K requirements *(kg/ha)* **of grazed and cut swards for dairy farms** *(These total K requirements should be adjusted for organic manures applied)*

Soil K Index	Grazed Swards				Silage Swards	
	Farm Stocking Rate *(LU/ha)*				Cut Once	Cut Twice
	<1.5	1.5-2.0	2.0-2.5	>2.5		
1	85	90	95	100	+120	+155
2	55	60	65	70	+120	+155
3	25	30	35	40	+120	+155
4	0	0	0	0	0	0

Conclusion

Trying to plan fertiliser application without information on soil fertility levels is impossible and soil test results for the whole farm are essential. Although it costs money to increase fertility levels on low fertility soils, the returns in terms of grass production can be considerable, which can increase livestock carrying capacity, provision of winter feed, animal health and ultimately farm profitability.

Using the Pasture Profit Index (PPI)

Michael O'Donovan, Laurence Shalloo and Noirin McHugh

Teagasc, Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork

Summary

- The PPI is a total merit economic index which ranks grass varieties on their economic value to a grassland farm
- The relative emphasis on each trait is as follows: grass DM yield (31%), grass quality (20%), silage yield (15%) and sward persistency (34%).
- There is a large range in PPI values (*€/ha/year*) between the highest (€225) and lowest (€61) varieties
- Farmers will need to carefully choose varieties to suit their purpose when using the PPI

Introduction

Food Wise has set a target to increase grass utilisation nationally by 2 t DM/ha by 2025. This target will be difficult to achieve without an increase in re-seeding to generate new high ryegrass white clover swards. The Pasture Profit Index (*PPI*) was introduced to the Irish grassland industry in 2013, after many years of focussed research work and refinements to Department of Agriculture, Food and the Marine evaluation protocols. The PPI set out in economic terms, the agronomic differences between traits of grass varieties, to allow farmers to select the most appropriate varieties for their chosen purposes. It is critical that the industry has direct feedback on the relative performance of varieties on commercial farms, as the recommended list ensures that varieties are appropriate for use in Ireland. It is also critically important that farmers and the industry only use or retail recommended listed material as this is the most reliable quality control for grass varieties.

Approach used

The use of the PPI enables the identification of varieties which will provide the greatest economic contribution to a ruminant grazing system. The sub-indices identify the relative strengths and weaknesses of individual varieties. The index ranks varieties based on their economic benefits and will ultimately result in an increase in the use of superior varieties which results in higher profitability for the industry as a whole. All varieties on the PPI now have a minimum of two years agronomic data generated before the PPI is calculated. The range in PPI in 2018 is from €225/ha/year to €61 (*Table 1*), this is the economic ranking difference between the highest and lowest ranked variety and on investigation of the PPI/Recommended list; this difference is easily recognised. Many of the lower ranked varieties have deficiencies in seasonal grass production and grass quality.

The data generated in the PPI is from the Department of Agriculture, Food and the Marine evaluation protocols. The relative emphasis on each trait is as follows: grass dry matter (*DM*) yield (31%), grass quality (20%), silage yield (15%) and sward persistency (34%). The base values that are used

are spring DM yield = 1.01 t DM/ha, mid-season DM yield = 6.1 t DM/ha and autumn DM yield = 1.9 t DM/ha. Base values for grass quality (*in terms of dry matter digestibility*) are 853 (*April*), 856 (*May*), 826 (*June*), 816 g/kg DM (*July*), respectively. The base value for first cut silage is 4.5 t DM/ha and 3.5 t DM/ha for second cut silage. Persistency is based on ground score change (GSΔ), the economic merit for persistency was determined by dividing the re-seeding cost €672/ha by the number of years a variety persists with varieties surviving the yield threshold of 12 years or longer getting a value of 0 and less persistent varieties having a negative economic value. In so doing, the PPI rewards varieties with a low GSΔ and consistently high levels of DM production (*Figure 1*).

The sub-indices present the opportunity to select varieties for specific purposes. For example, if selecting a variety for intensive grazing, particular emphasis should be placed on quality plus seasonal DM yield with less importance on silage performance. Inversely, if selecting a variety specifically for silage production, particular emphasis should be placed on the silage sub-index and persistency. The PPI will continue to develop and new traits such as a new grazing utilisation trait will be included in the future.

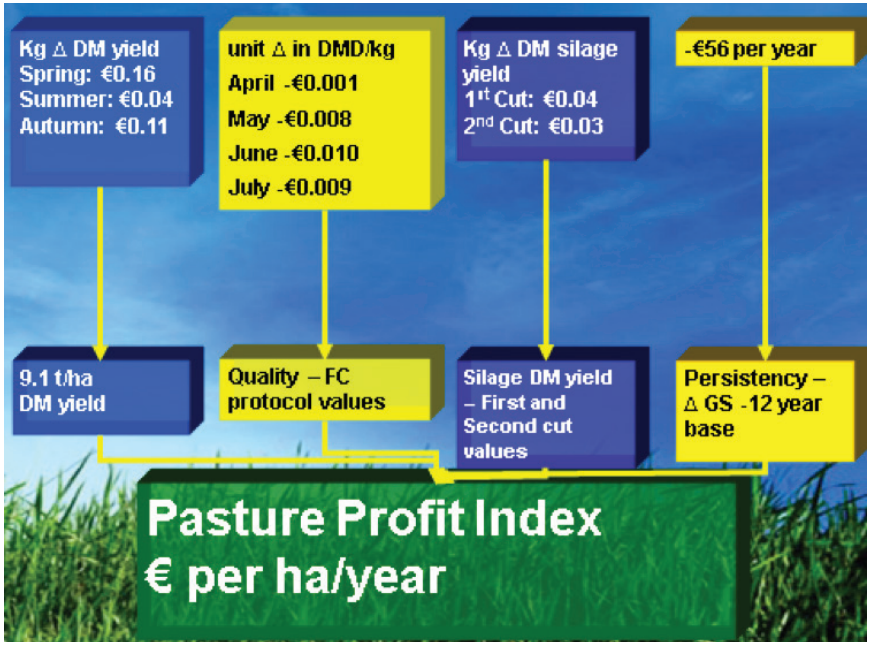


Figure 1. *Economic Values as assigned to base values of Pasture Profit Index 2018*

Table 1. Pasture Profit Index values for recommended listed varieties in 2018

Variety	Ploidy	Heading date	Spring	Summer	Autumn	Silage	Quality	Persistency	Total (€/ha/yr)
AberClyde	T	May 25	57	48	37	28	55	0	225
AberMagic	D	May 29	48	50	71	17	30	0	217
Fintona	T	May 22	78	28	46	39	24	0	215
AberZeus	D	May 29	70	48	52	34	9	0	212
Nifty	D	May 27	81	52	60	26	-12	0	208
Moira	D	May 25	121	26	52	27	-18	0	207
AberGreen	D	May 30	63	58	65	4	16	0	206
AberPlentiful	T	June 9	60	49	45	20	29	0	203
AberGain	T	June 05	32	43	45	30	60	-11	198
AberChoice	D	June 9	26	48	49	13	59	0	194
Meiduno	T	Jun 06	58	44	44	21	27	0	194
Dunluce	T	May 30	35	42	48	30	37	0	192
Elysium	T	May 26	75	34	29	20	31	0	189
AberWolf	D	May 31	68	37	36	21	25	0	188
Seagoe	T	May 28	44	39	46	42	14	0	185
Astonconqueror	D	May 26	81	31	36	24	7	0	180
AberBite	T	Jun 6	13	43	47	33	51	-11	175
Rosetta	D	May 24	88	28	43	20	-4	0	174
Solas	T	June 10	22	42	58	19	26	0	167
Kintyre	T	June 7	25	35	55	18	27	-5	156
Astonenergy	T	June 2	12	35	39	8	59	0	153
Xenon	T	June 11	22	36	33	19	40	0	150
Carraig	T	May 22	50	38	34	35	-16	0	140
Solomon	D	May 19	78	29	33	25	-28	0	137
Alfonso	T	June 4	10	35	37	7	45	0	134
Aspect	T	June 6	19	38	26	14	33	0	131
Navan	T	June 5	11	36	50	16	12	0	124
Drumbo	D	June 7	28	31	35	0	39	-11	121
AberLee	D	Jun 12	-5	41	40	3	42	0	121
Kerry	D	June 1	33	39	41	11	5	0	119
Glenroyal	D	June 5	26	38	41	11	-3	0	112
Clanrye	D	June 6	35	38	18	20	-15	0	97
Majestic	D	June 2	38	31	39	5	-26	0	88
Glenveagh	D	June 2	18	29	23	12	-21	0	61

Notes

Moorepark Animal & Grassland Research and Innovation Centre,
Teagasc,
Moorepark,
Fermoy,
Co. Cork

Tel : 353 (0)25 42222
Fax : 353 (0)25 42340
Email: Moorepark_dairy@teagasc.ie

www.teagasc.ie

Agriculture and Food Development Authority

Fermoy Print & Design 025-31355