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A Good Global Investment for Canada

How investing in CGIAR reduces global poverty and benefits Canadian citizens

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This note documents how CGIAR investments have delivered substantial economic, benefits for Canada while reducing global poverty and food insecurity. By driving agricultural innovation and providing evidence-based insights, CGIAR has boosted Canadian farm productivity, expanded export markets, and made food more affordable for Canadian consumers. It has also helped prevent billions of dollars in potential damage from pests and diseases that threaten Canadian farm livelihoods. CGIAR investments are likely to continue benefiting Canadian farmers in the future as the CGIAR continues to provide a large share of genetic materials for plant breeding. These genetic materials will be essential to the discovery and development of new traits that increase yields and benefit Canadian farmers in the future. CGIAR research will continue to support the work of Canadian partner institutions and promote demand for Canadian exports by fostering economic growth in low- and middle- income countries.

CGIAR's work is focused on low- and middle-income countries where food security is particularly at risk and where the benefits of its work are substantial. CGIAR is an international network of 15 agricultural research centers with more than 9,000 scientists across the world working towards a food-secure future for all. By 2020, CGIAR science—especially crops bred for higher yields and resistance to pests and diseases—had been introduced across more than 220 million hectares of agricultural land in Asia, Africa, and Latin America, creating USD 47 billion in annual economic benefits.[1]

CGIAR also directly benefits Canada, and this note documents how CGIAR's work has contributed to the higher yields and protection from pests for Canadian farmers, growth for Canadian exports, and improved affordability of food for Canadian consumers. This is in addition to benefits on safety and environmental benefits.

Farmers

CGIAR seed technologies directly benefit Canadian farmers. CGIAR's global wheat breeding network—the brainchild of agronomist and Nobel laureate Norman Borlaug and founder of the CGIAR center on maize and wheat, CIMMYT —is a good example of how CGIAR technologies benefit Canada. About 65 percent of wheat grown in Canada can be traced back to CGIAR breeding material. The result is wheat varieties that enable Canadian farmers to produce an additional 1.17 million tonnes of wheat per year, generating at least CAD 512 million in increased profitability for Canadian farmers.[2] If we consider CGIAR breeding of other crops such as corn, rice, sorghum, barley, legumes, and fodders, the benefits to Canadian farmers are even larger —far beyond the Canadian Government's CAD 15 million annual support to CGIAR.[3] About 20 percent of total Canadian cropping area is estimated to utilize CGIAR technologies. While it is difficult to calculate the added value of these crops, their widespread adoption is an indication of their appeal to farmers and agricultural businesses in Canada.

Future productivity growth in Canadian agriculture will benefit from Canadian investment in CGIAR. CGIAR is an important provider of crop genetic material to Canada, and these materials are critical to improving future yields and climate resilience on Canadian farms which translates into greater and more sustained farmer profitability. A recent collaboration between Canada and CGIAR, from 2022

[1] Fuglie, K. Echeverria, R. 2024. The economic impact of CGIAR-related crop technologies on agricultural productivity in developing countries, 1961–2020. *World Development*, *176*, 106523.

[2] Throughout the note an exchange rate of 1USD to 1.36 CAD is used to convert model results in USD to CAD.

[3] Average spending over 2022-2024

through 2024, supported the distribution of over 57,518 germplasm samples to 87 countries and the development of over 300 crop varieties developed from CGIAR improved germplasm.[4] CGIAR genebanks, which are funded by multiple donors, give Canada a substantial return for its own support. In the future, CGIAR is likely to remain a major source of foreign crop genetic material for breeding programs in Canadian universities and companies. These genetic materials will be essential to the discovery and development of new productivity-enhancing traits with greater stress tolerance to weather extremes that benefit Canadian farmers.

Exports

CGIAR research has contributed to rising incomes in low- and middle-income countries around the world, which has increased demand for Canadian consumer services and goods. Norman Borlaug was awarded the Nobel Peace Prize and Congressional Gold Medal for his work with CGIAR, which sparked a period of rapid growth in agricultural productivity and crop yields known as the Green Revolution. The Green Revolution is considered the most important period of agricultural innovation in modern history, bringing large and almost immediate increases in rice and wheat yields throughout Asia and Latin America. Recent work carefully documenting the impact of these technologies shows that yields of food crops increased by 44 percent from 1965 to 2010, and that this increased incomes and allowed households to educate their children, have fewer children, and move out of agricultural production into higher-return activities.[5] GDP per capita would have been 17 percent lower in developing countries in 2010 without the investments in agricultural technologies made by CGIAR and others.[6] The overall income gain from these technologies between 1965 and 2010 is estimated at USD 83 trillion, equivalent to one year of GDP in today's world. CGIAR accounts for 9 percent of total agricultural investments and can be credited with 9 percent of this increase.

The impact of this income growth on demand for Canadian exports has been substantial. CGIAR investments have resulted in a CAD 898 million increase in Canadian agricultural exports per year and CAD 2.39 billion in service exports per year driven by increased demand from low- and middle-income countries. Total exports increase by CAD 79 million annually as some of this increase is offset by reductions in manufacturing exports).

Exports to Asia have been a large component of the increase. Annual Canadian agricultural exports to Asian countries have increased by CAD 782 million and service exports have increased by CAD 1 billion in this region with smaller increases across all other LMIC regions. CGIAR has had a strong presence in South- and South-East Asia, where research has focused on issues including agricultural productivity, social safety nets, nutrition and governance. For example, CGIAR centers have introduced over 64 agricultural and food security innovations across Bangladesh since 2000, which benefitted at least 8 million households in 2023/24.[7] Some of this work, such as support for the adop-

[4] Government of Canada. Project profile — CGIAR Institutional Support - 2022 to 2024. Accessed June 27, 2025. https://w05.international.gc.ca/projectbrowser-banqueprojets/project-projet/details/p011186001?wbdisable=true#wb-cont

[5] Gollin, D. Hansen, C. W. Wingender, A. M. 2021. Two blades of grass: The impact of the Green Revolution. *Journal of Political Economy*, *129*(8), 2344-2384.

[6] This assumes that without these investments the green revolution would have happened, but just ten years later. If the green revolution had never happened GDP would be 50 percent lower.

[7] Stevenson, James R. (2025). SPIA Brief Bangladesh Report 2025. Rome: CGIAR Independent Advisory and Evaluation Service (IAES). https://iaes.cgiar.org/spia/publications/spia-brief-bangladesh-report-2025

tion of modern agricultural inputs, the development of food value-chains, and agrifood trade policy, creates demand that can be met by Canadian businesses. From 2000 to 2023, agricultural imports for Bangladesh increased by over 260 percent, as a result of a multitude of factors.[8]

CGIAR's food systems research continues to support economic development and income growth in low- and middle- income countries, ultimately supporting these positive spillovers for Canadian exporters.

Consumers

CGIAR investments make food more affordable for Canadian consumers. CGIAR research has increased global food production which has made healthy and nutritious foods more accessible and less costly in Canada. Estimates suggest that CGIAR investments have reduced the cost of a healthy diet in Canada by 1 percent —an annual saving of CAD49.64 for a family of four and close to a CAD 500 million annual saving for the population as a whole. Lower prices have increased the amount of dairy, fruits and vegetables consumed by Canadian families. One of the ways that CGIAR investments keep food affordable is through its work on monitoring and preventing zoonotic diseases such as Avian Influenza and African Swine Fever. CGIAR vaccine development and disease modelling helps prevent these diseases from causing widespread losses to the meat and poultry industry and thus from increasing prices of meat and eggs. One of the ways that CGIAR investments keep food affordable is through its work on monitoring and preventing zoonotic diseases such as Avian Influenza and African Swine Fever. CGIAR vaccine development and disease modelling helps prevent these diseases from causing widespread losses to the meat and poultry industry and thus from increasing prices of meat and eggs.

Summary

In sum, the benefits to Canada of investment in CGIAR far outweigh the value of Canadian funding to CGIAR since 1971. Canadian funding to CGIAR has averaged about CAD 15 million over recent years and this is far outweighed by the value of benefits to Canada outlined in this report.[9] Some of the benefits are quantifiable: an additional 1.17 million tonnes of wheat production in Canada each year from higher-yielding varieties, an additional CAD 3 billion in Canadian agricultural and service exports each year. Additional benefits include increased availability and affordability of healthy foods for Canadian consumers, reduced migration, better crisis intelligence, and improved environmental outcomes. Canada is a founding member of CGIAR and over its history CGIAR has built strong and mutually beneficial partnerships with Canadian institutions including Foreign Affairs, Trade and Development Canada, Agriculture and Agri-Food Canada, and the Canada-Based International Development Research Centre. This legacy has fostered excellence in research and magnified the impacts the partners have had on agricultural research and international development. Together the benefits make CGIAR a good investment for Canada.

[8] FAOSTAT. 2025. Trade Indices. Accessed on 27, June 2025. https://www.fao.org/faostat/en/#data/TI

[9] Government of Canada. 2025. Project Profile – CGIAR Institutional Support – 2022 to 2024. https://w05.international.gc.ca/projectbrowser-banqueprojets/project-projet/details/P011186001

Box 1: Methods used to estimate the impacts of CGIAR investments on Canada

1.1 Method used to estimate the impact of CGIAR technologies adopted in Canada.

Estimating the benefits of CGIAR-related technologies in a recipient country requires approximate impact estimates at each period of the typical generations of CGIAR-related technologies that were commonly used in the recipient country, with an assumption that later generations of technologies would have greater impacts on total factor productivity.[10] While these parameter estimates are generally only partially available for a specific crop, country, and period (including for wheat in Canada) it is possible to obtain reasonable estimates of these impact figures through the use of available secondary information.

We estimate the average generation of CGIAR-related wheat varieties in Canada using the information on the international flow of germplasm from other countries to Canada, the share of cultivated area where improved ("modern") varieties were planted, and the average generation of these modern varieties in the origin countries sharing germplasm with Canada. Specifically, we estimate the average generation of CGIAR-related varieties registered in Canada at each quinquennial period (1966-70, 1971-75, 1976-80, …) as a function of the weighted average of the generations of modern varieties in origin countries (countries that provide germplasm to Canadian genebanks and breeding programs, including those in Canada itself), the shares of modern varieties adopted in these origin countries, and the total number of germplasm accessions received by Canada from these origin countries. We estimate the average generation of CGIAR-related wheat varieties in Canada at each period (G_t) as

$$G_t = \sum_I G_{i,t-1} \cdot S_{i,t-1} \cdot N_{i,t-1}$$

where $G_{i,t-1}$ is the average generation of CGIAR-related wheat varieties in origin country i providing germplasm to Canada in period $t-1$. $G_{i,t-1} = 1$ if all CGIAR-related wheat varieties in country i in period $t-1$ are from first-generation modern varieties, $G_{i,t-1} = 2$ if all CGIAR-related wheat varieties in country i in period $t-1$ are from second-generation modern varieties, and $G_{i,t-1} = 1.5$ if first-generation and second-generation modern varieties account for an equal share among all CGIAR-related wheat varieties. Also, $G_t = 0$ if Canada received germplasm only from countries (including Canada itself) where no modern varieties were used in $t-1$. $S_{i,t-1}$ is the area share of modern wheat varieties to the total wheat area planted in the origin-country i providing germplasm to Canada in period $t-1$. $N_{i,t-1}$ is the proportion of accessions received by Canada from each origin-country i in $t-1$.

Information on $N_{i,t-1}$ is taken directly from the GENESYS database for all countries, including Canada, for each quinquennial period.[11] Information on $G_{i,t-1}$ and $S_{i,t-1}$ for developing countries is taken directly from the supplementary data for the recent study by Fuglie and Echeverria, while that for Canada and other high-income countries is estimated recursively.[12] For Canada and other high-income countries, $G_{i,t-1}$ is estimated recursively by setting the initial period value $G_{i,1961-65} = 1$ (when most available modern varieties were from first generation varieties) and estimating G_{it} in subsequent quinquennial periods.

[10]The incremental rate of productivity improvement associated with the switch from one generation to the next generation of modern varieties varies depending on the crop and the country or the agroecological environment. Nonetheless, reasonable figures are available for various cases in the literature. In the case of wheat varieties adopted in Canada and other high-income countries, the productivity effects of the switch to one generation newer varieties can be in the order of 10% (personal communication with Keith Fuglie, as well as *Fischer RA, D Byerlee & GO Edmeades. 2014. Crop yields and global food security: will yield increase continue to feed the world? ACIAR Monograph No. 158. Australian Centre for International Agricultural Research: Canberra. xxii + 634 pp.*

[11] GENESYS. 2025. GENESYS passport data. Available at https://www.genesys-pgr.org/. Accessed June 22, 2025.

[12] Fuglie KO & RG Echeverria. 2024. The economic impact of CGIAR-related crop technologies on agricultural productivity in developing countries, 1961–2020. World Development, 176, 106523.

Key assumptions underlying this approach are that (i) the area shares of modern varieties in origin countries are the same as the share of modern varieties among all germplasm received by Canada in a particular quinquennial period, and (ii) the share of CGIAR-related varieties among the total pool of germplasm registered in Canada in each quinquennial period equals the share of wheat area in which CGIAR-related varieties are planted in Canada during that period. While direct evidence supporting these assumptions is relatively scarce, many studies on international germplasm exchanges and their roles in crop improvement in recipient countries provide indicative evidence that is consistent with these assumptions.[13, 14]

1.2 Method used to estimate the impact of CGIAR investments on Canadian exports and prices

The impact of green revolution technologies on agricultural productivity growth as well as the impact of this growth on productivity in other sectors and incomes in developing countries has been carefully estimated in Gollin et al.[15] These estimates are used in this analysis to assess the impact of CGIAR investments on demand for exports from high income countries and on food prices globally.

The Gollin et al. study considers the impact of high-yielding varieties, not just CGIAR varieties.[16] Despite some evidence that the productivity impacts of the more fundamental research undertaken by the CGIAR are higher than those of more country-specific research undertaken at country level, for generating estimates of gains the total impact was apportioned by the share of total agricultural research and development funding that went to the CGIAR. This results in 9 percent of these gains being attributed to CGIAR research.

IFPRI's global economic model, MIRAGRODEP, was used to estimate the impact of increased income in low- and middle-income countries from CGIAR research on the demand for exports and imports in all countries, including Canada. The impact on prices is also estimated by this model. The advantage of using this model is its ability to assess the implications for trade between countries. MIRAGRODEP is a global Computable General Equilibrium (CGE) model based on MIRAGE.[17] The model was developed and improved with the support of the African Growth and Development Policy Modeling Consortium (AGRODEP). It is a multi-region, multi-sector, recursively dynamic CGE model. The model allows for a detailed and consistent representation of the economic and trade relations between countries. A more detailed description of the model can be found in Laborde, Robichaud & Tokgoz, 2013.[18]

[13] Evenson R & D Gollin. 1997. Genetic Resources, International Organizations, and Improvement in Rice Varieties. Economic Development and Cultural Change 45(3): 471–500.

[14] Evenson R & D Gollin. 2003. Crop Variety Improvement and Its Effect on Productivity: The Impact of International Agricultural Research. Wallingford, UK: CABI.

[15] Gollin, D. Hansen, C. W. Wingender, A. M. 2021. Two blades of grass: The impact of the Green Revolution. Journal of Political Economy, 129(8), 2344-2384.

[16] Gollin, D. Hansen, C. W. Wingender, A. M. 2021. Two blades of grass: The impact of the Green Revolution. Journal of Political Economy, 129(8), 2344-2384.

[17] Decreux, Y. & Valin, H. (2007). MIRAGE, updated version of the model for trade policy analysis: Focus on agriculture and dynamics, Working Papers 2007-15, CEPII, Paris http://cepii.fr/PDF_PUB/wp/2007/wp2007-15.pdf

[18] Bouët, A., Laborde, D., Robichaud, V., Traoré, F. and Tokgoz, S. (2022), MIRAGRODEP 2.0: Documentation, AGRODEP Technical Note 0026, IFPRI, Washington DC.

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