Comparison of compositional changes in multi-species grass/legume mixture experiments across three Nordic countries (Iceland, Sweden and Finland) over two years

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Introduction A multi-site experiment was established at 39 sites across Europe, Australia and Canada within COST Action 852 to: (1) assess the benefits of grass/legume mixtures over monocultures, (2) test the stability of mixtures and (3) evaluate the consistency of the observed patterns over broad environmental gradients. This paper compares the results from 3 Nordic sites using the same plant species: Korpa Experimental Station in Iceland, Lapland Research Station in Finland and Piteå in Sweden to investigate if compositional changes in mixtures are consistent across the sites.

Materials and methods A common experiment is ongoing at each of the 3 sites. See: http://www.cost852.com/ for full details of the experimental design. The experiment comprises 22 plots containing 11 mixtures of 4 species (*Phleum pratense* (G_1, fast growing grass), *Poa pratensis* (G_2, slow growing grass), *Trifolium pratense* (L_1, fast growing legume) and *Trifolium repens* (L_2, slow growing legume)) from 2 plant functional groups, legumes and grasses, sown at 2 densities. The 22 plots were sown with different proportions of the 4 species, varying from domination by one species to equal proportions of all 4. We analysed the average percentage contribution of each of the 4 species to stand biomass for the initial harvest (IH) and the final harvest (FH) for the first 2 years of the experiment for the 3 sites, where available. The analysis for each site fitted all main effects and interactions among the factors mixture, density and species and the main effect of harvest and its 2-factor interactions with the 3 other factors. We summarise the results of the species x harvest interaction here. We also analysed the average percentage of unsown species over the same time period. These data were analysed similarly to exclude the factor species. Because the 3 sites did not begin the experiment at the same time, the available data varied from site to site.

Results and Conclusions The fast growing grass, G_1, (Sweden and Iceland) or the fast growing legume, L_1, (Finland) was the dominant sown species in the initial harvest (Yr 1) (Figure 1). The change between the initial and final harvest for Yr 1 was consistent across the 3 sites: the proportion of G_1 decreased while the proportion of L_1 increased (see Table 1 for significance of tests). This pattern between initial and final harvest changed in Yr 2 for Iceland, as the slow growing species (G_2 and L_2) began to establish and increase their contribution. The proportion of unsown species was higher in the initial harvest than in the final harvest for 2 of the 3 sites in Yr 1. This trend also was observed in Iceland in Yr 2 (Figure 2 / Table 1).

Figure 1 Average percentage contribution of sown species at four harvests for each country

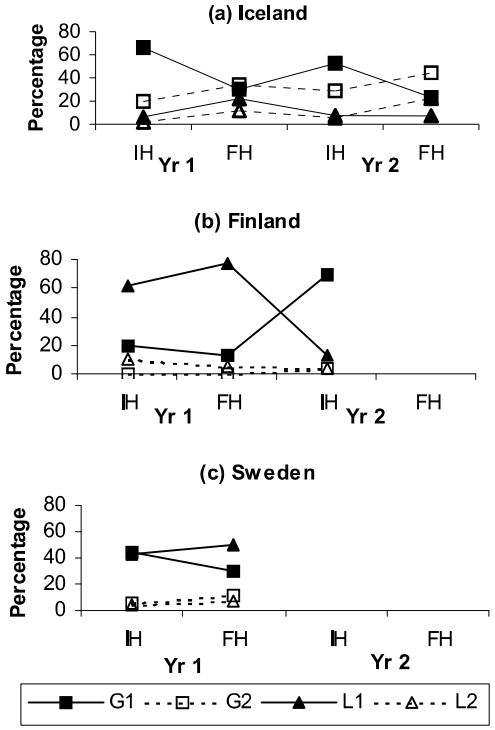

Figure 2 Average percentage of unsown species for four harvests at each country

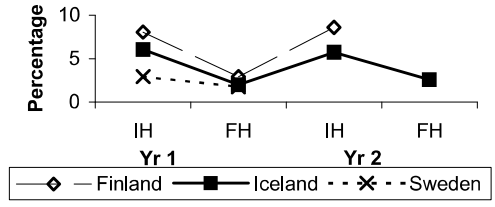

Table 1 Significance of changes in species percentage from initial to final harvest in year 1 and year 2

	Year 1			Year 2		
	G1 ↓	L1 ↑	Unsown ↓	G2 ↑	L2 ↑	Unsown ↓
Iceland	***	***	***	***	***	**
Finland	*	***	**	-	-	-
Sweden	***	**	ns	-	-	-

With significance levels: *** p<0.0001; ** p < .01; * p<0.05; ns=non-significant