

Alternative forage systems for marginal land (Interim Report for 2019; Year 2)

Background to project

This EIP Wales project is aiming to compare the performance of two different grass mixtures on marginal land on three farms within the South Wales Valleys. The hypothesis is that alternative seed mixtures may be more suited to the high rainfall conditions, poor soil quality and low input systems than standard ryegrass/clover mixtures. Welsh landscapes vary significantly in soil quality and fertility. Understanding the effectiveness of different sward compositions will allow a more efficient, targeted approach to sowing grass on marginal land. The three year project will compare the two grass mixtures on the following:

- establishment success
- forage production and quality
- stock performance
- ley persistence
- invertebrate populations

Project summary (End of year 1)

At the end of summer 2018 a 4-5 ha field on each of the three farms was split into two, and reseeded with 50% multi species ley and 50% ryegrass and white clover ley (Figure 1). The fields in the trial are between 100m and 260m in altitude and are different in terms of topography and in places soil type but are all situated within the less favoured area in an area of high rainfall. The farmers have valued working with the contractor (Chris Duller) who has provided ongoing mentoring to the group in terms of general grassland management and advice specific to the individual farms. Establishment conditions were challenging but leys were grazed and rested prior to season two where monitoring of grassland production, livestock performance and pollinator/invertebrate populations was to be implemented. The project has now completed its second year and the results to date are below and the project is ongoing until December 2020.

Herbal ley mixture		Conventional ryegrass/white clover mixture	
Variety Type	Kg of seed/Acre	Variety Type	Kg of seed/Acre
Meadow Fescue	1	Aber Choice late dip	3
Timothy	1	AberWolf int dip	2
PRG Int dip	2	AberGain late tet	3
PRG late dip	4	AberZeus int dip	3
PRG late tet	2	AberBite late tet	2
White Clover Blend	1	Presto Timothy	1
red clover - AberPasture	0.5	Aber Pasture medium white clover	1
red clover - AberChianti	0.5		
Festulolium	2		
Plantain	0.6		
Perennial Chicory	0.4		

Figure 1: Seed mixtures used in the project

Year 2 summary data

Dry matter output

Total dry matter recorded under cages – shows greater output from the multispecies ley at two of the farms – including 30% at Gellifeddgar. But as a project average, the increase in dry matter production with multispecies is only 4%. The lower level of performance at Bryn Chwith could be attributed to wetter/poorer soil conditions – combined with less attention to sward heights (grazing at high covers/higher stocking rates) – and yields have declined as weed species have ingressed into the more open and less competitive sward. Performance at Gilfach was undoubtedly checked by the silage cut in June – and it may be that the MS leys aren't that well suited to cutting.

	DM produced (kgDM/ha)		
	Control	Multispecies	
Gellifeddgar	8807	11160	30%
Gilfach	9152	9283	8%
Bryncwith	8412	6859	-23%

The greatest differences in production were observed in early season – with a 37% increase in growth with the multispecies leys.

	Growth assessments (25Feb - 10April 2019)			
	DM produced (kgDM/ha)		Growth rate (kgDM/ha/day)	
	Control	Multispecies	Control	Multispecies
Gellifeddgar	797	1443	18	32
Gilfach	1573	1790	36	41
Brynychwith	1170	1640	26	37
mean	1180	1624.3	26.7	36.7

When comparing farms, it is worth noting that the three farms had differing management and fertiliser strategies.

The early season growth at Gilfach was boosted with the use of 50kg N/ha in late February. Gilfach continued to use modest applications of N (60kg N/ha at closing out (late April) and a late summer application of 40kgN/ha. Maintenance dressings of P and K were also applied to replace silage offtake.

At Gellifeddgaer no nitrogen was applied in 2019 – although the fields did receive a spring application of TSP – supplying 58kg P₂O₅/ha.

At Brynychwith 100kg N/ha was applied in two dressings (March and June).

It is also worth noting that the plantain has been the dominant forb in the MS leys – with chicory there in smaller numbers. Red clover has not established well or persisted. It would appear that different sites, climatic conditions and management regimes will affect the success of individual components in MS mixtures – and in reality it is only by experimenting on farm with different mixtures that individuals will find out what works best for them.

Nutritional quality

There were no clear trends in nutritional value of the two treatments in either April or Sept 2019 – other than a fairly consistent difference in dry matter content – with the multispecies ley 1 to 1.5% lower in dry matter.

	Nutritional quality in Sept 2019					
	DM	ME	CP	NDF	ADF	WSC
ed con	16.3	11.4	19.2	51.1	27.3	4.1
ed ms	14.9	11.6	16.9	42.5	25.4	4.5
rm con	12	11.3	23.2	53.2	27.7	3.2
rm ms	11.9	11.2	20.4	51	28.3	3.2
p con	16.7	11.2	15	54	28.9	5.7
pms	15.2	11.5	18.7	45.5	25.5	5.3
mean con	15.0	11.3	19.1	52.8	28.0	4.3
mean MS	14.0	11.4	18.7	46.3	26.4	4.3

There were some differences in the mineral status of the two leys.

In June the following trends were identified

Greater P and K contents in control v multispecies – along with total Cation Anion balance (CAB)

Greater Ca, S, Fe, Mn, ZN, in multispecies leys

No consistent trends with Mg, Na, Cl, Al, Mo, Pb, Co, Cu and Se. The lack of any clear differences between treatments could well be as a result of the strong clover component of the control ley – and ultimately by the low levels of trace elements in these soil types.

In September there were slightly different trends – with consistently lower Mn contents and slightly higher selenium levels in the multispecies leys– but nothing else showing a clear pattern.

EIP9 - herbage mineral assessments September 2019																	
	CA	P	MG	NA	K	S	CHLORIDE	CAB	FE	MN	CO	ZN	SE	AL	PB	MO	CU
Gelli CON	1.1	0.44	0.19	0.15	2.95	0.29	1.63	179	194	49.5	0.02	126.9	0.083	86.6	1.22	0.81	6.6
Gelli MS	1.43	0.44	0.2	0.25	3.15	0.29	1.72	247	279	40.2	0.04	77.5	0.094	188.1	1.22	0.69	7.3
Gilf Con	0.89	0.38	0.19	0.38	2.24	0.28	1.31	191	307	114.4	0.06	86.7	0.062	168.5	1.6	0.68	6.3
Gilf MS	1.66	0.34	0.35	0.35	1.46	0.33	1.55	-119	133	80	0.04	87.6	0.064	55.2	1.34	0.54	8
Bryn Con	0.75	0.32	0.19	0.3	2.31	0.25	1.53	129	149	79.7	0.1	52.2	0.046	73.2	1.27	0.49	6.3
Bryn MS	0.75	0.31	0.16	0.16	2.23	0.19	1.4	125	350	71.9	0.09	46.7	0.11	297.6	1.44	0.72	4.8
Mean Con	0.91	0.38	0.19	0.28	2.50	0.27	1.49	166.33	216.63	81.20	0.06	88.60	0.06	109.43	1.36	0.66	6.40
Mean MS	1.28	0.36	0.24	0.25	2.28	0.27	1.56	84.33	254.23	64.03	0.06	70.60	0.09	180.30	1.33	0.65	6.70

Animal performance

Gellifeddgaer recorded over 9000 ewe/lamb grazing days to weaning, followed by 10,300 lamb grazing days through to 4th sept over the whole trial. In dry matter terms that equates to a 6400kgDM/ha – utilised.

There was little difference in animal performance between the two leys.

Both Gilfach and Gellifeddgaer reported marginally better lamb performance on the herbal ley – but both recorded fairly low lamb growth rates of between 100 and 120g/day post weaning. If each one of those grazing days recorded at Gellifeddgaer achieved the modest growth rate of 120g/day then that equates to 468kg LWG produced/ha over the whole season – which is a reasonable level of performance.

Future plans

The swards will continue to be monitored in 2020 to assess herbage production (cage cuts) and quality (ME, CP and mineral status). Appropriate fertiliser strategies will be agreed for each farm.

Farming Connect Knowledge Transfer days are planned for summer 2020.

Animal performance trials will aim to keep individual stock grazing the plots for a longer period – so lower stocking rate for an extended rotation (closer to set stocking system) – rather than high stocking rate for a short duration on a rotational basis.

This extended grazing period would also allow us to monitor any impacts on internal parasite levels – as reported in other multispecies trials.

Assessment of invertebrates

On 8th July 2019 Aldwyn Clarke of ADAS carried out the assessment of arthropods over the three farms involved in the EIP project. The conventional and herbal leys were each walked separately and two runs of 30 swipes were taken across a representative section of each ley with a sweep net. Arthropods captured in the net were collected and stored for future reference. Weather was warm and sunny, approximately 21 degree Celsius with a light southerly breeze.

Gilfach – The field had been cut for silage approximately 16 days previously but there was good regrowth (100mm in the conventional ley). The field had cropped well with 15 bales/acre, 50% up on normal (TBC). Approx. 370kg/ha compound 21:8:11 had been spread in the spring.

Some signs of rutting were evident in the field along with a population of docks. Anecdotally the herbal ley seemed more advanced than the conventional ley. Chicory and plantain regrowth was evident as was rye grass heading in the herbal ley. Anecdotally there was no observable difference in arthropod populations between the 2 leys.

Gellifeddgaer – the field had recently introduced sheep grazing (not cut) but there was plenty of grass, clover and herbs with sward height approx. 150mm in the conventional ley. The leys had received 125kg/ha TSP (46%) in the spring. There appeared no preferential grazing between the leys. Again the chicory and plantain growth was evident while yarrow was also present in abundance. Anecdotally there was no observable difference in arthropod numbers between the 2 leys.

Bryn Chwith – Both fields had been grazed hard with around 50mm of grass in the conventional ley. Grass had headed. Cages indicated good growth. The field with the herbal ley lies wet in winter but had turned hard at the time of the visit. Cattle had grazed the field but cages again indicated decent growth. The field could do with topping. Both fields had received approximately 45kg/ha N in the spring (TBC). Anecdotally there was no observable difference in arthropod numbers between the 2 leys.

It is too early to draw any conclusions from the data collected. The survey will be repeated in 2020 and this will provide the opportunity to compare findings over the two seasons.

Ecology and Evolution 2013; 3(10): 3347–3358

Sweeping beauty: is grassland arthropod community composition effectively estimated by sweep netting? Ryan D. Spafford & Christopher J. Lortie

Total number is invertebrates found in 2019 sampling.

Site Name	Sward Type	Number of invertebrates 8 July 2019					Total
		Diptera	Coleoptera	Arachnids	Collembola	Dermaptera	
Gellifeddgaer	Conventional 1	463	0	3	0	0	466
	Conventional 2	222	3	1	0	0	226
	Herbal 1	237	5	3	1	0	246
	Herbal 2	501	5	3	1	1	511
Bryn Chwith	Conventional 1	515	6	4	0	0	525
	Conventional 2	291	9	3	2	0	305
	Herbal 1	434	3	0	0	0	437
	Herbal 2	986	6	1	0	0	993
Gilfach	Conventional 1	245	8	1	9	0	263
	Conventional 2	299	18	3	8	0	328
	Herbal 1	187	17	0	5	0	209
	Herbal 2	169	13	1	5	0	188