

## **Crop Species Diversity Affects Productivity and Weed Suppression in Perennial Polycultures under Two Management Strategies**

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### **ABSTRACT**

Species diversity can increase natural grasslands productivity but the effect of diversity in agricultural systems is not well understood. Our objective was to measure the effects of species composition, species richness, and harvest management on crop and weed biomass in perennial herbaceous polycultures. In 2003, 49 combinations of seven species (legumes, C<sub>3</sub> and C<sub>4</sub> grasses) including all monocultures and selected two to six species polycultures were sown in small plots at two Iowa, USA, locations in a replicated field design. Plots were split in half and managed with either one or three harvests in each of 2004 and 2005. Biomass increased log-linearly with species richness in all location-management environments and the response was not different between managements. Polycultures outyielded monocultures on average by 73%. The most productive species in monoculture for each management best explained the variation in biomass productivity. The biomass of plots containing this species did not increase with richness in most environments but biomass of plots without this species increased log-linearly in all cases. Weed biomass decreased exponentially with richness in all environments. On average, increasing species richness in perennial herbaceous polycultures increased productivity and weed suppression, but well-adapted species produced high biomass yield regardless of richness.