The Farm Management Handbook

Farm Advisory Service

Grassland

The UK reference for farm business management

SAC CONSULTING

Part of Scotland's Rural College (SRUC)

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Introduction

With increasing weather extremes, grassland is getting more challenging to manage. This puts a greater onus on managing grass flexibly and being prepared to reduce pressure on grass if required by reducing stocking or through feeding. The 2024 grass growing season was slow to start with a burst of grass in May when weather conditions were favourable and dropped again in June due to unseasonably cold conditions.

To optimise grassland productivity and quality, consider the following management strategies:

- Soil Health: Regular soil testing and appropriate nutrient management are crucial. Monitor pH, phosphorus and potassium levels as a minimum to prevent deficiencies.
- Reseeding: Fields with poor growth and less than 60% of desired species should be reseeded with high-yielding varieties.
- Grazing Management: Implement rotational grazing systems to maximise grass utilisation and maintain sward quality. Avoid overgrazing, particularly during drought or excessive rain periods.
- Fertilisation: Apply nitrogen fertilisers if required when other factors such as drought or cold soils are not limiting grass production. Use organic manures for additional nutrient supply.
- Weed Control: Maintain vigilance with weed control measures. Persistent weeds like docks and thistles can be managed through a combination of chemical and mechanical methods.

Grass yield can range from 1t dry matter (DM)/ha on hill ground to 20t DM/ha on good dairy land. The average grass yield is around 6t DM/ha on Scottish upland/lowland grazing livestock farms.

Environmental Considerations

Biodiversity: Enhance biodiversity by maintaining field margins, incorporating diverse grass species and increasing pasture rest.

Water Management: Efficient water use and drainage systems are essential to prevent waterlogging and soil erosion.

Carbon Sequestration: Grasslands are a vital soil carbon store. Conserving this store is important for climate change mitigation.

Potential dry matter yields (kgDM/ha) at different N levels/ha

kg N/ha	Yield (kgDM/ha)	Cow grazing days /ha	Stocking density (LU/ha)
0	3,000	240	0.46
75	4,200	335	0.64
125	5,500	439	0.84
175	7,000	559	1.07
250	8,000	639	1.23
310	10,000	799	1.53

The values in the table above assume a low clover content. Use the table below to account for clover contribution.

Accounting for clover: Clover Content (%DM)	Potential Nitrogen supply (kg N/ha)
20-30%	180
40%	240
50-60%	300

Analysis of grazed leafy grass often ranges from 15-25% DM, 10-12.5 megajoules of metabolizable energy (MJ ME)/kg DM and 12-26% crude protein – it is often as nutritious as concentrate feed. The cost per kg DM depends on the yield.

The variable cost data tables for grass, silage and hay provide the basis of the forage costs for the livestock enterprise gross margin figures.

Grazing systems defined

The following table illustrates the main grazing methods practised in Scotland.

	Grazing Interval	Rest Period*	Grass Height Targets		Grass Utilisation
			Entry	Exit	
Set stocking	over 1 week	NA	5-8cm		50%
Paddock grazing	0.5 days-1 week	15-30 days	8-10cm	5cm	65-80%
Mob grazing	0.5 days-3 days	40 days+	30cm+	10-20cm	30-50%

* Guide during the growing season, this should be flexible according to the growing conditions.

More information on mob grazing and rotational grazing is available in the following FAS New Entrants Factsheets:

- Mob Grazing with Beef Cattle: https://www.fas.scot/publication/mob-grazing-with-beef-cattle/
- Rotational Grazing: https://www.fas.scot/downloads/rotational-grazing/

Stocking rate
Stocking rate is expressed as grazing livestock units (see Livestock section), GLU per effective (adjusted) hectare where:

- 2.5 GLU/ha (1 per acre) is very intensive (very high N input)
- 2.0 GLU/ha is intensive (high N input)
- 1.5 GLU/ha is semi-intensive (moderate N input or high clover %)
- 1.0 GLU/ha is extensive (low N input/clover based)
- 0.5 GLU/ha is very extensive (very low/no N inputs)

Choice of seed mixtures
The seed mixture should be chosen using recommended varieties tested in Scotland by SRUC, England & Wales by NIAB-TAG or Northern Ireland by DAERA. Grass swards will contain mainly perennial ryegrass, white clover, and timothy. Varieties chosen should be compatible and chosen according to the farm system, the use of the ley (silage, hay, dual purpose), special requirements such as disease resistance and winter hardiness.

Inclusion of herbs such as Plantain and Chicory have proven benefits to animal performance, but these plants may not persist for long. Rotational grazing is recommended to make the most of these herbs. Red clover is another great addition to the mix due to its high N fixation (over 300 kg N/ha is possible) and nutritional quality.

Sward Improvement

Options for sward improvement range from full ploughing (reseeding/replacement) to oversowing (renovation). The approximate costs of different improvement methods are outlined in the table overleaf. These include variable costs as well as the cultivation costs.

Assumptions:

- A long-term seed mixture at full rate, 37kg/ha, for ploughing and direct drilling, and half rate, 18kg/ha, for oversowing.
- Fertiliser inputs are based on moderate P and K soil status. No fertiliser assumed for the over sow. pH is assumed to be ideal thus no cost for lime is included.
- Chemical costs for the destruction of the old sward prior to cultivation have been assumed for ploughing and direct drilling options. Other pesticides may be required for specific circumstances.
- Cultivation methods are assumed to be carried out by contractors. See Labour and Machinery section.
- Machinery fuel use (l/ha) and fuel cost - See Labour and Machinery section.

	Plough		Direct drill		Over sow	
Reliability	High		Mod/High		Moderate	
Speed of improvement	Moderate		Moderate		Rapid	
Loss of grass production	High		High		Low	
			£/ha (acre)			
Variable costs						
Seed	215		215		104	
Fertiliser	129		129		-	
Sprays	14		14		-	
	358	(145)	358	(145)	104	(42)
Cultivation costs						
Spray	15		15		-	
Plough	73		-		-	
Power harrow/subsoil	65		-		-	
Harrow	-		-		34	
Roll and destone	21		-		-	
Sow	37		65		37	
Roll	28		28		28	
Fertilise	12		12		-	
Fuel cost	55		18		12	
	307	(124)	138	(56)	111	(45)
Total costs	665	(269)	496	(201)	216	(87)
No. of years per cultivation	*7*		*7*		*7*	
Total cost per annum	**95**	(38)	**71**	(29)	**31**	(12)

Preserved Grass Production Costs

The table on the following page shows the cost of producing preserved grass as silage or hay.

Assumptions:

- Yield and N fertiliser are outlined on pages 10 and 12.
- Establishment costs based on figures on pages 4-5.
- Annual variable costs are based on variable cost data (less annual share of seed) shown on pages 11 and 13.
- Annual production costs are assumed to be carried out by contractors. See Labour and Machinery section.
- Machinery fuel use (l/ha) and fuel cost - See Labour and Machinery section.
- Other crop expenses for ensiled silage are based on using plastic sheets. For baled silage, this includes net wrap and plastic wrap as described on page 11. For hay, the cost for net wrap is included in the annual variable costs.
- Land rent and maintenance or a finance charge associated with a silage clamp have not been included in the calculations.
- Yield potential will vary and no account has been taken for wastage in the preserved state and at feeding.

Cost of producing preserved grass as silage or hay

	Silage 1 cut ensiled	**Silage** 1 cut bales	**Hay** 1 cut bales
N fertiliser use (kgN/ha)	125	125	125
Yield (t FW/ha)	20	20	6
Yield (t DM/ha)	6	6	5
Bale weight (round 4' x 4' - kg)	-	650	250
		£/ha	
Establishment costs (annual share)	95	95	95
Annual variable costs	184	184	257
Annual production costs			
Spray	15	15	15
Fertiliser	12	12	12
Mow	33	33	33
Rake	19	-	41
Lift, cart and clamp crop	143	-	-
Bale, wrap and stack	-	299	70
Other crop expenses	3	108	-
Fuel	42	19	25
	267	486	196
Total cost per annum (£/ha)	**546**	**765**	**548**
Cost per t FW (£/t)	**27**	**38**	**91**
Cost per t DM (£/t)	**91**	**127**	**107**
Cost per bale (£/bale)	**-**	**25**	**23**

Grassland - Grazing

PHYSICAL DATA

(a) System

Assume a 7-year sward life.

Establishment costs are described under Sward Improvement.

(b) Yield

See pages 4-6 for the dry matter yield and stocking rate (LU/ha) assumptions for varying Nitrogen application rates.

(c) Seed

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly):

Mixture	£/ha
One year	98-185
Two-three years	117-224
Four-six years	159-223
Permanent	175-237

(d) Fertiliser

See Crop Inputs section for more info on nutrient planning.

	kg/ha (units/acre)/annum									
N	0	(0)	75	(60)	125	(100)	175	(140)	250	(200)
P_2O_5	0	(0)	10	(8)	15	(12)	20	(16)	30	(24)
K_2O	0	(0)	15	(12)	15	(12)	20	(16)	30	(24)

(e) Sprays

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly) to cover a herbicide during establishment, followed by a herbicide to control a broader range of perennial weeds, such as docks, thistles, and nettles.

Grassland - Grazing

VARIABLE COST DATA

Fertiliser kg N/yr	0	(0)	75	(60)	125	(100)	175	(140)	250	(200)
VARIABLE COSTS *					**£/ha (acre)**					
Seeds	23		23		23		23		23	
Fertiliser	0		91		144		200		288	
Sprays	10		10		10		10		10	
Other expenses	-		-		-		-		-	
	33	(13)	124	(50)	177	(72)	233	(94)	321	(130)

FERTILISER PRICE SENSITIVITY (+/-)

10 p/kg N	0	(0)	8	(3)	13	(5)	18	(7)	25	(10)
10 p/kg P_2O_5	0	(0)	1	(0)	2	(1)	2	(1)	3	(1)
10 p/kg K_2O	0	(0)	2	(1)	2	(1)	2	(1)	3	(1)

* The cost per tonne of dry matter grown depends on yield and should also include a share of reseeding costs (contractor/machinery upkeep/fuel). Cost will also depend on the response to nitrogen (see Introduction), and grazing utilisation.

Grassland - Silage and Aftermath Grazing

PHYSICAL DATA

(a) System

Assume a 7-year sward life.

Establishment and harvest costs are described under Sward Improvement.

(b) Yield

Settled silage (kg fresh weight) at 25%DM.

Fertiliser N kg/ha (units/acre)/annum	70	(56)	130	(104)	250	(200)	310	(248)
Silage t/ha (t/acre)								
1st cut	20	(8.1)	20	(8.1)	25	(10.1)	20	(8.1)
2nd cut	-	-	10	(4.0)	15	(6.1)	16	(6.5)
3rd cut	-	-	-	-	-	-	16	(6.5)
Total	20	(8.1)	30	(12.1)	40	(16.2)	52	(21.0)

Apportionment - the following yield ratios are suggested:

Silage	50	80	80	95
Aftermath	50	20	20	5

(c) Seed

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly):

Mixture	**£/ha**
One year	98-185
Two-three years	117-224
Four-six years	159-223
Permanent	175-237

(d) Fertiliser

Neither P_2O_5 nor K_2O is assumed for aftermaths, although their use would be recommended subject to nutrient management planning. See Crop Inputs section for more info on nutrient planning.

Silage cuts	**kg/ha (units/acre)/annum**							
For silage	**One**		**Two**		**Two**		**Three**	
N	70	(56)	100	(80)	220	(176)	310	(248)
P_2O_5	34	(27)	51	(41)	68	(54)	88	(70)
K_2O	120	(96)	180	(144)	240	(192)	312	(250)
For aftermath								
N	0	(0)	30	(24)	30	(24)	-	-

VARIABLE COST DATA

Fertiliser kg N/ha (units/acre)/annum	70	(56)	130	(104)	250	(200)	310	(248)
Silage cuts	One		Two		Two		Three	
VARIABLE COSTS				**£/ha (acre)**				
Seeds	23		23		23		23	
Fertiliser	174		284		453		574	
Sprays	10		10		10		10	
Other expenses	-		-		-		-	
	207	(84)	317	(128)	486	(197)	607	(246)
FERTILISER PRICE SENSITIVITY (+/-)								
10 p/kg N	7	(3)	13	(5)	25	(10)	31	(13)
10 p/kg P_2O_5	3	(1)	5	(2)	6	(2)	8	(3)
10 p/kg K_2O	12	(5)	18	(7)	24	(10)	31	(13)

(e) Sprays

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly) to cover a herbicide during establishment, followed by a herbicide to control a broader range of perennial weeds, such as docks, thistles and nettles.

(f) Other crop expenses

Heavy-duty silage covers cost approximately £2.36/m^2 (7-10 year lifespan). Associated gravel bags cost approximately £1.32/bag. Silage sheets cost approximately £0.25/m^2 for top sheets and £0.89/m^2 for wall liners. Clamp film is approximately £0.18/m^2. If baling, include costs for net wrap at 50p/bale for large round bales and bale wrap at £5.40/bale depending on number of layers of net and wrap and size of bales.

The use of an inoculant will typically add £1.00-1.30/t depending on the product chosen and its rate of application.

Grassland - Hay and Aftermath Grazing

PHYSICAL DATA

(a) System

Assume a 7-year sward life.

Establishment and harvest costs are described under Sward Improvement.

(b) Yield

Fertiliser N kg/ha units/acre)/annum	80 (64)	140 (112)	180 144)
Hay t/ha (t/acre)	5 (2.0)	6 (2.4)	7 (2.8)
Aftermath (cow grazing days)	125	140	180

Apportionment - a yield ratio of 75 : 25, hay : aftermath should be used.

To prevent heating in store, aim to bale hay at 15-20% moisture and leave to stand in field until heating ceases.

(c) Seed

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly):

Mixture	**£/ha**
One year	98-185
Two-three years	117-224
Four-six years	159-223
Permanent	175-237

(d) Fertiliser

Neither P_2O_5 nor K_2O is assumed for aftermaths, although their use would be recommended subject to nutrient management planning. See Crop Inputs section for more info on nutrient planning.

		kg/ha (units/acre)/annum					
For hay	N	80	(64)	80	(64)	80	(64)
	P_2O_5	30	(24)	35	(28)	42	(34)
	K_2O	90	(72)	108	(86)	126	(101)
For aftermath	N	-	-	60	(48)	100	(80)

(e) Sprays

A nominal annual charge (assume a 7-year sward life, for longer leys reduce the annual charge accordingly) to cover a herbicide during establishment, followed by a herbicide to control a broader range of perennial weeds, such as docks, thistles and nettles.

(f) Other crop expenses

Net wrap cost is costed at 50p/bale, based on 4 round bales/t and assuming one roll of net will wrap 410 bales.

Grassland - Hay and Aftermath Grazing

VARIABLE COST DATA

Fertiliser kg N/ha (units/acre)/annum	80	(64)	140	(112)	180	(144)
VARIABLE COSTS			**£/ha (acre)**			
Seeds	23		23		23	
Fertiliser	161		235		291	
Sprays	10		10		10	
Other expenses	10		12		14	
	204	(83)	280	(113)	338	(137)
FERTILISER PRICE SENSITIVITY (+/-)						
10 p/kg N	8	(3)	14	(6)	18	(7)
10 p/kg P_2O_5	3	(1)	3	(1)	4	(2)
10 p/kg K_2O	9	(4)	10	(4)	12	(5)