

colombia and the cgiar

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the colombia

and CGIAR partnership

FEW DEVELOPING COUNTRIES PLAY A MORE PRODUCTIVE AND MULTIFACETED ROLE THAN COLOMBIA DOES IN THE EVOLVING SYSTEM OF INTERNATIONAL AGRICULTURAL RESEARCH.

A MEMBER OF THE CGIAR SINCE 1993, THE COUNTRY IS ALSO A STEADFAST AND PRO-ACTIVE PARTNER OF VARIOUS CGIAR-SUPPORTED CENTERS AS WELL AS A MAJOR BENEFICIARY OF COLLABORATIVE RESEARCH FOR DEVELOPMENT.

COLOMBIA'S MULTIFACETED ROLE IN INTERNATIONAL AGRICULTURAL RESEARCH

As a central protagonist in projects carried out by the Rockefeller, Ford and Kellogg Foundations, starting in 1948, Colombia contributed importantly to the efforts that eventually led to the CGIAR's creation. With a view to broadening and giving continuity to that work, the Colombian government agreed to host the International Center for Tropical Agriculture (CIAT). Established in 1967, the Center has since then engaged in a highly varied program of research, which reflects the extraordinary diversity of Colombia's agriculture and natural resource endowment.

The country occupies a strategic geographical niche (linking Central and South America as well as the Caribbean) and encompasses a wide variety of agro-ecologies, farming systems and plant genetic resources. For those reasons, Colombia has served exceedingly well as a base for CIAT's ecoregional research and has also facilitated the Center's transfers of new technology from tropical America to sub-Saharan Africa and Southeast Asia. In addition, CIAT's headquarters in Cali have provided a logical venue for the regional operations of other CGIAR-supported Centers — notably Bioversity International and the International Center for Maize and Wheat Improvement (CIMMYT).

Colombian institutions have played an active role in the work of other CGIAR Centers and initiatives as well, including the Center for International Forestry Research (CIFOR), International Potato Center (CIP), Consortium for Sustainable Development of the Andean Ecoregion

(CONDESAN), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), International Food Policy Research Institute (IFPRI), International Livestock Research Institute (ILRI), International Water Management Institute (IWMI), Water and Food Challenge Program and World Agroforestry Centre. Their collaborative work has delivered sizable benefits for Colombia, for Latin America and the Caribbean as a whole and for many other countries of the developing world. In Colombia, many of the benefits have accrued from research on basic staples, especially common bean, cassava, maize, potato and rice, as well as tropical forages for sustainable improvement of livestock production. The country has also gained significantly from research aimed at enhancing the management of natural resources through both technology and policy interventions.

While remaining committed to continued improvement of the crops mentioned above, Colombian researchers are also actively pursuing the development of higher value agricultural products, especially tropical fruits, as part of new efforts to combat rural poverty. CIAT and other Centers are finding ways to support that work effectively, for example, through the characterization of fruit genetic diversity and biotechnology research focused on the development of methods for rapid multiplication of healthy planting materials.

Building on longstanding collaboration with the Centers, Colombia became a CGIAR Member in 1993, at precisely the time when many traditional donors began to curtail support for agriculture. For more



than a decade, the Colombian financial contribution was the largest among developing-country Members. For every million US dollars the country invested in CGIAR research, it obtained an estimated \$74 million in economic benefits.

Other Colombian assets that have greatly favored CGIAR-supported research in the country are its high-quality human resources and institutional capital. Colombian professionals have been key to the effectiveness of CIAT and other Centers, serving on their boards of trustees, as managers, as scientists and in other capacities.

Similarly, the strength and versatility of Colombian partners in research and development account in large measure for the success and innovative character of joint efforts in areas ranging from the conservation of plant genetic resources and crop improvement to integrated management of tropical pests and the development of alternative approaches for soil management and land use. Some Colombian partners, together with various international organizations and public-private partnerships, form part of the Agronatura Science Park at CIAT headquarters, which strengthens research capacities, provides support services and facilitates the formation of new alliances.

Colombia's support for the CGIAR is handled by its Ministry of Agriculture and Rural Development. Within the framework of that relationship, CIAT and other Centers work closely with the Colombian Corporation for Agricultural and Livestock Research (CORPOICA) together with other



national research institutes, the country's strong universities, its numerous socially committed civil society organizations and its dynamic private sector.

The Centers have contributed importantly to strengthening the research capacity of their Colombian partners, with CIAT alone training well

over 4,000 of the country's agricultural professionals. Many of them have gone on to further study in top universities and to occupy important posts in CORPOICA and other research organizations.

A significant part of the Centers' investment in capacity building has

consisted of support for Colombian postgraduate students. For example, in collaboration with the National University, Bioversity International and CIAT have assisted in the development of a masters program on plant genetic resources, which is among the few sustainable postgraduate programs on this topic in Latin America.

FRUITS OF A SUCCESSFUL PARTNERSHIP

More productive forages for tropical savannas: An early and persistent goal of CIAT and its host government was to find ways of enhancing the agricultural potential of the country's Eastern Plains — an aim that now seems more relevant than ever in light of the recent food price crisis. Occupying some 17 million hectares, the region forms part of South America's vast tropical savannas — the world's last great agricultural frontier. The most promising option for the Eastern Plains is to replace unproductive native pastures with improved forage grasses and legumes (preferably in combination with food crops), a process that is now well under way. Highly productive and tolerant to the region's infertile acid soils, the new forages increase weight gain in cattle from just 20 kilograms per hectare per year to 200 kilograms.

Rice and beans—An inseparable pair of staple foods grows stronger: For millions of consumers in Colombia and other parts of Latin America, rice and beans, often consumed together, are key sources of carbohydrates and protein. Working closely with national partners, CIAT is helping maintain a constant flow of improved varieties, which are critical

for keeping the prices of these staple grains low and stable.

Colombia has released 17 CIAT-related rice varieties in recent years — the latest in a series of some 40, many of which carry the name of the Colombian National Rice Growers Association, Fedearroz. The new varieties are generating economic benefits estimated in the hundreds of millions of US dollars, chiefly because of increased yields and reduced expenditures on chemicals to control diseases and pests. Rice improvement in Colombia and other South American countries has received a significant boost over the last decade from an innovative public-private partnership, the Latin American Fund for Irrigated Rice (FLAR). With support and guidance from Fedearroz and other members, FLAR has accelerated the flow of research results that satisfy rice sector demands.

Seventeen CIAT-related bean varieties released in Colombia since the 1980s also show higher yields and resistance to diseases and pests. New generations of bean varieties offer the additional advantage of higher content of micronutrients, specifically iron and zinc. CIAT recently signed agreements with

local partners in Colombia for large-scale multiplication and testing of these "biofortified" varieties, with the aim of strengthening food security for some of the country's most vulnerable people.

Enhancing market prospects for cassava: Collaborative research on cassava is strongly reinforcing the crop's dual role in Colombia and other Latin American countries. Consumed fresh as a traditional staple, the starchy root also provides raw material for processing into livestock feed, starch and, increasingly, bio-ethanol. Still grown mainly by small farmers in marginal environments, cassava represents an important opportunity for them to boost their incomes, as the crop is transformed into a market-oriented commodity.

Colombia has so far released 17 CIAT-related varieties, showing higher yields and starch content as well as disease resistance. Cassava varieties of the future will possess special starch qualities as well as other traits that further enhance the crop's market potential. This and related work is being advanced in collaboration with a public-private partnership patterned after FLAR — the Latin American and





Caribbean Consortium to Support Cassava Research and Development (CLAYUCA) — in which about a dozen Colombian partners play active roles.

Moving maize into important new niches:

When coffee prices plummeted, provoking a severe crisis in Colombia's coffee-growing zone during the 1990s, the sector opted for diversification, with strong support from the Colombian government, as its best route back to prosperity. One option that has emerged as a clear winner is the sowing of maize between rows of pruned coffee bushes. To help growers fill this new niche, CIMMYT has worked with national partners to develop four high-yielding, disease-resistant varieties, including two hybrids, which are now being actively promoted. As a result, the maize area in

Colombia's coffee-growing zone has risen from about 3,000 hectares in 2002 to more than 50,000 in 2007, providing much-needed employment for landless field laborers and profits of nearly US\$1,000 per hectare for coffee producers. Maize is also making headway in Colombia's Eastern Plains, where new maize varieties tolerant to acid soils have made it possible to expand production.

Tapping the potential of high-value tropical fruits:

Colombia harbors a rich array of tropical fruit diversity and places high priority on realizing its development potential. Among other benefits, tropical fruits offer a powerful means of raising the incomes of small farmers and other rural people through the production and processing of high-value crops. Since the mid-1990s, Bioversity International has

worked closely with CORPOICA and various Colombian universities in research aimed at characterizing the genetic diversity of fruit species, such as papaya and various *Passiflora* species, which have significant commercial value or potential. The new knowledge generated by this research is essential for improving the varieties currently in production, for identifying new fruit options that might appeal to consumers and for planning national conservation efforts. One recent product of collaborative research involving Bioversity, CIAT and CIRAD (France's Agricultural Research Center for International Development) is the New World Fruits Database, which covers 1,256 species.

A more competitive agriculture and better environmental stewardship:

Since the early 1990s, CIAT has engaged in an ambitious program of research on natural resource management, which complements the work on key crops. Covering major agroecologies in Colombia — hillsides, savannas and forest margins — this research has generated a rich collection of knowledge, methods and technological options, which are being applied by rural people and numerous research and development organizations across the country. Particularly noteworthy are improved production systems for Colombia's Eastern Plains; farmer participatory methods for local crop research, community watershed management and agroenterprise development; and information tools for guiding efforts to





combat poverty and protect natural resources.

One recent product of this research is a new information resource aimed at supporting the efforts of strategic alliances taking shape in Colombia and elsewhere to make agriculture more competitive and equitable in the face of economic turmoil and climate change. Devised in collaboration with a wide array of national and international partners, the resource provides detailed information covering some 30 million hectares of agricultural land in Colombia. Recent case studies have demonstrated the usefulness of the information in tasks such as selecting areas for the introduction of high-value crops, of schemes to compensate rural people for environmental services and of projects to reduce sedimentation of waterways.

Compensating rural people for environmental services: As CIAT undertook new research on natural resource management in diverse agroecologies during the early 1990s, CONDESAN embarked on complementary efforts in the high Andes. One innovation that has emerged from this work is a mechanism to compensate rural people for the provision of environmental services in vital Andean watersheds, which support agricultural livelihoods and harbor biodiversity, in addition to providing water.

In one such watershed, around Lake Fúquene in Colombia, eutrophication (or nutrient pollution), caused by excessive use of agrochemicals in potato production, was identified as a major environmental problem. An analysis of potential land uses found conservation agriculture (i.e., reducing tillage and leaving crop residues to cover the soil) to be the most beneficial option overall, especially as it controlled erosion and curtailed the leakage of nitrates and phosphates from fertilizer and animal wastes into the lake. To provide small farmers with incentives and means to adopt this alternative, a revolving fund was created, which offers them credit through farmer associations. Key to the success of this initiative was the technical assistance farmers received from local government and research backstopping provided by CIAT.



cgiar

WHY AGRICULTURAL RESEARCH MATTERS

Climate change and a worldwide financial crisis have ushered in a new era of challenge and opportunity for agriculture and natural resource management.

These global trends, while affecting people everywhere, have particularly high risks and consequences for the approximately 2.1 billion people who live on less than US\$2 a day. About three-fourths of these people live in rural areas and depend directly or indirectly on agriculture for their livelihoods.

Higher food prices are already forcing poor consumers to make painful tradeoffs in their spending, which drastically reduce their possibilities for improved nutrition and well-being.

Climate change, by worsening growing conditions for crops, will further strain the capacity of agricultural land and undermine the productivity growth that is vital for reducing poverty. Scientists estimate that rising temperatures and changing rainfall patterns could cause agricultural production to drop by as much as 50 percent in many African countries and by 30 percent in Central and South Asia.

Increased investment in agricultural science at the national and international levels is essential for meeting these new and multifaceted challenges through innovations that benefit the poor by increasing agriculture productivity, while conserving natural resources, such as water, forests and fisheries.

According to the *World Development Report 2008*, investment in agricultural research has "paid off handsomely," delivering an average rate of return of 43 percent in 700 development projects evaluated in developing countries. Clearly, strong programs of relevant and effective research must be at the top of the international development agenda, if the Millennium Development Goals of halving hunger and poverty by 2015 are to be met and if these gains are to be expanded in the decades to come.

AN EVOLVING STRATEGIC PARTNERSHIP

The Consultative Group on International Agricultural Research (CGIAR), established in 1971, is a strategic partnership, whose 64 Members support 15 international Centers, working in collaboration with many hundreds of government and civil society organizations as well as private businesses around the world. CGIAR Members include 21 developing and 26 industrialized countries, four co-sponsors as well as 13 other international organizations. Today, more than 8,000 CGIAR scientists and staff are active in over 100 countries throughout the world.

Through cutting-edge science, the CGIAR fosters sustainable agricultural growth that benefits the poor through stronger food security, better human nutrition and health, higher incomes and improved management of natural resources. The new crop varieties, knowledge and other products resulting from the CGIAR's collaborative research are made widely available to individuals and organizations working for sustainable agricultural development throughout the world.

The priorities of CGIAR research are:

- Reducing hunger and malnutrition by producing more and better food through genetic improvement

- Sustaining agriculture biodiversity both *in situ* and *ex situ*
- Promoting opportunities for economic development and through agricultural diversification and high-value commodities and products
- Ensuring sustainable management and conservation of water, land and forests
- Improving policies and facilitating institutional innovation

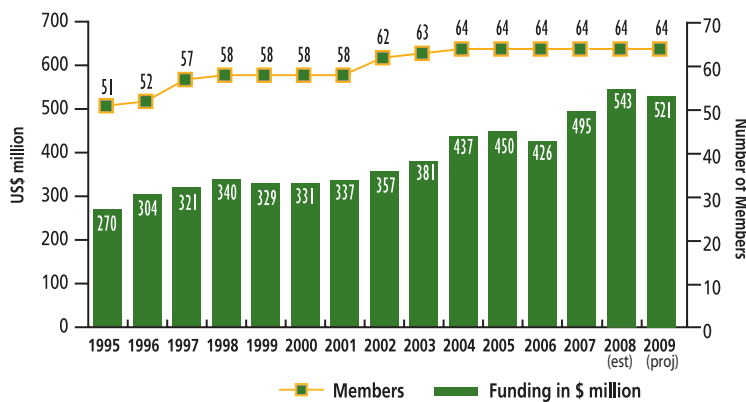
Eleven of the CGIAR Centers maintain international genebanks, which preserve and make readily available the plant genetic resources that form the basis of food security worldwide.

In addition, the CGIAR implements several innovative "Challenge Programs" designed to confront global or regional issues of vital importance. Working through broad-based research partnerships, Challenge Programs mobilize knowledge, technology and resources to solve problems such as micronutrient deficiencies, which afflict more than three billion people; water scarcity, which already affects a third of the world's population; and climate change, which poses a dire threat to rural livelihoods across the developing world.

To address those challenges more effectively, the CGIAR is embracing major institutional reforms, which were designed in 2008 through intensive analysis, an independent review and close consultation with stakeholders. The reforms, which are expected to be in place by 2010, should result in a stronger collective approach to international agricultural research that features streamlined governance, better funding and stronger partnerships.

The CGIAR is open to all countries and organizations that share a commitment to achieving sustainable agricultural development and are willing to invest financial, human and technical resources toward this end. Membership has expanded and diversified over the years, and the CGIAR is poised for further growth. CGIAR expenditures estimated at US\$530 million in 2008, represent the single largest investment made to mobilize science for the benefit of the rural poor worldwide.

An Evolving and Growing CGIAR



Without public investment in international agricultural research through the CGIAR,

- World production would be 4-5 percent lower.
- Developing countries would produce 7-8 percent less food.
- World food and feed grain prices would be 18-21 percent higher.
- 13-15 million more children would be malnourished.

For every US\$1 invested in CGIAR research, US\$9 worth of additional food is produced in developing countries, where it is needed most. The evidence is clear: agricultural growth alleviates poverty and hunger.

Source: R. E. Evenson and D. Gollin (eds), *Crop Variety Improvement and its Effect on Productivity – The Impact of Agricultural Research*, CABI Publishing, UK.

BENEFITS FOR THE POOR AND THE PLANET

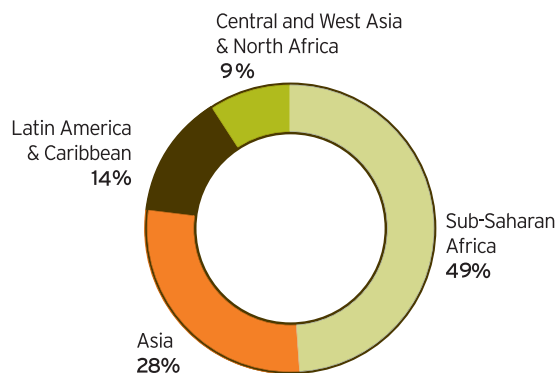
International agricultural research has a strong record of delivering results that help confront the central development and environmental challenges of our time.

Research carried out by the CGIAR-supported Centers and their partners has contributed significantly to reducing hunger and raising the incomes of small farmers throughout the developing world. While much CGIAR research is focused on boosting crop and livestock productivity, it also encompasses a wide range of initiatives aimed at enhancing stewardship of soils, water, biodiversity, forests and fisheries. Improved policies and practices have helped protect millions of hectares of forest and grasslands, safeguarding biodiversity and preventing land degradation.

Among the outcomes of that research are the following:

- Successful biological control of the cassava mealybug and green mite, both devastating pests of a root crop that is vital for food security in sub-Saharan Africa. The economic benefits of this work alone, estimated at more than \$4 billion, are sufficient to cover almost the entire costs of CGIAR research conducted so far for Africa.
- New Rices for Africa, or NERICAs, which combine the high yields of Asian rice with African rice's resistance to local pests and diseases. Currently sown on 200,000 hectares in upland areas, NERICAs are helping reduce national rice import bills and generating higher incomes in rural communities.
- More than 50 varieties of recently developed drought-tolerant maize varieties being grown on a total of about one million hectares across eastern and southern Africa.
- A flood-tolerant version of a rice variety grown on six million hectares in Bangladesh. The new variety enables farmers to obtain yields two to three times those of the non-tolerant version under prolonged submergence of rice crops, a situation that will become more common as a result of climate change.
- Widespread adoption of resource-conserving "zero-till" technology in the vital rice-wheat systems of South Asia. Employed by close to a half million

2008 Allocation by Developing Region



farmers on more than 3.2 million hectares, this technology has generated benefits estimated at \$147 million through higher crop yields, lower production costs and savings in water and energy.

- An agroforestry system called "fertilizer tree fallows," which renews soil fertility in southern Africa, using on-farm resources. More than 66,000 farmers have adopted this technology in Zambia, where it has strengthened food security and reduced environmental damage, and the system is spreading in four neighboring countries.
- Information and tools used by conservationists to monitor some 37 million hectares of forest, resulting in better management of this diminishing resource and contributing to more sustainable livelihoods for forest dwellers.
- A new method for detecting aflatoxin, a deadly poison that infects crops, making them unfit for local consumption or export. In sub-Saharan Africa, this technology and a novel biological control method that has proved able to reduce aflatoxin by nearly 100 percent are helping to curb a major threat to human health, especially in children, and to save millions of dollars in lost sales of grain for export.
- A simple methodology for integrating agriculture with aquaculture to bolster

income and food supplies in areas of southern Africa, where the agricultural labor force has been devastated by HIV/AIDS. Under large-scale testing in Malawi, the method doubled the income of 1,200 households and dramatically increased fish consumption.

- A new approach to predicting the likely impact of climate change on major crops' wild relatives, which are a key source of genes needed to enhance climate resilience, as well as valuable findings on the likely consequences of biofuels development in China and India for increasingly scarce water supplies.
- Increased smallholder dairy production and strengthened local capacity to market milk products in Kenya, which have improved child nutrition while creating jobs.

RESEARCH IS A COLLABORATIVE ENTERPRISE

cgjar members

The CGIAR's achievements are made possible by the commitment and support of the 64 Members and many hundreds of collaborating organizations who together form the CGIAR partnership.

African Development Bank	Food and Agriculture Organization of the United Nations	Japan	Romania
Arab Fund for Economic and Social Development	Ford Foundation	Kellogg Foundation	Russian Federation
Asian Development Bank	France	Kenya	South Africa
Australia	Germany	Republic of Korea	Spain
Austria	Gulf Cooperation Council	Luxembourg	Sweden
Bangladesh	India	Malaysia	Switzerland
Belgium	Indonesia	Mexico	Syngenta Foundation for Sustainable Agriculture
Brazil	Inter-American Development Bank	Morocco	Syrian Arab Republic
Canada	International Development Research Centre	Netherlands	Thailand
China	International Fund for Agricultural Development	New Zealand	Turkey
Colombia	Islamic Republic of Iran	Nigeria	Uganda
Commission of the European Community	Ireland	Norway	United Kingdom
Côte d'Ivoire	Israel	OPEC Fund for International Development	United Nations Development Programme
Denmark	Italy	Pakistan	United Nations Environment Programme
Arab Republic of Egypt		Peru	United States of America
Finland		Philippines	World Bank
		Portugal	
		Rockefeller Foundation	

cgjar-supported centers

The 15 Centers supported by the CGIAR are autonomous organizations, each with its own charter, board of trustees, director general and staff. Center scientists are recruited from around the world. The CGIAR today has more than 8,000 scientists and staff working in over 100 countries. Thirteen of the CGIAR Centers are located in developing countries.

Africa Rice Center (WARDA)

Cotonou, Benin

www.warda.org

Bioversity International

Maccaresse (Rome), Italy

www.biodiversityinternational.org

International Center for Tropical Agriculture

(CIAT, its acronym in Spanish)

Palmira (Cali), Colombia

www.ciat.cgiar.org

Center for International Forestry Research (CIFOR)

Bogor, Indonesia

www.cifor.cgiar.org

International Maize and Wheat Improvement Center

(CIMMYT, its acronym in Spanish)

Texcoco (Mexico, D.F.), Mexico

www.cimmyt.org

International Potato Center

(CIP, its acronym in Spanish)

Lima, Peru

www.cipotato.org

International Center for Agricultural Research in the Dry Areas (ICARDA)

Aleppo, Syria

www.icarda.org

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Patancheru (Hyderabad), India

www.icrisat.org

International Food Policy Research Institute (IFPRI)

Washington, D.C., USA

www.ifpri.org

International Institute of Tropical Agriculture (IITA)

Ibadan, Nigeria

www.iita.org

International Livestock Research Institute (ILRI)

Nairobi, Kenya, and Addis Ababa, Ethiopia

www.ilri.org

International Rice Research Institute (IRRI)

Los Baños (Manila), the Philippines

www.irri.org

International Water Management Institute (IWMI)

Battaramulla (Colombo), Sri Lanka

www.iwmi.cgiar.org

World Agroforestry Centre (ICRAF)

Nairobi, Kenya

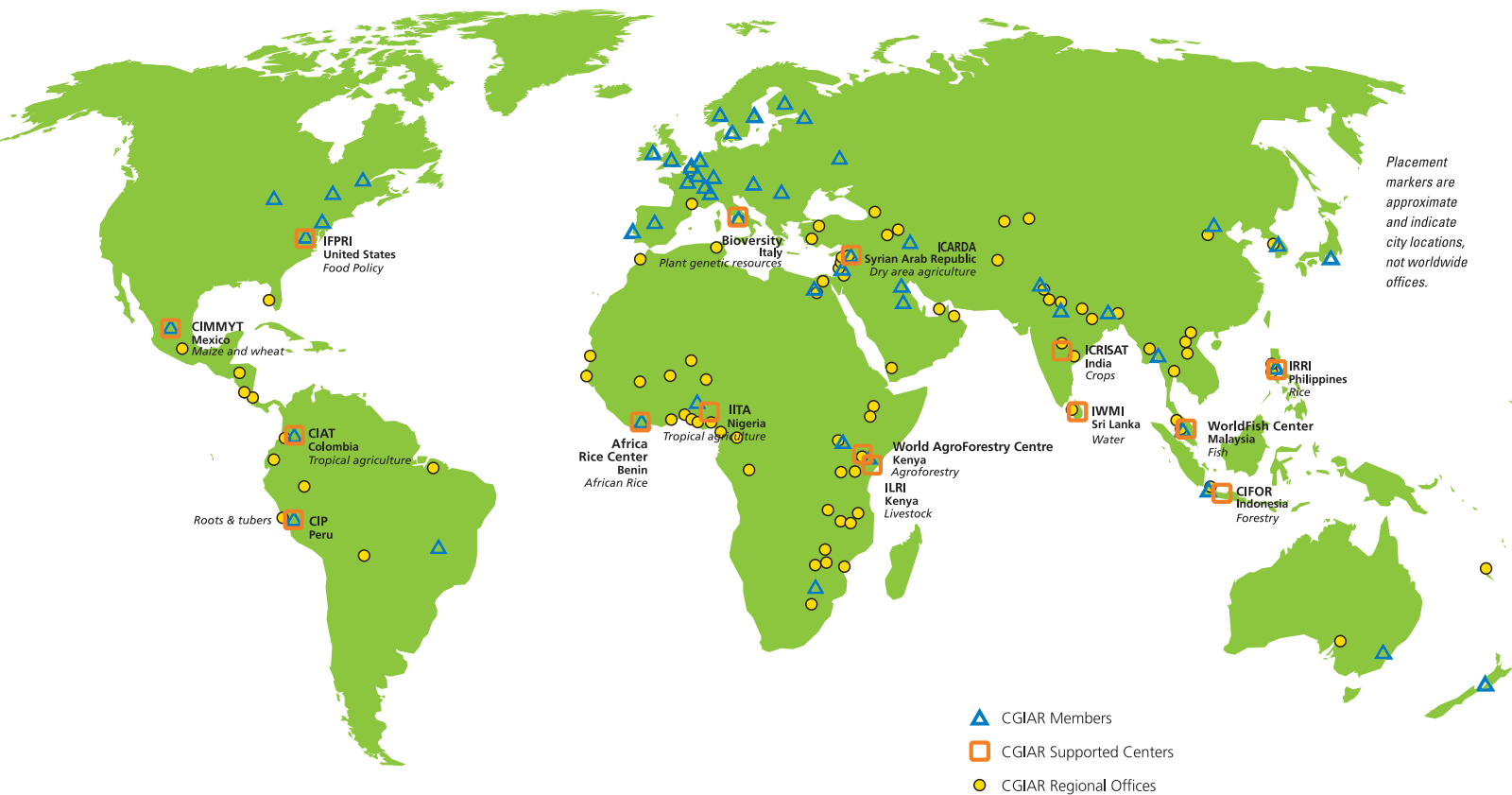
www.worldagroforestrycentre.org

WorldFish Center

Penang, Malaysia

www.worldfishcenter.org

a global cgiar



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