A Novel Research Approach to Sustainable Agriculture

CIAT
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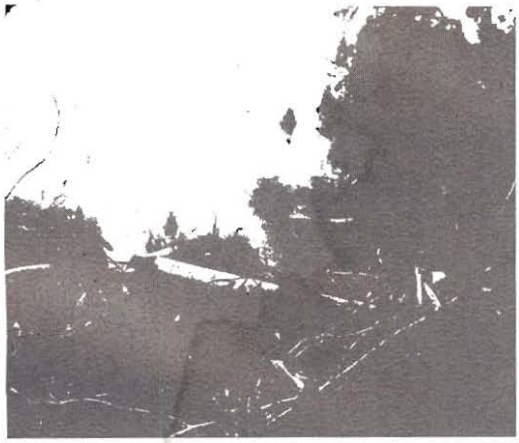
CIAT

in the 1990s



Balancing Conflicting Forces in Sustainable Development

Developing countries are hard pressed for economic growth to escape from misery which, rather than receding, has been growing during the last decade, despite many remarkable efforts to stem it.

Increased agricultural output and trade are to fuel the takeoff. There is a risk, however, of economic growth being achieved at excessive social cost or at the expense of a deteriorating resource base and environment, thus making progress unsustainable. Growth of agricultural production, therefore, needs to be achieved in harmony with considerations of equity, resource conservation, and environmental concerns.

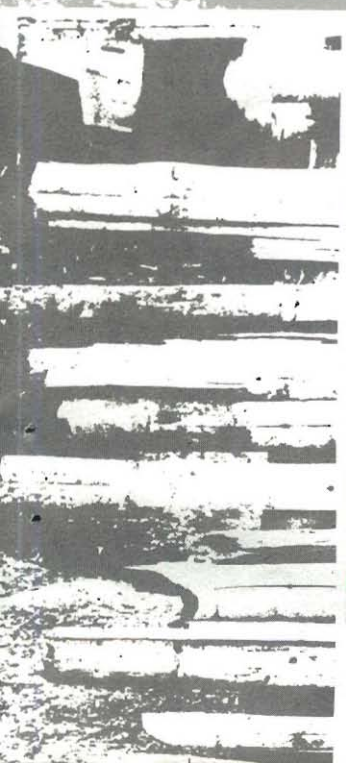
To face this challenge CIAT has developed a **new research strategy** that seeks to increase production and resource productivity in such a way as to relieve market and social pressures on the most fragile ecologies.

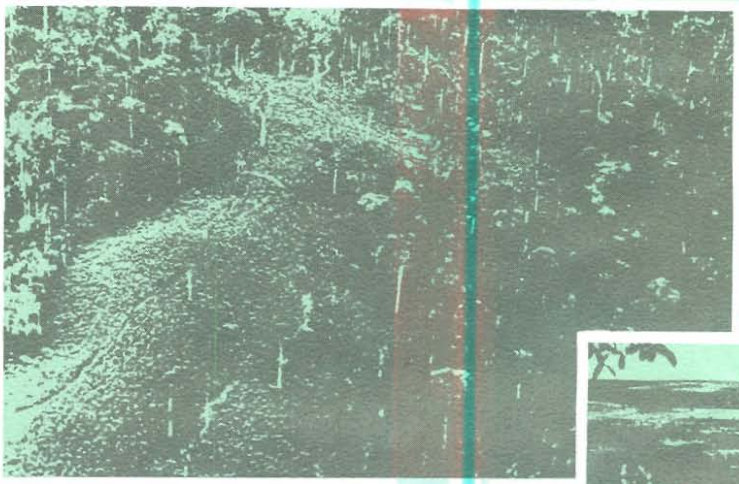
A Systems Approach for a Multidimensional Problem

To make agriculture and its growth sustainable is a multidimensional challenge of utmost complexity.

There is a hierarchy of interlocked subsystems which encompasses such diverse components as the genes in a crop; the intimate relationships between plants and the soil on which they grow, or between plants and the pests and disease agents that may attack them; relationships among plants and fields on a farm; land tracts in ecological zones; economic interactions at the farm, national, regional and even global level; as well as the policy making, legislative and political frameworks. Sustainability at any one level may depend on events occurring at other levels.

Research at each level is necessary, but far from being sufficient! An integrative research that links all levels is required for long-term sustainable agriculture. To meet this need, a systems approach has been adopted in CIAT's new research strategy





A New Resource Management Research Division

In its quest for improved management of tropical America's agricultural resources, CIAT has established a RESOURCE MANAGEMENT RESEARCH DIVISION, which will seek to keep the production of food and other products in harmony with the long-term preservation of the resource base.

The new division's research agenda includes such aspects as the characterization of agroecologies; the analysis of land use patterns and options; the understanding of relationships among soils, water and plant nutrition; the design of crop, pastoral, and tree-based technologies and their combinations in farming and land use systems; and the analysis of relationships between policy instruments and farmers' decision making.

Research output will be land use options aimed at optimizing the social returns to agriculture under different trade-off scenarios between agricultural production and resource conservation.

Land Use and Agroecosystem Programs

Three agroecological and one agricultural land use research programs integrate the Resource Management Research Division.

The agroecosystem programs focus on disturbed **forest margins** in the humid tropics, on mid-altitude tropical **hillsides,** and lowland acid-soil **savannas.** They investigate the biological and physical processes that underpin agricultural sustainability, from soil-plant interactions to the farming system and watershed or catchment levels. They assess farmers' responses to market forces, social pressures, and policies. With the participation of farmers at all stages, they design or adapt ecologically and socioeconomically appropriate production technologies.

The **land use** program investigates the relationships between policies and land use strategies, and the impact of both on production, the resource base, and the environment.

Knowledge combined from the four programs converges for the design of land use systems to reconcile the three potentially conflicting objectives of economic growth, social equity, and resource and environmental conservation.

A Changed Role of Germplasm Development

Germplasm development in beans and snap beans, cassava, rice, and tropical forages, which is the more traditional field of CIAT's endeavors, is taking on a new role.

On the one hand, it does increasingly more strategic research, such as biotechnological characterization and manipulation of the genetic makeup, or unraveling the intricacies of the mechanisms governing plant resistance to diseases and adaptation to poor soils or drought.

On the other hand, it is closely linked with resource management, to which it provides germplasm and commodity-based expertise—built up over more than 20 years of research—and from which it receives information on germplasm performance and on the needs of genetic materials that are customized to fit into productive and environment-friendly farming and land use systems.

Interinstitutional Collaboration, an Operational Pillar of the New Approach

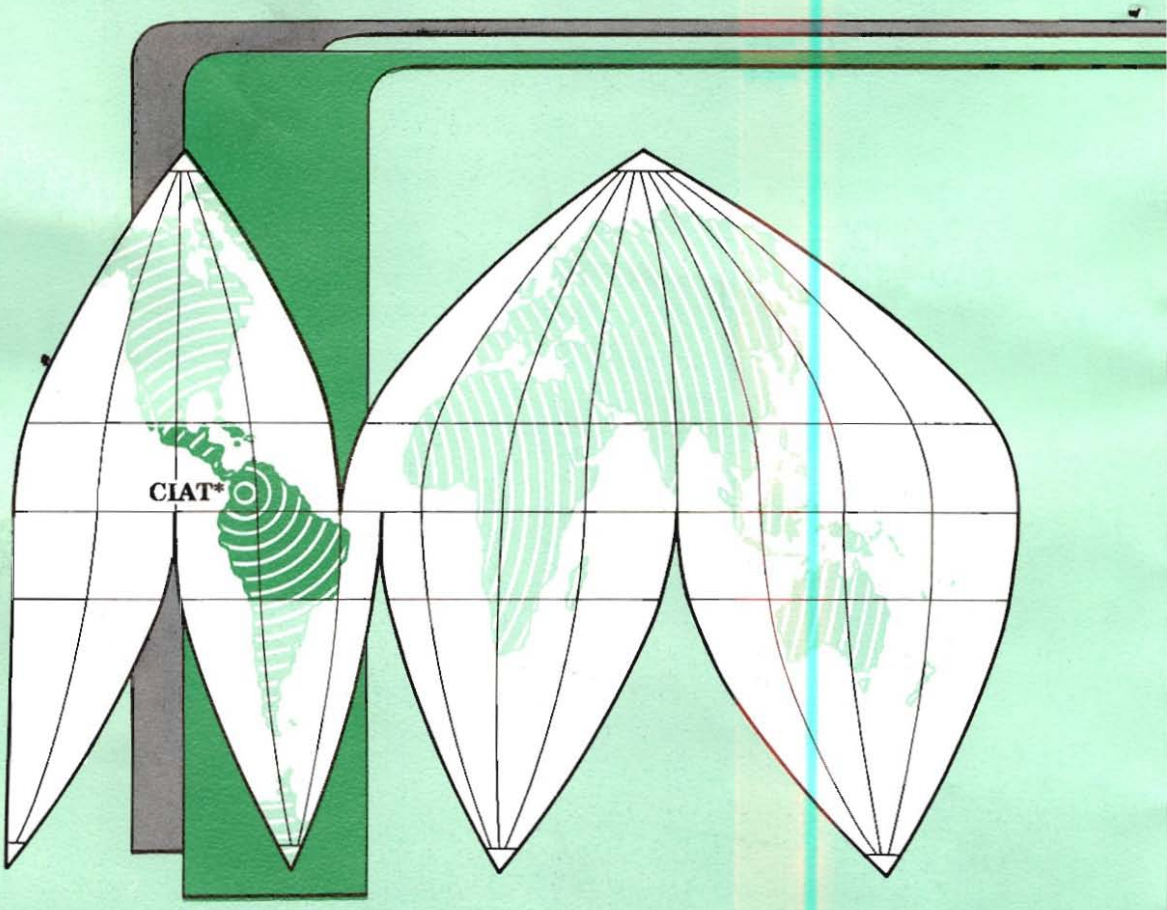
The myriad of issues in agricultural sustainability and their complexity prevents any single institution from developing and covering a blanket research agenda. The efforts of many institutions must come together, in cooperation and in complementarity, to achieve the ambitious but unavoidable tasks associated with sustainable agricultural development.

Mechanisms must be devised and established to encourage collaboration on common objectives among advanced research organizations, international agricultural research centers, regional organizations, national agricultural research systems, private enterprise, non-governmental organizations, resource management institutions, and farmers' organizations.

CIAT offers an international focal point where interinstitutional efforts can coalesce in research consortia, projects, and networks. It has the will to act in a convening, catalyzing, and facilitating role.

Regional and Global Responsibilities

Natural resources management research is necessarily circumscribed to specific ecoregions, which is why CIAT's activities in this field are centered on tropical America.



Strategic research on germplasm development, by contrast, is not constrained by regional ecological peculiarities. Therefore CIAT's germplasm development for commodity improvement spans the world for cassava, common beans, and soil quality enhancing tropical forages.

For operational reasons, however, germplasm development activities in certain regions are delegated among sister centers. Thus CIAT's support of cassava and tropical forages improvement in Africa is coordinated with the international Institute of Tropical Agriculture (IITA) and the International Livestock Center for Africa (ILCA). Similarly, CIAT's rice germplasm development in Latin America is coordinated with the International Rice Research Institute (IRRI), which serves the world on this crop.

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