

Why should you add legumes?

Soil benefits

- Decreased N fertilizer needs
- Decrease soil erosion
- Longer stand life (usually)
- Increased grazing capacity and animal gain

Gain (lb/acre) grazed on interseeded pasture		
	Calves	Yearling steers
Treatment	ND (1978-85)	SD (1977-79)
Check (no alfalfa)	33	53
Alfalfa	61	85

Source: Anowar Islam, U Wyoming, 2009.

Nitrogen fixation

Table 8.3. Median values and ranges for N₂ fixed by well-nodulated forage legumes under favourable field conditions

Legume fodder crop	Median kg N/ha/y	Ranges kg N/ha/y
Lucerne	180	50 - 350
Red clover	170	50 - 200
Birdsfoot trefoil	90	-
Vetch	-	50 - 160
Forage peas	70	50 - 100

Median values from Vance (1997); ranges in values from Jennings (2006) and Lacefield et al. (2006)

Forage Quality Benefits

<i>Legumes</i>	<i>Cool-Season Perennial Grasses</i>
Increased <ul style="list-style-type: none"> • Energy • Protein • Calcium 	Increased <ul style="list-style-type: none"> • Non-structural carbohydrates • ADF • NDF
Decreased <ul style="list-style-type: none"> • Non-structural carbohydrates • ADF • NDF 	Decreased <ul style="list-style-type: none"> • Energy • Protein • Calcium

Nutrient	Legume Hay Average	Number of Samples	Standard Deviation	Grass Hay Average	Number of Samples	Standard Deviation
Dry Matter %	90.1	227230	1.4	92.3	97771	1.74
DE (Mcal/ lb)	1.19	108791	.13	.91	37412	0.10
Crude Protein %	21.26	223248	2.65	10.86	92601	3.9
Acid Detergent Fibers %	30.73	222190	3.91	39.89	90607	4.77
NSC %	11.00	39412	2.24	12.85	17590	4.81
Ca %	1.5	202588	2.43	.492	87777	.22
Phosphorous %	.273	202566	0.05	.238	87879	.09
Iron (PPM)	393.9	49396	386.4	195.53	43002	291.6
Copper (PPM)	9.0	49410	5.04	8.696	42976	1128.37

What species can you add?

Tolerance to

Legume	Heat/drought	Wet	Winter Injury	Freq. cutting/ grazing	Soil acidity	Low Fertility	Seedling Vigor	Bloat Inducing
Alfalfa	E	P	G	F	P	P	G	YES
Alsike clover	P	E	P	P	G	F	G	YES
Birdsfoot trefoil	F	E	F	G	G	F	P	NO
Cicer milkvetch	G	F	E	F	F	F	P	NO
Crownvetch	G	P	F	P	G	F	P	NO
Kura clover	F	G	E	E	F	G	P	YES
Red clover	F	F	F	F	G	G	E	YES
Sweetclover	E	P	E	P	P	F	G	YES
White clover	P	G	F	E	G	G	G	YES
Berseem clover	P	E	P	G	P	G	E	NO

From University of Minnesota.

Inoculation

- Important to do it correctly
- Have to have the right species of bacterium

Legume	Rhizobia
Alfalfa Sweet clover	<i>Rhizobium meliloti</i>
Sainfoin	<i>Rhizobium spp.</i>
Birdsfoot trefoil Lima bean	<i>Bradyrhizobium spp.</i>
Lentil Peas Field Peas Garden Peas	<i>Rhizobium leguminosarum</i> bv viceae
Field Bean Garden Bean	<i>Rhizobium leguminosarum</i> bv phaseoli
Other clovers	<i>Rhizobium leguminosarum</i> bv <i>trifolii</i>

- Make sure to either buy properly inoculated seed, or store inoculum in cool dark place
 - Apply within 48 hours prior to seeding if doing yourself
- Digging up plants several weeks after growth can allow you to evaluate inoculation success

Competitiveness and Compatibility

Table 2. Montana and Wyoming Introduced Irrigated Pasture Species Compatibility Chart

Species	Bromegrass, meadow	Fescue, meadow	Fescue, tall	Foxtail, creeping	Foxtail, meadow	Orchardgrass	Ryegrass, perennial	Timothy	Milkvetch, cicer	Alfalfa, spreading	Birdsfoot trefoil	Clover, alsike	Clover, strawberry	Clover, red or white	Wheatgrass, intermediate	Wheatgrass, tall	Wheatgrass, western	Wildrye, altai	Wildrye, Russian
1. Bromegrass, meadow	x	G				E	E	E	Alt	E	E	G	G	G					
2. Fescue, meadow	G	x			G	G	E		Alt	Alt	G	G	G	G					
3. Fescue, tall (endophyte-free)			x		G		G		Alt		Alt								
4. Foxtail, creeping				x	G		G	G	Alt	G	F	E							
5. Foxtail, meadow		G	G	G	x		G	E		G	F	E	G	G					
6. Orchardgrass	E	G				x	G	E	Alt	E	G	E	G	G	E				
7. Ryegrass, perennial ¹	E	E	E	G	G	G	x			G			G	F	F				
8. Timothy	E			G	E	E		x	E	E	G	E	E	E	G				
9. Milkvetch, cicer	Alt	Alt	Alt	Alt		Alt		E	x					Alt		G	Alt	Alt	
10. Alfalfa, spreading	E	Alt		G	G	E		E		x	E			G		G	Alt	Alt	
11. Birdsfoot trefoil	E	G	Alt			E		G		E	x			G	Alt	G	Alt	Alt	
12. Clover, alsike ²	G	G		E	E	E		E				x						F	
13. Clover, strawberry ²	G	G			G	G		E					x						
14. Red or white clover ²	G	G			G	G		E						x					
15. Wheatgrass, intermediate ³						E	F	G	Alt	G	G			x		F			
16. Wheatgrass, tall							F		Alt		Alt				x				
17. Wheatgrass, western								G	G	G	F			F		x			
18. Wildrye, altai ³								Alt	Alt	Alt							x		
19. Wildrye, Russian								Alt	Alt	Alt									x

1 Endophyte-free perennial ryegrass may be used for first year establishment and is considered an annual in Montana and Wyoming.

2 Due to their susceptibility to molds, clovers are generally not recommended for horse pastures.

3 Intermediate and pubescent wheatgrass are considered the same species in this chart. The same designation applies to altai and many-stem wildrye.

4 Russian wildrye is generally used as a dryland species, however, it will respond to additional moisture with increased yield.

Legend: E = Excellent compatibility G = Good compatibility F = Fair compatibility Alt = Plant in Alternate Rows

From NRCS Pasture Publication.

Competing Species	Sainfoin	Alfalfa	Crested	Intermediate	Smooth Bromegrass	Russian Wildrye	Mean
Sainfoin	2513 b*	4830 c	4381 a	2718 a	1799 b	2053 b	3049 a
Alfalfa	1665 c	3270 d	4096 a	2452 b	2129 a	2489 a	2684 b
Crested Wheatgrass	3721 a	6703 a	1170 b	1235 d	1082 c	597 d	2418 c
Intermediate Wheatgrass	3391 a	6125 ab	1317 b	1437 cd	1113 c	866 c	2375 cd
Smooth Bromegrass	3606 a	5668 b	1429 b	1363 cd	1301 c	636 d	2334 d
Russian Wildrye	1174 c	4566 c	1312 b	1524 c	1080 c	732 cd	1731 e

From NRCS Irrigated Pastures Publication.



Animal toxicity?

- Alsike clover and cicer milkvetch- can cause issues with photosensitivity and secondary liver damage
 - Mainly observed in light animals
 - Horses particularly susceptible
- Red clover (rarely white clover and alsike)- can cause “slobbers” due to presence of *Rhizoctonia leguminicola* fungi
 - Also called slaframine poisoning
 - Not generally a health concern, more of a nuisance, but can lead to dehydration and colic
 - Common in cool, wet pastures
- Sweetclover- “Sweetclover toxicity”
 - Only a problem in moldy hay, does not occur on fresh pasture
 - Has to have mold present to convert coumarin to dicumarol- a blood thinner
 - There are low coumarol sweet clover varieties available
- Birdsfoot trefoil- has been found to contain some elevated levels of prussic acid
 - Also called cyanide poisoning
- Hairy vetch- toxic mainly to cattle and horses
 - Creates an allergic reaction with subcutaneous swelling, photosensitization, abortions, death, etc
 - Most die from kidney failure, animals with black skin most susceptible
- Crown vetch- mainly toxic to horses, ruminants can detoxify component in rumen
 - Toxic compound primarily in leaves and vegetative stems
 - Can cause methemoglobinemia, seeds can cause cardiac issues

Bloat concerns?

Table 1. Forage Species and Their Potential for Causing Bloat in Cattle

High Potential	Low Potential	Considered Safe
Alfalfa	Arrowleaf clover	Birdsfoot trefoil
Sweetclover	Spring wheat	Cicer milkvetch
Red clover	Oats	Crownvetch
White clover	Rape	Lespedeza
Alsike clover	Perennial ryegrass	Fall rye
Winter wheat		Most grasses

From Cattle Today.