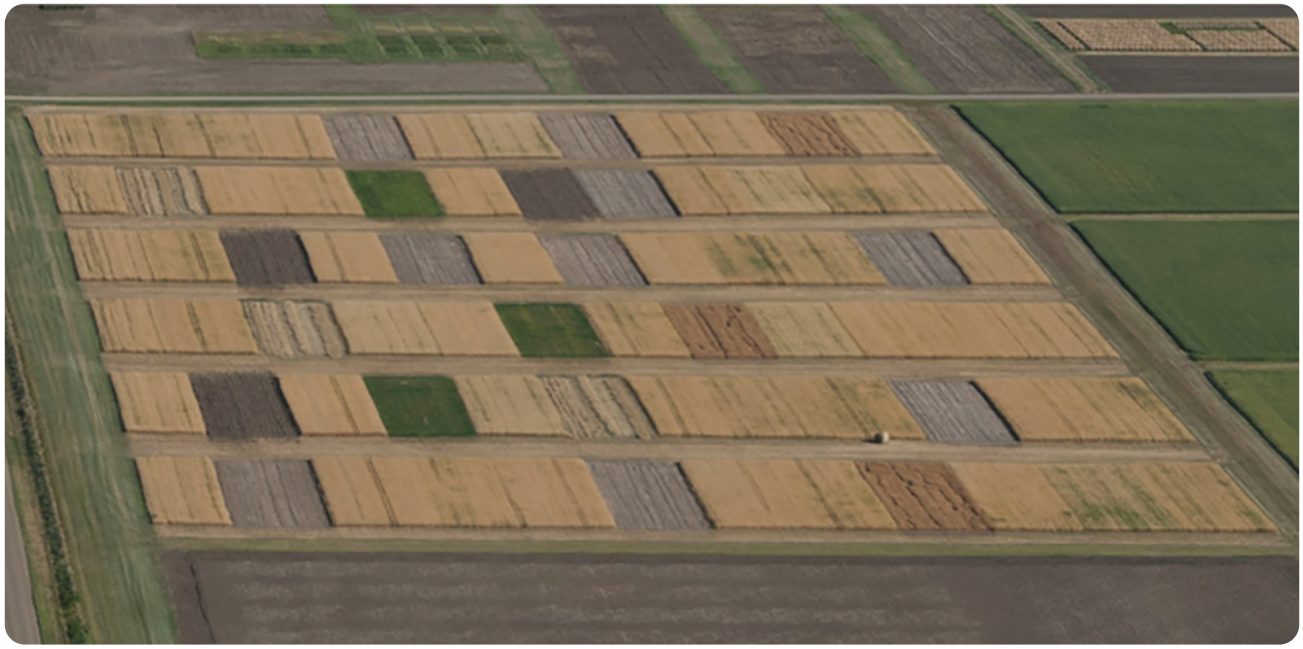
Science Societies

Diversified systems are more productive, stable, and efficient

January 29, 2020



“New Rotation” at Swift Current, SK, Canada, which was initiated in 1987. Photo Credit: Darcy Schott.

Until recent decades, crop production in the semi-arid region of the Northern Great Plains was based predominantly on a spring wheat (*Triticum aestivum* L.)–summer fallow system, which conserves soil moisture and boosts soil nitrogen (N) supply to subsequent crops. However, frequent summer-fallowing results in serious soil degradation and low, inconsistent productivity. Intensifying with cereal monocultures increases productivity, but diversified rotations are potentially more productive, stable, and resilient.

In a soon to be published *Agronomy Journal* article, researchers used a systems approach with 12 years (2004–2015) of data derived from five cropping systems—one cereal monoculture, three fallow-based, and one diversified rotation—in a long-term experiment (>30 years) in Saskatchewan, Canada to compare productivity, yield stability, and resource use efficiency.

The researchers found that grain and protein yields for the diversified system of wheat–canola (*Brassica napus* L.)–wheat–field pea (*Pisum sativum* L.) was 14–38% and 33-66% higher, respectively, than monoculture cereal or summer fallow-based systems. Though summer fallow systems were the most stable, they were the least productive and best suited to low-moisture growing conditions. Replacing summer fallow with green manure enhanced N fertilizer use efficiency and protein yield but did not increase grain yield or yield stability. The diversified system was particularly productive under optimum growing conditions and produced high grain and protein yields across years. The monoculture cereal system had fair stability but was better suited for optimum growing conditions for grain yield.

Here, diversifying the cropping system and including a pulse crop consistently produced high grain and protein yields while reducing N fertilizer requirements and increasing N use efficiency, thereby potentially reducing the negative environmental consequences associated with N fertilizer application.

Dig Deeper

St. Luce, M., Lemke, R., Gan, Y., McConkey, B., May, W., Campbell, C. et al. (2020). Diversifying cropping systems enhances productivity, stability, and nitrogen use efficiency. *Agronomy Journal*, *112*. When published, the article will be viewable at **https://acsess.onlinelibrary.wiley.com/journal/14350645**

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