

Managing red clover on dairy farms



James Humphreys, Daniel Barrett,
Owen Cashman, William Burchill



Why red clover?

Intensification of production on dairy farms

Higher stocking rates on grazing platform

Greater reliance on silage production from out-blocks

New CAP: 20% lower fertilizer N

Very high N fixation and yields of silage from out-blocks



History of red clover

Not much experience of red clover in Ireland: big risk of the unknown/unforeseen

Traditionally used on mixed arable and grassland farms in England, Belgium etc.

Cost of reseedling partially covered by the arable crop

Three-year fertility building part of a grass-arable rotation

Widespread clover sickness in UK in 1970s & 1980s (*Sclerotinia* & stem eelworm)

Coincided with a large-scale transition to chemical fertilizer N use during the 1970s

Problems with stem eelworm on grass/arable dairy farms in Denmark in late 2000s



Disease risks with red clover

Stem eelworm and Sclerotinia can be controlled by a 4-year break between crops

New cultivars bred with resistance to these diseases

Stem eelworm is a common disease of many arable crops (more prevalent on arable farms?)

Low incidences of these diseases on Irish farms at present

Stem eelworm (nematode)

Ditylenchus dipsaci



Sclerotinia trifolium (Clover rot)



SWOT Analyses

Strengths/Opportunities

Very high N fixation: Lower fertilizer N costs

Very high yield of silage from out-blocks

New CAP: 20% lower fertilizer N

Lower carbon footprint

Lower ammonia emissions

Very low nitrate leaching under cut & carry

Inclusion in grazing swards

Weaknesses/threats

Poor persistency (3 or 4 years)

Costs and risks of regular reseeding

More care needed when making silage

Dock control

Stem eelworm/Sclerotinia

High phyto-oestrogen content

Risk of bloat under grazing

The growth habit of red clover

Red Clover



White Clover



Growth habit of red clover



Tap rooted species

Erect growth habit: up to 1.0 m tall

Multiple shoots from a crown

Limited vegetative regeneration



Herbage production

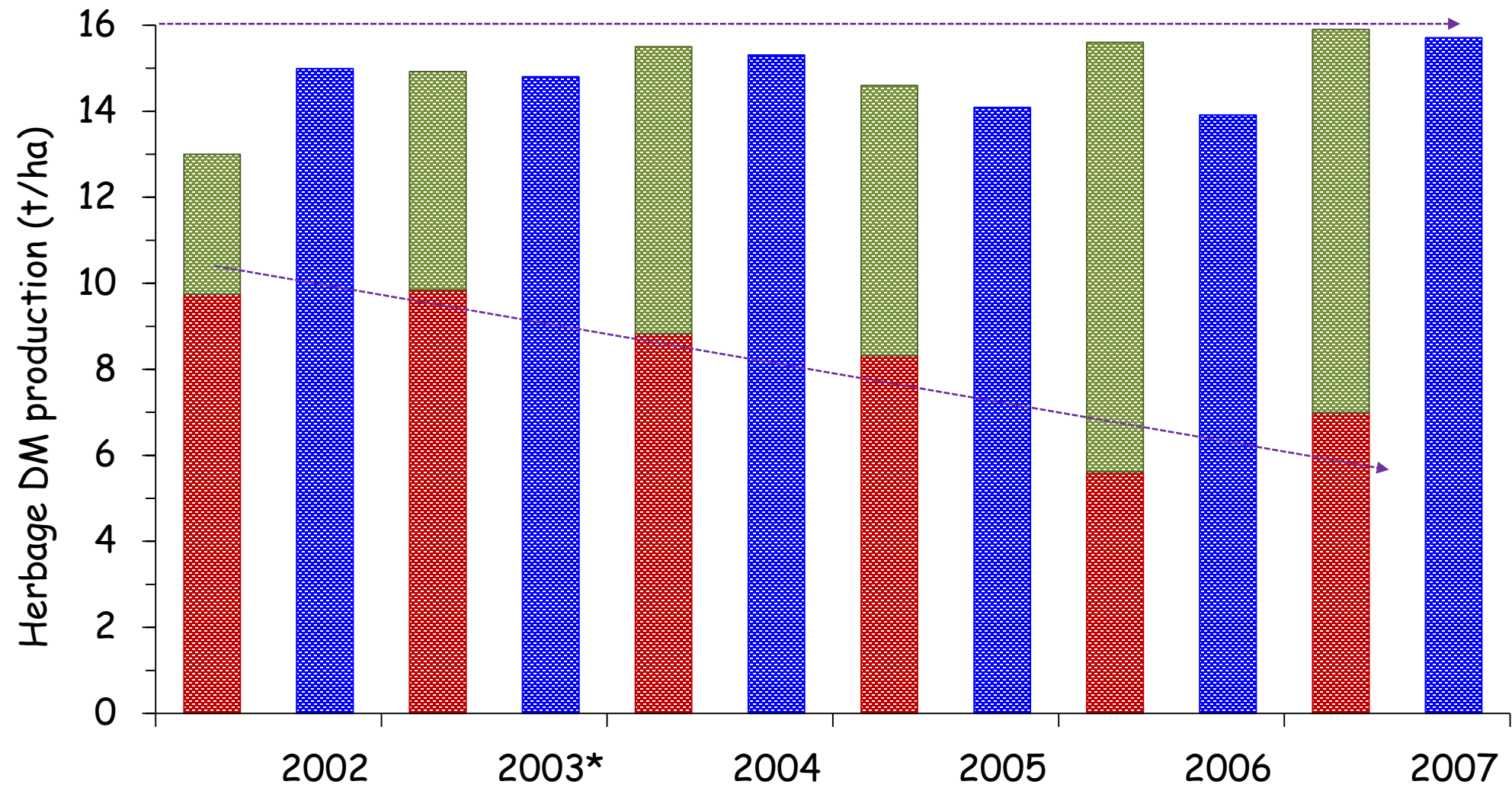


Annual herbage dry matter (DM) production (t/ha) at Grange

Clavin et al., 2016

Red clover + PRG

PRG + 600 kg/ha of FN



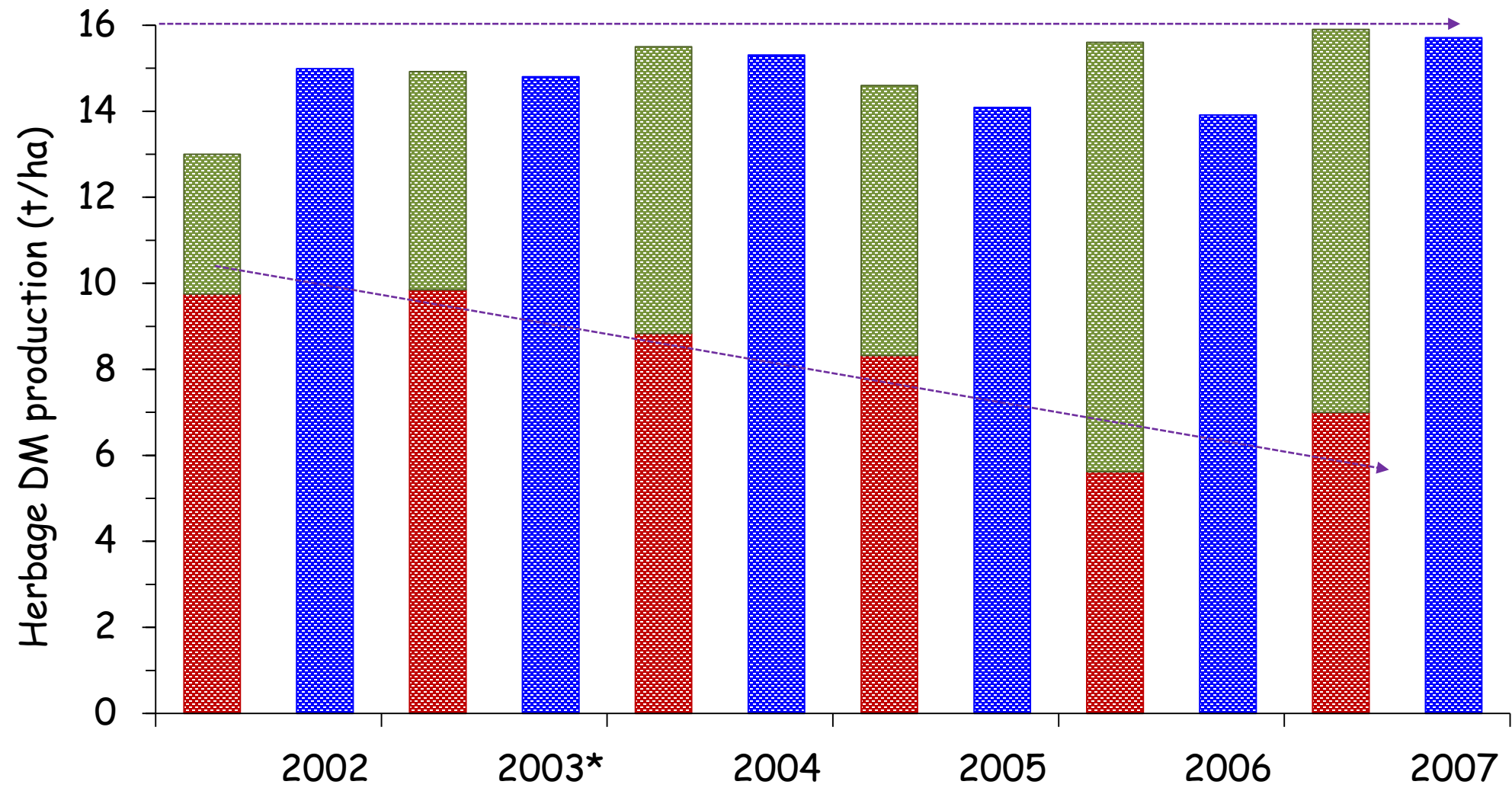
*missing data is replaced by the mean of the other years

Annual herbage dry matter (DM) production (t/ha) at Grange

Clavin et al., 2016

Red clover + PRG

PRG + 600 kg/ha of FN



Red clover + PRG	PRG + FN
(t DM/ha)	
14.9	14.8

*missing data is replaced by the mean of the other years

Red Clover Cultivars



Northern Ireland recommended list 2016

Annual herbage DM yields (t/ha) over three years

Red Clover	Year 1	Year 2	Year 3	Mean	Persistence score (0-9)
Milvus	18.1	18.2	15.3	17.2	4.9
AberClaret	17.9	18.0	14.8	16.9	4.7
AberChianti	16.6	17.5	15.0	16.4	5.1
Lemmon	18.1	16.8	13.8	16.2	4.6
Merviot	16.5	17.7	14.0	16.0	4.5
Amos	17.3	16.3	13.5	15.7	4.1
Average	17.4	17.4	14.4	16.4	

Recommended list England and Wales 2020/2021



Cultivar	Relative annual Yield 100% = 11.69 t/ha	Ground Score
Merviot	98	43
Lemmon	101	57
AberClaret	106	53
AberChianti	99	57
Avisto	100	55
Harmonie	100	59
Metis	95	57
Discovery	100	43
Hegemon	92	50
Sinope	104	53
Fearga	107	58
Amos*	101	53
Maro*	100	49
Atlantis*	104	56
Magellan*	104	55



*Tetraploid



Recommended red clover cultivars

Fearga

Milvus

AberClaret

AberChianti

Lemmon

Merviot

Amos



Seeding rates

Red Clover



500,000 seeds per kg

White Clover



1,500,000 seeds per kg

Examples of seed mixture for multi-cut silage (Acre packs)

Species	Cultivar	Rate
Hybrid RG	Astoncrusader	9 kg
Red clover	Milvus	4 kg
White Clover	Barblanca	1 kg

Species	Cultivar	Rate
Perennial RG	Fintona	4 kg
Perennial RG	Moira	4 kg
Red clover	AberChianti	4 kg
White Clover	Buddy	1 kg

Hybrid ryegrass: more suitable for shorter-term leys (rotation with maize)

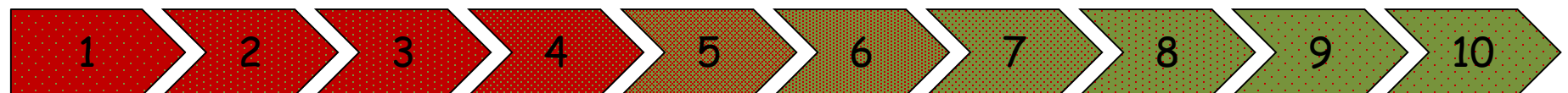
Intermediate perennial ryegrass: more persistent; 10-year reseeding interval

White clover: more persistent than red clover (top up by over-sowing white clover)

Maintain a productive sward after red clover dies out: 4-year break for disease control

Red clover dominant after reseeding

White clover dominant disease break



Oversowing red clover?

Number of seeds per kg	
Red clover	500,000
White clover	1,500,000



Red clover does not produce stolons

Shading the clover seedlings in a multi-cut silage system

Better to put in a full reseed for red clover

Making silage

An earlier harvesting schedule increases herbage production and persistence of red clover



Harvest schedule

Grange 2002 to 2007

Harvest date	Herbage DM yield (t/ha)
Late May	5.95
Mid July	4.42
1 September	3.68
Nov/Dec	0.99
Total	15.04

Harvest schedule

Grange 2002 to 2007

Harvest date	Herbage DM yield (t/ha)
Late May	5.95
Mid July	4.42
1 September	3.68
Nov/Dec	0.99
Total	15.04

Solohead 2021

Harvest date	Herbage DM yield (t/ha)
3 March	1.20
31 May	5.04
17 July	4.38
27 August	2.73
Mid November	1.99
Total	15.34

Comparison of ensiling characteristics of herbage

	Weighted mean of cuts 1 to 3		
	Red clover + PRG	Perennial ryegrass	
Herbage DM yield (t/ha)	14.67	13.51	
DM Digestibility (%)	74	81	Lower digestibility
Crude protein (%)	18.1	19.1	Similar crude protein
WSC (g/kg DM)	81	213	Much lower WSC for fermentation
Buffering capacity	472	415	Higher buffering capacity: more difficult to ensile

Comparison of ensiling characteristics of herbage

	Cut 1		Cut 2		Cut 3		Cut 4	
	RC	PRG	RC	PRG	RC	PRG	RC	PRG
Herbage DM yield (t/ha)	6.36	6.68	4.46	3.61	3.85	3.22	1.12	2.18
DM Digestibility (%)	74	80	74	81	75	81	75	79
Crude protein (%)	15.5	17.2	18.7	20.2	21.8	21.8	13.4	27.3
WSC (g/kg DM)	99	233	73	271	59	166	59	126
Buffering capacity	419	407	516	437	508	409	475	456

Implications

More difficult to ensile: need to wilt or application of an effective preservative

48 hour wilt works well at Solohead; weather forecast

Third cut can be risky. No hope of ensiling the fourth cut

High covers in late October/November; risk of senescence

Need to be harvested by zero-grazing or grazing with heifers



	Harvest date
Cut 1	15 - 20 May
Cut 2	Early to mid July
Cut 3	late Aug/early Sept
Cut 4	November

Zero grazing



First-cut red clover silage Solohead 2021

Silage analyses	Results	Desirable values	Status
Dry matter (%)	42	20 - 30	
pH	4.4	4.0 - 4.7	Good
Ammonia N (%)	2.7	<10	Good
Ash (%)	8.5	<8.6	Good
NDF (%)	45	<45	Good
DMD (%)	71	>69	Good
UFL (per kg)	0.79	0.65 - 0.90	Good
ME (MJ/kg)	10.2	>9.8	Good
Crude protein (%)	12.3	13.5 - 17.0	Low

FBA LABORATORIES

Carrigroh Industrial Estate, Cappoquin, Co. Waterford
 TEL: 051 52861 FAX: 051 52865
 EMAIL: forageanalysis@fba-labs.com www.fba-labs.com



Account Number: 50180

TIPPERARY CO-OP Paul Fortune Andrew O'Neill
 O'BRIEN ST.
 TIPPERARY

Certificate Number: SES2405

Farmer: Solohead Research Farm Solohead Monard Tipperary
 Sample Receive Date: 19/11/2021 Return Date: 24/11/2021 Lab Reference: SES745

Item	Units	Desirable Values	Result	Status
Dry Matter	%	20 - 30	41.5	-
pH	-	4 - 4.7	4.4	Good
Ammonia N	% of Total N	< 10.1	2.7	Good
ASH	%	< 8.6	8.5	Good
NDF	%	< 45.0	44.50	Good
DMD	%	> 68.9	70.7	Good
ME	MJ/kg	> 9.8	10.2	Good
Crude Protein	%	13.5 - 17	12.3	Low

Item	Units	Normal Range	Result	Status
PDI	g/kg	65 - 102	73	
PDI	g/kg	58 - 83	68	
PDI	g/kg	16 - 37	22	
UFL	per kg	.65 - .90	0.79	
UFV	per kg	.59 - .89	0.75	
SFU	per kg	1.04 - 2.81	1.51	
LFU	per kg	.95 - 1.89	1.22	
CFU	per kg	.96 - 1.92	1.24	
DM Intake Cattle	g/kg W ^{0.75}	70 - 130	108	
DM Intake Sheep	g/kg W ^{0.75}	60 - 140	100	

PREDICTED PERFORMANCE (silage ad lib in meals)		SUPPLEMENTATION	
WITH GOOD MANAGEMENT		Dairy Ration Protein %	20
Lactating Cows (Litres/Day)	18.5	Kg/Day for 27 litres	7.4
Dry Cows (Kg/Day)	8.6	Beef Ration Protein %	14
Beef Cattle / In-Calf Heifers (Kg/day)	8.5	Kg/Day for 1Kg/day Gain	5.29
Weanling (Kg/Day)	8.4	Weanling Ration Protein %	15
		Kg/Day for 0.6 Kg/day Gain	1.1

CUT ID: : Silage 0 Cut Date Cut System: Additive:

Note: Status A = Average

Zero-grazing red clover swards at Solohead in late November 2021



Feeding value of red clover silage

More to feeding value than digestibility

Higher rate of particle size breakdown and outflow rate from the rumen

>>> Higher DM intake

Higher intake compensates for lower digestibility

Cows perform very well on red clover silage once allowances are not restricted

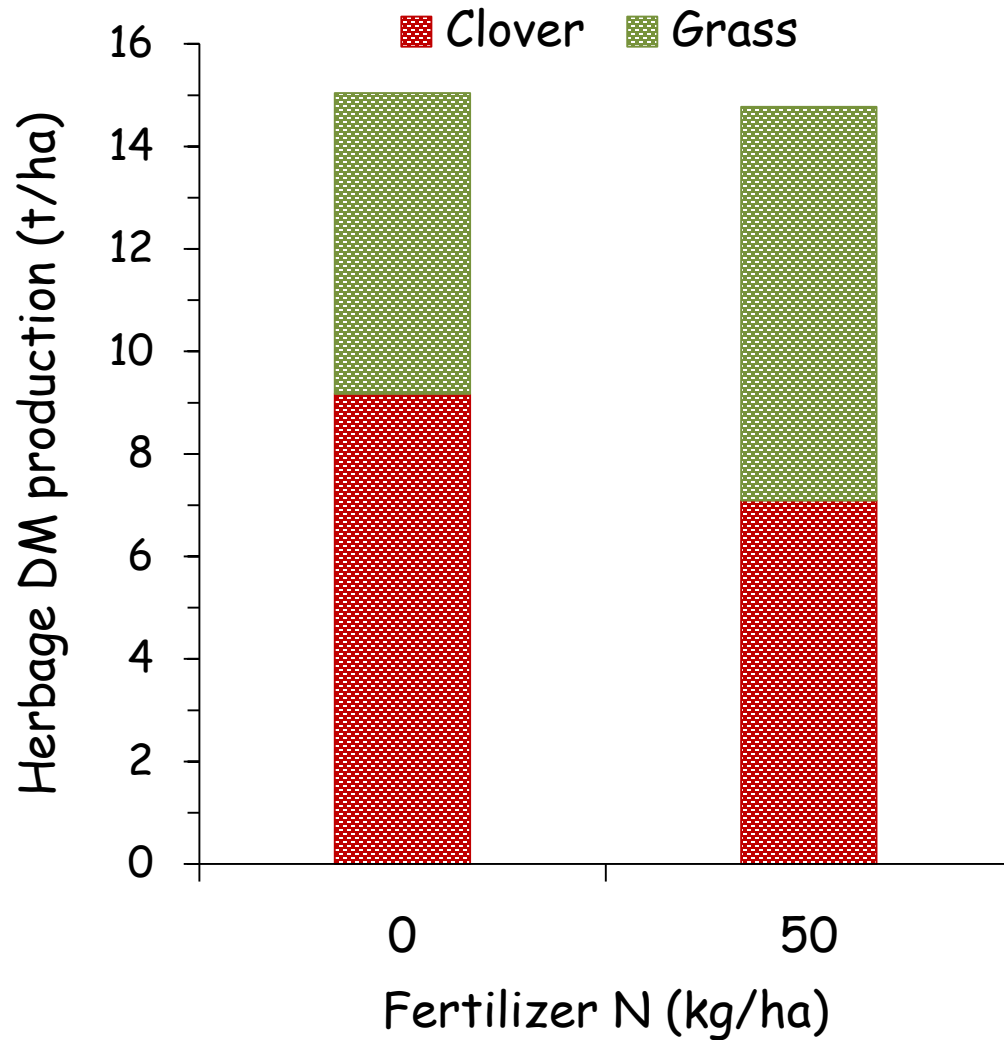


Soil Fertility



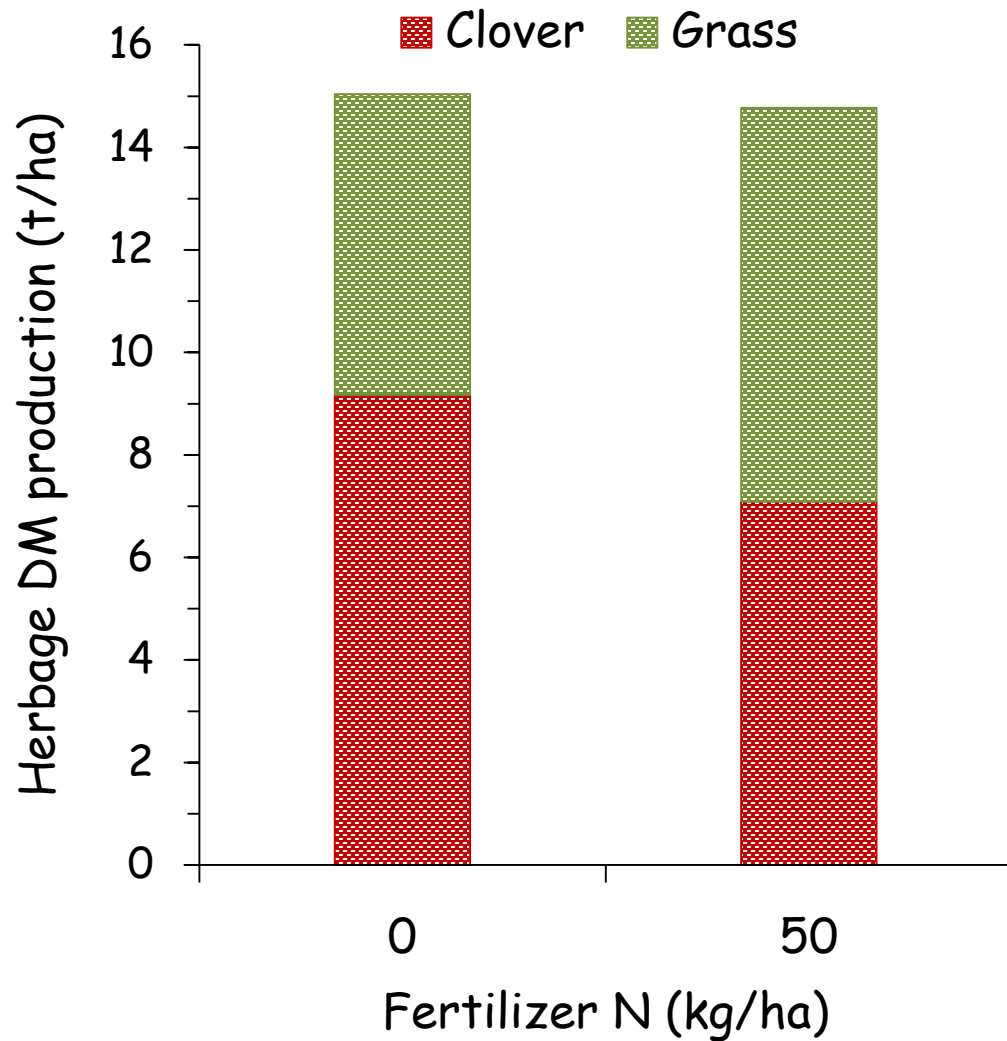
Fertilizer N and productivity of red clover swards

Grange 2002 to 2007

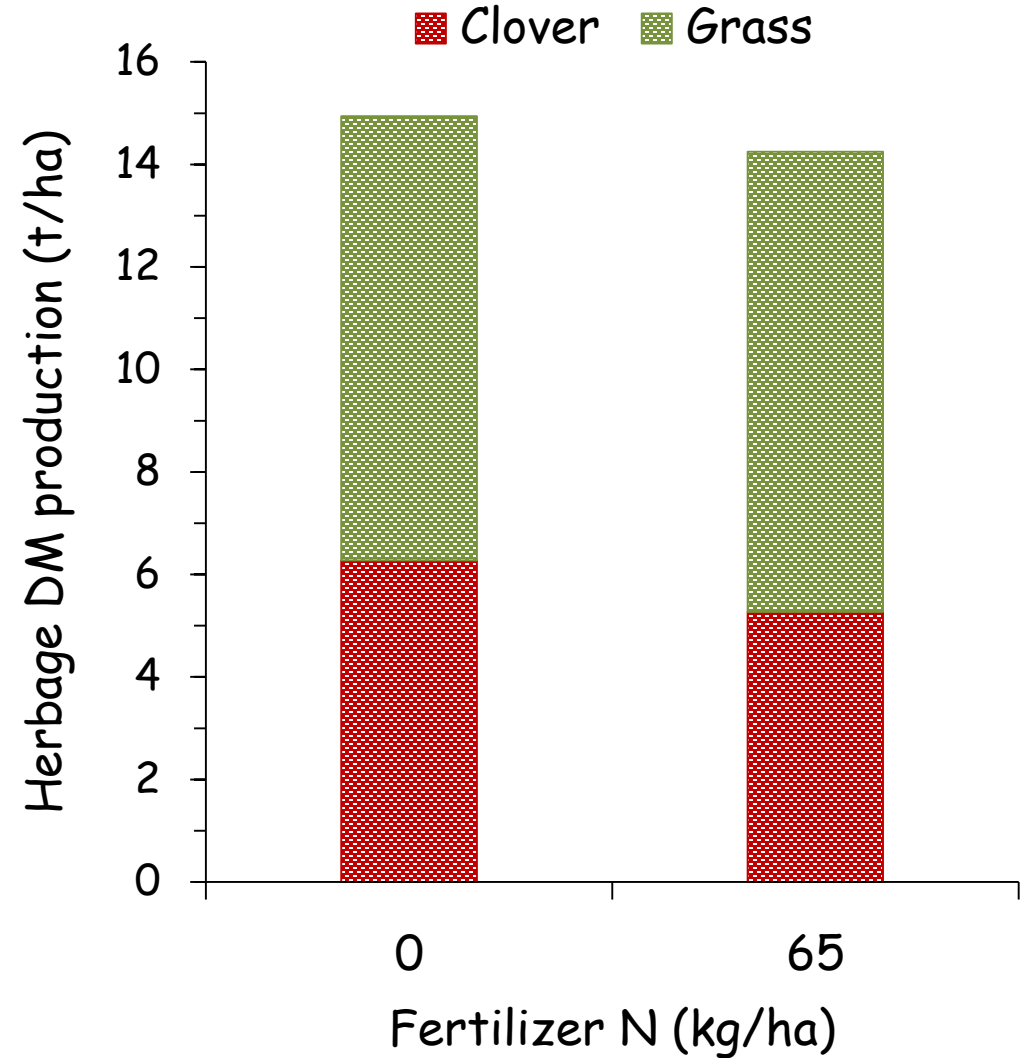


Fertilizer N and productivity of red clover swards

Grange 2002 to 2007



Solohead 2020 & 2021



Fertilization: Lime, K & P

Apply lime to bring soil pH to >6.5 (N fixation is a biological process)

Very high requirement for K: $15 \text{ t DM/ha} = 375 \text{ kg/ha}$ (300 units/acre)

Apply K & P compounds depending of soil test results

Index 1 soils: 25 kg K and 3 kg P for every t DM/ha expected in next harvest
either as organic manure or as mineral fertilizer

K applied prior to each crop - luxury uptake

High-K silage (>2.5% K) increase the risk of milk fever

Inadequate K shortens the longevity of red clover swards

Fertilizer N does more harm than good



1000 gallons
cattle slurry
8:5:32



Controlling docks in red clover swards

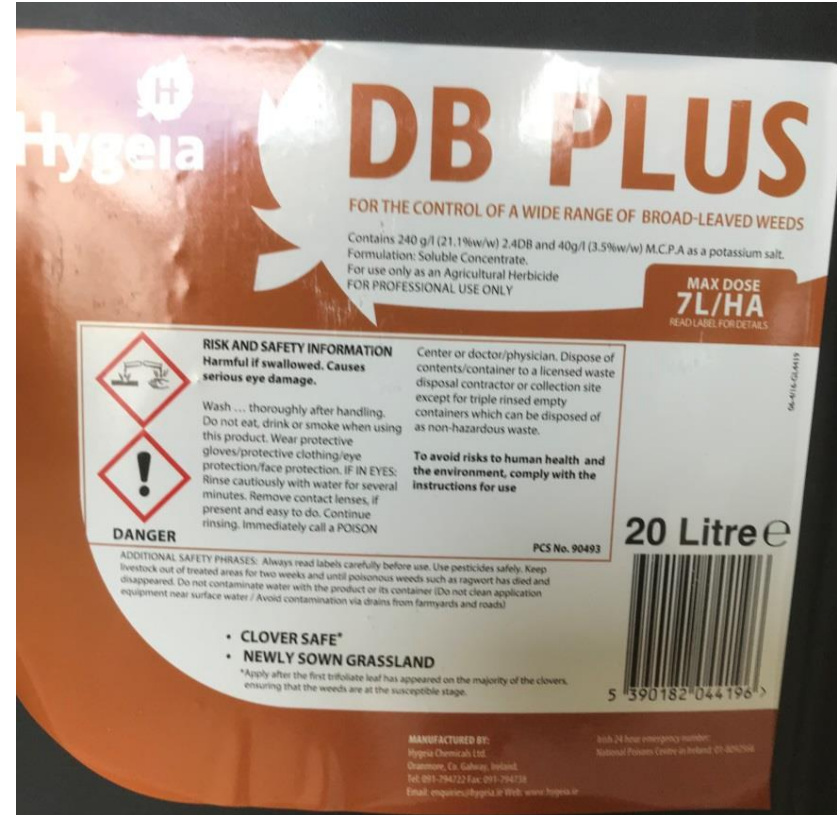
Conditions that are optimum for red clover are also favourable for docks



Post-emergence dock control



Post-emergence dock control



for the control of a wide range of broad-leaved weeds, including Charlock, in all cereals, including undersown and direct re-seeds.

METHOD OF APPLICATION

Apply 7 pints/acre (7 litres/hectare) of the product in 20–50 gallons/acre (220–550 litres/ha) of water using any convenient type of crop spraying equipment. Application should be made in good growing weather and not in cold weather, during drought or if rain is expected.

TIME OF APPLICATION

Spring Oats and Barley: Apply from the first leaf stage Z.C.K. 1.1. until the start of "shooting" or "jointing" Z.C.K. 3.1
Spring Wheat: Apply between the five-leaf Z.C.K. 1.5 stage and the start of "shooting" or "jointing" Z.C.K. 3.1
Winter Wheat, Barley and Oats: Apply when fully tillered in the Spring Z.C.K. 3.0 to the start of "shooting" or "jointing" Z.C.K. 3.1

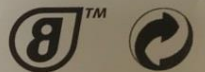
Cereals undersown with White and Red Clovers: Apply after the first trifoliate leaf stage provided the cereal has reached the specific stage of growth. With red clover, some leaf deformity may be observed but subsequent growth will be normal.

Direct re-seeds: Apply after the first trifoliate leaf has appeared on the majority of the clovers, ensuring that the weeds are at the susceptible stage.
Lucerne: Do not use on cereals undersown with lucerne or on seed mixture containing lucerne.

WEEDS CONTROLLED

Black Mustard, Corn Buttercup, Fat Hen, Pennycress, Shepherd's Purse, Yellow Charlock, Redshank (Willow Weed), Pale Periscaria, Treacle Mustard, Small Nettle, Annual Sowthistle, Bulbous Buttercup, Perennial Sowthistle.

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Red clover for grazing?



Seed mixtures for grazing and silage (acre packs)

Species	Cultivar	Rate
PRG	Abergain	5.0 kg
PRG	Aberchoice	5.0 kg
Red clover	Aberchianti	2.0 kg
White Clover	Buddy	1.0 kg
White Clover	Aberherald	1.0 kg

Species	Cultivar	Rate
PRG	Astonenergy	5.0 kg
PRG	Astonconqueror	5.0 kg
Red clover	Milvus	2.0 kg
White Clover	Crusader	1.0 kg
White Clover	Chieftain	1.0 kg

Late-heading perennial ryegrass cultivars (PRG)

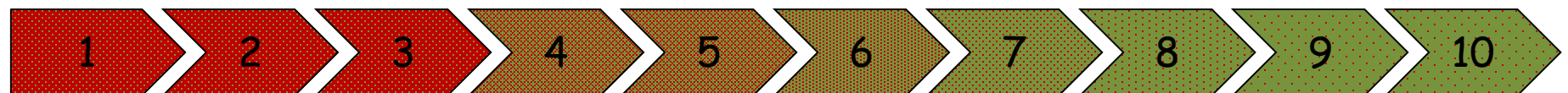
Red clover: very high production in first 2 to 4 years

White clover more persistent in the sward



Red clover after reseeding

White clover dominant disease break



Conclusions & Recommendations

Herbage production and longevity

High production under multi-cut silage system

Cost-effectiveness depends on longevity

Longevity improved by zero fertilizer N

adequate K fertilization

avoid damage by machinery & animal hooves during wet weather

post-emergence dock control when reseeding

Lime

Lime also maximises N fixation



Conclusions & Recommendations

Silage

First cut on 15 - 20 May and then at 6 or 7 week intervals

No need to adjust cutting height (5 - 6 cm)

48-hour wilt or use an effective preservative

High intake compensates for lower digestibility

Reseeding

Choose a cultivar off one of UK recommended lists (temperate climate)

Per acre pack: 3 - 4 kg red clover

6 - 9 kg ryegrass

1 kg white clover

Post-emergence dock control; you get one opportunity - don't miss it



Red clover

Fearga

Milvus

AberClaret

AberChianti

Lemmon

Merviot

Conclusions & Recommendations

Stem eelworm & Sclerotinia

Low risk for the time being

Implement a four-year break between crops of red clover

Select disease resistant cultivars

Other FAQ

Maize vs red clover?

Phyto-oestrogens do not affect the fertility of dairy cattle

Bloat is not a problem when feeding high-clover silage

Over-sowing red clover is not the same as over-sowing white clover



Red clover dominant after reseeding

White clover dominant disease break

