



The development of a high-output grass-based spring milk production system



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The development of a high-output grass-based spring milk production system

- Typical Irish Dairy Production

- The predominant system is grass-based
- Grazing for 280 days +
- 80% + of the diet is from grazed or conserved grass
- Compact seasonal calving at the start of the grazing season
- Low concentrate input: 800kg to 1 tonne
- Low production: fat and protein kg is on average 375 kg per cow per yr



The development of a high-output grass-based spring milk production system

- Grazing systems that have developed
- Based on low output per cow
- Avid cost control
- Relatively high stocking rates
- High profitability is possible



The development of a high-output grass-based spring milk production system

- Reasons to consider a grazing system based on high output per cow
- Environmental concerns:
 - Increasing animal numbers and methane emissions
 - Increasing animals numbers and ammonia emissions
 - Increasing animals numbers an N load to inland waters
 - Continuance of derogation from Nitrates directive



The development of a high-output grass-based spring milk production system

- Reasons to consider a grazing system based on high output per cow
- Issues at farm level
 - Fragmented land resources
 - Traditionally farms in Ireland are small in area
 - Limited buildings and infrastructure
 - Limited skilled labour available
 - Requirement for work life balance



The development of a high-output grass-based spring milk production system

- A limiting factor to expansion on many dairy farms is the availability of land around the milking platform (MP)
- Farm fragmentation - the average farm in Ireland consists of 3.5 land parcels (O'Donnell, 2014)
- Survey of Tipperary Co-op suppliers in 2016: every hectare farmers have on the MP, they have another 0.6/0.7 ha away from the MP (Mullane 2016, per comms)

The development of a high-output grass-based spring milk production system

- **Rationale**
- **A high-output grass based spring milk production system can be profitable when built on a foundation of good grassland management and meeting performance targets (for land and cows) and has a place in a sustainable Irish dairy industry**

Innovative Dairy Production Systems and Technologies (DairyTech)

Three year project established to :

Report the possible animal and grassland performance for a grazing system based on high-output per cow and the resultant system profitability



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Dairy Systems

Low input

- Max utilisation of least cost feed
- Competitive resilience
- But may be suboptimal in periods of higher milk prices
- Farm expansion reliant on high animal numbers

But what about the middle ground?

- High solids per ha
- Maintain grass focus
- Moderate use of purchased feed
- Fertility and output goals

High input

- TMR, confinement
- High output
- Scalable
- Reliance on purchased feed
- Risky (ability to cope with volatility)?
- Complexity
- Cost control issues



Herd Targets

Parameter	Target
Stocking rate (milking platform)	3.4 LU per ha
Stocking rate (whole farm)	2.4 LU per ha
Milk yield per cow	7,500-8,000 kgs
Milk solids per cow	625 kgs
6 week in calf rate	75%
Concentrate (kg/cow/yr)	1,500 kgs
% diet as grazed grass	51
% diet as grazed grass and grass silage	75

60 cows on 17.65 ha MP

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Herd of 60 dairy cows

- High EBI (Economic Breeding Index)

- Balanced ratio of Production Sub-Index and Fertility Sub-Index

- Positive for Milk kg (PTA)

- All animals genomically tested

- Animals imported following disease screening and pregnancy diagnosis

- In year 1 60% of the herd were imports (remainder from UCD Lyons farm)

Genetics of the Herd – January 2018

EBI	Production	Fertility	Calv	Beef	Mint	Health	Mgt
161	56	61	42	-8	4	3	3
Milk kg	Fat kg	Protein kg	Fat %	Protein %	Calving int	Surv %	
78	10.54	6.9	0.12	0.074	-3.0	1.8	

Top 1% Overall EBI
Top 1% Production Sub-index
Top 10% Fertility Sub-index



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Total land area 26.6 and 24.6 ha

17.6 ha of land in the milking platform

Milking platform: grazing and silage

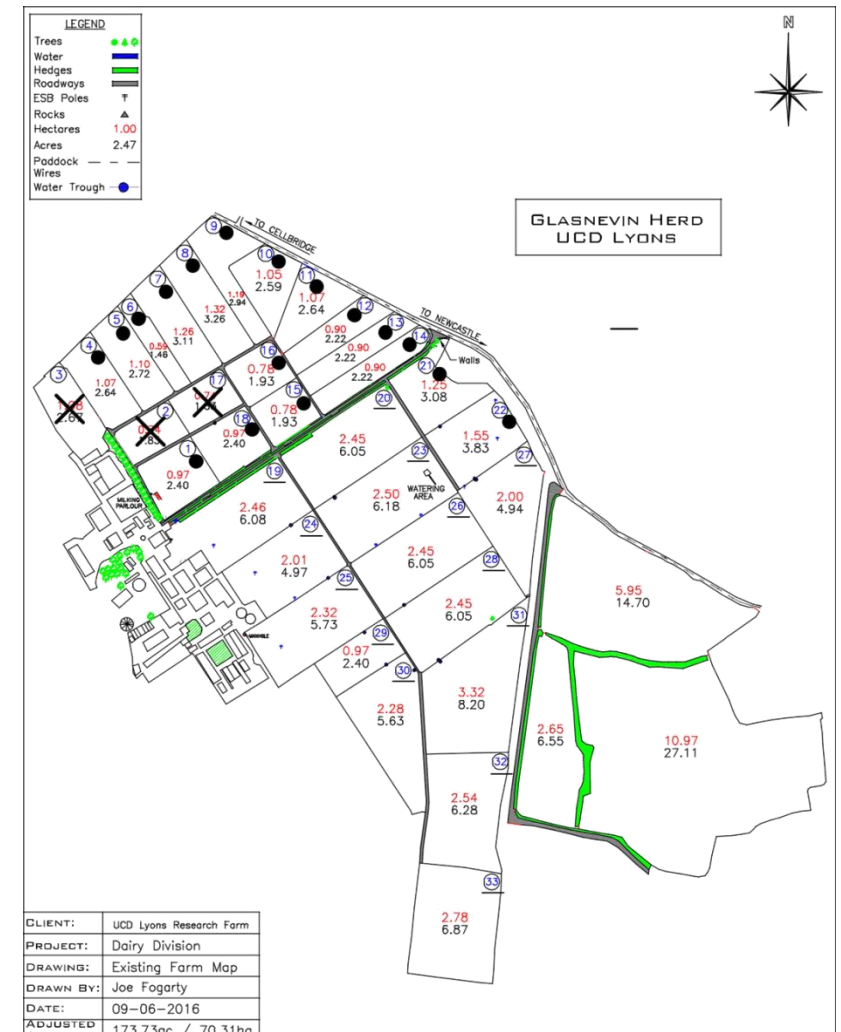
9.0 ha for grass silage only in 2016

7.0 ha for grass silage only in 2017

Medium Clay loam

Adequate drainage

Grey brown podzolic soil



The development of a high-output grass-based spring milk production system

- Herbage supply calculated weekly (O'Donovan, 2000)
 - Recorded using Agrinet software (Agrinet, Co. Meath)
 - Grazing management decisions based on budget information
 - Herbage availability (herbage mass: kg of DM/ha above 4cm)
 - Determined pre- and post-grazing using 3 quadrant (0,25 m²) cuts at 4cm above ground level





The development of a high-output grass-based spring milk production system

- Breeding
 - All cows pre-breeding exam
 - All breeding AI (12 weeks 2016; 13 weeks 2017)
 - Once daily AI
 - Heat detection Automated and visual (2 x daily)
 - 42 day voluntary waiting period



The development of a high-output grass-based spring milk production system

- **2016 Feed Budget (including dry period)**

Days in milk	0-20	20-60	60-120	120-180	180-240	240-270	270-305	306-365 (dry)*	Total annual DMI (t DM)
Milk yield	31	34	32	27	22	19	15	-	7500
Silage DM	12	0	0	0	0	6	10	11	1.5
Grass DM	0	15	16	15	13	6	0	-	3.6
Concentrate	8	8	7	3.5	2.5	2.5	6	-	1.3

Actual tonnes DM 2016: Grass silage 1.85; Grazed grass 2.95; Concentrate 1.3

49% of diet from grazed grass

79% of diet from grazed grass + silage

Approx. 4400kgs from forage



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2017 Feed budget (including dry period)

Days in Milk	0-20	20-60	60-120	120-180	180-240	240-270	270-305	306-365 (dry)	Total Annual DMI (t DM)
Milk yield	31	34	32	27	22	19	15	-	7500kgs
Silage DM	12	0	0	0	0	5.5	10	8.5	1.5
Grass DM	0	13.5	14.5	14.5	14	5.5	0	-	3.2
Concentrate	8	8	6	3.5	2.5	4	6	-	1.3

Provisional tonnes DM 2017: Grass silage 1.3; Grazed grass 3.0; Concentrate 1.3

53% of diet from grazed grass

78% of diet from grazed grass + silage

Approx. 4400kgs from forage



UCD Lyons Planned Feed Budget: 2018

In order to achieve and sustain high milk and milk solids output along with good fertility, high energy intakes are essential

Days in Milk	0-20	20-60	60-120	120-180	180-240	240-270	270-305	306-365 (dry)	Total Annual DMI (t DM)
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Silage DM	12	0	0	0	0	5.5	10	11	1.5
Grass DM	0	13.5	14.5	14.5	14	5.5	0	-	3.2
Concentrate	8	8	6	3.5	4	4	3	-	1.3

Silage Quality for spring 2018: 81% DMD, 35% DM, 0.90 UFL (12.2 MJ/kg DM), 16.6% CP



Lyons farm compound 2017 (15% Protein)

- 22.5% Maize grain (ground)
- 22.5% Barley (rolled)
- 15% Maize distillers grains
- 10% Unmolassed beet pulp
- 10% Soya hulls
- 10% Soyabean meal
- 1.5% Fat
- 4.5% Molasses

- From September
- Soyabean meal increased to lift protein to 18%



UCD Lyons Herd Performance –2016 and 2017

Parameter	Target	2016 Actual	2017
Cow numbers	60	58	60
Milking Platform ha	17.64	17.58	17.65
Silage ha	9.02	9.02	7
Whole farm ha	26.6	26	24.65
Stocking rate on milking platform	3.4	3.3	3.4
Stocking rate whole farm	2.25	2.2	2.4
% heifers in herd	22	22.4	23.3

UCD Lyons Herd Performance –2016 and 2017

Parameter	Target	2016 Actual	2017
Average lactation days	305	301	305
Yield/cow (305d)	7750	7441	7548
Milk solids/cow (305d)	625	592	602
Yield/cow (actual)	7750	7407	7466
Milk solids/cow (actual)	625	588	595
Milk solids/ha MP (actual)	2125	1940	2,023
Milk solids/ha Whole Farm (actual)	1500	1294	1,428

2016/17 Grassland Performance

Parameter	2016	2017
Grass grown kg/ha	13,060	14,000
Silage on MP (kg/ha)	1,710	2,000
Herbage utilized kg/ha	11,417	12,200
Grazed Grass utilized/ha	9,707	10,200
Grazed Grass utilized/cow	2,942	3,000
Milk from forage (kgs)	4,400	4,400
Silage ground required	9.02	7
Nitrogen MP kg/ha	235	260
P MP kg/ha	9.3	8.6
K MP kg/ha	31.7	44
Nitrogen Silage kg/ha	263	232

Dairy eprofit monitor analysis 2015

	Grass Rich		Grass Poor	
	<10%	10-20%	20-30%	>30%
Proportion of purchased feed in the diet				
No. of farms	244	831	261	56
Physical				
Stocking rate (LU/ha)	2.2	2.2	2.2	2.3
Grass used (t DM/ha)	10.2	9.3	8.5	7.7
Grass in diet (% total DM consumed)	92%	85%	76%	64%
Milk yield (litres/cow)	5,142	5,477	5,681	6,267
Milk solids (kg/ha)	949	955	978	1,086
Financial (€/ha)				
Gross Output	3,795	3,865	3,954	4,495
Variable Costs	1,173	1,358	1,599	1,990
Gross Margin	2,622	2,507	2,355	2,505
Fixed Costs	1,053	1,033	1,061	1,217
Net Profit excl. premia	1,569	1,474	1,293	1,288

Fodder scarcity: 2018

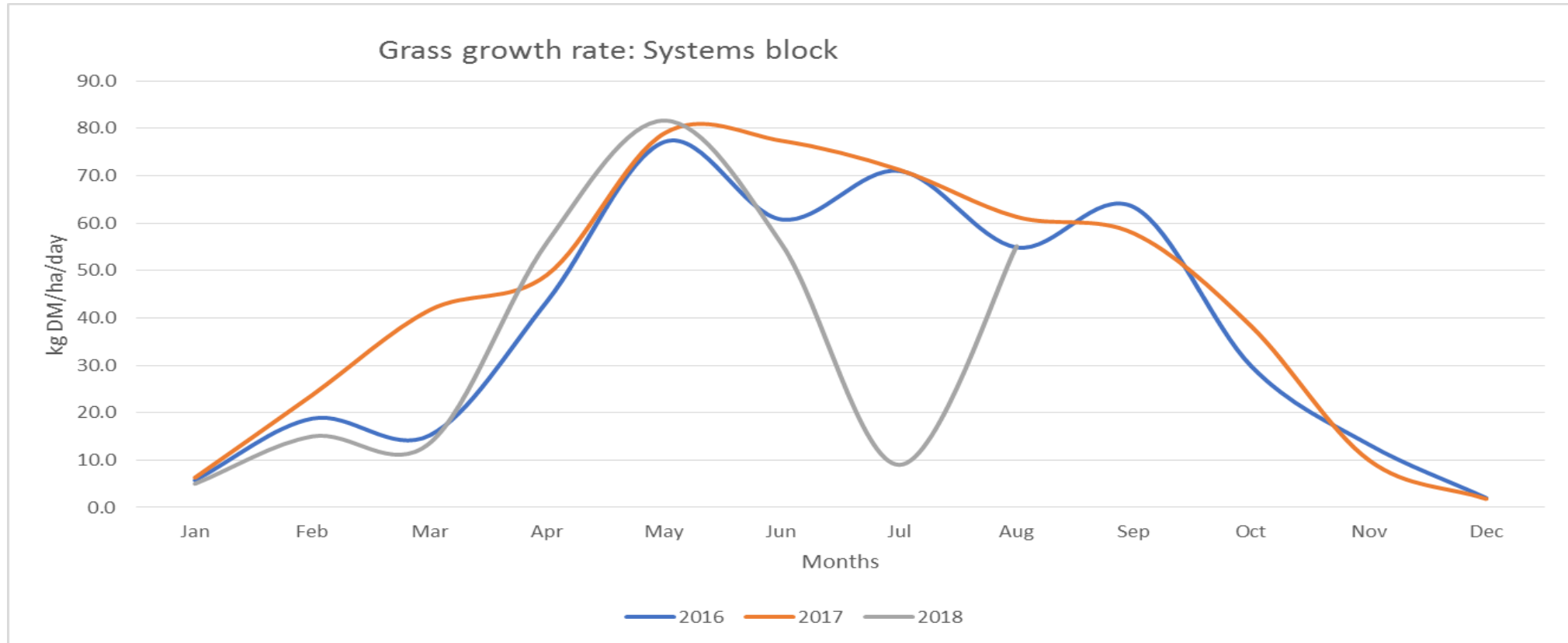
- Very heavy snow fall March 2nd 2018
- Grazing impossible for some weeks



Fodder scarcity: 2018

Expected Vs observed grass growth patterns

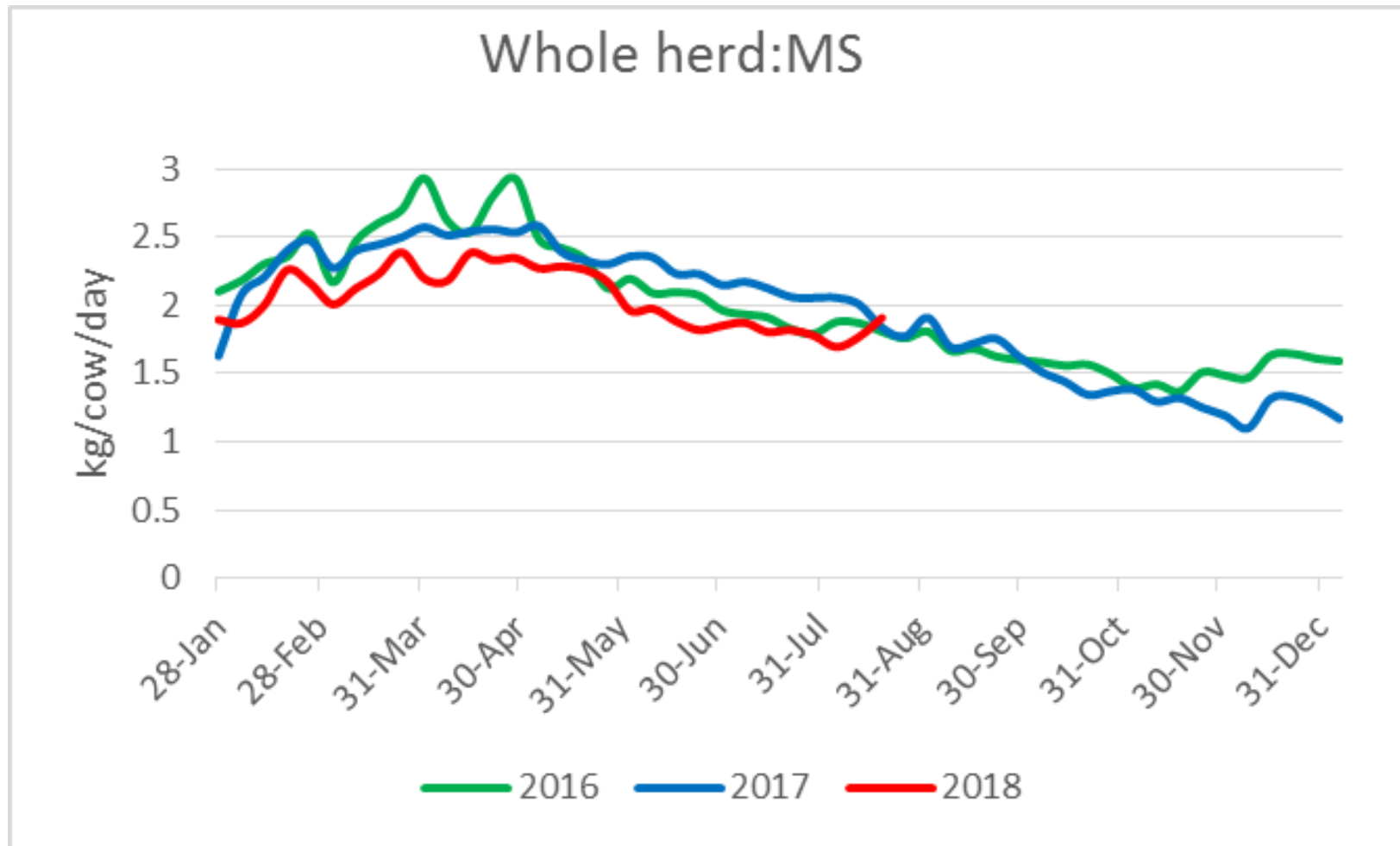
Lyons Farm



Fodder scarcity: 2018

- Drought in Summer of 2018
- For approximately six weeks in a row at Lyons
- Grass growth rate less than 20 kg of DM/ha/day

Milk solids performance (kg fat and protein): Lyons herd 2018



2016 – 2018 Reproductive performance

	2016	2017	2018
Number of Cows	58	59	55
Submission Rate %	91	90	96
First Service Conception Rate %	43	50	69
6-week In-Calf Rate %	59	54	84
Resultant 6 week calving down rate the following year	83 (23% 1 st lactation)	85 (28% 1 st lactation)	
Empty Rate %	9 (12 weeks)	15 (13 weeks)	13

- Breeding started 24/25th April in both 2016 and 2017, April 30th in 2018
- 12 or 13 weeks of A.I (once/day) 2016 and 2017
- 2018 2 x daily AI use of scratch cards as well as automated heat detection



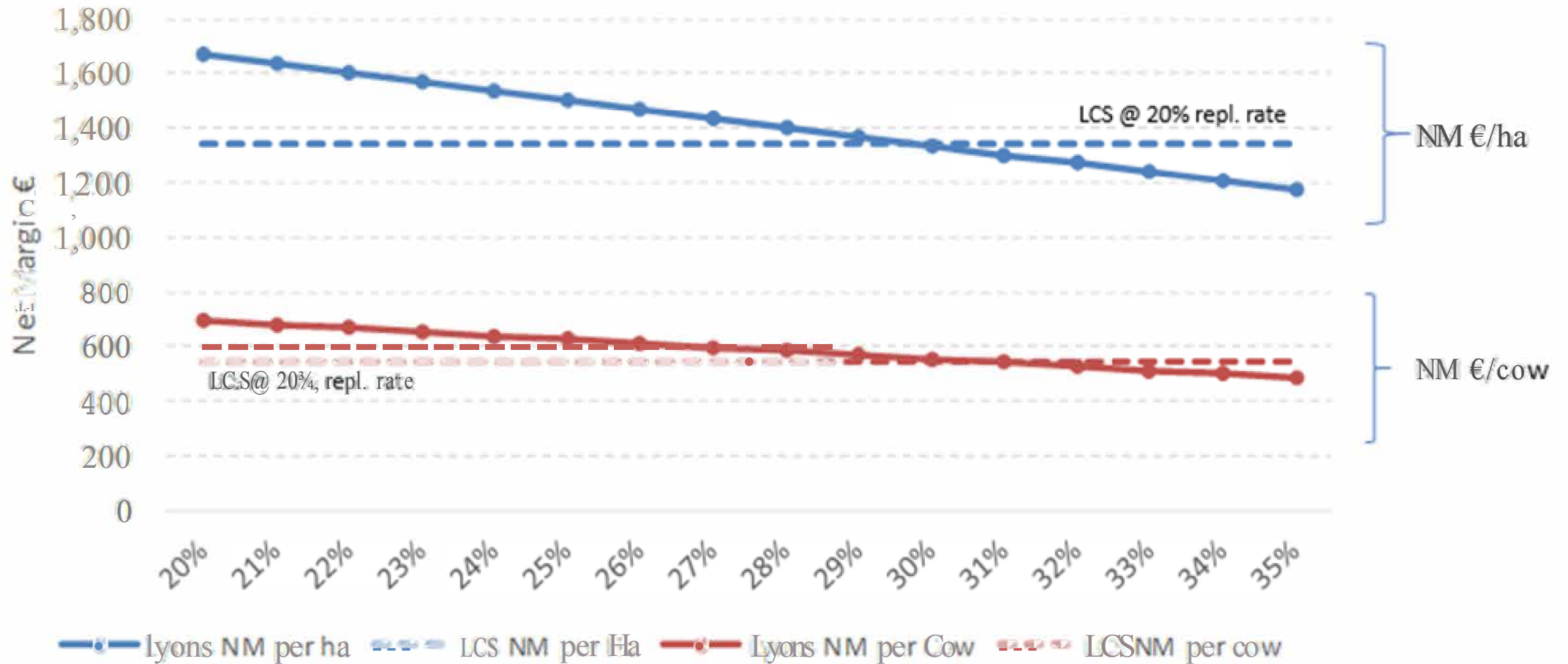
Financial Simulation 2017: System Comparison		
	Very efficient low concentrate system	UCD Lyons high-output grazing system
SR Cows/ha milking platform	3.50	3.40
Overall SR (LU/ha)	2.50	2.40
Replacement rate	20%	30%
Milk Solids (kg/cow)	450	595
Milk Solids (kg/ha)	1,125	1,430
Concentrates (t DM/cow)	0.43	1.30
Grazed Grass (t DM/cow)	4.10	3.20
Grass Silage (t DM/cow)	1.10	1.50
Milk output (€/cow)	1,679	2,206
Milk output (€/ha)	4,193	5,302
Gross Margin (€/cow)	1,042	1,159
Gross Margin (€/ha)	2,591	2,786
Fixed Costs (€/cow)	500	585
Fixed Costs (€/ha)	1,243	1,406
Net Margin (€/cow)	542	574
Net Margin (€/ha)	1,347	1,380
Breakeven milk price (€/kg MS)	3.05	3.24
Breakeven milk price (€ cent/L)	23.17	25.10

Milk price 30c/l: Concentrate €310/t DM

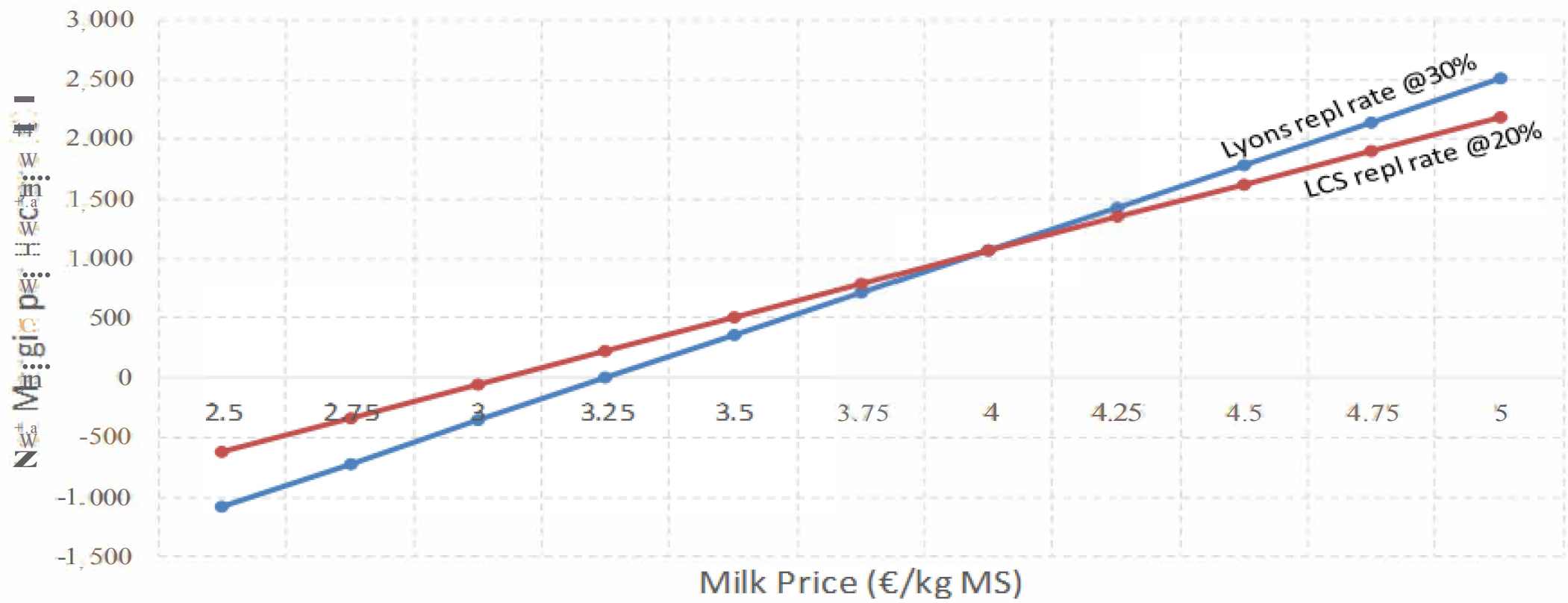
Impact of Replacement Rate on Lyons Net Margin vs Low

Centralized System (LCS) system benchmark

Milk price: 30cpl



Sensitivity Analysis: Milk Price vs Net Margin/ha

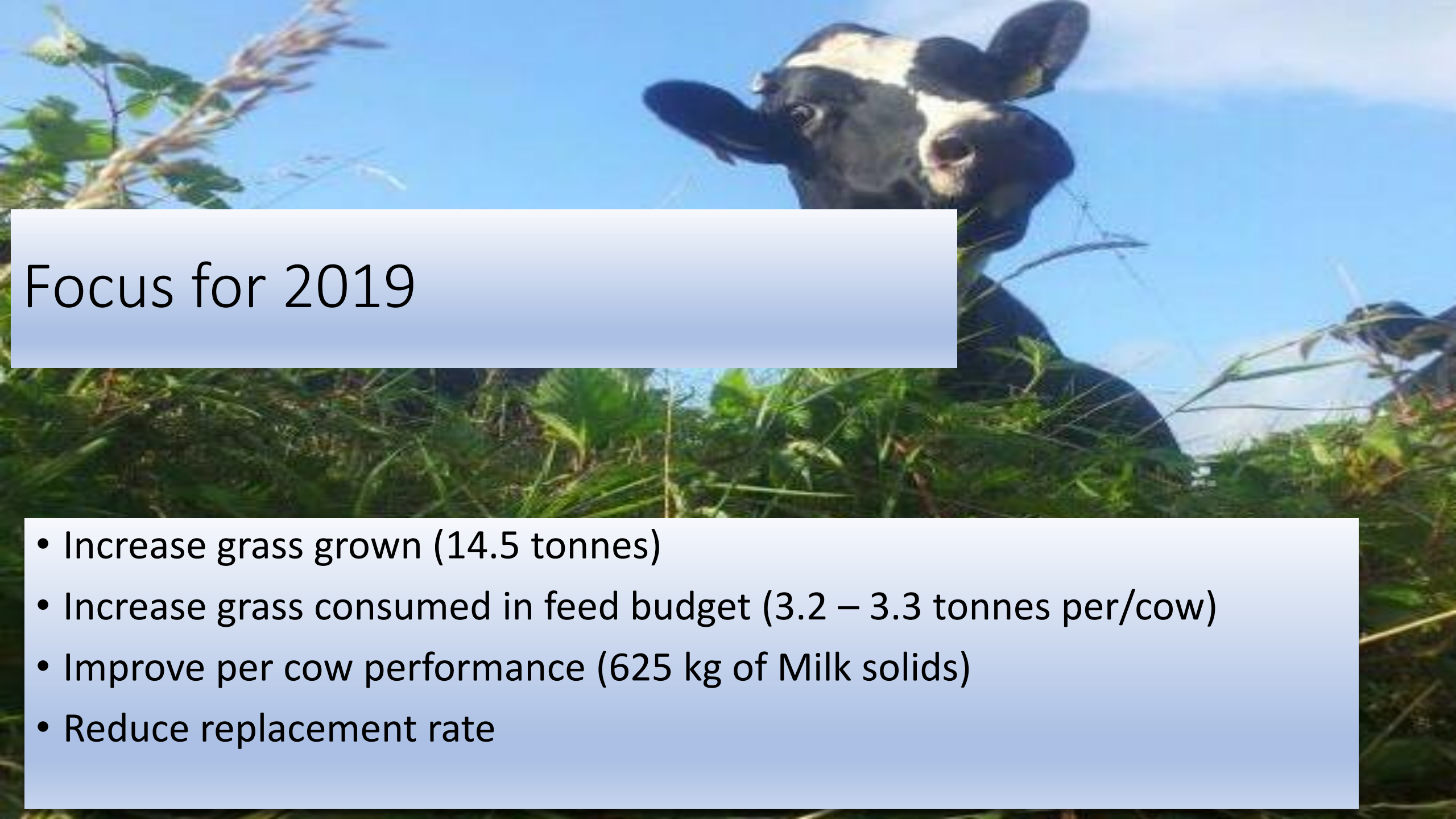


-- Lyons System -- Letc System

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Conclusion

- High levels of milk and milk solids (fat and protein) production possible on a per cow basis in grazing systems
- High levels of output from cows that have been selected on a high-fertility type index for some time
- High levels of grass production and utilisation possible in a high-output milk production system



Focus for 2019

- Increase grass grown (14.5 tonnes)
- Increase grass consumed in feed budget (3.2 – 3.3 tonnes per/cow)
- Improve per cow performance (625 kg of Milk solids)
- Reduce replacement rate

Acknowledgements:



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