Building a sustainable food future since 1967
From CIAT to the world

CIAT’s genebank conserves and shares the world’s largest collections of beans, cassava, and tropical forages – more than 67,700 crop accessions in all.

Since its inception, CIAT has distributed more than half a million samples from 141 countries to requesters in more than 160 countries.
When CIAT was created in 1967, the majority of poor and hungry people in the tropics were smallholder farmers. Increasing the productivity of their crops was, therefore, the critical entry point for CIAT’s research. Since that time, we have been concerned with nearly every aspect of tropical agriculture: the crop varieties that farmers grow, the production systems they manage, the agricultural landscapes they inhabit, the markets in which they participate, and the policies that influence their options and decisions.

On the occasion of our 50th Anniversary, we are happy and proud to share a selection of “50 wins” in the fight against hunger, malnutrition and poverty, and towards a sustainable food future.
Pro-vitamin A-rich cassava, developed by CIAT and the International Institute of Tropical Agriculture (IITA) as a contribution to the World Food Prize-winning HarvestPlus initiative, is helping tackle vitamin A deficiency, especially among women and children in Nigeria, Uganda, and the Democratic Republic of the Congo. Vitamin A deficiency can cause vision loss and blindness, and impair the immune system.

CIAT provides cassava, bean, and forage materials stored in its genebank free of charge for research and breeding purposes, now under the terms of the International Treaty on Plant Genetic Resources for Food and Agriculture, which it signed in 2006. Over the years, CIAT has distributed:

- 37,390 varieties (441,225 samples) of beans to 105 countries since 1973
- 6,492 varieties (43,458 samples) of cassava to 84 countries since 1979
- 13,692 varieties (90,624 samples) of tropical forages to 110 countries since 1980

CIAT’s collaboration with the Rwanda Agriculture Board (RAB) and HarvestPlus resulted in the release of 10 iron-biofortified bean varieties in 2012. Large efforts have been undertaken to make those varieties available to bean farmers in Rwanda. Our estimates indicate that by 2015 around 350,000 households were growing biofortified bean varieties, and nearly 1.75 million people were able to consume them. These high-iron beans have been shown to reverse iron deficiency and anemia in young women in just four-and-a-half months.

The ICTA Petén bean variety, which contains 50% more iron than the conventional varieties, was released in Guatemala in 2010 as part of the first group of biofortified crops in the world. ICTA Petén is still consumed in the country, which has one of the highest rates of chronic malnutrition. Globally, 144 biofortified varieties of beans, maize, cassava, and sweet potato have been released in 27 countries through HarvestPlus.
CIAT and partners have developed “quick-cook” beans (as well as precooked bean snacks) to reduce the amount of time and energy households, typically women, spend preparing nutritious meals, freeing up time for other (productive) activities.

CIAT provided technical assistance and forage grass hybrids for farmers enrolled in Rwanda’s One Cow per Poor Family initiative launched in 2006, which intends to reach 350,000 farmers by 2017. Besides improving meat and milk production, the grasses are also climate friendly: they prevent soil erosion, store carbon in their deep root structure, and inhibit the release of nitrous oxide, a potent greenhouse gas, from the soil.

In late 2015, CIAT deployed, through the Pan-Africa Bean Research Alliance (PABRA), new drought-tolerant white beans to Ethiopia, where erratic weather was threatening bean production and the related industry. These drought-tolerant varieties outperform other commercial varieties by 10 percent. Most commonly used in the production of baked beans, the country’s export market for white beans is worth over US$100 million a year, providing incomes for around 3 million smallholder farmers.

Climbing beans – the type that climbs up stakes like a vine, and is up to three times more productive than bush beans – provide a solution to intensify production in places where farm size is small, like Rwanda and eastern DR Congo. A 2001 adoption study of bean varieties released in 1998 suggested that Rwanda and the eastern areas of the DR Congo had 16 and 48%, respectively, of their bean area planted to climbing bean varieties. The study also found that in Rwanda 34% of households were planting improved bean varieties (equally divided between climbing and bush beans). Yield for improved varieties averaged 782 kg/ha compared to 688 for local varieties. In the last decade, Rwanda has transitioned from a net importer to an exporter of beans, with exports valued at US$12–20 million.
CIAT’s work on cassava genetic improvement started in Southeast Asia in 1983. By 1998, 57% of Thailand’s cassava fields were already planted to CIAT-improved varieties, and the combined adoption rate in Thailand, Vietnam, China, Indonesia, and Philippines was 23.4%. By 2014, that rate had increased to 66.6%, with a total of 2.33 million hectares of cassava planted to CIAT varieties in the 5 countries.

The adoption of CIAT-improved beans in Rwanda, thanks to their high-yielding traits (between 43 and 82% higher yield compared to local varieties), translated into 90,000 people being lifted out of poverty in 2001, and reduced food insecurity in the country from 29.3 to 13.4%, which means there were 182,400 food-insecure people less that year.

The cassava variety KU50, released in 1992 in Thailand and in 1995 in Vietnam, has been the most successful variety ever in Asia. It is estimated that 1.3 million hectares of KU50 are planted in Thailand using genetic material facilitated by the CIAT genebank, and that related economic benefits in Thailand and Vietnam reached US$393.5 million between 1992 and 2010.

Although KU50 was expected to still be the dominant cassava variety in Vietnam, a recent adoption study using DNA fingerprinting demonstrated that KM140, another variety developed with CIAT material and released in 2013, is now the most planted variety, covering more than 210,000 hectares (38.7% of the total cassava area). KM140 offers superior starch content, early maturity, and wider adaptability, which helps farmers supply the growing cassava processing industry in Vietnam.
Long-standing collaborative research on tropical forages in Colombia has resulted in the introduction and promotion of *Brachiaria* grasses and their evaluation to identify best management practices. Our estimates show that, in 2016, there were 3.05 million hectares sown to *Brachiaria* in tropical Colombia, almost 35% of the total forage area.

CIAT has also played an instrumental role in introducing *Brachiaria* grasses into other Latin American countries, selecting the cultivars best adapted to specific country conditions, and identifying best agronomic practices. It has been estimated that in Peru, Costa Rica, Honduras, and Nicaragua there are at least 620,000 hectares of pastures planted to *Brachiaria* bred or selected by CIAT.

Currently around 63.5% of the 1.33 million hectares of rice cultivated in the Andean and Central American regions are planted with genetic material from CIAT. Returns to CIAT investments in rice improvement in the last 15 years have been calculated at US$314.4 million.

CIAT’s rice research in Colombia and its collaboration with the Colombian Agricultural Institute (ICA, its Spanish acronym) started in 1970 and quickly produced significant impacts. After only 5 years, 27% of the total rice area was already under new CIAT varieties, and the yields doubled from 2.2 to 4.4 tons per hectare.

The world’s third largest consumer goods company, Unilever, has adopted CIAT’s LINK Methodology in support of its Sustainable Living Plan. Unilever used LINK for their assessments of value chains for tomatoes in India, tea in Kenya, and soy in Indonesia in 2013 and 2014, and for the development of a guide aimed at helping over 300 global buyers who purchase raw materials to engage in business relationships more inclusive of smallholder farmers.
CIAT collaborated with CRS in Nicaragua to implement the PROGRESA project (2013–2016), aimed to increase livestock producers’ access to productive assets and services, and to improve their capacity to meet market standards. Evaluations show that, on average, the almost 2,000 participating households increased milk productivity by 0.9 litres per cow per day, a significant 28% rise.

The Borderlands project (2012–2016), carried out by CIAT and Catholic Relief Services (CRS) among coffee growers in Colombia and Ecuador, trained farmers in best agronomic practices, production diversification, negotiation skills, and marketing portfolio. About 1,600 households involved in the project were able to increase their coffee income by an average of 58%. The Governor’s Office of the Nariño Department in southwestern Colombia also invested the equivalent of US$4.5 million to implement strategies suggested by the project to strengthen its coffee value chain. This could potentially impact the entire population of Nariño coffee growers, around 40,000 people.

After the 1994 genocide in Rwanda, crop genetic resource facilities were destroyed and seeds were eaten. In an effort to help boost the nation’s food supply, CGIAR Centers launched a project called “Seeds of Hope” aimed to supply Rwandan farmers with the seed varieties they had before, suited to their soil and climate, and resistant to local pests and diseases. Through the following decade, CIAT, CRS, and CARE Norway collaborated on a series of seed aid and seed system security guides. In the case of beans, researchers estimate that the rescue operation saved Rwanda’s breeding programs around 20 years of work already done to deliver high-iron beans.
The first high-iron, drought-resistant beans were released through the Kawanda genebank in Uganda and distributed to Tanzania, Malawi, Kenya, Madagascar, Ethiopia, and South Sudan in 2016. CIAT scientists have also discovered 30 new types of “heat-beater” beans able to handle an average 4-degree Celsius temperature increase.

After Hurricane Mitch tore through Central America in 1998, CIAT’s geographic information systems (GIS) team worked with the Canadian Space Agency to help relief workers identify most affected areas, and determine suitable crops and locations for replanting.

AGRI (Water for Irrigation, in Spanish), an automated GIS tool that integrates publicly available information on terrain, soils, and climate with mathematical and hydrological models, has successfully been used over 200 times to identify water sources for smallholder agriculture in western Honduras. AGRI has facilitated cost-effective investments by government and development agencies in Honduras and can be applied to other countries.
Brachiaria humidicola forage grasses have been shown to inhibit nitrification, a natural process that causes the conversion of nitrogen into nitrous oxide (N\textsubscript{2}O) – a greenhouse gas 300 times more potent than CO\textsubscript{2}. With the seven-fold rise in the use of nitrogen fertilizers in agriculture since the 1970s, inhibiting nitrification in soil using these grasses could greatly contribute to tackling climate change.

CIAT’s work on data and spatial analysis started in the 1970s. In particular, CIAT built a climate database of thousands of weather stations across the tropics with the aim of constructing spatial climate surfaces for targeting of agricultural technologies. The data helped CGIAR and its partners identify priorities, set crop improvement targets geographically, and better understand how to tailor solutions to site-specific problems. Datasets eventually fed into WorldClim, a suite of global gridded climate surfaces, which was made freely available online and has been downloaded by hundreds of thousands of users, paving the way for an open-access culture within CGIAR. The paper published on WorldClim is the second most cited paper in CGIAR’s history.

In 2014, 170 rice growers with 1,800 hectares in Colombia’s Córdoba Department avoided big economic losses by following a recommendation to skip a growing season due to forthcoming drought. The recommendation, made by the country’s rice growers association FEDEARROZ, was based on CIAT climate simulations.

Research by CIAT and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) led the Nicaraguan Government to prioritize the adaptation of smallholder coffee and cocoa farms to the impact of climate change in its 2013 National Adaptation Plan for Agriculture (NAPA). The NAPA has already mobilized major investments, including US$24 million from the International Fund for Agricultural Development (IFAD) to help finance that adaptation.
In Colombia, Terra-i – a near-real time deforestation monitoring tool developed by CIAT and partners – revealed massive deforestation in 2008 and 2009. The Colombian Government used the information to revise its estimates and set new targets to tackle deforestation ahead of the 2009 climate negotiations in Copenhagen.

In Peru, Terra-i is being used by the Ministry of Environment (MINAM) as the official early warning system for land cover and land-use change, producing monthly updates and pin-pointing deforestation hotspots. In particular, MINAM uses Terra-i alerts to identify and monitor new mining areas and related deforestation.

CIAT’s research helped design the Tana-Nairobi Water Fund, which was launched in 2015 thanks to The Nature Conservancy (TNC) and partners. The Fund, the first of its kind in Africa, is a public-private scheme aimed to increase farm productivity upstream, while improving water supply and cutting costs of hydropower and clean water downstream. It is expected to generate US$21.5 million in long-term benefits to Kenyan citizens, including farmers and businesses.

CIAT’s research helped put a value on ecosystem services in Peru’s Cañete River Basin. In 2014, the country’s Congress approved a law promoting compensation mechanisms for equitable sharing of economic benefits from vital services provided by the country’s diverse ecosystems.
In 2016, a Harvard Business School investigation cited a CIAT report as a “major wake-up call” for Barry Callebaut, one of the four major chocolate manufacturers in the world. In its 2014/2015 sustainability report, Barry Callebaut outlined two main fronts in its plan to address climate change, including working with farmers to encourage the planting of shade trees and the use of heat-resistant varieties of cocoa as recommended by CIAT.

More than 100,000 Kenyan smallholder farmers have taken up the climate-smart version of a “push-pull” crop production system developed by the International Centre of Insect Physiology and Ecology (icipe) and which aids the elimination of stem borer, a devastating insect pest of maize and other cereals. This version of the “push-pull” system integrates drought-tolerant Brachiaria hybrid Mulato II developed by CIAT as a “trap” crop for the pest, while also being used to feed cattle. The system has also expanded to Ethiopia, Tanzania, and Uganda.

In 2014, scientists from Indonesia’s Bogor Agricultural University released about 3,000 parasitic wasps with CIAT and FAO’s support to thwart cassava mealybug invasion. Similar biocontrol responses were implemented in Vietnam in 2013 and Thailand in 2010, as well as in Africa in the 80s, where it saved a whopping US$20 billion for the cassava sector. The introduction of the wasp in Africa by IITA is recognized as one of the most successful pest control programs in the world.

In 2015, CIAT, the World Agroforestry Centre (ICRAF), and CCAFS, with World Bank support, developed the climate-smart agriculture (CSA) country profile for Kenya. CIAT had also prepared 8 of the 24 county risk profiles. These national and county plans served as the technical basis for the World Bank to develop the Kenya Climate-Smart Agriculture Project, an investment worth US$250 million. The Kenyan Government has also requested CIAT to prepare 16 additional county profiles.
Since the 1990s, CIAT has carried out participatory research on improved agroforestry systems such as Quesungual as an alternative to slash-and-burn practices in Central America. By replacing slash-and-burn with “slash-and-mulch,” which maintains tree cover, agroforestry systems have helped restore soil moisture, prevent erosion, reduce deforestation, and mitigate climate impacts in Honduras, Nicaragua, and El Salvador.

Between 1993 and 2003, CIAT led a large effort to develop crop and soil conservation activities in cassava-based systems of Southeast Asia. By involving farmers in the research, CIAT drove a significant increase of the use of hedgerows, counter ridges, farmyard manure, and inorganic fertilizer (from 53 to 91%). This initiative not only contributed to mitigating the environmental impacts of the cassava expansion into hillier areas, it also boosted cassava yields and therefore farm income.

CIAT has largely contributed to developing alternatives to slash-and-burn agriculture in the forest margins of Latin America. Alternative technologies promoted by CIAT in the Peruvian Amazon have reduced annual deforestation by 17%, or the equivalent of 25,000 hectares of rainforest saved annually.

By building up an arable layer on the infertile acid soils of the savannas of Colombia’s Eastern Plains in the early 2000s, farmers were able to greatly increase their productivity and economic returns on investments. This was made possible thanks to soil improvement and conservation practices promoted by CIAT, including crop and pasture rotation, vertical corrective tillage, correction of soil nutrient deficiencies, and sowing improved forages adapted to the region’s soils.
Through the Tropical Soil Biology and Fertility (TSBF) Institute – the forerunner of the current Soils and Landscapes for Sustainability research area – CIAT’s research on integrated soil fertility management (ISFM) demonstrated that both mineral and organic fertilizers are required for improving yields in African agricultural systems. ISFM is a broad concept that integrates traditional approaches to soil fertility with soil microbiology. Results of this work were widely scaled up to farmers thanks to the African Network for Soil Biology and Fertility (AfNet) and found early application in major projects such as N2Africa and COMPRO. CIAT’s ISFM work also informed the Bill & Melinda Gates Foundation’s African Soil Health Initiative (2007).

Since CIAT created the Latin American Fund for Irrigated Rice (FLAR) in 1995, it has evolved into a strong regional organization encompassing 36 public and private sector partners in 17 countries. FLAR has rapidly made important contributions to the rice sector in Latin America. In Ecuador, two FLAR varieties introduced only 5 years ago are already planted on 36% of the total rice area. In Bolivia, the FLAR variety MAC18 is rice growers’ favorite variety and covers over 25% of the rice area. While providing similar yields as the top rice varieties, these FLAR varieties have superior grain quality and receive premium prices in the markets.
CIAT co-established the African Network for Soil Biology and Fertility (AfNet) in 1988 to build the capacity of African institutions to conduct interdisciplinary and integrated soil fertility management (ISFM) research at regional and international levels.

Over five decades, CIAT has hosted and collaborated with tens of thousands of visiting researchers from universities, the private sector, other CGIAR Centers, and local organizations.

Since the 1990s, CIAT has promoted the “Learning Alliances” model in Central America and Africa as a way to successfully scale up development impact. Learning Alliances are platforms where researchers and development practitioners combine forces, skills, and funds, and where research outputs are shared, adapted, used, and improved upon to effectively translate research findings into development outcomes.

CIAT mentored current and future leaders in agricultural science such as Rwanda’s Minister of Agriculture and Animal Resources, Gerardine Mukeshimana, who worked with then CIAT bean breeder and current Bean Program leader, Steve Beebe, to gain exposure to drought selection techniques.

CIAT emeritus scientist Rainer Schultze-Kraft received the 2016 Friendship Award from the Chinese Government for his long-term work with tropical forage scientists in the country. The award – presented by China’s Vice Premier Ma Kai – is considered the highest accolade that foreign experts working with Chinese institutions can receive.
The Ethiopia Bean Research Programme led by the Ethiopian Institute of Agricultural Research (EIAR) has won the country’s highest scientific award – the Gold medal and Cup – for the impact of its bean research, which has transformed the lives of millions of farmers. Dr. Berhanu Amsalu Fenta, Coordinator of the National Lowland Pulses Research Program, who received the award on behalf of EIAR, is a former PhD student supported by CIAT.