

Canadian Agronomist



DIGGING INTO RESEARCH



Genetically modified crops boost farm income

CATEGORY [weeds](#) | July 11, 2023

Over the period 1996 to 2020, the farm level economic benefits from genetically modified crops increased global farm income by \$261.3 billion US dollars. In Canada, the average farm income increase from growing herbicide tolerant canola was \$23.49/ac (\$58.01/ha).

Genetically modified (GM) soybean, corn, cotton and canola crops have been widely grown for over 25 years. These crops with GM traits were grown on 47% of their combined global acreage, on about 460 million acres (186 million ha) in 2020. This peer reviewed paper examined the impacts of GM soybeans, corn, cotton, and canola on yields, variable costs of production including the cost of the technology, direct farm (gross) income, and impacts on the production base of the main crops where the technology is used. The period covered was 1996 to 2022.

This world-wide, detailed analysis of existing farm-level data for GM crops was mostly based on the findings of peer-reviewed literature on the impact of this technology. This literature took a farm accounting or partial budget approach that looked at the main variable cost of production inputs such as seed cost, crop protection, and weed control, use of labor and fuel/machinery, and considered revenue and gross farm income.

Economic analysis looked at both herbicide tolerant and insect resistant GM crops, and combinations of these traits. All figures are in US dollars.

Herbicide tolerant canola increases farm income

GM canola has been grown in Canada since 1996, in the USA since 1999, and in Australia since 2008. The average income gain was \$23.49/ac (\$58.01/ha) in Canada, \$18.95/ac (\$46.80/ha) in the USA, and \$15.47/ac (\$38.20/ha) in Australia. These gains were due to a combination of yield increase and savings in weed control costs. In 2020, the income gain from using this technology in the three countries combined was \$624 million, and cumulatively since 1996 is estimated at \$8.18 billion.

Billions of dollars in increased global farm income

The adoption of GM crops globally from 1996 to 2020 has resulted in an increase of \$261.3 billion in gross farm income, for an average farm income gain of \$45.34/ac (\$112/ha). In 2020, average farm income gains averaged \$41.70/ac (\$103/ha) totalling \$18.8 billion.

Developing countries have benefited more, with 55% of farm income gains from GM crops occurring in these countries. The cumulative farm income gain in developing countries since 1996 was \$136.6 billion.

These income gains came from an increase in yield and production at 72% of the gains, and 28% from cost savings.

The yield gains of corn, soybean, cotton and canola have also contributed to increased global food, feed and fibre supply, and resulted in the need for less land for agricultural production. Yield gains from GM soybean have resulted in an additional 330 million tonnes of production, and 595 million tonnes of additional corn production from the use of GM corn since the introduction of GM technology in the mid-1990s. The highest yield gains have occurred in developing countries

If conventional crop production systems had been used in 2020, 57.82 million acres (23.4 million ha) of additional land would have been required to produce the extra global production of 85 million tonnes of the 4 main GM crops.

The investment in GM seed, relative to the cost of conventional seed, also provides a large return on investment. In developing countries, for every extra dollar invested in GM seed, the average return was \$5.22. In developed countries, the average return was \$3.00.

The income benefits of the adoption of these GM herbicide tolerant, insect resistant, and drought tolerant crops are broken out in the open access Journal article by country and crop.

The analysis is available on open access in the journal GM crops and food. The author acknowledges that funding towards the researching of this paper was provided by Bayer Crop Science.

Graham Brookes (2022) Farm income and production impacts from the use of genetically modified (GM) crop technology 1996-2020, GM Crops & Food, 13:1, 171-195

OPEN ACCESS: <https://doi.org/10.1080/21645698.2022.2105626>