

Developing dual-purpose perennial forage and grain legumes

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Developing new perennial grain crops to increase continuous living cover on agricultural landscapes has been proposed to improve the resilience and sustainability of food systems. Dual-purpose perennial forage and grain legumes, through currently nonexistent in temperate climates, would be uniquely positioned as crop plants that produce alternative protein sources (seeds) for human or animal consumption and forage for livestock without requiring additions of inorganic nitrogen to the cropping system. By producing two harvestable products: grain and forage, farmers could reduce their risk for negative returns from either of the two cropping enterprises. As such, a perennial grain legume breeding program has been initiated at The Land Institute (Salina, KS, USA). While de novo domestication of native perennial legumes common to the Great Plains is plausible, enhancing the seed yield and nutritional characteristics of previously domesticated forage legumes offers numerous advantages. Forage legumes, such as alfalfa and sainfoin, have many desirable characteristics including: existing seed industries with best management practices, existing genomic and germplasm resources, known pests and diseases, and experienced researchers, farmers, and industry personnel dedicated to their improvement as forage legumes. Perennial dual-purpose legumes might be particularly useful by diversifying income streams for farmers in growing regions, like the arid West, where most cereal and grain legumes are unadapted and unproductive and where cattle are an integral part of farming operations. Some specific morphological and ecophysiological characteristics of the perennial forage and grain legume ideotype, and ongoing projects for their genetic improvement in alfalfa and sainfoin, will be discussed.