

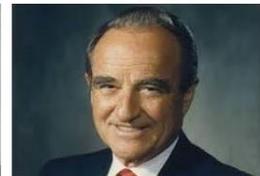


## Agricultural Innovation and Perennial Crops in Central Illinois

In the 20<sup>th</sup> Century, Decatur-based businesses and Central Illinois farmers changed the agricultural landscape with soybeans and the agricultural economy with ethanol. Lessons from this history show why and how local farmers, businesses, and scientists should collaborate for agricultural innovation in the 21<sup>st</sup> Century. These stories about annual crops can illuminate the path to a future in which perennial crops grown for multiple uses enhance the environmental and economic performance of modern agriculture. Central Illinois can once again be at the forefront of transformational change.

**Soybeans** were introduced in the U.S. by pioneering farmers like Charles Meharry who planted 19 acres for hay on his family's Champaign County farm in 1909. Soybean acreage grew slowly until 1921 when A.E. Staley announced plans for a soybean crushing plant in Decatur. With a commercial market, more and more farmers began growing soybeans in rotation with corn. University agronomists developed improved soybean varieties. Staley company researchers developed many food and non-food uses.

When Archer Daniels Midland began producing **ethanol** in Decatur in 1978, farming became a source of bioenergy. This new use for corn affected the agricultural economy but did not significantly change the landscape. By then, nearly all Central Illinois farmland was used to grow corn and soybeans.



*Left: Charles Meharry – Farmer, soybean pioneer*  
*Center: A.E. Staley – Industrialist, soybean pioneer*  
*Right: Dwayne Andreas – Industrialist, bioenergy pioneer*

A technology-driven shift from grain-livestock operations to grain-only farming had begun shortly after World War II. The **Haber-Bosch process** uses enormous amounts of fossil fuel for nitrogen fixation. During the war, this process was used to manufacture munitions. After the war, it was used to make nitrogen fertilizer that could replace manure and achieve increasing yields from new hybrid seeds. Illinois grain was processed to feed animals in distant feedlots. Between 1950 and 1975, pasture and hay declined from almost 20 percent of total farmed acres to less than 5 percent in east-central Illinois.

The **corn—soy system** is highly productive but brings with it serious adverse impacts, notably including soil erosion and nutrient loss. Innovative approaches are also needed for climate mitigation and resilience. As just one example, nitrous oxide emissions can be high where fertilizer is applied to wet soils. Perennial crops can address these issues and can also improve wildlife habitat.

**Perennial plants** live for at least three years, regenerating each spring from their roots, unlike annual plants that grow from seed and then die each year. Trees, shrubs, and most herbaceous plants are perennial, but most agricultural crops are annual. The **Agricultural Watershed Institute** is one of the nonprofit members of the **Green Lands Blue Waters** partnership, which also includes university scientists. AWI shares the GLBW vision and strategy for **continuous living cover** – perennial crops and cover crops – to enhance the environmental and economic performance of Midwestern agriculture.

The conservation benefits of perennial plants are well known. USDA's Conservation Reserve Program provides incentives for perennials for wildlife and soil conservation but usually does not allow harvesting or grazing. **Multifunctional Perennial Cropping Systems** can provide soil, water, wildlife, and climate benefits comparable to CRP acreage yet still produce harvested crops or grazed forage. Water quality plans have traditionally relied on conservation practices to address soil erosion, nutrient loss and chemical runoff from corn and soybean fields. Strategically converting some row crop areas to perennial crops can significantly improve environmental performance of an agricultural landscape.



L: Annual wheat  
R: Kernza

For economic viability, expanded markets are needed for perennial crops. The **Midwest Perennial Forage Working Group** promotes grass-fed beef to increase hay and pasture acreage. Plant breeders at The Land Institute are developing **Kernza™ perennial grain**. Kernza is being grown on a few Illinois farms and will be used by bakers and brewers. **Agroforestry plots** with food-producing trees and shrubs are gaining popularity through the efforts of the nonprofit Savanna Institute. As a GLBW-member nonprofit, AWI actively promotes each of these perennial systems.

AWI's main focus and major accomplishments are related to **perennial biomass crops** such as switchgrass, Miscanthus, and other high-yielding grasses and trees grown for bioenergy, bioproducts, or animal feed. AWI TMDL Implementation Plans for two Upper Sangamon subwatersheds are the first plans approved by Illinois EPA that prescribe perennial crops – in addition to conservation practices – to meet nutrient and sediment reduction targets. AWI is seeking funding and partners for on-farm demonstrations of concepts that combine selected perennial crops with drainage system modifications to increase the water quality benefit of each acre converted from annuals to perennials.

In 2018, AWI helped to launch a multi-state **Perennial Biomass Initiative** associated with GLBW and chaired by Steve John. A long-term goal is to increase perennial crop acreage on Upper Midwest farms by about 15 percent of total farmed acres, i.e. to roughly the same level as in 1950. By involving innovative farmers in testing improved crops and new systems and then applying research findings, improvements in water, soil, wildlife, and climate metrics can be substantially greater than the percentage of land converted to perennial crops.

Our **Theory of Change** to achieve this transformational vision emphasizes synergistic efforts by scientists, farmers, NGOs, industry, entrepreneurs, government, and funders. Broad activities to increase adoption and enhance benefits of perennial and cover crops are (1) R&D on perennial crop improvement; (2) R&D on ecosystem services and policy incentives; and (3) development of new and expanded uses, markets, and enterprises for the products of perennial-based farming systems. An early priority is on-farm R&D to optimize agricultural production plus ecosystem services. Perennial Biomass Initiative scientists and NGOs are partnering with the 21<sup>st</sup> Century counterparts of farmer Charles Meharry and industrialist A.E. Staley. Promising near-term uses and markets for biomass include animal feed, animal bedding, industrial absorbents, and heating.

A paradigm shift is needed to improve the environmental, economic, and social outcomes of agriculture. Multifunctional perennial cropping systems can be a key component. AWI does not suggest this shift will be easy. We do believe it is achievable and that our collaborative approach is well-designed to make this vision a reality.