



A Good Global Investment for the United Kingdom

How investing in CGIAR reduces global poverty and benefits U.K. citizens

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CGIAR investments have delivered substantial economic benefits for the U.K. while reducing global poverty and food insecurity. CGIAR has boosted productivity on British farms, expanded export markets, and made food more affordable for British consumers. It has also helped prevent potential damage from pests and diseases that threaten U.K. farm livelihoods. CGIAR investments are likely to continue benefiting U.K. farmers in the future as the CGIAR's provision of genetic material to the U.K. has increased over time. This paper quantifies the benefits to farmers, exporters and consumers.

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. CGIAR's work is focused on lower-income countries where food security is particularly at risk and where the benefits of its work are substantial. By 2020, CGIAR science—especially crops bred for higher yields and resistance to pests and diseases—had been introduced across more than 544 million acres of agricultural land in Asia, Africa, and Latin America, creating \$47 billion in direct annual economic benefits¹ and even greater indirect effects.²

CGIAR also directly benefits the United Kingdom, and this note documents how CGIAR's work has contributed to higher yields and protection from pests for U.K. farmers, growth in U.K. exports, and improved affordability of food for British consumers. This is in addition to environmental and other benefits that were documented in IFPRI (2022).³

Farmers

CGIAR crop technologies—seeds and traits—directly benefit U.K. farmers. CGIAR's global wheat breeding network was the brainchild of American agronomist and Nobel laureate Norman Borlaug that led to the creation of the International Maize and Wheat Improvement Center (CIMMYT) in 1966. Approximately 65 percent of wheat grown in the U.K. can be traced back to CGIAR breeding material containing important genetic characteristics such as dwarfing that significantly reduces plant height, leading to improved lodging resistance and increased yield; and resistance to wheat rusts⁴ and other pest and disease threats. The result is wheat varieties that enable U.K. farmers to produce an additional 793,600 tons of wheat per year, generating at least GBP193 million in increased profitability annually since 1971, with additional benefits accruing from the prevention of losses to pests and diseases. Over a period of five decades, these gains have translated into substantial cumulative benefits for U.K. farmers (see Box 1 for the methodology used to calculate these impacts⁵). If we also consider CGIAR breeding of other crops such as corn, rice, sorghum, barley, legumes, and fodders, the benefits to U.K. farmers are even larger in absolute dollar terms—far beyond the U.K. Government's annual support to CGIAR.

Future productivity growth in U.K. agriculture will benefit from investment in CGIAR. The available evidence points to CGIAR being a continuously important source of breeding material to the U.K.,

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 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.

³ International Food Policy Research Institute (IFPRI). 2022. How the United Kingdom benefits from investments in CGIAR research. Washington, DC: International Food Policy Research Institute (IFPRI). <https://doi.org/10.2499/p15738coll2.136348>.

⁴ Lewis, C.M., Persoons, A., Bebbler, D.P., Kigathi, R.N., Maintz, J., Findlay, K., Bueno-Sancho, V., Corredor-Moreno, P., Harrington, S.A., Kangara, N., Berlin, A. 2018. Potential for re-emergence of wheat stem rust in the United Kingdom. *Communications Biology*, 1(1), 13.

⁵ Throughout, benefits are calculated in USD and converted in GBP using the GBP-USD exchange rate in April 2025.

providing genetics that are critical inputs to U.K. crop improvement programs that are dedicated to increasing future yields and output on U.K. farms. On average 40 percent of wheat germplasm coming into the U.K. originates from countries where CGIAR-derived varieties are prevalent, demonstrating the close link between U.K. breeding and CGIAR's influence in global wheat improvement. During the most recent 5-year period this figure was as high as 70 percent.⁶

Varieties that contain CGIAR genetic material have been continuously and increasingly used as parent varieties in wheat breeding programs in the U.K. for several decades. More than half (57 percent) of all new accessions registered in U.K. wheat genebanks during the last decade contained CGIAR genetic material in their pedigree. During the 1970s and 1980s, the same figure was just 20 percent (see

Table 1 and Figure 1). Even despite the declining number of wheat accessions added to U.K. genebanks during the last few decades, the number of accessions containing CGIAR pedigrees has remained relatively stable and increased again in the 2010s. Cumulatively, at least 21 percent of U.K. wheat accessions with known pedigrees have contained CGIAR material since the 1960s. These data suggest that CGIAR is likely to remain an important source of genetic material for U.K.'s wheat improvement programs and the research centers, universities, and companies that invest in the discovery, development, and delivery of more productive, resilient, and profitable wheat varieties for U.K. farmers.

Table 1. Number of wheat accessions of known pedigrees registered between 1960s and 2010s in U.K. genebanks, by decade and type

Period	New wheat accessions with CGIAR pedigrees ^a	Total new wheat accessions with known pedigrees ^{b, c}	Share (%) of new accessions with CGIAR pedigrees
1960s	13	177	7
1970s	213	1,009	21
1980s	277	1,421	19
1990s	59	279	21
2000s	18	46	39
2010s	129	225	57
Total (1960s-2010s)	709	3,401	21

Source: Data compiled from [GENESYS](#), the [SeedStor public database](#) maintained by the Germplasm Resource Unit of the John Innes Center, and [Wheat:Gateway data](#). Seed Box 2 for details on the method used to generate these figures. Disclaimer: GENESYS, SeedStor public database and wheat:gateway data are constantly updated, and therefore the information may change frequently. The information here is based on the data as of May 13, 2025.

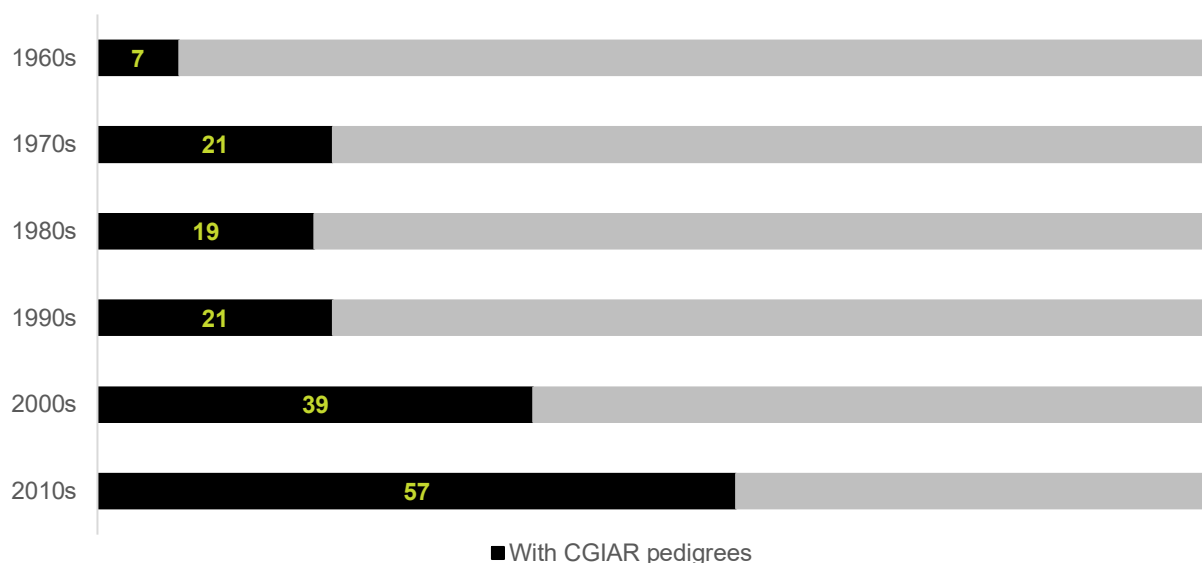
^a Refers to accessions for which at least one of the ancestors is CIMMYT-bred varieties.

^b This excludes about 5,000 accessions (mostly consisting of land races in each of the origin countries) that are not associated with specific pedigree information, and typically have not been used in subsequent wheat breeding in the UK.

^c The figures in the 2010s also include a new addition in 2019 of 15 CIMMYT accessions selected from the CIMMYT Wheat Resistance gene enrichment sequencing (RenSeq) program.

⁶ Data compiled from GENESYS (<https://www.genesys-pgr.org/>), an online platform for information on plant genetic resources for food and agriculture (PGRFA) conserved in genebanks worldwide.

Figure 1. Share (%) of new wheat accessions in the UK with known pedigrees that contain CGIAR pedigrees, by decade and type



Source: Data compiled from [GENESYS](#), the [SeedStor public database](#) maintained by the Germplasm Resource Unit of the John Innes Center, and [Wheat:Gateway data](#).

Benefits for a wide range of other crops have been similarly observed in the past and are expected to be realized in the future. Additionally, CGIAR has collaborated closely with the U.K. on developing a range of tools and technologies that benefit the U.K. wheat improvement agenda, in addition to the genetically diverse elite germplasm novel trait sources described above and used by U.K. research centers, universities, and companies. Examples include rapid genotyping tools for wheat rust detection,⁷ field-based phenomics protocols, cutting-edge field phenotyping infrastructure that enables U.K. scientists to conduct research in the winter in Mexico, for yield potential and climate resilience, and unique research panels dedicated to a range of U.K.-led wheat improvement objectives.⁸

Exports

CGIAR research has contributed to rising incomes in low- and middle-income countries around the world, which has increased demand for British consumer 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, crop yields, and food security 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,

⁷ Savva, L., Bryan, A., Vinopal, D., Gonzalez-Navarro, O.E., Kosgey, Z., Ndung'u, K.C., Horo, J.T., Danu, K.G., Molla, M., Alemayehu, Y., Hodson, D.P. 2025. A portable, nanopore-based genotyping platform for near real-time detection of *Puccinia graminis* f. sp. *tritici* lineages and fungicide sensitivity. *BMC Genomics*, 26(1), 327.

⁸ S. Hearne, CIMMYT, pers. comm, April 6, 2025. A complete list of publications highlighting technologies shared with the U.K. from CIMMYT's Global Wheat Program Wheat is available upon request.

allowed households to educate their children, have fewer children, and move out of agricultural production into higher-return activities.⁹ 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.¹⁰ The overall income gain from these technologies between 1965 and 2010 is estimated at \$83 trillion, equivalent to almost 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 British exports has been substantial. Estimates indicate that CGIAR investments result in an additional GBP2.6 billion in annual exports for the U.K. These include British industrial equipment and consumer goods, as well as U.K. expertise in financial and technical services. Box 1 details how the impact on British exports was estimated.

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 U.K. exporters. There is significant potential for future growth in exports to Africa, where much of CGIAR research is focused and where the population is expected to double by 2070.¹¹ For example, from 1999 through 2019, agricultural imports to African countries from outside the region have grown by 7.4 percent annually.¹² Africa is expected to lead the world in poultry imports over the coming years, reaching 2.5 million metric tons annually by 2031.¹³ As incomes rise and the population grows faster than in any other region, imports of a wide range of consumer goods will likely increase, presenting opportunities for U.K. businesses.

Consumers

CGIAR investments make food more affordable for British consumers. CGIAR research has increased global food production which has made healthy and nutritious foods more accessible and less costly in the U.K. Estimates suggest that CGIAR investments have reduced the cost of a healthy diet in the U.K. by 1.2 percent—an annual saving of GBP 46 per family of four—and increased the amount of dairy, fruits and vegetables consumed by British families. This was estimated using the same method as the impacts of CGIAR's work on exports (Box 1). Another way 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.

⁹ 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.

¹⁰ 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.

¹¹ Van Teutem, Simon. 2024. The UN projects that Africa's population will double by 2070. Data from UN World Population Prospects 2024. Our World In Data. <https://ourworldindata.org/data-insights/the-un-projects-that-africas-population-will-double-by-2070>

¹² Farris, Jarrad. Morgan, Stephen. Johnson, Michael. 2023, February 6. Market opportunities expanding for agricultural trade and investment in Africa. Amber Waves. USDA-ERS website.

¹³ Farris, Jarrad. Morgan, Stephen. Johnson, Michael. 2023, February 6. Market opportunities expanding for agricultural trade and investment in Africa. Amber Waves. USDA-ERS website.

Summary

In sum, the benefits to U.K. of investment in CGIAR far outweigh the value of funding to CGIAR since 1971. U.K. annual funding to CGIAR has averaged about GBP 30 million over recent years and this is far outweighed by the value of benefits to the U.K. outlined in this report.¹⁴ Some of the benefits are quantifiable: an additional 793,600 million tons of wheat production in the U.K. each year from higher-yielding varieties, averted wheat stem rust losses, an additional GBP 2.6 billion in U.K. exports each year. Additional benefits include increased availability and affordability of healthy foods for U.K. consumers, reduced migration, better crisis intelligence, improved environmental outcomes, and strengthened U.K. networks across the developing world. Together the benefits make CGIAR a good investment for the U.K.

Box 1: Methods used to estimate the impacts of CGIAR investments on the U.K.

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

Estimating the benefits of CGIAR-related technologies in a recipient country requires, among others, approximate figures 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 having greater impacts on total factor productivity.¹⁵ While these parameter estimates are generally only partially available for a specific crop, country, and period (including for wheat in the U.K.) it is possible to obtain reasonable estimates for these figures through the use of available secondary information. This section provides a brief description of our estimation method and its validity.

We estimate the average generation of CGIAR-related wheat varieties in the U.K. using the information on the international flow of germplasm from other countries to the U.K., the area share of improved (“modern”) varieties, and the average generation of these modern varieties in the origin countries sharing germplasm with the U.K. Specifically, we estimate the average generation of CGIAR-related varieties registered in the U.K. 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 U.K. genebanks and breeding programs, including those in the U.K. itself), the shares of modern varieties adopted in these origin countries, and the total number of germplasm accessions received by the U.K. from these origin countries. We estimate the average generation of CGIAR-related wheat varieties in the U.K. 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 U.K. 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 the

¹⁴ [CGIAR Trust Fund Contributions - CGIAR](#)

¹⁵The 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 the U.K. 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 et al., (2014)).

U.K. received germplasm only from countries (including the U.K. 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 the U.K. in period $t - 1$. $N_{i,t-1}$ is the number of accessions received from each origin-country i in $t - 1$.

Information on $N_{i,t-1}$ is taken directly from the GENESYS database (GENESYS 2025) for all countries, including the U.K., for each quinquennial period. 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 (2024), while that for the U.K. and other high-income countries is estimated recursively. For the U.K. 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.

Based on this approach, it is estimated that the average technology generation of CGIAR-related varieties in the U.K. has increased gradually from 1 in the earlier decades to about 1.3 in the 2010s and later.

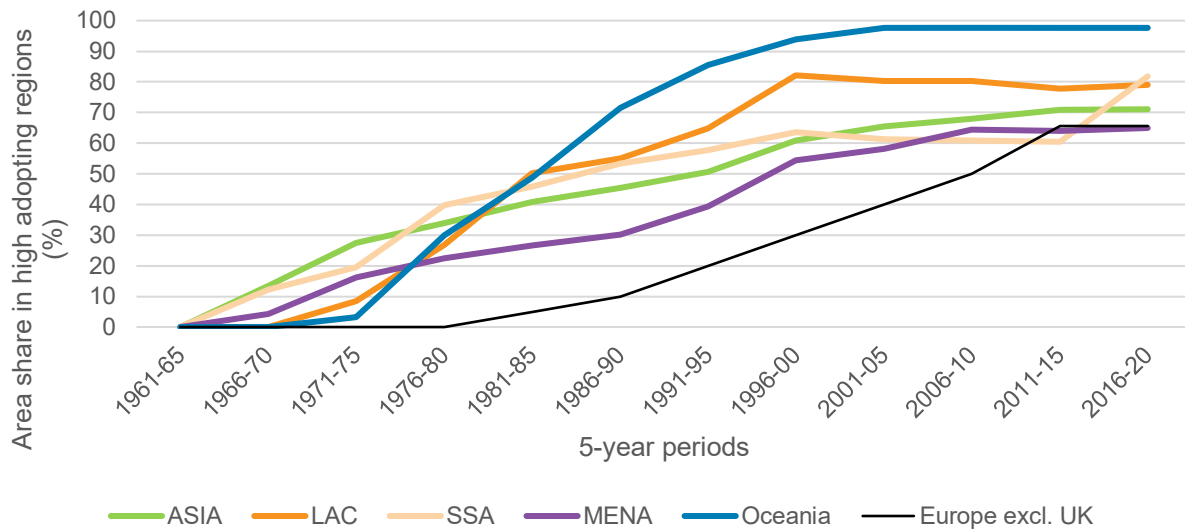
Key assumptions underlying this approach are that (i) the area shares of modern varieties in origin countries are the same as the share of modern varieties among all germplasm received by the U.K. in a particular quinquennial period, and (ii) the share of CGIAR-related varieties among the total pool of germplasm registered in the U.K. in each quinquennial period equals the share of wheat area in which CGIAR-related varieties are planted in the U.K. 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 (e.g., Evenson & Gollin, 1997, 2003). In addition, when applying the aforementioned methods to simulate area share of CGIAR-related varieties in the U.K. and other high-income countries (available upon request), those simulated figures are in similar orders of magnitude as the true area shares reported in other studies (Dalrymple, 1980; Byerlee & Moya, 1993; Pardey et al., 1996; Lantican et al., 2016).

Historically, the UK has received comparable or higher shares of wheat germplasm from regions that have had higher adoption rates of CGIAR-related wheat varieties. According to Fuglie & Echeverria (2024), Asia, Africa South of the Sahara (SSA), Middle East & North America (MENA), Latin America and the Caribbean (LAC) and Oceania regions have generally had higher adoption rates of CGIAR-related wheat varieties since the late 1960s (Figure B2). Based on the [GENESYS data](#) that records the historical flows of wheat germplasm between countries, the shares of newly registered wheat accessions in the U.K. originating from these high-adopting regions have, on average, accounted for approximately 40 percent (albeit with fluctuation between 0 percent and 70 percent depending on the period) of all newly registered wheat accessions since the 1960s (

Figure B3). This figure is generally comparable to the rest of Europe, which has averaged about 20 percent during the same period (

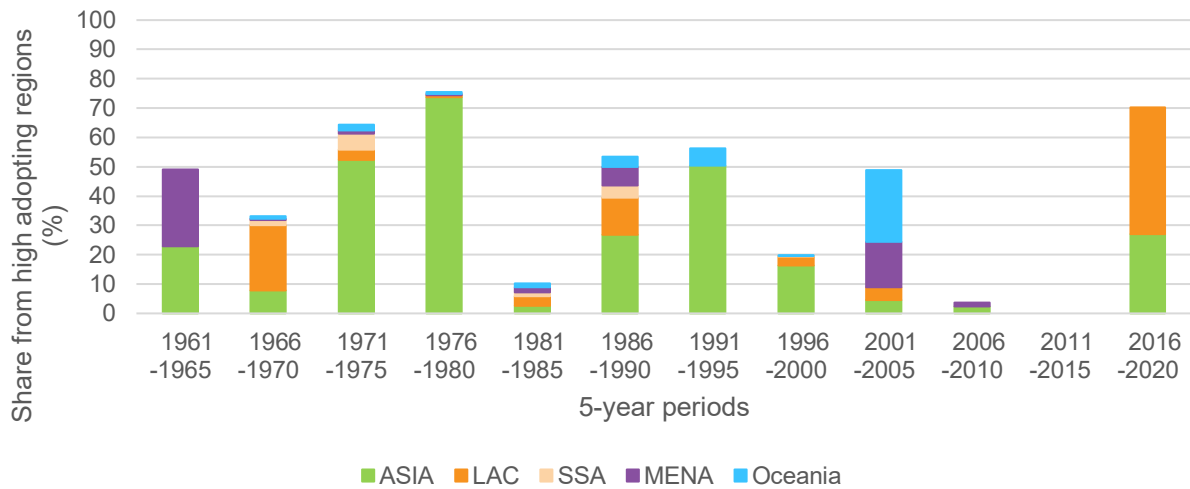
Figure B4). It is therefore reasonable to assume that CGIAR-related wheat varieties have been adopted in the U.K. at the least at the same rate as in the rest of Europe, and that this assumption is likely a conservative one.

Figure B2. Historical area shares of CGIAR-related wheat varieties in high-adopting regions by 5-year periods



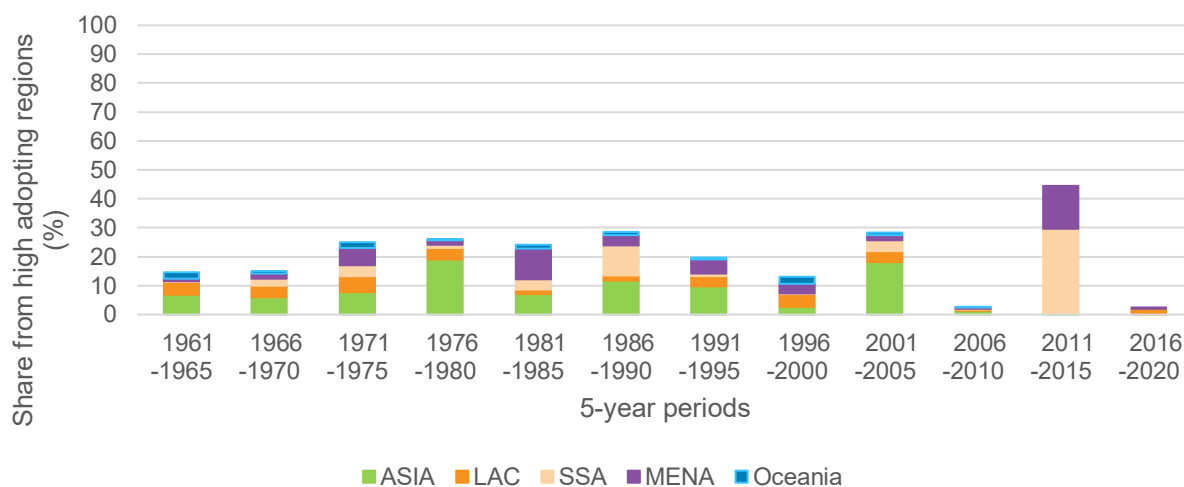
Source: Authors' compilations based on background materials for Fuglie & Echeverria (2024).

Figure B3. Historical shares of wheat accessions newly registered in the UK gene banks, originating from each of high-adopting regions, by 5-year periods (%)



Source: Authors' compilations based on GENESYS data.

Figure B4. Historical shares of wheat accessions newly registered in European gene banks (excluding UK), originating from each of high-adopting regions, by 5-year periods (%)



Source: Authors' compilations based on GENESYS data.

1.2 Method used to estimate the impact of CGIAR investments on U.K. 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. (2021). 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. (2021) study considers the impact of high-yielding varieties, not just CGIAR varieties. 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 the United Kingdom. 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 (Decreux & Valin, 2007). 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 Bouët et al. (2022).

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Box 2: Method for estimating the number of wheat accessions registered in the UK gene bank having at least one CGIAR-related germplasm in their pedigrees

Using the pedigree information of each wheat accession registered in U.K. genebanks, we assessed how genetic materials originating from CGIAR-related varieties have entered into U.K. wheat varieties over time. We conducted this exercise using three primary sources of data, namely data from [GENESYS](#), the [SeedStor public database](#) managed by the Germplasm Resource Unit at the John Innes Center in the U.K., and the [wheat:gateway data](#).¹⁶ Using the information from these sources, we proceed as follows.

- **Step 1:** Wheat accessions registered in U.K. genebanks that have been directly bred or donated by CIMMYT were identified from the SeedStor public database and wheat:gateway data. These include popularly known varieties from the 1960s, like Yaqui-50, Sonora-64, Ciano-67, INIA-66, and Lerma Rojo-64, among others.
- **Step 2:** For 3,401 wheat accessions that have entered into U.K. genebank lists since the 1960s, parent varieties were identified based on the SeedStor public data and wheat:gateway data.¹⁷
- **Step 3:** Using the pedigree information from Step 2, accessions that contain CIMMYT-bred varieties from Step 1, either as parents or more distant ancestors, were further identified.
- **Step 4:** The Step 3 process was continued recursively. First, accessions that used CIMMYT-bred varieties as immediate parents were identified. Second, later accessions that used these CIMMYT-offspring varieties as parents were further identified. These steps were repeated for all the subsequent accessions registered (up to 2019, which is the latest year for which information is available for wheat in the UK genebanks).

¹⁶ The [wheat:gateway data](#) brings together publicly available data for over 535,733 wheat lines with over 23,588 collection site locations from many wheat germplasm collections, including the European Wheat Database, the [Vavilov Institute \(Russia\)](#), the [Australian winter cereals collection](#), [USDA/GRIN \(USA\)](#), [CIMMYT](#), [ICARDA](#) and the [Nordic Gene Centre](#) with additional collection site information from FIGS plus pedigree, synonym and genetic data from [GRIS](#) and gene symbol and class information from the [Catalogue of Gene Symbols](#) (source: description on wheat:gateway data website (<https://www.wheat-gateway.org.uk/>)).

¹⁷ There are approximately 5,000 other accessions that were entered into the UK gene bank registration during the 1980s or earlier period (recorded in the SeedStor public database), which lack associated pedigree information. The majority of these 5,000 accessions are landraces in origin countries from which these varieties were shared with the UK. Most of them have not been used in wheat breeding in the UK since the 1990s and thus have accounted for only a minor share of genetic pools in recent periods compared to varieties with CGIAR genes. These 5,000 accessions were therefore excluded from our analysis.

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