



Successfully Inter-seeding Legumes into Existing Cool-Season Pastures

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Cool-season grasses, such as tall fescue, orchard grass and meadow brome grass, are less productive without added nitrogen. Applying the optimum amount of nitrogen fertilizer can be expensive and may not be economically sustainable.

Supplemental fertilizer isn't the only way to provide nitrogen to forage species. Another option includes planting a legume into existing pasture and the legume plant will supply nitrogen to the forage crop. This fact sheet provides research based

guidance on the most effective way to inter-seed legumes into existing pasture which will create a more sustainable grazing system.

Why Inter-seed?

Legumes form a symbiotic relationship with rhizobium bacteria by forming nodules on the roots of the legumes and fixing atmospheric nitrogen into a form usable by the plant. This nitrogen also becomes available to surrounding grasses when legumes are planted in close proximity. Not only



Figure 1. Inter-seeding plots using a no-till drill in Panguitch, Utah, in spring 2016.

do legumes provide nitrogen and increase pasture production, they also increase forage nutritive value. Legumes have higher crude protein and digestibility and lower fiber content than grasses. Completely renovating a pasture by tilling up the existing pasture and planting anew is expensive. The cost of complete pasture renovation not only includes the cost of fuel used in tillage and planting operations, and new seed, but it also includes the lost production of the pasture due to time needed for tillage, replanting, and establishment.

Inter-seeding Basics

Inter-seeding forage legumes into existing pasture is a simple process and can be done by broadcast or drill seeding. However, to ensure successful establishment, legume seeds must be planted between 1/8-1/4 inch deep, have good seed-to-soil contact and must be given a competitive advantage over the existing pasture.

Planting

The best results for inter-seeding legumes are achieved when a no-till drill is used to plant the seed. No-till drills are specifically designed heavy duty and are able to penetrate unplowed ground

including existing pasture. No-till drills also establish good seed to soil contact and place the seed at the proper planting depth. Alternatively, the seed could be broadcasted, but achieving adequate seed to soil contact is an issue with broadcasting. A harrow or tire drag could be used to move the seed to the ground, but the seeding rate should be increased at least by 10% when broadcast seeding.

Grass Suppression

Legume inter-seeding often fails because the existing grasses out-compete legume seedlings. In order to successfully establish legumes in a grass pasture, the legumes need to be given an advantage over the grasses. But any method of reducing grass competition needs to be sub-lethal so the grasses will recover and be productive again.

Mowing is often used to simulate close grazing in small plots, and is often done with a lawn mower. However, this isn't practical for large scale pastures. Other mowers, such as rotary or flail, can be used, but short stubble length is essential for maximum seed germination. Mowing should leave no more than 2 or 3 inches of stubble so sunlight reaches legume seedlings.



Figure 2. A young birdsfoot trefoil plant 3 months after inter-seeding into tall fescue and Kentucky bluegrass pasture



Figure 3. Inter-seeded alfalfa rows planted in summer 2016, picture taken 14 months after planting. Treatments were applied left of flags and producer's pasture right of flags. Cattle grazed pasture spring before planting and fall and spring after planting.

Grazing by livestock can also reduce the grass forage mass, allowing sunlight to reach the legumes. However, once young legumes emerge, livestock should be taken off the pasture to allow legumes to establish.

Using herbicides to suppress grasses is another option. Various studies have used glyphosate, paraquat, and dalapon to reduce grass competition. Glyphosate is used predominantly, due to its availability, low toxicity/residual and familiarity by the general public. Reduced rates of these herbicides should be used so the grass pasture growth is stunted, rather than killed. A quarter of the labeled application rate is a good rule of thumb for grass suppression.

Vertical tillage or disk tillage can also be used to suppress grass competition. As with herbicides, efforts should be made to reduce grass competition, but not kill the grass completely, so an implement with straight shanks is best. Soil disturbance should be no more than 25-30% of the total area.

Legume Species

The most prevalent legume used for inter-seeding pastures is alfalfa, due to its quick establishment and palatability. However, alfalfa can cause bloat in

ruminants. Birdsfoot trefoil and cicer milkvetch do not cause bloat. Birdsfoot trefoil has similar production as alfalfa and tends to like warmer areas, but is often grazed preferentially over most pasture grasses. Cicer milkvetch is very slow to establish, but once it becomes established it is very tolerant to grazing and quite productive. Other forage legumes, such as sainfoin, could also be used to improve pastures using the methods described in this fact sheet.

Seeding rates for these legumes are lower than they would be in a solid stand of each species, but higher than they would be planted in a mixture. Recommended seeding rates for alfalfa are 11 lbs PLS per acre, birdsfoot trefoil 8 lbs PLS per acre and cicer milkvetch 13 lbs PLS per acre, for other legume species consult your local Extension agent.

Season of Planting

Seasonal temperature is important when considering inter-seeding. This is because cool-season grasses are extremely vigorous in the spring, and somewhat vigorous in the fall. Spring and fall are times of heightened grass competition. During the summer, cool-season grasses are the least competitive, while legumes are most vigorous during the summer.

In a Utah State University study, where measurements were taken to determine the frequency of legume presence in a grass plot 1 year after planting, spring legume plantings either failed or were only moderately successful, while fall legume plantings failed and the greatest success was achieved with summer legume plantings (Table 1). This study was conducted in irrigated pastures, so lack of irrigation was not an issue during summer months. If irrigation is limited, spring plantings may be a viable option.

Table 1. Frequency of legume presence 1 year after planting in a USU trial at three Utah locations. Plantings were made in Summer 2013, Fall 2014 and Spring and Summer 2016.

	Alfalfa	Birdsfoot Trefoil	Cicer Milkvetch
	-----%-----		
Spring	21	0	0
Summer	58	57	17
Fall	-	-	-

†Fall planting did not survive, no data was collected

Summary

The most successful legume inter-seeding should take place in early summer once grass has declined in production. For best results of inter-seeding legumes in established pasture, follow these guidelines: allow livestock to graze spring grass growth, there should be very little stubble left after grazing. Following grazing a no-till drill should be used to plant the legume of choice at the proper planting rate. After planting, irrigation should be provided to ensure germination of the legume. Pasture can be grazed immediately after planting until legume seedlings emerge, and then livestock should be removed from the pasture. The pasture can be utilized again in late fall allowing a summer for legume growth. The following spring growth of the pasture should be grazed again to reduce competition from the grasses. If the pasture is not irrigated, a spring planting, or using another legume species such as sainfoin may be the best option. Though, the most important part of inter-seeding is reducing competition from the existing grasses, no matter the season or species planted.

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