

# Does including wheat in rotation with corn and soybeans increase net returns?

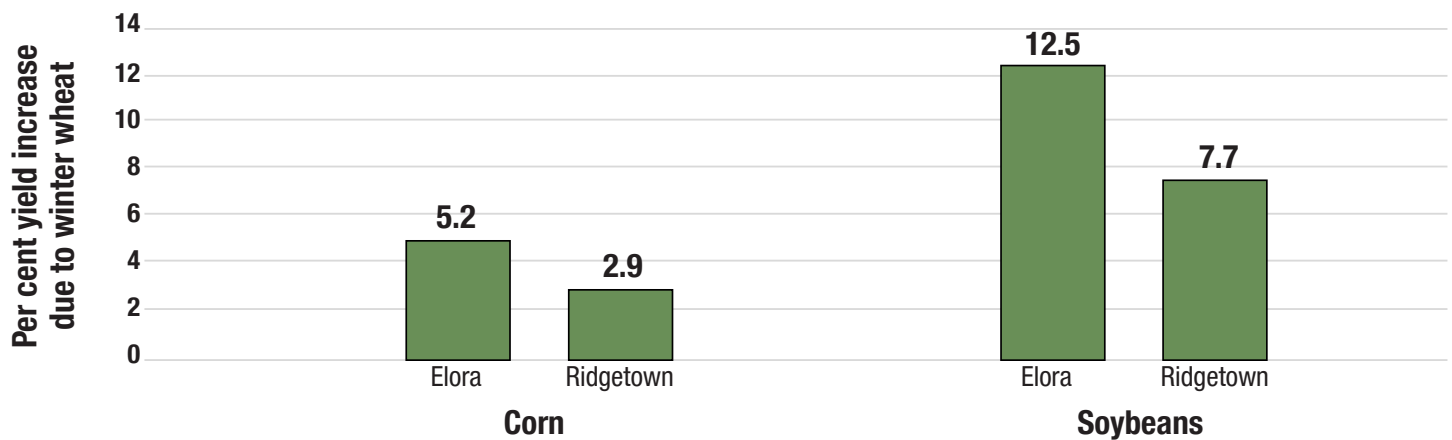
Ontario research has demonstrated that winter wheat in rotation improves corn and soybean yields. But with greater returns on corn and soybean acres, do these yield benefits outweigh revenue reductions from wheat acres? We will answer that question using University of Guelph research to help you make the most profitable crop rotation decisions.

## The simple answer

Rotations including winter wheat provided higher net returns compared to rotations with only corn and soybeans, when straw is sold. Grow winter wheat every 3-4 years in rotation.

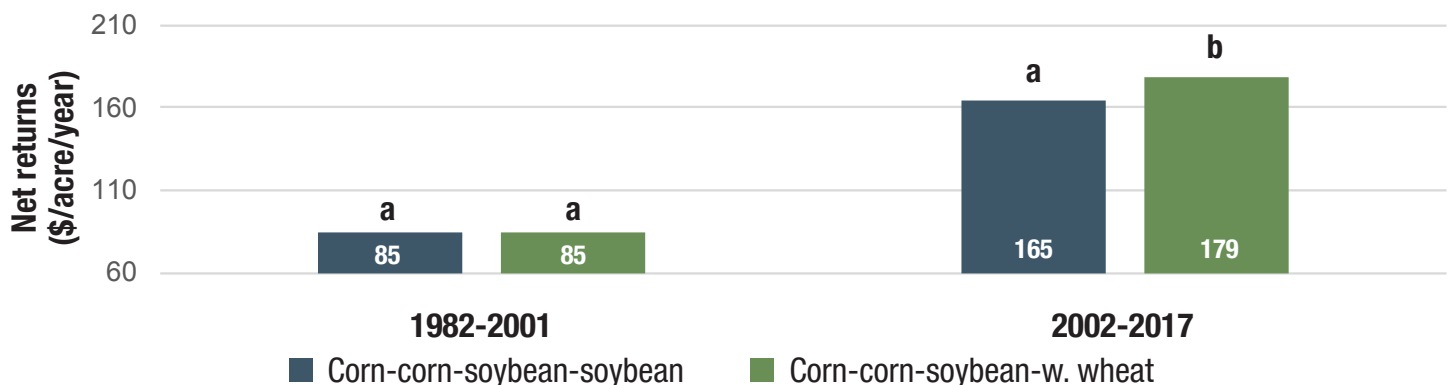
## A little more information

Winter wheat boosts corn and soybean yields. In long-term rotation-tillage system trials, crop yields increased an average of 5.2% and 2.9% for corn, and 12.5% and 7.7% for soybeans at Elora and Ridgeway, respectively (Figure 1).



**Figure 1.** Per cent yield increase in first-year corn and first-year soybeans in a corn-corn-soybean-winter wheat vs. corn-corn-soybean-soybean rotation between 2002-2017 (Elora), and in a corn-soybean-winter wheat vs. corn-soybean rotation between 2012-2017 (Ridgeway). Data averaged across tillage treatments.

Wheat also increased net returns, but not immediately. At the Elora trial – established in 1980 – the benefits of winter wheat in rotation took several years to show up. Growing wheat once in four years did not lower net returns in the first 20 years of the experiment. But after 20 years, wheat provided an economic advantage – \$14 more in annual net returns per acre (Figure 2). Revenue from straw was not included in the analysis, but if baled and sold would have boosted net returns by a further \$20/acre/year for wheat-containing rotations in both eras.



**Figure 2.** Annual net returns for corn-corn-soybean-soybean vs. corn-corn-soybean-winter wheat rotation averaged from 1982-2001 vs. 2002-2017 at the Elora long-term rotation-tillage system trial. Values with the same letter from the same era are not statistically different ( $P < 0.05$ ).

# The full story

## Economic assumptions

University of Guelph researchers conducted a detailed economic study of the long-term rotation-tillage system trials to draw the conclusions (Figure 2). In the study, cost assumptions were taken from the OMAFRA 2017 Field Crop Budgets publication. Crop prices were set at \$4.93/bu for corn, \$12.95/bu for soybeans and \$5.63/bu for wheat.



**Figure 3.** The long-term rotation-tillage system trials at Elora and Ridgetown. Photos: J. Sulik and L. Van Eerd

## Straw revenue plays important role

At the Ridgetown trial location (established in 1995), the corn-soybean rotation had a slight edge over corn-soybean-wheat, with a \$21/ac higher net return (Figure 4). However, when straw revenue was considered, the three-crop rotation provided a slightly higher net return. This advantage was enhanced when an under-seeded red clover (RC) cover crop was grown (Figure 4). This economic advantage to wheat-containing rotations will likely grow over time (as seen at Elora).



**Figure 4.** Average annual net returns across three different crop rotations from 2012-2017 from the long-term rotation-tillage system trial, Ridgetown, with and without straw sale. Assumes straw yield of 4 tonnes/ha (1.8 tons/ac) and cost of associated phosphorus and potassium nutrient removal.

## Bottom line

Including winter wheat in rotation once every three or four years adds value to the entire cropping enterprise. Although the economic advantage of wheat-containing rotations can take time to occur, Ontario farmers are realizing immediate and additional value through practices such as seeding annual forages following wheat harvest, acquiring nitrogen credits with under-seeded red clover and minimizing compaction through summer manure applications.

To view the full research article: Janovicek K, Hooker D, Weersink A, Vyn R, Deen B. Corn and soybean yields and returns are greater in rotations with wheat. *Agronomy Journal*. 2021;113:1691–1711. visit <https://doi.org/10.1002/aj2.20605>