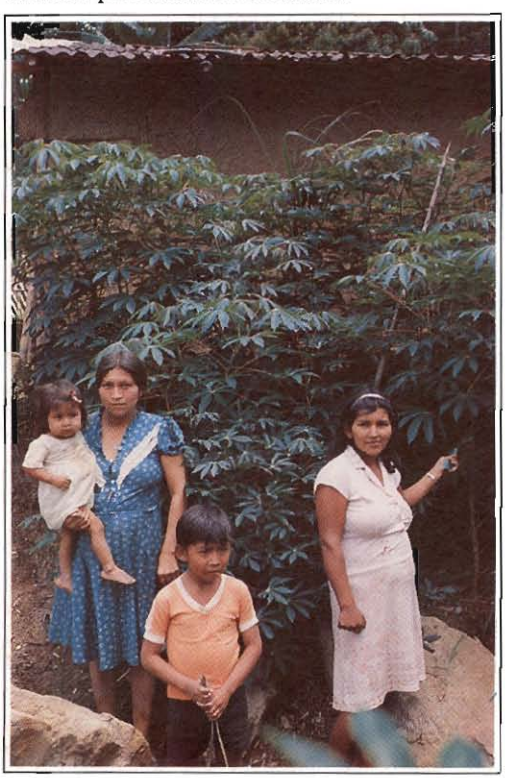
The Cassava Biotechnology Network

CBN

To create CBN took a leap of the imagination—from sophisticated laboratories using advanced techniques to rustic fields and towns where people's livelihoods depend on an ancient crop.

Cassava production in Colombia.



Alvaro Cuéllar

That leap has carried CBN a long way.

When CBN was founded, fewer than 10 projects in the entire world were developing biotechnology tools for genetic improvement of cassava. Today, partly as a result of CBN's efforts, 50 laboratories are applying new techniques such as molecular markers, gene cloning, genetic transformation, and disease diagnostics in cassava research. About a third of these projects are in national research institutes in developing countries. Another 20 laboratories in the developing world use tissue culture (a more "mature" biotechnology) to conserve and manage their cassava genetic resources.

Through its work with small-scale traditional processors, CBN found that they apply a wealth of microbial biotechnologies to cassava. In response to processors' needs, the

Network broadened its scope and today includes about 50 laboratories focusing on such technologies. In much of this work, national programs are applying traditional and new fermentation methods to enhance cassava's nutritional and economic value.

CBN focuses sharply on real-life problems.

That's because the Network has gone straight to small-scale cassava producers and processors in developing countries—for example, Brazil, China, and Tanzania—and asked them what they need from research. Combining users' demands with expert technical knowledge and socioeconomic analysis, CBN has developed a clear sense of priorities for applying biotechnology to cassava research and development (see list, in pocket).

The projects coordinated by CBN are pulling together.

The Network's small-grants program and regional representatives encourage international and interdisciplinary cooperation. A newsletter, directory, and international meetings keep cassava biotechnology specialists in touch.

In the following pages, we explain why CBN focuses on cassava; why cassava researchers, producers, and processors need this network; how it operates; and how you can get in touch with us.

Cryopreservation of cassava genetic diversity.

Mauricio Antorveza

The application of powerful new tools to a once-neglected crop could benefit many of the world's neediest people.

A mother crop for millions.

Cassava (*Manihot esculenta*) is a vital staple for about 500 million people, many of them small-scale farmers, in

Processing cassava flour in Tanzania.

Ann Marie Thro

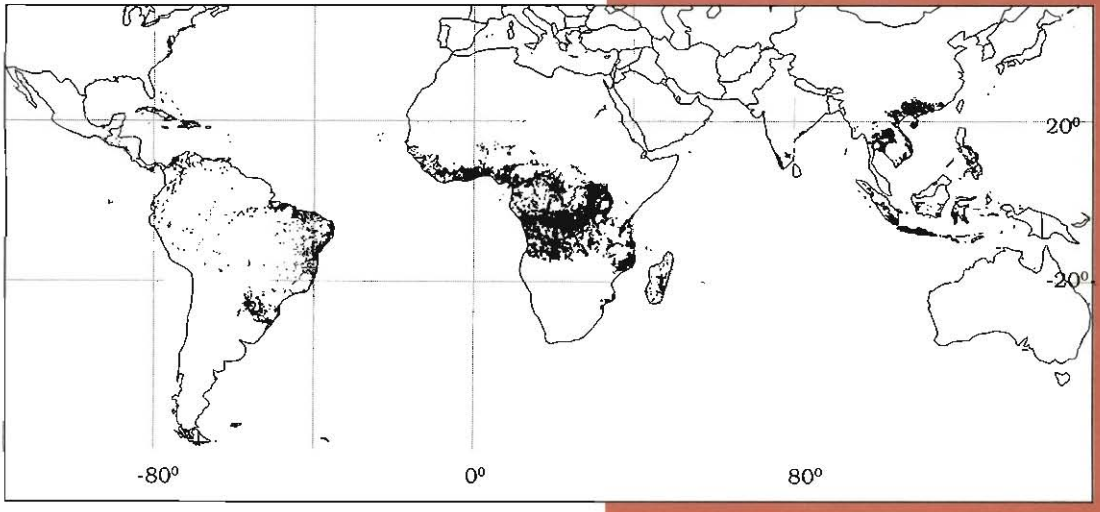
some of the most marginal areas of the tropical world (see map).

The crop tolerates seasonal drought and poor soils, and has an unequalled ability to recover after stems and leaves have been damaged by pests, diseases, and even the ravages of war. Cassava's starchy roots produce more food energy per unit of land than any other staple crop. Its leaves, commonly eaten as a vegetable in Africa, provide vitamins and protein.

Improvements benefit women directly.

Particularly in Africa and Amazonia, women have traditionally produced, processed, and marketed cassava. In other areas, such as dry Northeast Brazil, women must take over cassava farming and processing as men migrate to cities in search of employment. In these situations improved cassava varieties and processing methods can benefit women directly.

Cassava distribution (each dot represents 1,000 hectares).

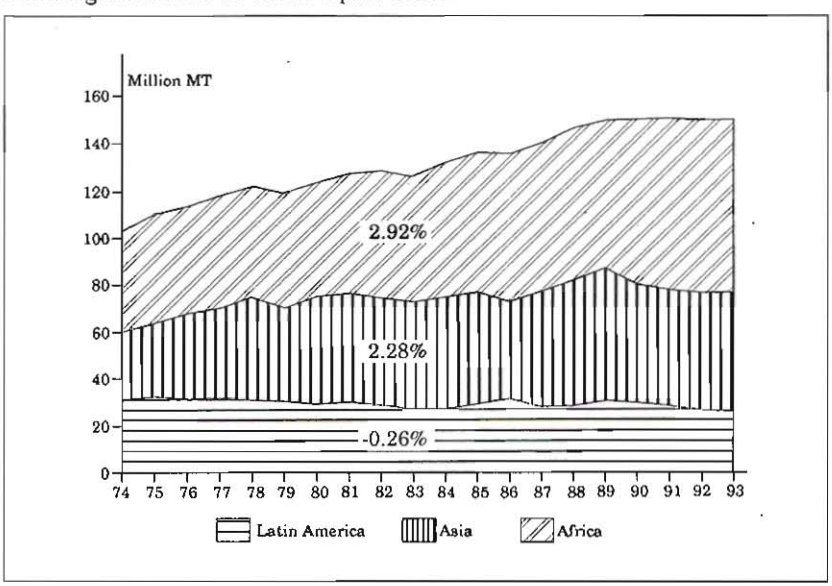


An opportunity for local development.

Cassava yields a high-quality raw material that can be processed into a wide variety of end-products, including food, feed, and industrial starches. Since much of this processing can be done locally, it offers a valuable opportunity to increase employment and income for rural people.

Global cassava production has expanded by almost 2% annually over the last decade (see figure). Some developing countries export the crop, but mainly to low-value feed markets in the developed world. CBN promotes the development of upgraded cassava products that would enable producers to break into more lucrative domestic and export markets.

Annual growth rates in cassava production.



A number of national institutes and two international centers have done much to make up for previous neglect of cassava research and development.

Why was CBN added to the good work already being done?

Biotechnology has great potential for enhancing the efficiency of current work. Yet, many of the countries that most depend on cassava have little or no biotechnology capacity. CBN was established to help these countries build multilateral links to global biotechnology research.

These ties better enable cassava-producing countries to communicate their needs, participate in research and development, and benefit from the results. Leading biotechnology labs, some of them in the most advanced cassava-producing countries, get the information and contacts they need to contribute more effectively to economic development and food security.

By weaving a web of connections between Network participants, CBN aims to:

- Integrate the needs of small-scale farmers, processors, and consumers into research planning.
- Stimulate research on high-priority topics.
- Foster the exchange of information on research materials, techniques, and results.

Cassava mosaic virus disease.

Network members work together through projects.

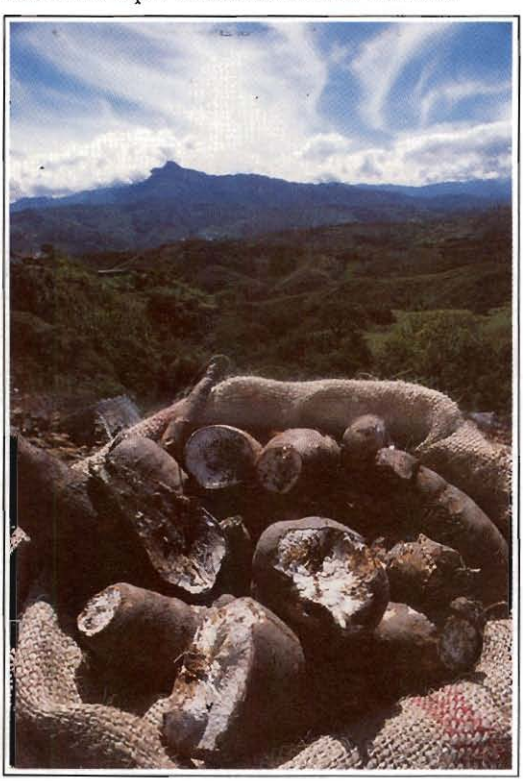
Those carried out by CBN coordination are designed to:

- Focus cassava biotechnology research on relevant problems through the participation of farmers, processors, and consumers.
- Enable developing countries to take part more fully in cassava biotechnology research that yields appropriate solutions.
- Help individual biotechnology labs and their cooperators achieve research and development goals cost-effectively.

Examples are CBN's Small-Grants Program, international scientific meetings, training workshops, database development, and newsletter. (The Network does not provide fellowships or full-scale research grants.)

CBN members conduct independently managed and funded research projects to:

Cassava's rapid deterioration after harvest.



Mauricio Antorveza

- Develop and apply biotechnology tools that can help solve problems and realize opportunities.
- Generate new biological and socioeconomic knowledge that identifies entry points for cassava biotechnology research.
- Produce and test improved genetic material, processes, or products for transfer to cassava farmers, processors, and consumers.

Among the biotechnology tools being developed for cassava research are protocols for cassava regeneration and genetic transformation, methods of conserving *Manihot* genetic diversity, and molecular markers.

Projects aimed at solving problems focus on topics such as control of the African cassava mosaic virus; molecular "tracking" of biocontrol organisms in the environment; safe management of cyanogenesis; and development of new cassava products to diversify markets, stabilize prices, and add value to the crop.

Donor support

Network coordination and associated tasks are funded by the Special Programme for Biotechnology and Development Cooperation of The Netherlands Directorate General for International Cooperation (DGIS).

Many other donors and institutions fund the biotechnology research projects of individual CBN members.

Molecular markers for cassava improvement.

Mauricio Antorveza

CBN is guided by a Steering Committee and Scientific Advisory Committee. A coordinator promotes and ensures the coherence of Network activities.

The Steering Committee (see lists, in pocket) determines the Network's overall aims, guides the planning of its activities and setting of research priorities, and is active in donor relations. Committee members include a representative from each of the major cassava-growing regions: Africa, Asia, and tropical America. Three other members represent the main areas of cassava research: biology, postharvest technology, and socioeconomics. CIAT, IITA, and DGIS are permanent members.

The Scientific Advisory Committee (see list, in pocket) consists of leading scientists who advise on research issues. Their number and composition vary according to developments in cassava science. The coordinator (see back cover) keeps Network activities focused, supports information exchange, and managers the small-grants program.

Once every 2 years, CBN holds international scientific meetings alternately in different cassava-growing regions. These events serve as the Network's main forum for discussing research priorities and new results, and for enhancing communication among biotechnologists and cassava researchers.

Shipment of cassava plantlets from tissue culture.

CBN Steering Committee, 1994-1996

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Priorities for Cassava Biotechnology Research, 1995-1996

Where most important	*Topics*
	Biotechnology applications: Opportunities for cassava
Asia, LAC*	Starch quantity and quality for diverse end uses
	Fermentation, biochemistry, and molecular genetics for:
Asia, LAC Africa, LAC	New product development Improved traditional products (texture, taste, nutritional value)
Global	Plant nutrient cycling efficiency
Global	Extended range and increased productivity in suboptimal environments: photosynthesis, enhanced mycorrhiza, biofertilizers, and water- and nutrient-use efficiency
	Biotechnology applications: Solving problems in cassava production and use
Africa, LAC	Integrated pest management, including host/pathogen-pest interactions
Africa, global	Resistance to important viral diseases
Africa	Modified cyanogen biochemistry to optimize food security
	Enhanced fermentation systems for:
Africa Asia, LAC	Cyanogen reduction Processing-waste management

* LAC = Latin America and the Caribbean.

Where most important	*Topics*
Global	Postharvest deterioration
Global	Development of true seed for cassava production
	Biotechnology tools: Genetic improvement of cassava
Global	Improved plant regeneration systems
Global	Improved genetic transformation techniques
Global	Useful genes and gene promoters, characterized and cloned
Global	Molecular genetic map and international genomic database
Global	Molecular and cytological characterization of *Manihot* genomes
Global	Techniques for regulation of reproductive biology (flowering, pollen conservation, haploid production, and apomixis)
	Biotechnology tools: Conserving and exchanging* Manihot *genetic diversity
Africa, LAC	Disease diagnostic methods for clean germplasm transfer
Global	Cryopreservation for long-term conservation of genetic diversity
Global	Tissue culture for germplasm conservation and micropropagation

CBN serves an expanding group of international research and development workers, building bridges between them and cassava farmers and processors.

Through new leaps of the imagination, all these participants in cassava research can find novel solutions to age-old problems.

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