



Shared Innovation Space for Sustainable Productivity of Grasslands in Europe

Project Acronym: Inno4Grass

Project Number: 727368

Deliverable No. 5.4

Material to be transferred to MOOCs (Massive Open Online Course)

Responsible partner: Teagasc

Submission date: 09 July 2018



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727368

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Infrastructure

The education of the present and the next generations of grassland farmers and advisors is an essential element of Inno4Grass. Inno4Grass differentiates 3 types of training:

- For the current situation (operational training)
- Near future (tactical training)
- Long-term (strategic training)

This deliverable is targeting strategic training. For strategic training, we adopted existing e-learning structures. While e-learning is commonly used across a number of other disciplines, it has not been commonly used in grassland science education. Within Inno4Grass we developed links with existing MOOCs (Massive Open Online Courses). We choose the Encyclopedia Pratensis (<https://www.encyclopediapratenensis.eu/>) as our major source of e-learning.

Methods

Thus far, the following material has been transferred to <https://www.encyclopediapratenensis.eu/>:

- Farm portraits
- Reports of practice science meetings on grassland innovations
- Video clips
- Technical leaflets
- Factsheets

As part of WP5, the available material will be summarized in a specific grassland syllabus and power point presentations available for young farmers and advisors (Deliverable 5.3, due M26). This will be an important aspect of the MOOC. Sample material has been drafted up by Ireland and the Netherlands to be dispersed to the other partner countries involved in the project. Slides were developed. This means that all stakeholders have example slides to benchmark their own course material from and to aid in the assembly of their own course material. An example is given in the next chapter.

A lot of thought and effort was put into drafting up these slides for member states. Each country has their own areas of interest to focus in terms of grassland, depending on climate and location. It is up to the member states to identify the important messages for their own country to be included in the course material.



Sample Course Material from Ireland



Ireland- Teagasc

- Introduction
- Principles of Grazing Management
- Spring Grazing Management
- Mid-Season grazing Management
- Autumn Grazing Management
- PastureBase Ireland



The Inno4Grass Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 7571802



Introduction

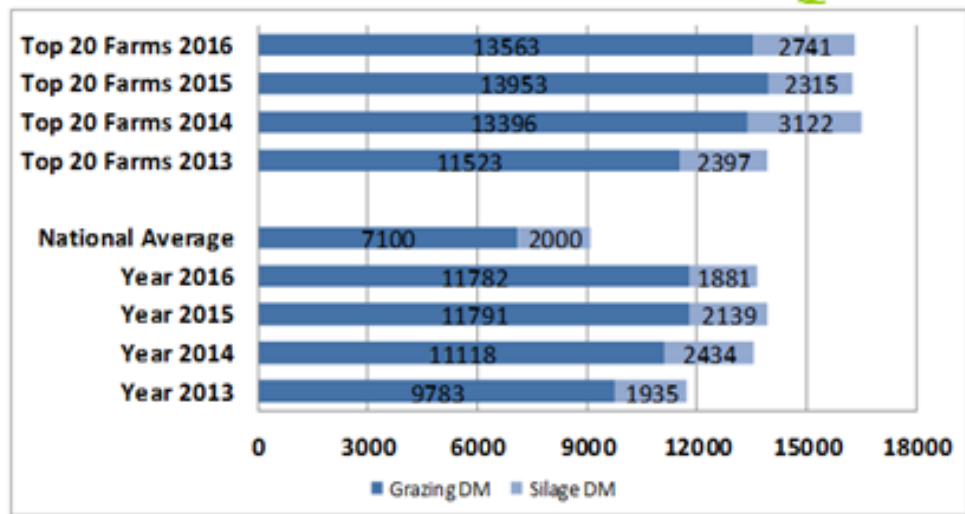


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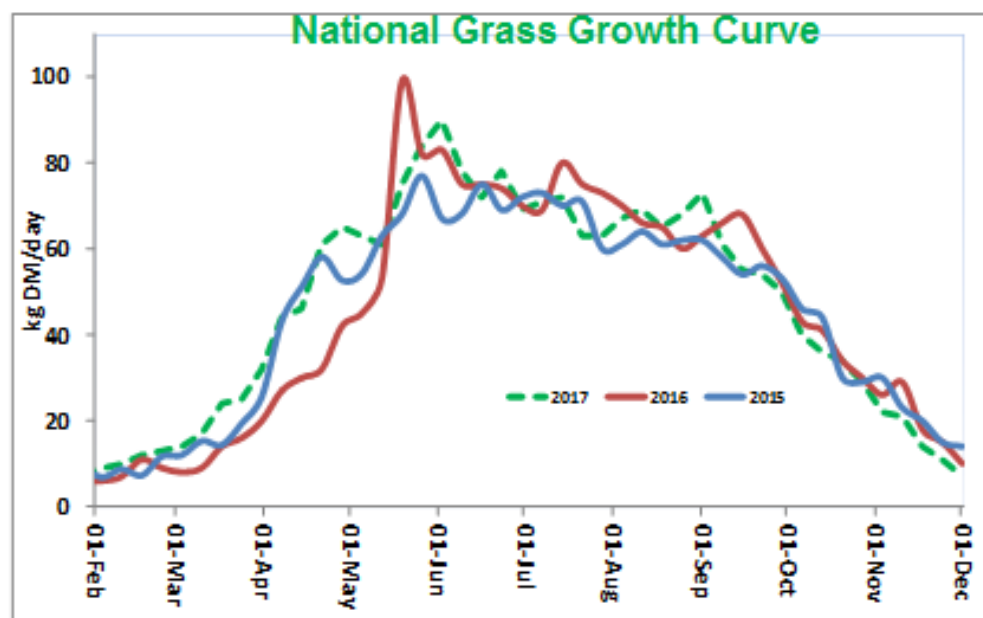
Pasturebase Ireland Dairy Farms DM Production/Ha



The Irish Agriculture and Food Development Authority

02.07.2018 5

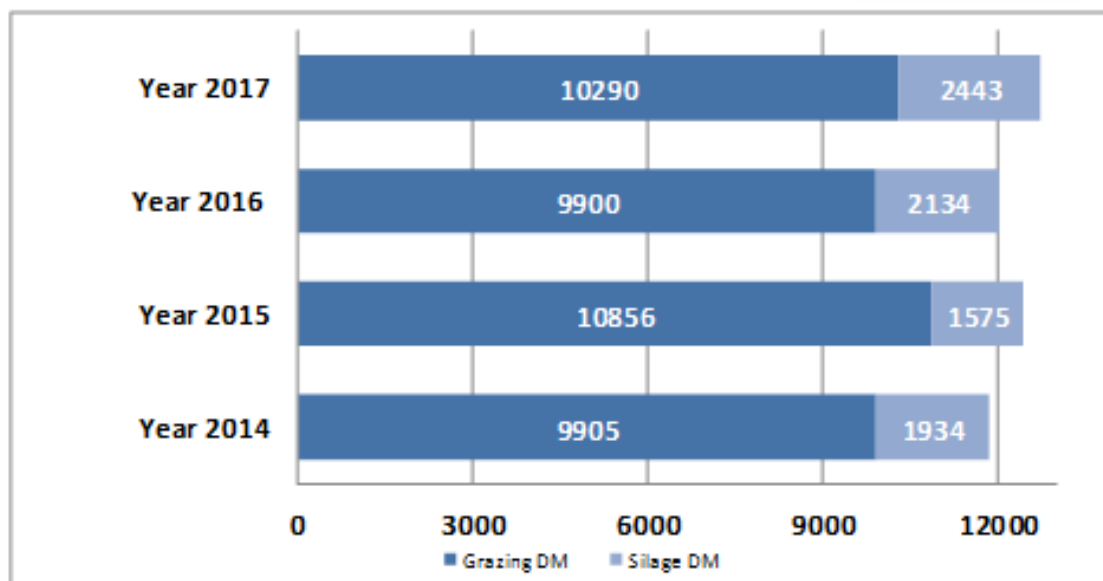
The Inno4Grass Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101016601.



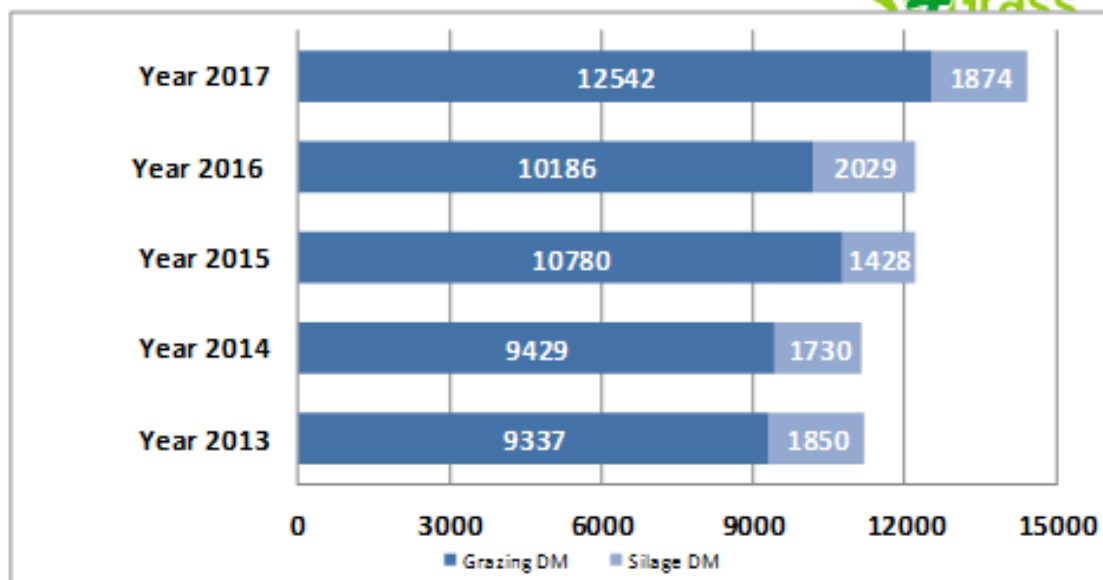
The Inno4Grass Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101016601.



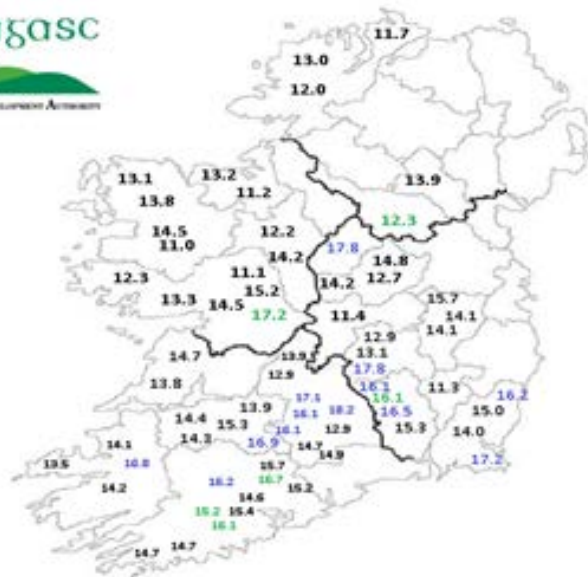
Grass DM Production - Beef



Grass DM Production - Sheep



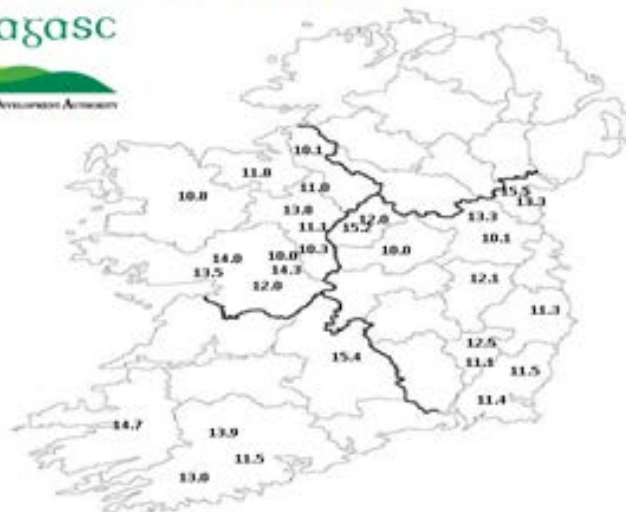
DM Production 2016 on Dairy Farms Average DM Production 13.9 t DM/ha



The Sustainable Future of Farming with Growing from the
European Union's Horizon 2020 research and innovation
programme under grant agreement No 101040000

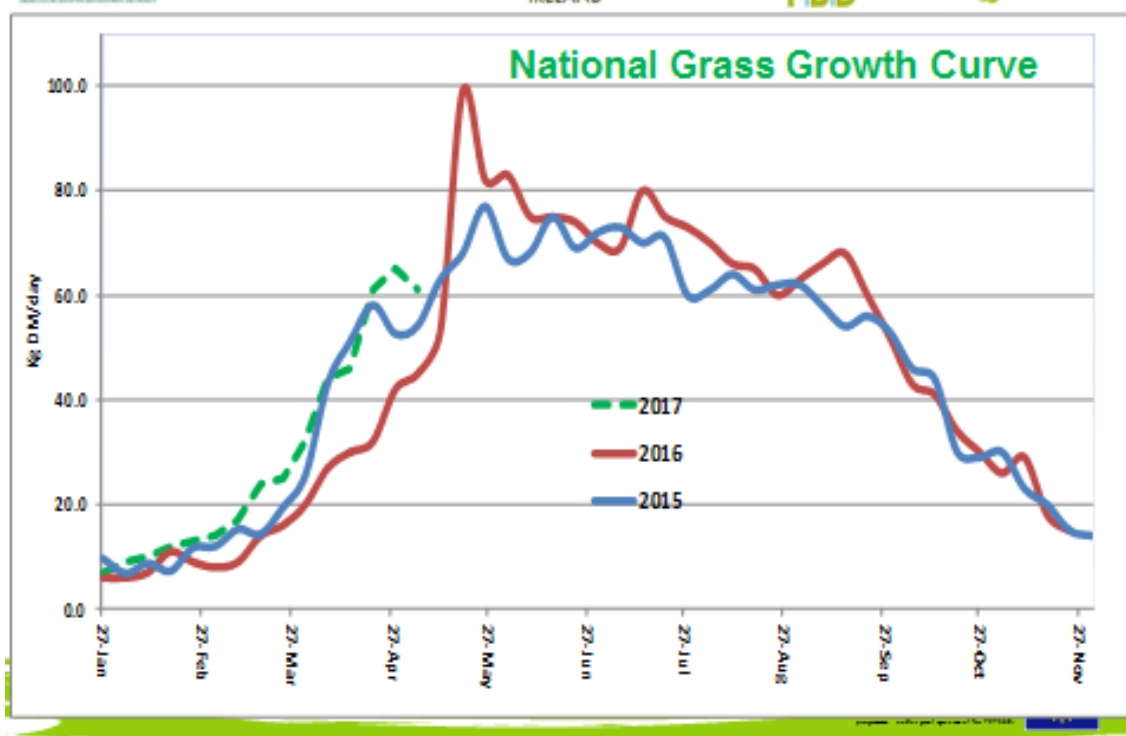


DM Production 2016 on Drystock farms Average DM Production 12.2 t DM/ha



The Sustainable Future of Farming with Growing from the
European Union's Horizon 2020 research and innovation
programme under grant agreement No 101040000





Principles of Grazing Management

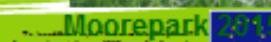
23rd January 2015

Brendan Horan

Teagasc Moorepark, Fermoy, Co. Cork.

<http://www.agresearch.teagasc.ie/moorepark>

brendan.horan@teagasc.ie



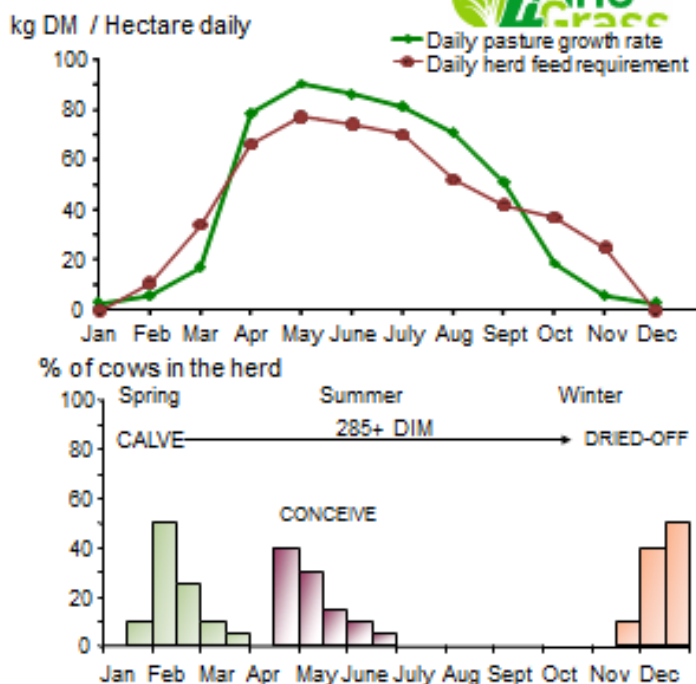
Integrated Grass-based Production Systems



Integrated decisions

Alignment of
grass supply
&
animal requirements

**Compact calving,
high fertility status
dairy herd**



"Simplicity is the ultimate sophistication" – Leonardo da Vinci

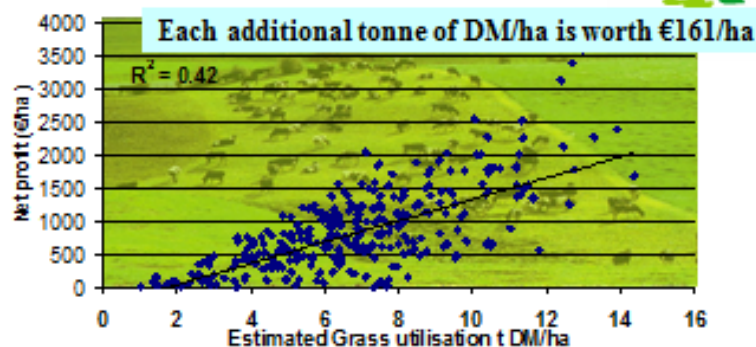
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Stocking rate and Grass Utilisation



- Profitability of Irish dairying is closely linked to grass utilisation (tonnes DM/ha)
- Increasing SR only profitable when grass utilisation (tonnes DM/ha)



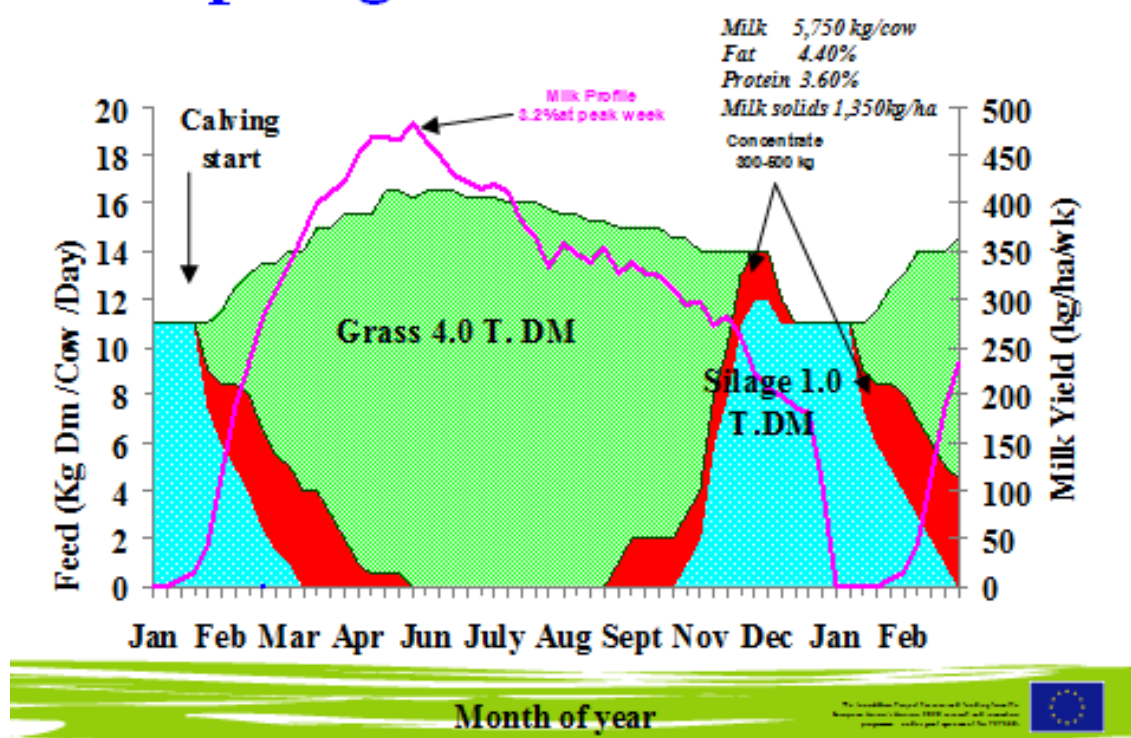
- Optimum Stocking rate for Dairy Farms in 2015

t supplement DM/cow	Pasture grown, t			
	10	12	14	16
0.00	1.5	2.0	2.3	2.6
0.25	1.7	2.1	2.4	2.8
0.50	1.8	2.2	2.5	3.0
0.75	1.9	2.3	2.7	3.1

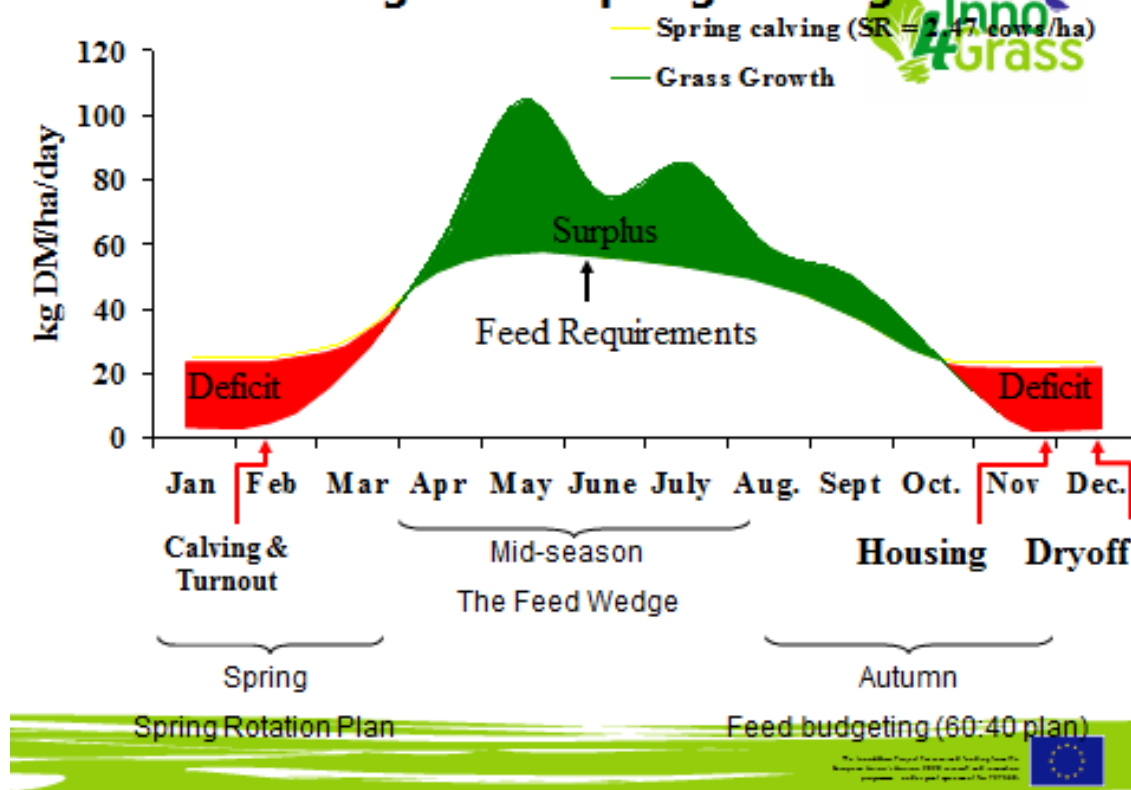
The Inno4Grass Project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101016666

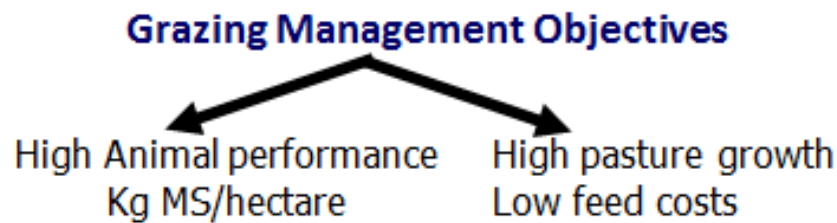


Spring Milk Production

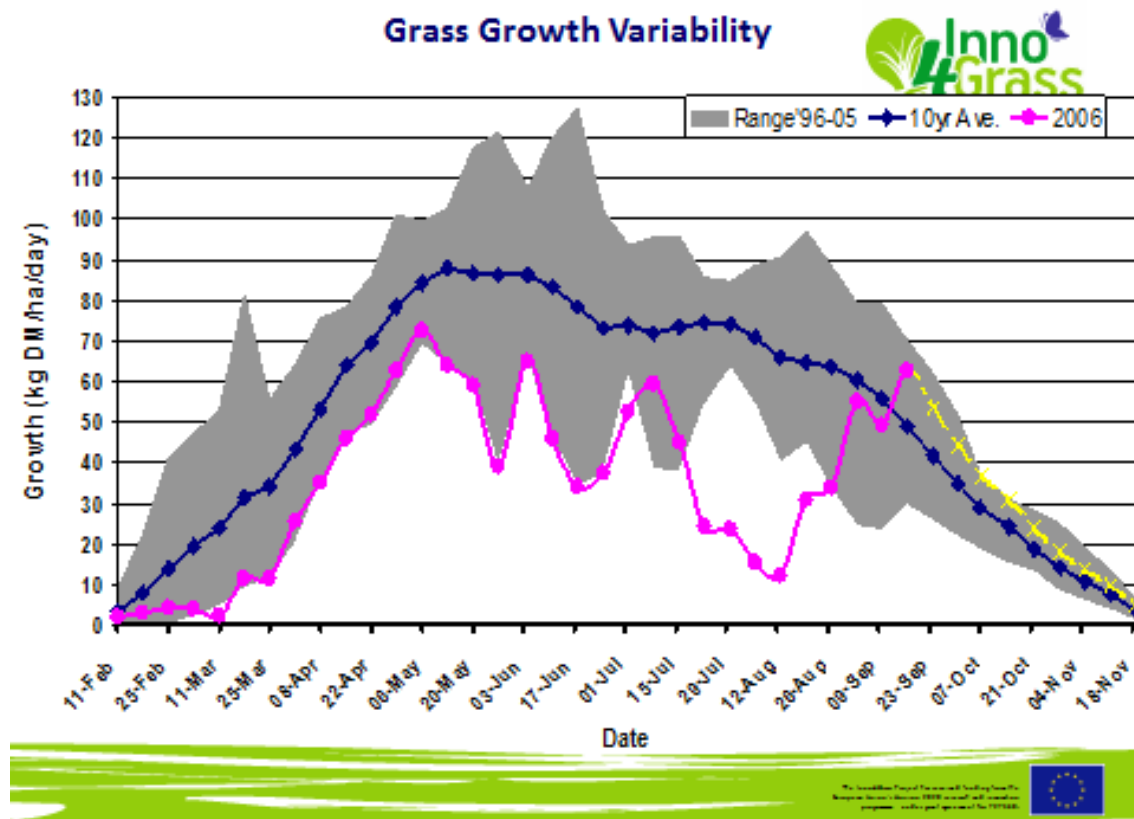


The Grazing Year – Spring Calving Herd





1. Maximise the proportion of grass in the diet
2. Supply adequate green leaf to the cow while conditioning the sward for future grazing
3. Feed budgeting –
 - Achieve seasonal targets
 - Identify and react to surplus/deficit quickly



COMPLETING A FARM COVER

- Measure/estimate the quantity of grass in each paddock - DM yield
e.g. 1,400 kg DM/ha
- Multiply the DM yield of each paddock by the area of the paddock in ha
 $1,400 \times 1.8 \text{ ha} = 2,520 \text{ kg DM in the whole paddock}$
- Repeat this for all the paddocks on the farm
- Sum all the paddock DM yields together
- Sum all the paddock areas together (i.e. get total area of grazing platform) in hectares
- This can be completed on the table below (example in the first line)



Paddock	DM yield (kg DM/ha)	Area (ha)	Total Cover
1	1400	X 1.8	= 2,520
		X	=
		X	=
		X	=
		X	=
		X	=
		X	=
		X	=
Sum the next two columns		(A)	(B)

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**CALCULATING GRASS GROWTH**

- Grass growth is calculated on the paddocks that were not grazed during the week before walking the farm, i.e. if you walk the farm on a Monday all the paddocks that were not grazed from the previous Monday are used to calculate the grass growth rate
- Subtract the DM yield measured last week from the DM yield measured in the same paddock this week and divide by the number of days since the last farm walk
- Repeat for all un-grazed paddocks
- Average all the values obtained to get average growth rate

**EXAMPLE****Week 1 (Monday):**

Paddock 1 = 500 kg DM/ha; Paddock 2 = 1,100 kg DM/ha

Week 2 (following Monday):

Paddock 1 = 800 kg DM/ha; Paddock 2 = 1,300 kg DM/ha

Growth

Paddock 1: $800 \text{ kg DM/ha} - 500 \text{ kg DM/ha} = 300 \div 7 \text{ days}$
(since last cover) = 42.9 kg DM/day

Paddock 2: $1,300 \text{ kg DM/ha} - 1,100 \text{ kg DM/ha} = 200 \div 7 \text{ days}$
(since last cover) = 28.6 kgDM/day

Average Growth Rate = $(42.9 + 28.6) \div 2 = 35.8 \text{ kg DM/day}$

This can be completed in the table below (example in first line)

Paddock No.	DM yield this week	DM yield last week	days between farm walks	Growth Rate (kgDM/day)
1	800	- 500	7	42.9

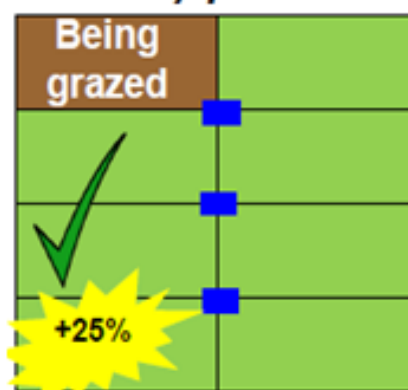
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Grazing Technology – Basic Principles

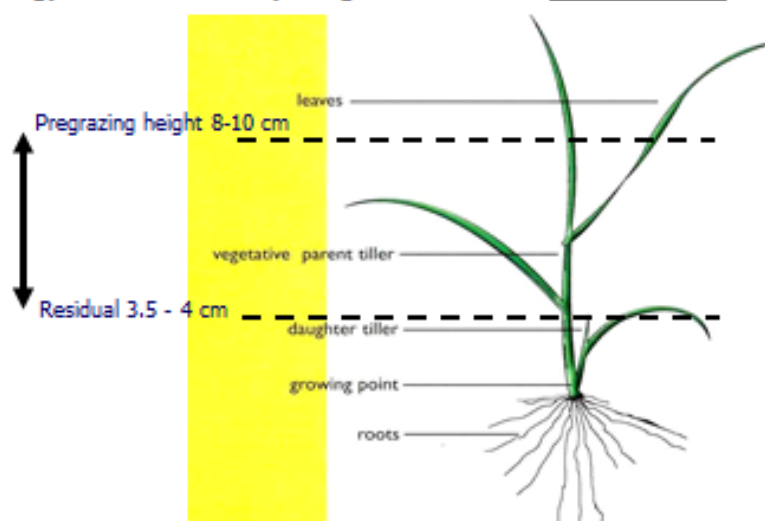
- Measurement and informed decision making
- Extended grazing season based on feed budget (280+ days)
- Good roadways / paddock access/ water infrastructure
- Supplements included when grass supply is limited/ growth reduced
- Excellent soil fertility – has the farm been soil tested in last 24 months?
- On/off grazing to avoid paddock damage and increase grazing efficiency

2-3 day paddocks



Grazing Practices to promote green leaf Growing more grass ~ 16 tons DM/ha/yr

- Energy = Growth*Quality = Light + nutrients + management

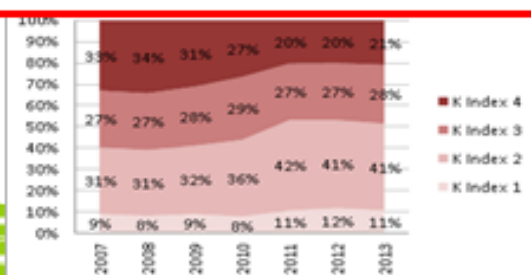
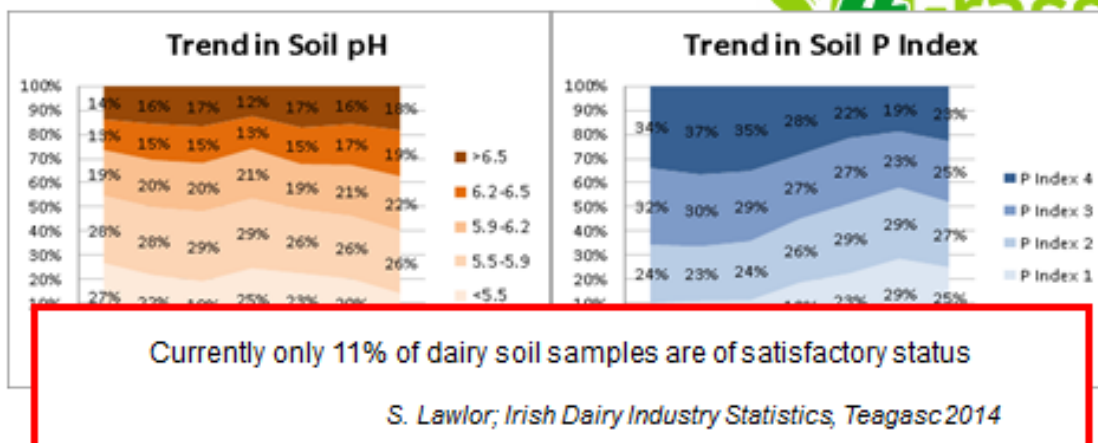


Reseeding
Avoid leaf decay
Soil fertility
Avoid poaching



Agronomy – Growing more higher quality feed

Soil fertility status & nutrient management planning



Spring Grazing Principles



Ryegrass supports 3 actively growing leaves

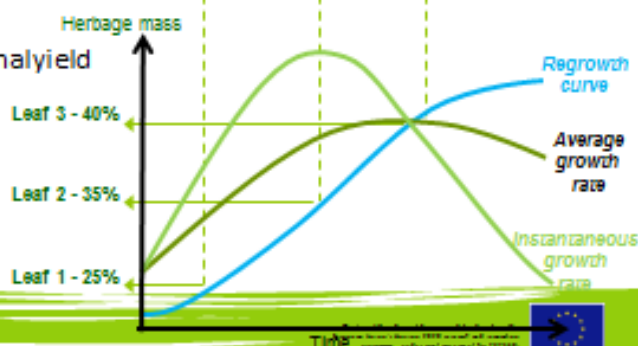
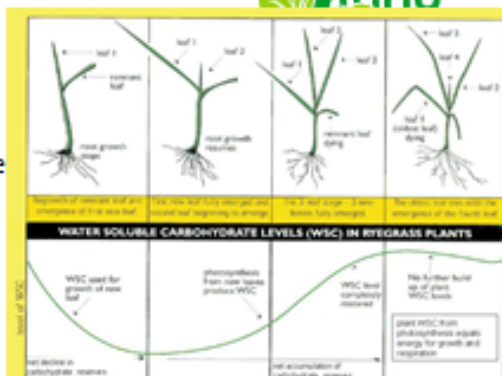
- maximum average growth rate
- high in sugar and nutritionally balanced

High Autumn Covers (>1,200 kg DM/ha) should be grazed before Mid-march to prevent tiller death due to canopy closure

To achieve 2.5 - 3 leaves

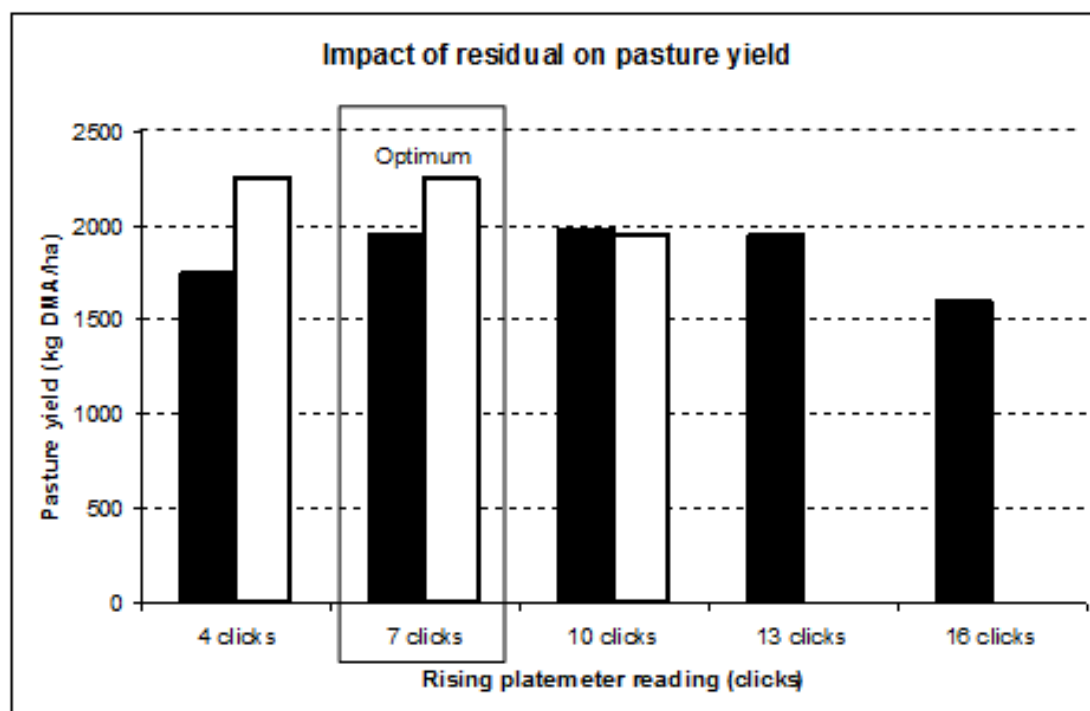
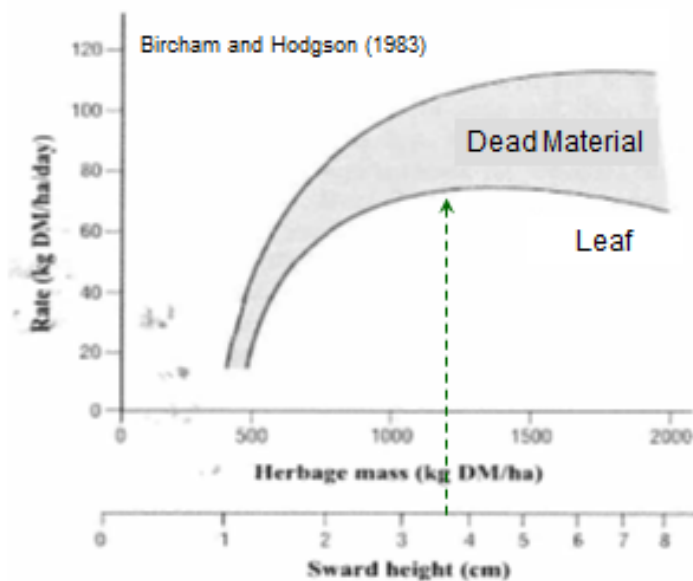
- Slow 1st rotation (100 days)
- Rapid 2nd & subsequent rotations (21 days)

When consistent residuals are achieved, approximately 25, 35 and 40% of total final yield comes from the 1st, 2nd and 3rd leaf



Increase Leaf Production

- Leaf production is maximized by grazing to 3.5 – 4 cm residual height



Winter



Spring to Autumn

(Lee et al., 2007)

Early Grazing Effects on Sward Characteristics

Early grazed sward



Late grazed sward



LevyinAction 2015

Recommended Spring Grazing Management and Herd Nutrition

Animal & Grassland Research and Innovation Centre

Teagasc,
Moorepark,
Fermoy,
Co-Cork.

Phone: 025 42 222

web: <http://www.agresearch.teagasc.ie/moorepark/>

Email: moorepark_dairy@teagasc.ie



Moorepark2015



The Irish Agriculture and Food Development Authority





Spring Grazing Objectives & Guidelines

Why?

Get calved cows out to grass as early as possible

- Increased animal performance - high quality diet with minimal supplements
- Recondition swards for the year ahead – stimulate growth and improve quality
- Maximise spring grass utilisation & minimise sward decay
- Reduce workload on the farm

Each extra day at grass = €2.70/cow/day

How?

- Maintain target Average Farm Cover (AFC) each week during Spring
- Allocate spring grass based on Spring Rotation Plan (SRP)
- Achieve target post-grazing height of 3.5cm
 - maximise utilisation & recondition spring swards
 - enable plants to capture sunlight energy
- Steadily increase total feed allowance from calving into breeding
 - Maximise milk solids production and fertility performance & minimise BCS loss



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Early Grazing Effects on Sward Characteristics

Early grazed sward



Late grazed sward



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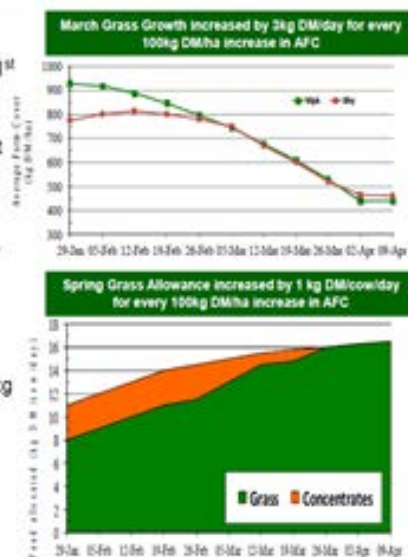
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Target Feed Budget & Allowance

- The ideal average farm cover (AFC) of 800 - 900 kg DM/ha on February 1st
- High quality predominantly grass diet from calving
- Extend the 1st rotation from February 1st to early April with minimal supplements
- Feed allowances increasing by 0.75kg DM/cow/wk from calving to breeding



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Using the Spring Rotation Plan (SRP)

Example SRP for a 40 ha dairy farm with 100 dairy cows

Week	Rotation (days)	Daily area (ha/day)	Total area grazed by week end (%)
1 st to 7 th Feb	100	0.4	7
15 th to 21 st Feb	82	0.49	23
22 nd to 28 th Feb	73	0.55	33
8 th to 14 th Mar	56	0.72	56
22 nd to 28 th Mar	38	1.06	90
29 th Mar to 4 th Apr	29	1.38	114

For the plan to be successful

- Stick to the planned area
- Post-grazing residual 3.5cm
- Use a strip wire on a 12-hour basis.
- Grazing area should be back fenced
- On/Off grazing is essential in wet weather.



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Fertiliser Recommendations: February/ March

- Spring Nitrogen (N) application is essential to boost growth on all paddocks

Average Grass Growth Response of 10 kg DM per 1 kg N applied per ha in Spring

Efficiency of slurry utilisation increased (x6) during February & March

High risk of N loss to groundwater (x25) during February & March

- Immediately after the closed period for fertilizer and slurry application
 - Apply 2,500 gals. slurry/ac. to 30% of paddocks (<650 kg DM/ha herbage mass)
 - Apply 23 units urea/ ac. to remainder (Urea= 30% cheaper than alternatives/kg N)
- In early March
 - Apply 2,500 gals. slurry/ac. to 30% of paddocks
 - Apply 40 units urea/ ac. to remainder
- 70 units N applied by April 1st
- Pay close attention to weather forecasts to avoid heavy rain and waterlogged soils within 48 hours of nutrient application to minimise losses and maximise benefits.

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Mid Season Grazing Management



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Getting it right during the main grazing season

DOs

DON'Ts

Walk the farm weekly

Walk farm fortnightly or less frequently

Keep monitoring the recovery of re-growths

Delay the reaction to high grass growth

React quickly to increasing grass growth

Let pre-grazing yields increase

Maintain pre-grazing yields at 1,300-1,600kg DM/ha (8-10cm)

Increase SR too much on grazing area, by closing paddocks for long-term silage

Graze paddocks out to 4-4.5cm

Graze paddocks to 5.0-5.5cm

Top only when necessary to 4-5cm

Extend rotation length >23 days

Keep rotation length at 18-21 days

Continually react to changes in growth

Take out paddocks quickly



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Grazing to 3.5-4cm in the first rotation provides a platform for excellent quality grass re-growth.



The ideal pre-grazing yield for maximum animal performance is 1,300-1,600kg DM/ha (8-10cm).



Under-grazing leads to a greater proportion of stem. This will lower grass quality and animal performance.



Avoid turning stock into too heavy covers. React quickly to surplus grass and save as baled silage.

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Getting it right during the main grazing season

	Too low	Just right	Too high
Pre-grazing yield (kg DM/ha)	950 - 1,050	1,300 - 1,600	2,000 - 2,200
Pre-grazing height (cm)	6-7	8-10	12+
Rotation length (days)	14/16	18/21	26/30
Leaf content (%)	>70	>70	>60
Days ahead	10	14	22

Advantages of grazing a cover of 1400kg DM/ha and disadvantages of not

Advantages	Disadvantages
 <ul style="list-style-type: none"> Have 7-9cm of grass (1400kg DM/ha) on paddocks for grazing next Have the recommended 10-14 days grass on the farm High grass quality - high leaf content 'Wedge' shaped supply - the most grass will be in the paddock to be grazed next and the least in the paddock grazed last Have flexibility to close for silage Little topping required Higher weight gains 	 <ul style="list-style-type: none"> Too much grass on farm Have 21-28 days grass on farm (double the requirement) Poor grass quality and low utilisation Post-grazing height too high Will have to close >50% of farm to correct grass surplus Two to three rounds of topping required Weight gain poor



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Autumn Grazing Management



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Autumn grazing management

DOs 	DON'Ts 
Build grass from mid August	Build grass from mid July
Harvest excess grass as bales in August	Harvest grass as bales in September
Block graze the higher grass covers	Re-graze closed paddocks
Graze cover <2300kg DM/ha	Graze covers >2500kg DM/ha
Have the highest farm cover in mid September	Have the highest farm cover in mid October
Start closing paddocks in early October	Start closing paddocks in late October
Plan your closing rotation for the farm	Have no closing plan
Graze paddocks to 4cm	Graze paddocks to 5-6cm



Nitrogen and slurry applications in autumn

DOs 	DON'Ts 
Apply slurry to paddocks with low soil index	Use urea in dry periods
It may be possible to use urea when spreading N in autumn	Apply nitrogen to clover rich pastures
Apply low levels of nitrogen rather than missing N on paddocks	Miss nitrogen on paddocks if possible
Use light applications of slurry if available	
Apply a blanket application of nitrogen if required pre-September 15	



10 STEPS To managing a wet autumn

- 1 A flexible attitude – don't allow poaching.
- 2 Use most sheltered and driest paddocks when grazing in wet weather.
- 3 Strip grazing or block grazing can be used during wet weather to ensure minimal damage from poaching. Use one section per day to get the most from the grass.
- 4 Where possible, use a back fence. This will help to protect regrowths and prevent soil damage.
- 5 On/off grazing can be practised to reduce poaching damage and keep animals at grass for longer.
- 6 Have multiple access points into a paddock so that grazing animals do not have to use the same entrance. If you don't, create a 4ft to 5ft grass roadway on a fence line to get animals to the back of the paddock.
- 7 Strategically place water troughs in the paddock so that they will service several strips or blocks when a strip wire is being used.
- 8 Graze paddocks with heavy covers from the back of the paddock on the sheltered side.
- 9 Change grazing break daily or every two days.
- 10 Change animals at the same time; give them a routine.





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PastureBase Ireland









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 ☐ Show Password

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Reasons to Measure Grass

Belfry - 1000 ha total date 1.9.18

Kiln-Cover Details	
Cover Date	04/11/2017
DM%	18
Home Cover (kg DM/ha)	152
Cover (kg DM/ha)	
Growth (kg DM/ha)	30
Demanded (kg DM/ha)	
Overland (kg DM/ha)	
Cover (kg/ha)	6
kg Moisture	0.00
Soil Quality	0.00% For 6 + 0.00% For 10

Tweets to @PastureBase



Teagasc #GrassBase



Agriculture Ireland

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What is PastureBase Ireland & who should use it?



1. Grassland Management Support Software
2. Helps farmers to quantify the amount of grass on their farm
3. Any farmer that wants to increase the profitability of their farm
4. Currently >5,000 farmers on the system





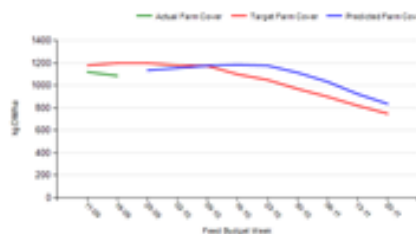
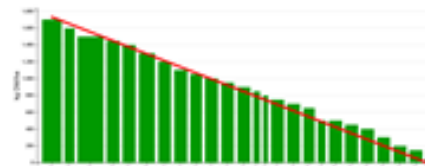
- Web based grassland management decision support tool
- National Grassland Database
- Farmer captures the data
- Core measurement is pre-grazing cover per paddock



What tools are included in the application?



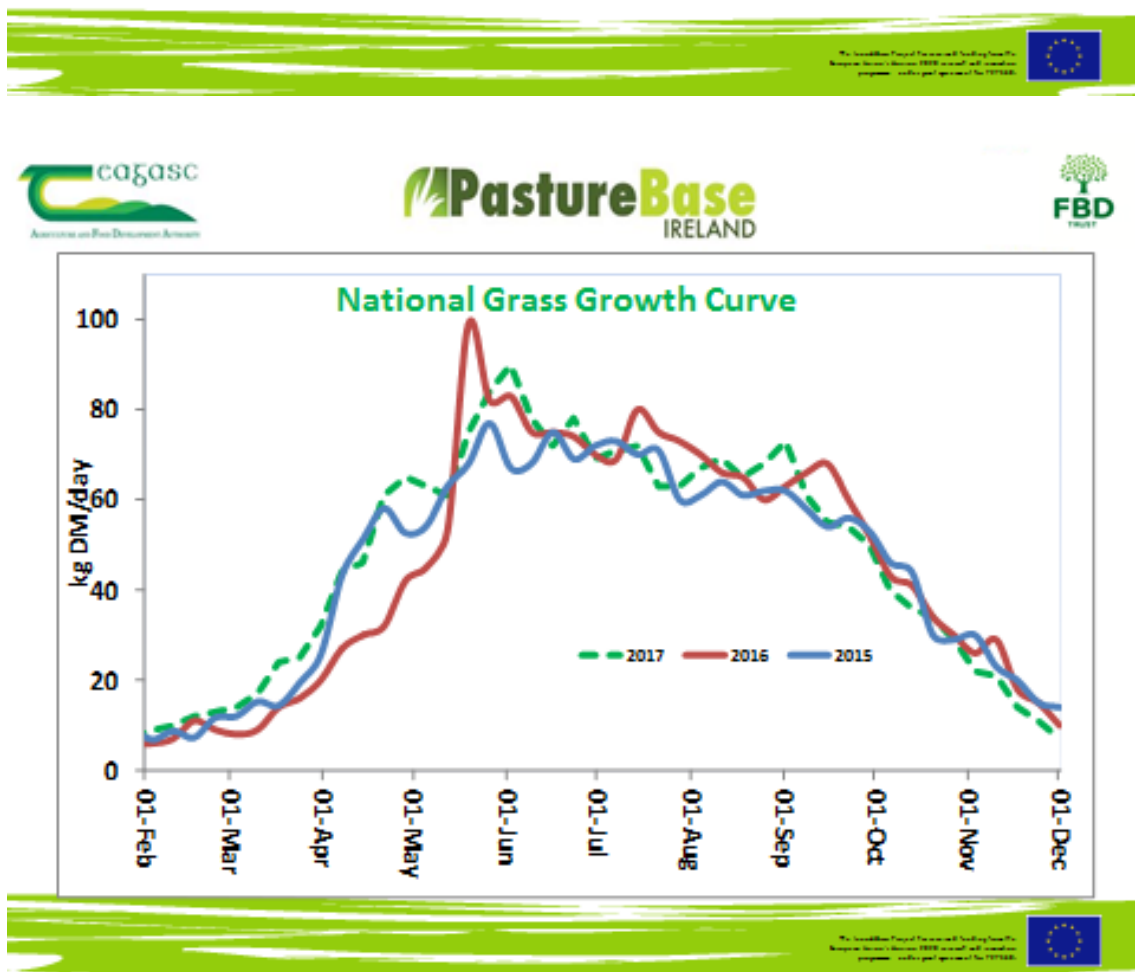
1. Summer Wedge
2. Spring & Autumn Rotation Planners
3. Feed Budget
4. Fertiliser/Slurry application



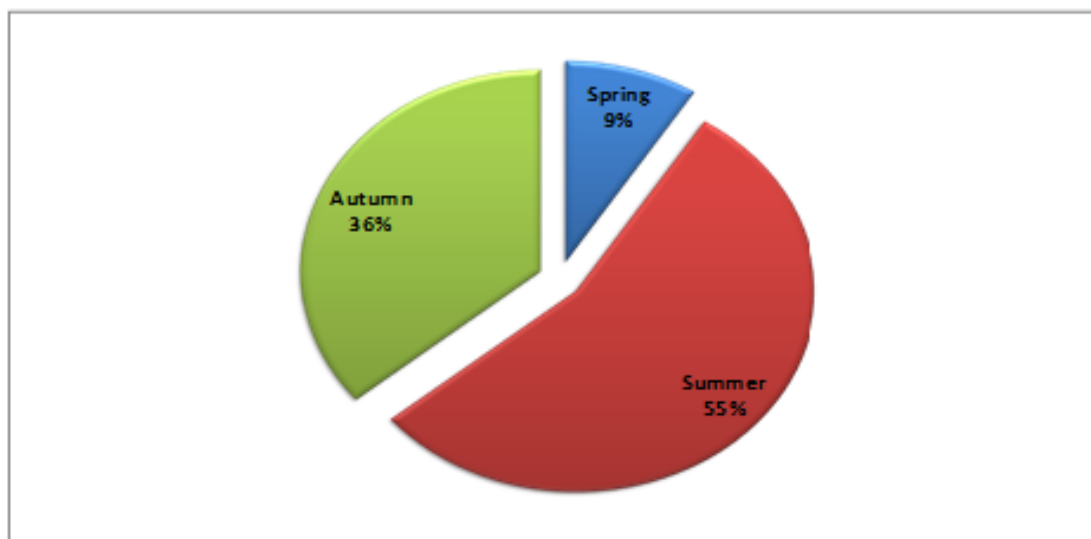
Who is using PastureBase Ireland?



- >3000 farms
- >2500 Dairy farms
- 500+ Drystock farms
- 270 – Dairy and Drystock advisors and industry personnel
- 8 Teagasc Research farms
- 6 Agricultural Colleges
- Aiming to increase usage to 4,000 farmers **actively** measuring in '18



DM Production Proportion by Season



2014-2016 - Spring Growth Variation was 5% to 14% - 0.4t DM/ha to 1.8t DM/ha



Spring Rotation Planner: 40 ha Farm



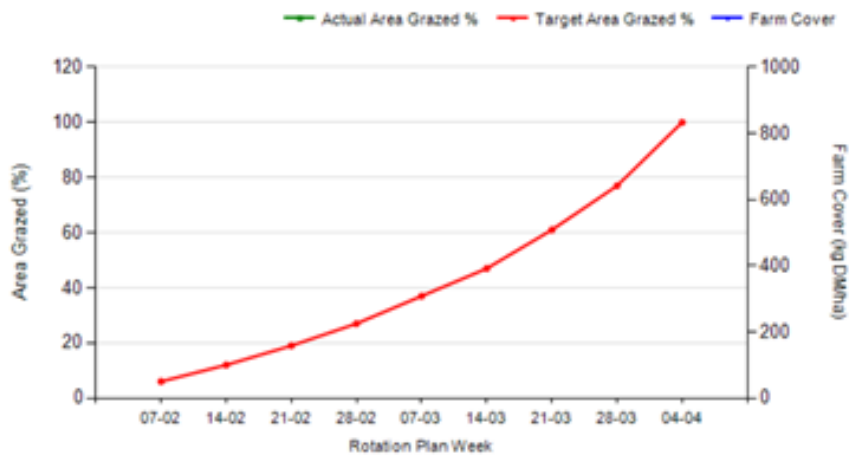
Week	Total area grazed by week ending (%)	Cumulative area grazed (ha)/ week ending	Pregrazing Herbage Mass on April 5 th (kg DM/ha)
1 st to 7 th Feb	7	2.8	800 - 1,200
8 th to 14 th Feb	14	5.6	
15 th to 21 st Feb	21	8.4	
22 nd to 28 th Feb	30	12	
1 st to 7 th Mar	45	18	400 – 800
8 th to 14 th Mar	60	24	
15 th to 21 st Mar	73	29.2	
22 nd to 28 th Mar	87	34.8	100 - 400
29 th Mar to 4 th Apr	100	40	



Spring Rotation Planner



Comparison Chart



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Grass Wedge- Identifying a grass Surplus/Deficit on the Farm



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Grass Wedge- Data Generated to make Decisions



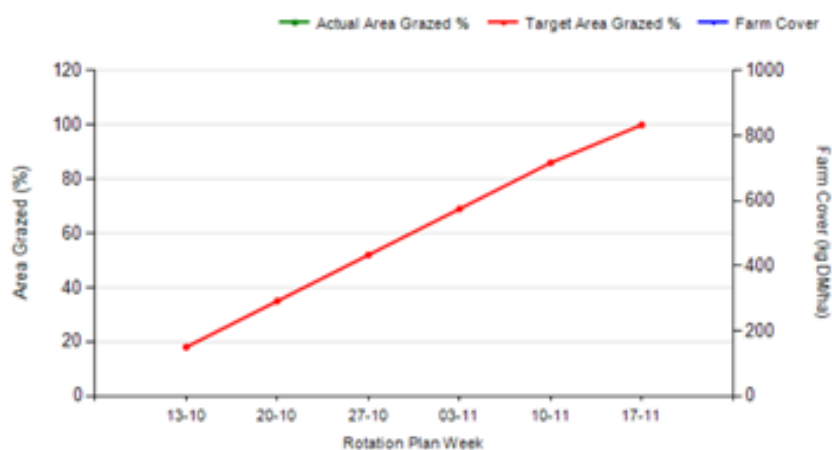
Farm Cover (kg DM/ha)	Help	481	Total LU	Help	35
Cover / LU (kg DM/LU)		158	LU / ha		3.15
Growth / ha (kg DM/ha/day)	Help	43	Grazing Area		9.10 ha (10)
Demand / ha (kg DM/ha/day)	Help	50	Silage - Cut Later		0.00 ha (0)
Demand / day (kg DM/day)		560	Silage - Cut Now		2.00 ha (2)
Days ahead	Help	10	Reseed		0.00 ha (0)
Kg LWT / ha	Help	72	Other		0.00 ha (0)



Autumn Rotation Planner



Comparison Chart



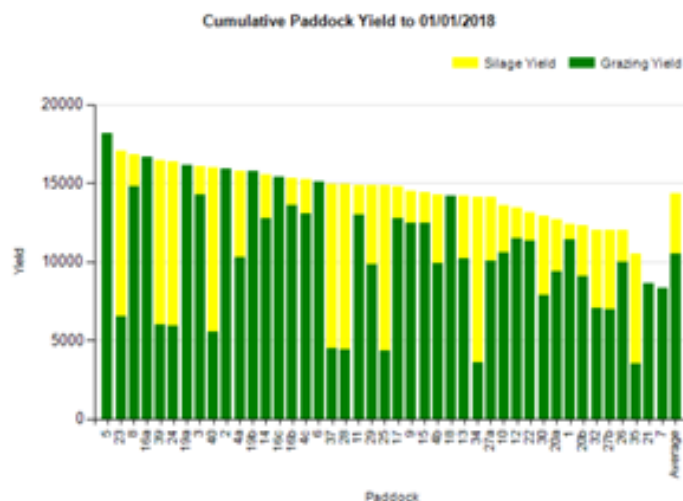
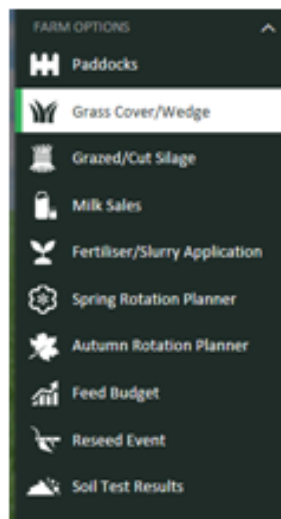
Autumn Rotation Planner Record Chart



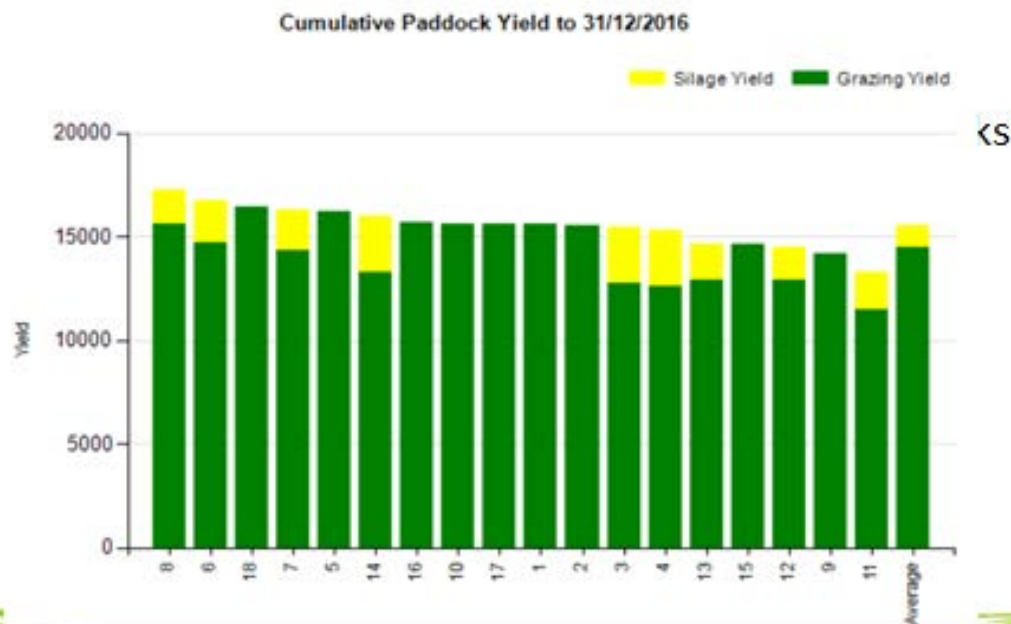
WEEK	TARGET HA GRAZED/DAY	TARGET HA GRAZED BY WEEK END	ACTUAL HA GRAZED BY WEEK END	TARGET %	ACTUAL %
07/10/2018 - 13/10/2018	0.53	3.73		18	
14/10/2018 - 20/10/2018	0.53	7.46		35	
21/10/2018 - 27/10/2018	0.53	11.18		52	
28/10/2018 - 03/11/2018	0.53	14.78		69	
04/11/2018 - 10/11/2018	0.50	18.29		86	
11/11/2018 - 17/11/2018	0.50	21.30		100	



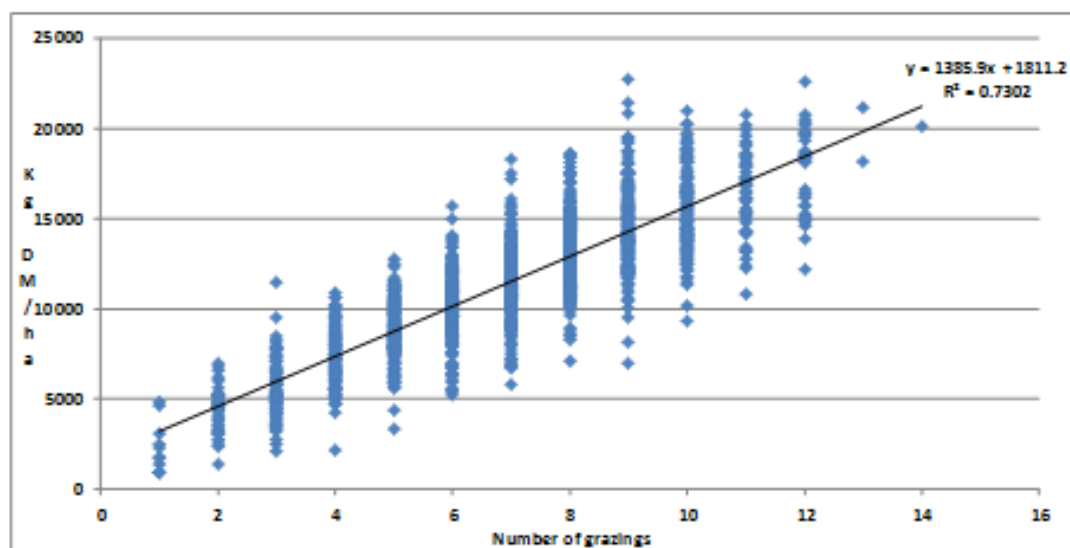
Other PastureBase Functions Include:



What are high producing farms doing ?



Number of grazings achieved and its association with total grazing DM production



15 Tonne Grass Map

Growth Period	Grass grown (kg/ha)	Rotn. Length (days)	No. of Rotations	Growth (kg/ha) required/day
1 st Feb – 6 th April	1250	65	1	20
7 th April – 5 th Aug	1,500	20	6	75
6 th Aug – 1 st Sept	1,625	25	1	65
1 st Sept - 1 st Oct	1,650	30	1	55
1 st Oct – 15 th Nov	1,450	45	1	30
Total	15,000	287	10	



What has PastureBase Highlighted?



- **DM production** can **increase** on all grassland farms
- Variation **across** and **within** farms
- **Regional** effect on DM production is **minimal**
- **Management** is key to increase DM production
- Huge **variation** in **spring** DM production on farms nationwide
- **Average farm cover** at closing and at the **start and end of the first rotation** are critical targets for all grassland farms





Conclusion

Development of course material is well underway (e.g. farm portraits, factsheets, videoclips, etc.). Each partner country has the opportunity to submit course material to date and each country did submit so far. Examples for further material have been dispersed for demonstration purposes and a template has been laid out. The process of developing course material for MOOCs will continue until the end of Inno4Grass. We are now in a state where the Deliverable 5.4 (Material to be transferred to MOOCs; this Deliverable) is achieved. Material has been developed and uploaded at the Encyclopedia pratensis (<https://www.encyclopediapratensis.eu/>). The MOOC will continually be updated until the end of the project Inno4Grass and possibly even beyond the end of the project. Important further elements of the MOOC from the perspective of WP5 of Inno4Grass will be the specific grassland syllabus (Deliverable 5.3.1 due M26) and the power point presentations for young farmers and advisors (Deliverable 5.3.2 due M26).

