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SHAREHOLDERS IN DEVELOPMENT

**Germany**  
**and**  
**CIAT**

Centro Internacional de Agricultura Tropical  
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# Germany and CIAT

German scientists have worked in tropical America for centuries. Alexander von Humboldt is perhaps Germany's most cited botanist on South American flora and vegetation. Other well-known but more recent botanists who have studied tropical American vegetation are A. Weberbauer, Heinrich Walter, and Heinz Ellenberg.

The Centro Internacional de Agricultura Tropical (CIAT) is situated in a major center of tropical American genetic diversity. It has therefore been a focus for German cooperation since the Center became part of the CGIAR system in 1971. Cooperation involves not only funding, but also research and direction. Germans have served on CIAT's Board of Trustees: Dr. W. Treitz, Federal Ministry for Economic Cooperation (BMZ) in Bonn, from 1975 to 1981; Professor E. Reisch, Institute of Agricultural Economy and Leader of the Center for Tropical Studies at the University of Hohenheim, Stuttgart, from 1981 to 1987; and Professor P. L. G. Vlek, Institute for Crop Production and Animal Hygiene in the Tropics and Subtropics at the Georg August University, Göttingen, joined the Board in 1992. Together with other German experts, they have helped shape CIAT's research strategy and ensured its scientific excellence. At present there are four German staff members and three German students working at CIAT.

CIAT's mission is to help reduce hunger and poverty in tropical developing countries by applying science to improve agriculture while maintaining the environment. For the first two decades, the Center operated through four Commodity Research Programs: Beans, Cassava, Rice, and Tropical Pastures (formerly known as Beef Production until 1979). Traditionally, German scientists were involved more with pasture

research than with the other programs, but, recently, more German scientists have been joining CIAT's Cassava Program to research sustainable cassava cultivation.

## Collaboration Between Germany and CIAT

Each collaborative research project between German universities and research institutes, and CIAT lasts from 1 to 5 years, and has a well-defined problem-oriented focus. Young German scientists work at CIAT under the guidance of project leaders from CIAT and German research institutes.

Valuable scientific ties have developed between CIAT and the German Agency for Technical Cooperation (GTZ), the Technical University of Berlin (TU Berlin), and the University of Hohenheim. In the early 1980s, Dr. G. John served as liaison officer for GTZ at CIAT. Liaison scientists appointed by the Council for Tropical and Subtropical Agricultural Research (ATSAR) advise on collaboration between CIAT and German research institutes. The first liaison scientist was Professor J.-H. Weniger, TU Berlin, since 1976. He was succeeded by Professor D. Smidt, Federal Research Centre for Agriculture (FAL), Neustadt, during 1987-1990. The current appointee is Professor D. Leihner, University of Hohenheim.

The projects in which Germany and CIAT have collaborated are:

### **Tropical Pastures Program (formerly Beef Production Program)**

**Germplasm.** Dr. R. Schultze-Kraft headed the Germplasm Section of the Tropical Pastures Program for almost 15 years. Under his leadership, the world's largest collection was made of wild legumes and grasses with forage potential, unique in their potential to adapt to acid soils. Through two collaborative projects with the Georg August University, Göttingen, many legumes, particularly some agronomically unknown *Stylosanthes*

species, were screened for variability and their adaptation potential to acid infertile soils. Selected legumes were then evaluated at sites all over tropical America. During 1984-1985, Dr. G. Keller-Grein collected grasses, particularly those of the *Brachiaria* genus, from East African countries. Dr. B. L. Maass has been in charge of CIAT's tropical forage germplasm collection since 1989. She has integrated all germplasm-related activities into CIAT's Genetic Resources Unit and consolidated the collection.

**Agronomy.** In the early 1980s, two young German scientists from the Friedrich Wilhelms University, Bonn, and TU Berlin completed studies on promising legumes for the Eastern Plains of Colombia (Llanos Orientales). One important finding was the excellent adaptation of *Stylosanthes capitata*, which was eventually released as the commercial cultivar 'Capica' in Colombia. Since late 1985, Dr. G. Keller-Grein has headed the Agronomy Section for the Humid Tropics. He initiated agronomic evaluation at the Tropical Pastures Program's major screening site in Pucallpa, Peru. Many germplasm materials have since been screened and several forage legumes, such as *Arachis pintoi*, *Desmodium ovalifolium*, and *Stylosanthes guianensis*, proved adapted to this ecosystem. They will eventually be used to reclaim degraded pastures.

**Soil biology.** A collaborative project with the University of Hohenheim aims to identify the physiological and biochemical mechanisms that help various grasses and legumes adapt to Latin American acid soils. Results should help identify desirable traits for improving forage genotypes.

**Pasture quality.** In collaboration with TU Berlin, two studies were carried out to understand how improved pastures affect animal performance in the Llanos Orientales. When grazing improved grass-legume pastures, the animals selected in a seasonal pattern, that is, they progressively chose more legumes from the end of the rainy season onward. The animals proved remarkably able to select suitable plant materials despite low availability. When grazing

native grasslands supplemented with a legume pasture, the animals tended to overgraze the legume pasture because of higher availability and better nutritional quality, particularly in the dry season. A major factor limiting performance in savannas complemented with legume pastures is low energy intake, not low protein intake, as expected.

**Beef production systems.** A comprehensive technical and economic study on beef production systems in Brazil, Colombia, and Venezuela, known as "ETES" (Estudio Técnico y Económico de Sistemas de Producción Pecuaria) was carried out in collaboration with TU Berlin. Covering the period 1978-1982, it was coordinated by Dr. I. Kleinheisterkamp. It aimed to identify major limitations of beef production systems in the area, and to integrate new technological components, developed by the Tropical Pastures Program, into relevant production systems. It was published in 1985.

**Dual-purpose production systems.** The Tropical Pastures Program saw potential for significant impact for legumes in dual-purpose systems. In the early 1980s, dual-purpose farms were monitored, in collaboration with TU Berlin, in Panama's central provinces. Because both herbaceous and shrub legumes, such as *Leucaena leucocephala*, have high production, protein contents, and concentrations of metabolizable energy, their potential was identified as supplementing the diet of milking cows and calves. During 1987-1991, an additional collaborative project with TU Berlin researched dual-purpose systems and the role of improved grass-legume pastures for milk and beef production in tropical America's acid soils. Results proved the newly developed grass-legume pastures to be more productive than grass alone.

## **Bean Program**

**Breeding.** Traditionally, almost exclusively pure lines of common beans (*Phaseolus vulgaris*) are cultivated in Latin America because of consumers'

preferences. In East Africa, however, heterogeneous mixtures are cultivated. In collaboration with the Technical University of München (TU München), Weihenstephan, a comparative study of these two cropping systems was made on competition and disease control. Variety mixtures cropping proved superior.

**Biotechnology.** Besides traditional plant breeding, advanced biotechnology techniques may be used to incorporate useful genes into beans. One precondition for this, however, is the establishment of an efficient *in vitro* regeneration system. Plant regeneration of common beans in tissue culture is currently being researched in collaboration with the University of Bonn.

**Phytopathology.** The Federal Institute of Biology in Agriculture and Forestry (BBA), Braunschweig, assisted CIAT to study the distribution and importance of viruses naturally infesting common beans and their relatives in Africa. The bean common mosaic potyvirus (BCMV) proved to be the most important virus in African bean cultivation.

**Soil microbiology.** A collaborative project with Philipps University, Marburg, studies competition and survival in strains of the bacterium *Rhizobium leguminosarum* biovar. *phaseoli* and in vesicular-arbuscular mycorrhizae (VAM). Increased knowledge about these soil microorganisms will help overcome limitations of nitrogen and mineral deficiencies, ineffective symbiosis with native soil *Rhizobium* strains, and limitations of the root system in crops such as the common bean. Through this project, selected, highly effective *Rhizobium* isolates may become commercially useful or appropriate *Rhizobium* strains may be genetically transformed.

**Economics.** Mexico is the second largest common bean producer in the world. CIAT collaborates with the University of Hohenheim and CIMMYT to carry out a "hedonic price" analysis on consumer preferences for dry bean qualities in Mexico. This methodology, previously used to establish breeding priorities, will help establish postharvest research priorities.

## **Cassava Program**

### **Management of intercropping systems.**

Ecologically, cassava is wide ranging and is known for its tolerance of low soil fertility, drought, and pests. Hence, the crop plays an important role in traditional, tropical cropping systems. About half of the cassava grown in America and Africa is intercropped to reduce risk of crop failure, obtain food production at different times of the year, make the best use of available land and labor resources, and help provide the family with a balanced diet. Dr. D. Leihner, who headed the Cassava Program's Agronomy Section during 1977-1984, researched to improve intercropping practices such as plant selection, planting times, planting densities and patterns, fertilization, and pest management.

**Soil conservation.** In the Andes, inappropriate agricultural practices can cause severe erosion and soil degradation. In many areas, the only temporary cropping option left for small farmers is cassava, because it adapts to very poor soils. Dr. K. Müller-Sämman leads an interdisciplinary team of scientists from CIAT, the University of Hohenheim, and collaborating Colombian institutions to conduct basic research on the erosion of Andean Inceptisols. The team also conducts field research to test and develop sustainable crop production systems. These innovative systems include soil conservation practices and intercropping cassava with perennial legumes. The legumes help protect the soil, and contribute to food production and income by providing fodder for livestock.

**Vesicular-arbuscular mycorrhizae (VAM) management.** For 6 years, Dr. E. Sieverding, Georg August University, Göttingen, collaborated with CIAT on the practical use of mycorrhizal fungi in the nutrition of tropical plants, especially cassava. Soil-borne mycorrhizal fungi benefit plants growing in tropical low-phosphorus soils and also help them make more efficient use of applied phosphorus fertilizers. In the long term, only through biological technologies, such as the use of VAM, can soil productivity be maintained and/or increased, and food production costs per unit be reduced.

**Entomology.** The biological control of cassava pests is an important research topic for the Cassava Program. In the late 1970s, the Justus Liebig University, Giessen, collaborated on studies of the biology, ecology, economic importance, and control of the cassava stemborer *Chilomima clarkei*. At present, the Georg August University, Göttingen, collaborates on the investigation of the mites *Neoseiulus idaeus* and *Typhlodromalus limonicus* as important natural enemies of the cassava green spider mite (CGM). This project is part of a large international research initiative aimed at the biological control of the CGM, a devastating pest accidentally introduced to Africa from South America in the 1970s.

## **Rice Program**

**Agronomy.** The influence of planting season on the growth, development, and yield of rice was studied in the Llanos Orientales, with the collaboration of the Justus Liebig University, Giessen, in the early 1970s. At that time, no commercially grown variety combined sufficiently early growth, particularly for second-season plantings, with tolerance of the severe iron problems of the Llanos soils. Recommendations were therefore made to search for improved varieties.

**Entomology.** In the past, uncertainty about economic thresholds of pests, the potential destructiveness of the *Sogatia*-hoja blanca complex, and active promotion of pesticides led to increasingly heavier use of insecticides. Dr. G. Weber, who headed the Rice Program's Entomology Section during 1985-1988, gave research priority to reducing pesticide misuse, and to systematically developing an integrated pest management strategy for Latin America that would be acceptable economically, ecologically, and toxicologically.

**Economics.** In the late 1980s, CIAT, in collaboration with TU München, Weihenstephan, carried out a comprehensive study on the social benefits and costs of rice research in Brazil.



## **Swine Production Program (1971-1979)**

Most Colombian swine production is carried out in the subhumid Atlantic coastal plains. Most pigs are "Zungo," or crossbred Zungo, a black hairless race of the tropics. In the early 1970s, a study on the performance and environmental adaptation of these Zungo pigs was carried out in collaboration with TU Berlin.

## **Training**

CIAT has a long tradition of providing young German scientists facilities for their thesis research. More than 20 have come as visiting research associates. Many later served in CIAT's scientific community. Two, Drs. D. Leihner and R. Schultze-Kraft, were among the first to do their doctoral studies at CIAT (in the early 1970s). After many years of research in Cassava Agronomy and Tropical Pastures Germplasm, respectively, they both returned to Germany as Professors to teach at the University of Hohenheim, Stuttgart.

The GTZ also trained young professionals at CIAT in the recent advances of rice and tropical pastures to apply in their activities with bilateral cooperation projects.

## **Relations Between Germany and CIAT**

German and CIAT scientists have collaborated for many years. With its new emphasis on research in natural resources management, CIAT looks forward to further, stronger cooperation with Germany during the 1990s. German scientists and financing will play important roles in implementing the infrastructure required for research to ameliorate the consequences of land use intensification and of degradation of natural resources in tropical agroecosystems. For example, a new project to be financed by BMZ has just been approved to develop area-based strategic research in resource management for tropical America.

## Germany's Contributions to CIAT's Budget (in thousands of US\$)

The GTZ has managed most of the funds for the collaborative projects financed by the BMZ. Other donors, for example, include the German Science Community (DFG), German Academic Exchange Service (DAAD), and the Eiselen Foundation. For the last 20 years, Germany contributed an annual average of over US\$800,000 to CIAT's overall budget (Table 1). In addition, a substantial amount is contributed through the European Economic Community.

Table 1. Funds contributed by Germany to CIAT's budget (in thousands of US\$).

Year	Unrestricted core	Complementary funds
1973	56	
1974	89	
1975	344	
1976	636	
1977	606	
1978	1,096	71
1979	1,183	93
1980	1,276	93
1981	1,156	173
1982	1,027	106
1983	1,041	132
1984	814	55
1985	708	131
1986	626	23
1987	649	70
1988	688	30
1989	655	30
1990	711	97
1991	728	100
1992	720	146
Total	14,809	1,350

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