

# Grass Economic Index: recent developments and future direction

# Grass Economic Index

New approach to cultivar selection

Quantifies economic effect of a change in cultivar  
performance on farm profitability

Supports objectives of Food Harvest 2020

- Efficiency, growth and utilisation

# Grass Economic Index

Total merit index developed to assist in cultivar selection

- Assigns an economic value to important traits of grass performance
- Define the total economic merit of a cultivar (€ per ha per year)
- Rank cultivar's on Total Economic Merit

Traits of importance:

- Seasonal DM yield
- Quality
- Silage DM Yield
- Persistency

# Calculating Economic Values

## Moorepark Dairy Systems Model (MDSM)

- Simulates a model dairy farm across 12 months
- Includes
  - Herd parameters, nutritional requirements, land use
  - Total inputs and outputs
  - Receipts
  - Variable and fixed costs (Shalloo et al., 2004)
- Base assumptions
  - Spring calving herd
  - 365 day calving interval
  - Milk price of 27c/l
  - 40 ha farm

# Calculating economic values

Calculated base net margin per hectare for the system

Simulate a change in each trait independently

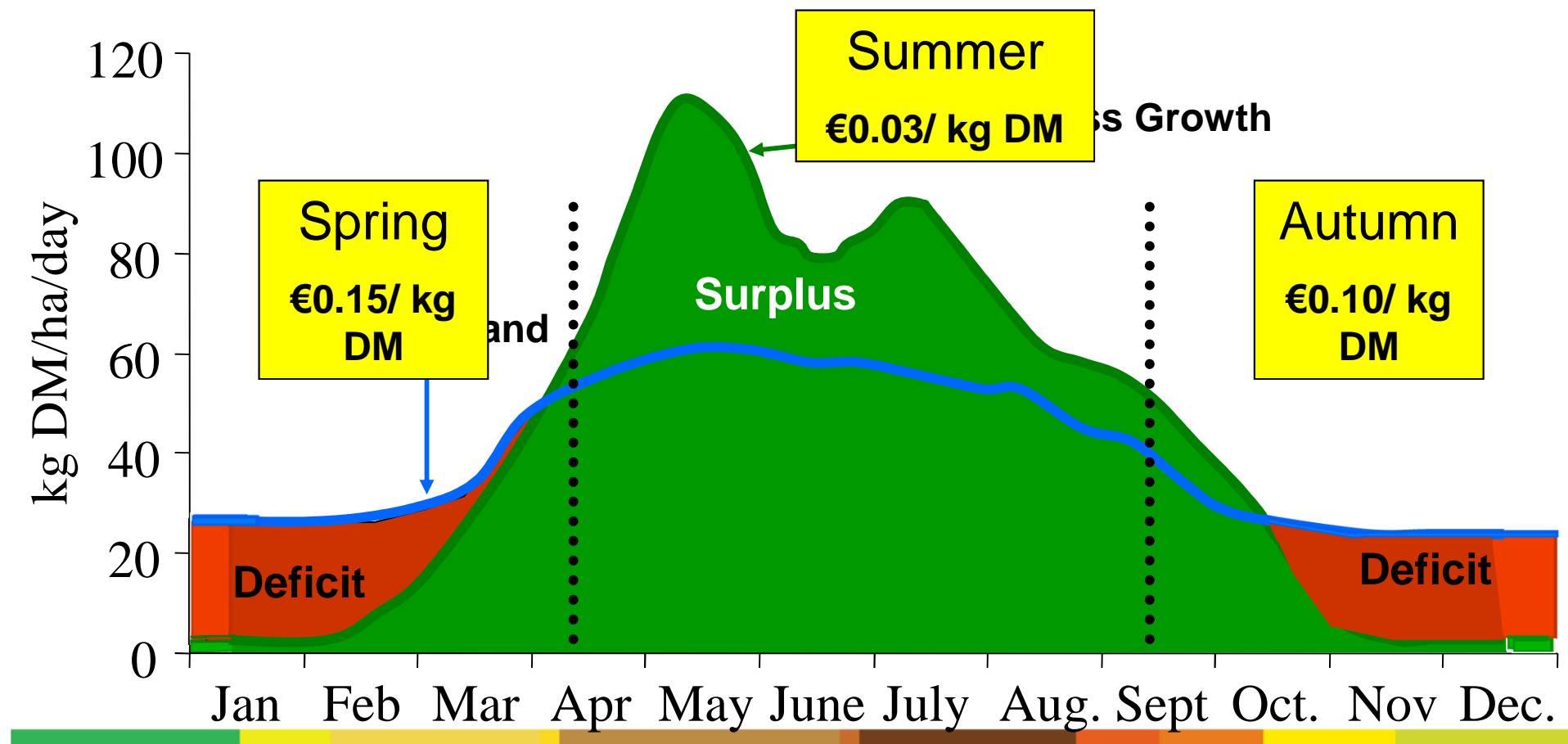
Identify the effect of each simulated change on performance of model farm

Calculate difference between base and new net margin

$$\text{Economic Value} = \frac{\text{change in net margin per hectare}}{\text{change in trait of interest}}$$

# Grass Growth and Feed Demand Curve

(2.5 cows/ ha)



# Economic Value – Quality

## (€ per unit change in DMD per kg DM)

Meet energy requirements – if not met Intake and performance affected

- April        -€0.001
- May         -€0.008
- June        -€0.010
- July         -€0.009

# Economic Value – Silage

Increased yield reduces area required for harvesting

Extra grass conserved compared to base

- **1<sup>st</sup> cut silage**      €0.03 per kg DM
- **2<sup>nd</sup> cut silage**      €0.02 per kg DM

## Persistence

Uses ground score change ( $GS\Delta$ ) over time

- Actual  $GS\Delta$  calculated at end of Year 2 (Year 1 – Year 2)

GS decline is higher in Year 1 to Year 2 than subsequent years

- Assume after Year 2 rate of GS decline is 0.54 of initial  $GS\Delta$

(Moorepark data)

Effect of GS change on DM yield loss (Moorepark data)

- 1-unit decline in GS = loss of 1683 kg DM

50% of original yield triggers requirement to reseed

- Quantified using  $GS\Delta$  to determine rate of DM yield loss



# Economic Value – Persistency

Calculated the change in sward lifetime relative to base

- Standard (base) 10-yr sward longevity
- Cost of reseedling (€526 per ha)



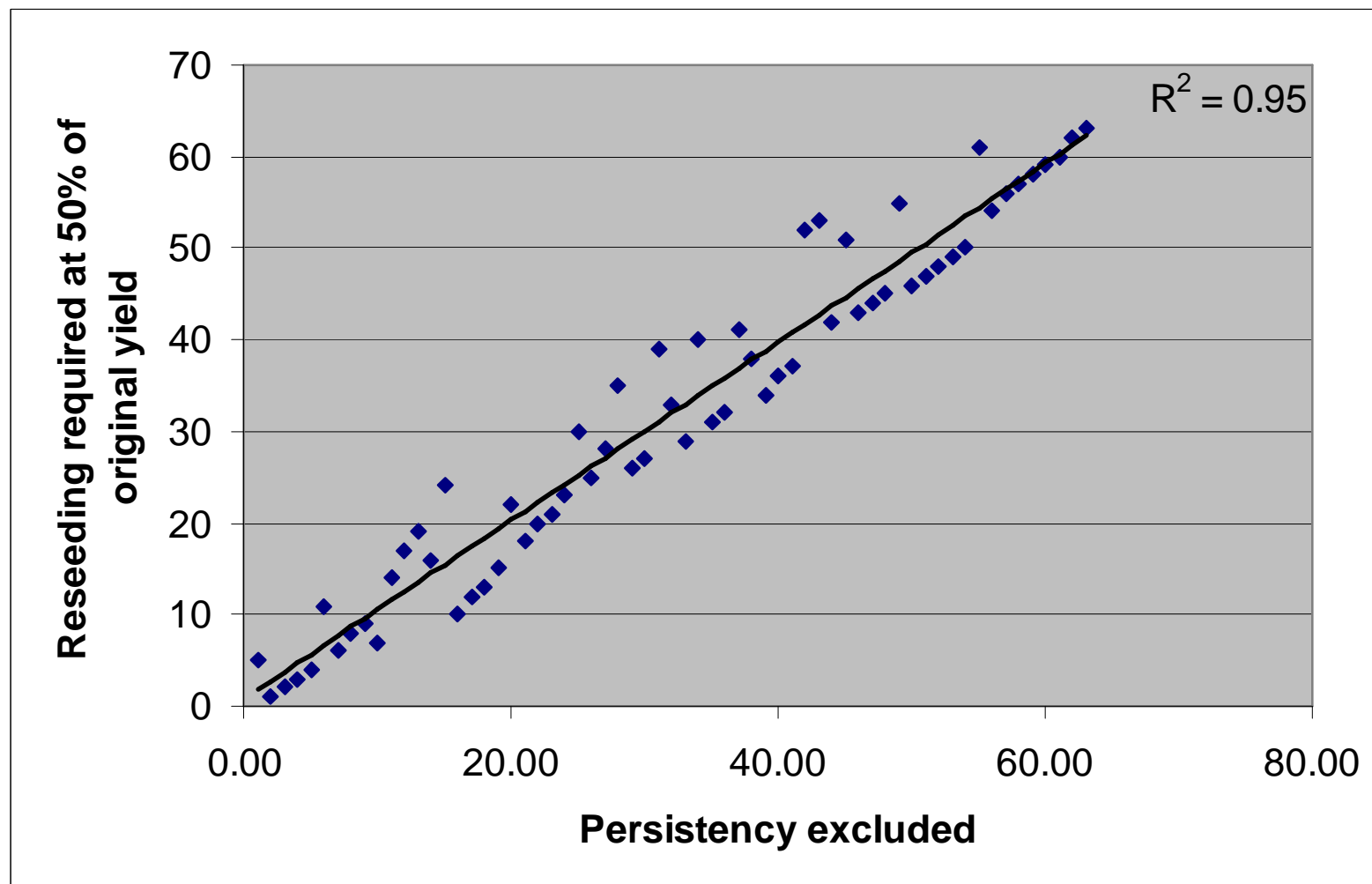
Measurement of persistency

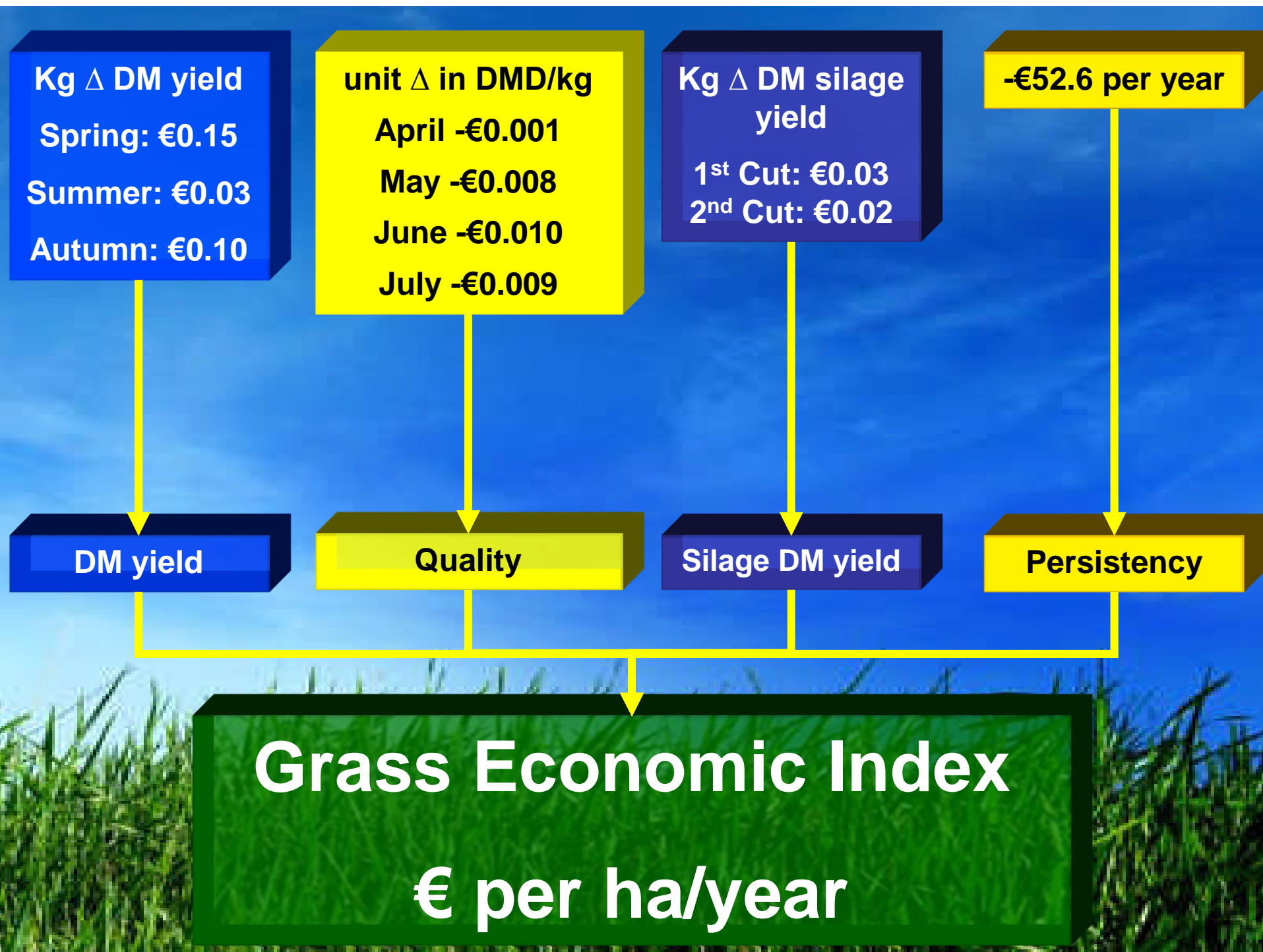
- One unit decline in ground score = 1683 kg loss in DM yield
- Applies loss in production to ground score change
- At 50% of it's original DM yield sward is due to be reseeded

$$\frac{-€526}{\text{number of years a cultivar survives}} + €52.60$$

- Cultivar does not reach 50% of initial for 10 years or longer =  $(-€526/10) + 52.60 = €0$
- Cultivar reaches 50% of initial yield after 7 years =  $(-€526/7) + 52.60 = -€23$

## Excluding persistency from index versus including persistency – effect on rank correlation





# Defining Base Values

Necessary to quantify the economic effect of each cultivar for each trait

If cultivar performance exceeds base value – positive effect

If cultivar performance falls short of base value – negative effect

Where possible use farm data to define base values

- DM yield (9.1 t DM/ha) average level of on-farm production (Shalloo *et al.* 2009)
- Persistency – target is 10 years at farm level

Alternatively use average data from DAFM trials

- Silage DM yield
- Quality

# Application

Apply economic values to biological data

Data generated in DAFM plot trials

- 2011 & 2012 harvest years
- 63 cultivars
- 3 reps per site
- 5 sites
  - 4 sites - frequent cutting (simulated grazing)
  - 1 site - general purpose (silage)

Combine biological data and economic values

- Determine total economic merit of a cultivar

## DM Yield (kg DM/ha)

Cultivar	Spring	Summer	Autumn	1 <sup>st</sup> Cut	2 <sup>nd</sup> Cut
101	1632	7026	2176	4073	3125
102	1555	6947	2067	3767	3005
103	1543	7383	2422	3862	4020
104	1593	7052	2291	3850	2860
105	1479	7420	2193	4602	3002
106	1701	7062	2368	4075	3378
107	1658	7121	2570	3583	3565
108	1620	7559	2666	4077	3183
109	1377	7339	2398	3637	2997
110	1494	7053	2175	3790	3248
111	1641	7530	2242	4218	3113
112	1706	7033	2338	3882	3483
113	1414	7002	2178	3463	3810
114	1748	6975	2330	4002	3378
115	1503	7005	2419	3560	3347
116	1790	7034	2334	3578	2750
117	1413	7284	2256	3888	3070
118	1875	7081	2465	3888	3577
119	1602	6824	2426	3518	3695
120	1717	7398	2427	4308	3662
Base values	1221	6021	1858	3785	3693

Cultivar	DMD (g/kg DM)				GC Change
	April	May	June	July	
101	834	829	792	811	-1.05
102	838	832	805	818	-0.94
103	850	846	830	839	-0.60
104	843	844	812	822	-0.68
105	848	843	809	824	-0.50
106	842	839	800	833	-1.25
107	854	846	816	828	-1.21
108	860	852	806	837	-1.01
109	839	832	792	807	-0.51
110	847	843	802	817	-0.64
111	865	853	810	853	-0.56
112	844	845	813	832	-0.82
113	843	845	824	829	-1.16
114	839	832	787	815	-0.67
115	842	849	821	827	-0.43
116	842	835	814	815	-0.65
117	852	841	804	831	-0.37
118	833	828	806	817	-1.07
119	854	843	825	831	-0.99
120	850	841	809	810	-0.82
Base Values	850	849	814	810	-0.65

# Application

	DM yield (kg DM/ha)			Silage DM yield (kg DM/ha)		Persistency
	Spring	Mid-season	Autumn	1 <sup>st</sup> cut	2 <sup>nd</sup> cut	
<b>Base yield (kg DM/ha)</b>	1221	6021	1858	3785	3693	10 years
<b>Cultivar A</b>	1344	7383	2388	3582	1344	9 years
<b>Difference</b>	123	1362	530	-203	767	1 year
Then multiply the difference by the economic value for each trait						(-526/9) + 52.6
	0.15	0.03	0.10	0.03	0.02	
<b>€ /ha/ yr</b>	19	41	53	-7	18	-5.84

# Total Economic Merit

	Trait	Trait value	
Kg DM		€ /ha/ yr	
	Spring	19	
	Summer	41	
	Autumn	53	€112.6
Silage			
	1 <sup>st</sup> cut	-7	
	2 <sup>nd</sup> cut	18	€10.8
Quality			
	April	1	
	May	15	
	June	19	
	July	-2	€33.5
Persistency			-€5.80

**Cultivar A**

**Total Economic Merit**

**€151**

***per ha/ yr***

## Total Economic Merit

Cat	Cultivar	DM Yield	Quality	Silage	Persistency	Total	Rank
IT	<b>103</b>	148	53	10	0	212	1
LT	<b>214</b>	140	47	18	0	206	2
IT	<b>121</b>	163	10	29	0	202	3
IT	<b>111</b>	149	51	1	0	201	4
LT	<b>217</b>	98	55	1	0	155	10
ID	<b>107</b>	173	20	-10	-35	148	11
ID	<b>118</b>	194	-27	1	-23	145	14
IT	<b>115</b>	130	30	-15	0	145	15
LT	<b>208</b>	87	9	17	0	113	27
LD	<b>221</b>	103	-3	16	-6	110	28
IT	<b>127</b>	148	-10	-28	0	110	29
LT	<b>223</b>	83	12	14	-35	74	40
ID	<b>122</b>	97	-17	-12	0	68	42
LD	<b>231</b>	49	0	10	0	59	43
ID	<b>123</b>	78	-28	6	0	56	44
LD	<b>202</b>	39	-30	5	0	14	60
LD	<b>201</b>	58	-11	-12	-23	13	61
LD	<b>204</b>	30	-26	6	0	11	62
ID	<b>126</b>	87	-64	-34	0	-11	63

## Sub-indices and Total Economic Merit (€ per ha/year)

€ per ha per year													Rank
HD	Cultivar	DM yield			Quality				Silage		Persistency	Total	
		Spring	Summer	Autumn	Apr	May	Jun	Jul	1 <sup>st</sup> cut	2 <sup>nd</sup> cut			
IT	103	49	42	58	0	-3	21	35	3	7	0	212	1
LT	214	37	45	58	2	28	22	-4	8	11	0	206	2
IT	121	69	35	59	0	-9	0	19	23	7	0	202	3
IT	111	64	46	40	1	5	-6	51	14	-13	0	201	4
LT	217	34	37	27	2	24	18	11	-3	4	0	155	10
ID	107	66	34	73	0	-3	2	21	-7	-3	-35	148	11
ID	118	99	32	62	-1	-22	-12	8	3	-3	-23	145	14
IT	115	43	30	58	-1	1	9	20	-8	-8	0	145	15
LT	208	21	41	26	1	14	4	-11	12	5	0	113	27
LD	221	30	39	35	1	7	-8	-3	9	7	-6	110	28
IT	127	31	50	67	-1	-10	-12	13	-14	-15	0	110	29
ID	122	36	22	39	-1	-13	-2	0	-9	-3	0	68	42
ID	123	26	25	27	-1	-16	-19	8	6	0	0	56	44
LD	202	3	30	6	0	2	-1	-30	4	2	0	14	60
LD	204	3	26	2	0	4	3	-33	2	4	0	11	62
ID	126	8	37	42	-1	-25	-41	3	-15	-19	0	-11	63

# Conclusions

New DAFM protocol is a significant advancement in identifying the most suitable grazing cultivars for Irish grass based production systems

Grass economic index

- Unique approach to cultivar selection
- Sub-indices will simplify cultivar selection

Economic index will evolve over time

- price information
- new traits

## Discussion

Currently only info on 50% of Rec. List cultivars (2010 sowing year)

- As data per cultivar increases over time the reliability can also improve

Index only published for available cultivars

- “Active grass list”
- Total economic merit will be calculated for all cultivars under evaluation

Adaption of index

- Consequences for grass breeders
- Effect on grass seed industry

# Acknowledgements

Dairy Levy – Irish Dairy Farmers

Department of Agriculture, Food and the Marine staff

Department of Agriculture Fisheries & Food Research  
Stimulus Fund (RSF07526)

