

**Forage Production of Five cool season grasses in binary mixtures
with three legumes at three planting ratios**

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High operational costs of livestock production have led to increased interest in using grass-legume mixtures to improve forage value and reduce costs of supplementing pastures with N. Our objective was to determine optimal species combinations of binary grass-legume mixtures to maximize forage production of irrigated pastures in the Intermountain Western United States. Tall fescue (TF) (*Festuca arundinacea* Schreb.), orchardgrass (*Dactylis glomerata* L.) (OG), meadow brome (*Bromus biebersteinii* Roem. & Schult.) (MB), timothy (*Phleum pratense* L.) (TM), and perennial ryegrass (*Lolium perenne* L.) (PRG) were grown in monocultures and mixtures with alfalfa (*Medicago sativa* L.) (ALF), birdsfoot trefoil (*Lotus corniculatus* L.) (BFTF), and cicer milkvetch (*Astragalus cicer* L.) (CMV) in grass-legume mixes at planting ratios of 25:75, 50:50, 75:25 and compared with N fertilized and unfertilized grass monocultures. Plots were harvested four times annually in 2011, 2012 and 2013. Average seasonal forage production of unfertilized TF, OG, MB, TM and PRG monocultures was 8.85, 6.79, 8.03, 5.79 and 5.77 Mg ha⁻¹, respectively. Average yield of grass monocultures fertilized at 62 and 134 kg/ha was 20 and 41 % higher than the unfertilized grass monocultures. The most productive legume to grass ratio was the 50:50 ratio for all grasses and legumes except those with PRG. The most productive PRG-legume ratio was 25:50 with all legumes. Average grass:ALF, grass:BFTF, and grass:CMV forage yields were 76, 55 and 27% higher than their respective unfertilized grass monocultures. The CMV was slow to establish and when the 2012 and 2013 data are compared the grass:CMV yields averaged 54% greater than their respective unfertilized monocultures. Grasses were the most productive in mixes with ALF followed by BFTF, with all legumes providing uniform distribution of forage production by compensating for the cool season grasses during mid-summer. Overall the TF and MB mixtures were the most productive and not different from each other by year three. The PRG and TM monocultures productivity dropped to less than one third of their first season production and the production of these grasses in mixtures can be attributed to the legumes component.