

DINTER 0021

**Sustainable Development and Valorization of Cassava  
in Paraguay: Integration of User-oriented Crop  
Production, Plant Protection and  
Postharvest Processing**

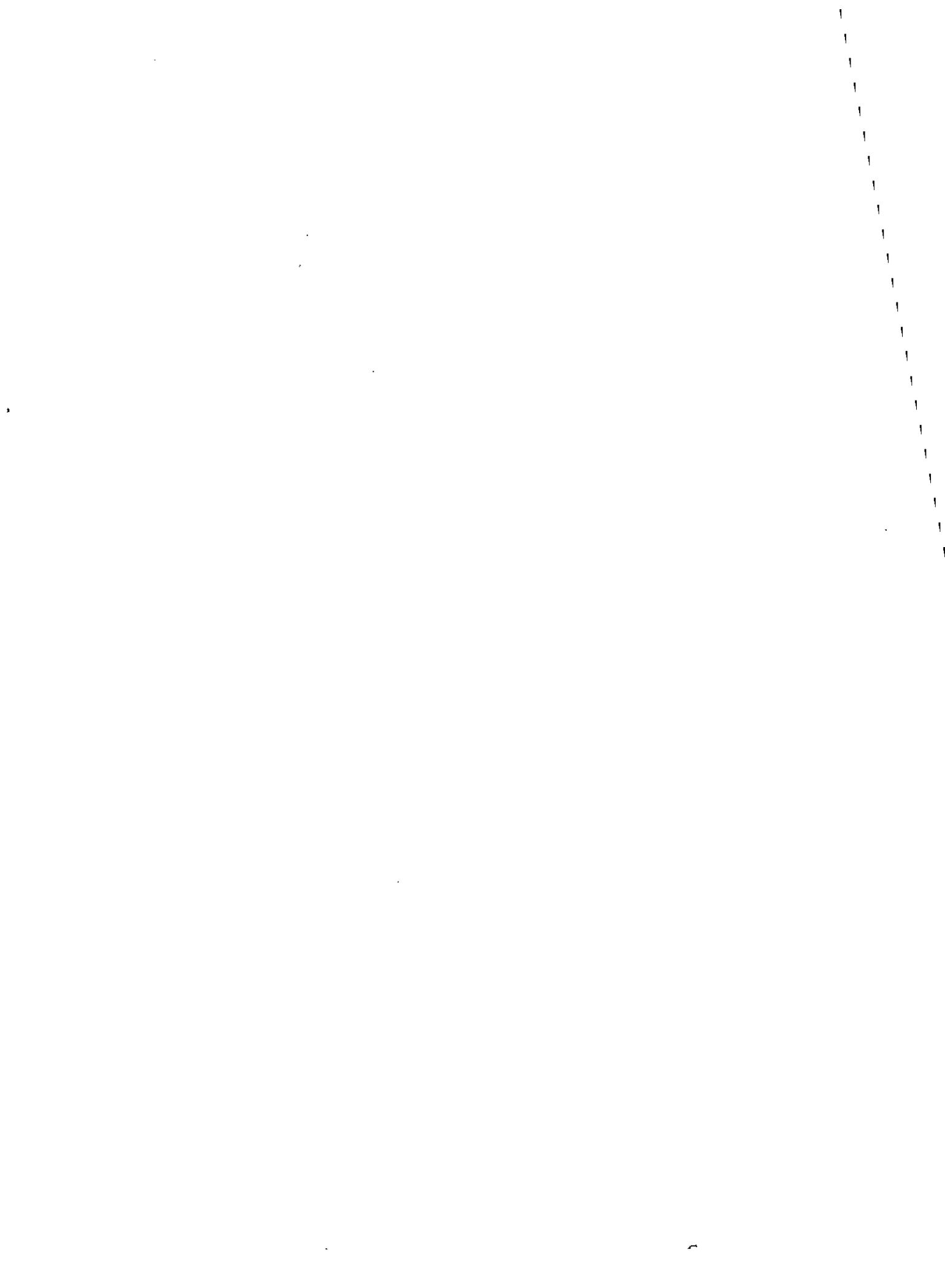
A project pre-proposal

Submitted to: **International Fund for Agricultural  
Development (IFAD) - Rome, Italy**

By: **Dirección de Extensión Agraria (DEAg),  
Dirección de Investigación Agrícola (DIA),  
Facultad de Ciencias Agrarias (FCA)  
Asunción, Paraguay**

**International Center for Tropical Agriculture  
(CIAT) – Cali, Colombia**

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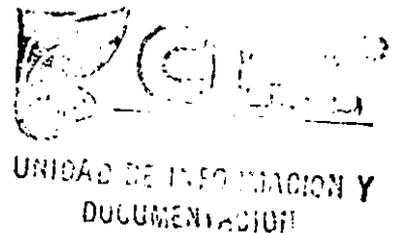
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**PROJECT PURPOSE:**

To alleviate rural poverty and increase food security by increasing and stabilizing the productivity of small-scale cassava-based agricultural production systems in Paraguay.

**DEVELOPMENTAL RATIONALE/NEED:**

**Developmental challenge**

Paraguay has a population of 4.6 million people and is one of the poorest countries in its region. Per capita income is US\$1,380; however, there is a large disparity of wealth, and the poorest 50% of the population receives only 16%. The country suffers from rampant deforestation (losing 70% of its forest in the last 50 years) and high population growth rate (3.2%), which threaten economic stability and the improvement of quality of life. Agriculture produces more than 1/4 of the gross domestic product (GDP), employs half the work force, and generates 90% of the registered exports, with heavy concentration in cotton and livestock. Deforestation and deterioration of soil quality are major concerns, as are the needs to diversify exports and increase value-added postharvest processing of agricultural products. Small scale farmers continue to wrestle with issues of land tenancy, crop diversification and product commercialization, while large-scale commercial agricultural enterprises profit from better soils, infrastructure, credit, technical assistance and market access. The development challenge of the project is to strengthen rural development through integration of sustainable cassava production systems with linkages to growth markets.

**Importance of cassava**

Cassava is a tropical/subtropical root crop that has great social importance in Paraguay where it has long been one of the principal sources of carbohydrates. It is a hardy crop that is generally produced on marginal agricultural land by small-scale farmers who have limited access to land, inputs (fertilizer, pesticides and machinery), and improved technologies. Paraguay is the second largest producer of cassava in Latin America, cultivating 175,000 ha to produce 2.82 million mt per year. Cassava produces income and employment for 230,000 small-scale farmer families, which is about 70% of this socioeconomic class in Paraguay. This crop produces a variety of products including fresh roots for human consumption, flour for baked foods, starch for industrial uses, and fodder for livestock. Paraguay has the highest per capita consumption rate of cassava in Latin America, 137.2 kg/yr. Presently, 60-65% of the production is consumed on the farm, 30% is sold as fresh roots in urban centers, and only 3% is used for "traditional" starch extraction. Average cassava yield is 15.6 t/ha, which is lower than the regional potential of 24 t/ha because of severe production, credit and market constraints.

Principal constraints to production include quality planting material (30% estimated regional yield gain possible), soil erosion (24%), poor soil quality (12%), crop management (10%), improved varieties (8%), diseases (bacteriosis 20%, root rots 5%, anthracnose 4%, common mosaic virus 4%), and insects (hornworm 12%, whiteflies 8%, stemborers 5%).

Major postharvest constraints include fluctuating and low product prices at the farm and large marketing margins; lack of value-added processing of products and market diversification; absence of market information; and absence of cooperative-based commercialization systems. Furthermore, 1997 surveys of small farmer cooperatives in Southeastern Paraguay, have recorded that technical assistance, improved technologies and operational credit are among the top farmer necessities. In addition, one of the more important small-farm cash crops, cotton, has suffered major yield losses, which has caused many farmers to become heavily in debt.

### Previous projects

Implementation of currently available technologies for increasing productivity has been hampered by poor integration of farmers, extensionists, and researchers in the research and development process.

This proposal builds on the results of several preceding projects:

- The UNDP global project, "Ecologically Sustainable Cassava Plant Protection in South America and Africa: An Environmentally Sound Approach" (ESCaPP, or PROFISMA in Brazil), which had activities in Northeast Brazil executed by CNPMF/EMBRAPA and CIAT, and activities in Africa executed by IITA and NARS (1993 - 1996).
- The project "Agro-industrial Development of Cassava in the Atlantic Coast of Colombia" executed by CIAT and the Colombian Integrated Rural Development Program (DRI) with additional financing by CIDA (1981-1996).
- The "Project to Generate and Validate Technologies for Production and Industrialization of Cassava" funded by IDRC, which was executed by CIAT and the Paraguayan Ministry of Agriculture and Livestock (1986-1991).
- The "Project for Training of Trainers in the Network for the Development of Cassava in the Southern Cone", which was executed by CIAT and the Paraguayan Ministry of Agriculture and Livestock (1992-1993), trained 10 extensionists in testing of cassava varieties with farmers, IPM of cassava hornworm, management of planting material, soil conservation and use of roots and other plant parts for animal feed.
- The EC-STD3 Project "Valorization of Cassava Products in Latin America", 1993-1996, coordinated by CIRAD-SAR, especially targeting the Brazilian cassava sector, generated proofs and a valuable experience that a market-led integrated project approach can lead to product valorization and linkages to growth markets.

The UNDP project achieved outstanding impact in the successful establishment of predators of the cassava green mite in Africa and parasitoids of mealybugs in Northeast Brazil. The mite predators are reducing pest populations by up to 90% in Africa, increasing yields by 30%, and adding US\$ 60/ha in profits. This project also conducted diagnostic surveys, trained farmers, extension agents and national program scientists in farmer participatory research (FPR) methods. The impact on improving research priority setting and in accelerating transfer and adoption of crop production and plant protection methods in Northeast Brazil was so impressive that the national agricultural research agency, EMBRAPA, has adapted this project as a model of how they want to do research. This project leaves a legacy of trained personnel experienced in conducting and training others to conduct FPR and to develop locally-appropriate methods for increasing crop production that will continue after the project ends.

The Atlantic Coast of Colombia project established 2 pilot plants to produce dry cassava chips to use as animal fodder. This provided a stable floor price for cassava, which motivated farmers to independently increase their production. Within two years the price of cassava in a nearby city, Baranquilla, dropped by 27% from 4.5 to 3.3 (1978 Colombian pesos), with total benefits of about US\$4 million per year to the urban population. The success of the pilot plants stimulated an expansion of small agro-industries, which numbered 192 by 1992. The region now has at least 40 plants and is selling about US\$1 million of dry chips per year. Economic studies have shown, that this integrated project generated a return of US\$18 for every dollar invested.

The preceding Paraguayan IDRC project provides a foundation for realizing a substantial increase in cassava production and expansion of markets for its products. The project conducted research trials on soil preparation and fertilization, evaluation of cassava varieties, intercropping, use of herbicides, survey of existing markets and uses (in 1987), deterioration of roots after harvest, and a pilot plant for starch extraction. However, these gains failed to become widely adopted. What is lacking is the direct collaboration of national program scientists with farmers to develop and evaluate production and plant protection technologies, and to develop processing plants that produce products that are competitive and that have elastic markets.

### **Current projects**

USAID is currently supporting projects to reduce population growth and preserve natural regions. IFAD is supporting a project to develop "panaderías" that produce baked products from cassava flour, frequently employing women. What is needed is a project to increase crop productivity in an ecologically sustainable way, diversify postharvest products and develop markets, which will stabilize prices and increase production demand — thus providing incentives to farmers to adopt technologies. The increased production will lower consumer prices and increase rural employment for production and processing.

### **INTENDED BENEFICIARIES**

1. **Small-scale cassava producers of Paraguay:** Farmer participatory research will accelerate the adoption of new technologies for production and protection of cassava from pests and diseases. Diversified markets will reduce market risk and stabilize on-farm prices. Improved marketing systems will lower marketing margins. Farmer-processors will increase the value of their cassava products by producing improved and new processed products, thus generating additional revenues and employment, especially for women, whose current opportunity cost is extremely low. Empowerment of local farmer research committees will create a demand for new technologies, information, and other inputs from national research and extension agencies.

2. **Urban consumers of cassava products:** Increased production of cassava with better marketing systems will lower and stabilize consumer prices.

3. **Extension agents and extension agencies:** Development of their human resources through training in Farmer participatory research methods and in cassava production methods will increase their penetration of target areas, increase the efficiency of technology transfer, and provide a downstream infrastructure for technology testing and adoption.

4. **Scientists at national research institutes:** Training in Farmer participatory research will provide feedback from farmers regarding their priorities and needs, and will provide an efficient means of setting research priorities and testing emergent technologies during the development process. Training and experience with the ICRDP approach will be beneficial for application in other R&D projects in Paraguay.

### **ANTICIPATED IMPACT**

1. At least 400 farm families in 15 pilot sites will increase cassava productivity by 45-55%, translating into additional revenues of 30-35%.

2. At least 100-120 farm families (among which are a high percentage of women) in 6 pilot sites will improve cassava-based revenues by 30-40% from value-adding and labor-generating activities (fresh packaged roots, dried chips, starch).

3. Fresh cassava price stabilization and marketing improvements will reduce market price fluctuations (on average) by 50-70% in at least 3-6 rural and semi-urban markets, benefiting consumers and producers (with a negative effect on trader margins).

4. Improved management practices will reduce the slash and burn incidence and improve soil sustainability.

5. At least 12 national students will directly benefit from specialized training and thesis research opportunities as part of the project.

6. 20-24 national scientists and extensionists will directly benefit from FPR and ICRDP methodology training and from specialized on-the-job experience, strengthening the R&D and technical capacity of three national agencies. In addition the R&D integration with the project will foster increased long term collaboration opportunities for national institutions with international R&D agencies.

7. Training in farmer participatory research and new technologies will enable NARS scientists and extensionists to continue developing solutions to cassava production and processing problems after termination of the project. Development of farmer research committees provides an infrastructure in participating communities that will continue to test and adopt new technologies. These committees also serve as examples that help to spread new technologies to other communities.

## **INTERNATIONALITY OF OUTPUTS**

The farmer participatory research (FPR) model developed for crop variety selection, crop production, integrated pest management (IPM), and postharvest processing is applicable to many developing countries in Latin America, Africa and Asia. It provides for early input to prioritize problems, identify viable solutions, and test alternatives on the farm before producing "finished" technologies, thereby decreasing the development time and increasing adoption rate. Timely feedback from end-users avoids development of inappropriate solutions. This developmental approach is applicable across crops, ecosystems, and geographical regions.

Technological solutions to production constraints such as planting material quality, soil erosion, soil quality, bacteriosis, root rots, cassava common mosaic virus (CsCMV), hornworm, whiteflies and stemborers have global application.

Development of postharvest products such as dried chips, flour and starch that have elastic demand, and the processing plants to produce them, have already had great impact in Asia and parts of Latin America and offer important possibilities for other countries in the Americas and Africa.

## **PROJECT DESCRIPTION**

This project uses the Integrated Crop Research and Development Project (ICRDP) approach, which links small farmers with growth markets, increases the on-farm market value of produce, and increases efficiency of crop production, all of which work together to increase the profitability of small-holder farming. The method of farmer participatory research (FPR), which involves an integrated interaction between farmers, consumers, market agents, extensionists and scientists to identify and prioritize problems, develop viable solutions, test them with farmer-conducted experiments, and modify technological solutions for local adoption, in an iterative process. Thus, on-farm applied research and extension activities are directly linked to upstream research in crop management, germplasm development, biological control, biotechnology, postharvest processing and market development. Training of national program scientists, extensionists and farmers in FPR and in the development and use of new technologies is an important component of the project, which will ensure that this project will continue to impact national development after termination. Similarly, the ICRDP approach and accompanying methodologies, will ensure the integration of actors and production, processing and market R&D activities, resulting in optimizing the impact and efficiency of the use of project resources.

Project outputs and activities are presented in the attached work breakdown structure (Figure 1).

## RELEVANCE TO NARS PRIORITIES

The "Project for Generation and Validation of Technology to Produce and Industrialize Cassava" was initiated in 1986 under the direction of the Department of Agricultural Extension (DEAg) to improve production technology and to train cassava producers in the use of new production technologies. Relationships between the Department of Agricultural Investigation (DIA), the University of Agricultural Sciences (FCA) and DEAG are being strengthened to support research and technology transfer.

This project proposal is consistent with the stated general objectives and priorities of the Ministry of Agriculture and the Ministry of Commerce and Industry. Furthermore this proposal acts on demands by these ministries for interventions on (i) the development and transfer of cassava production technologies, (ii) institutional strengthening, (iii) identification and implementation of cassava value-adding interventions, and (iv) especially for the south-eastern regions, identify and develop viable alternatives for cassava based farmers suffering from the current cotton crisis.

A representative of the Dirección de Cooperación Técnica Internacional (Secretaría Técnica de Planeación), with a mandate on international project proposal prioritization was actively involved in formulation of this proposal.

Explicit support for this project has been received from directors of FCA, DIA and DEAG. Moreover, representatives of the pertinent national agencies have been full actors in the various stages of project formulation, prioritization and consensus-seeking activities since 1996.

## RELEVANCE TO DONOR PRIORITIES

Project strategy, approach and methods are in direct agreement with the ongoing activities and preliminary results of the global cassava development strategy spearheaded by IFAD. This strategy has already specified the need to emphasize market-led, integrated research and user-oriented R&D approaches.

Biological control of major pests and diseases of cassava increases agricultural productivity and contributes to alleviation of poverty while protecting the environment from inappropriate use of agrochemicals. Production of high quality planting material optimizes the use of external inputs and contributes to overall crop vigor and resistance to pests and diseases, directly increasing yield. Soil and water resources can be conserved through the use of legume intercrops and improved planting systems. FPR provides highly relevant diagnostics of the reality faced by farmers within the target area, thereby contributing to improved allocation project resources and demand-driven selection of research and development activities. Analysis of markets to develop products with greater elasticity of demand will lower consumer costs, stabilize and increase farmer income, and increase jobs in the processing and marketing sectors. The training component of the project aims to strengthen the capability of DIA, DEAG and FCA in participatory methods and new technologies, making project gains institutionally sustainable in the long term.

## INNOVATIVENESS

Using community-based farmer research committees (CIALs) to choose, test, and disseminate technology will increase the probability of adoption of improved varieties, crop management and postharvest processing practices. In many areas of Paraguay, neither improved varieties nor available crop production practices have been adopted because traditional top-down development and extension practices exclude farmer input in technology development. Use of FPR by this project will speed up technology adoption several fold by incorporating farmer criteria in its development and evaluation, by increasing farmers' knowledge of production constraints, and by stimulating farmers to experiment with new methods.

Following the ICRDP approach, which links small farmers with growth markets, the analysis and development of postharvest products that have greater elasticity of demand will increase and stabilize demand for cassava production, improving the welfare of poor rural farmers. Increasing profitability helps to motivate them to adopt new technologies to increase productivity and conserve the quality of their land and water.

Integration of activities in crop production, plant protection, postharvest processing, product marketing, and natural resource management will help ensure that all components of the system will be developed so that no "weak links" prevent sustainable development.

## **CIAT CAPACITY TO DELIVER**

This project will draw on the expertise and experience of the ESCaPP/PROFISMA project, as well as others such as those on postharvest processing and cassava variety evaluation. We currently have personnel available in each of the technological areas covered by the project. Project management and execution will partly depend on concurrent funding of the UNDP-IFAD global ESCaPP project.

## **PRIOR INSTITUTIONAL EXPERIENCE WITH DONOR AND SECTOR**

CIAT has had prior experience with IFAD in projects in Northeast Brazil involving development of cassava varieties using farmer participatory research. CIAT has had extensive experience in each technical component of the project. The CIRAD economist has previously worked at CIAT and has extensive experience in cassava marketing systems. CIAT has previously worked with the cassava sector in Paraguay on several projects.

## **INSTITUTIONAL COLLABORATING PARTNERS AND THEIR ROLE IN THE PROJECT**

**IITA:** Collaboration between CIAT and IITA includes collection and evaluation of biological control agents of mites and other insects; identification and characterization of pathogens causing root rot, bacteriosis, anthracnose, and common mosaic virus; methods for selection of resistant germplasm; development of crop production methods; training in FPR methods and new technologies.

**CIRAD:** An economist with extensive experience in market analysis and development of cassava products and ICRDP methods will be seconded to this project and located in Paraguay.

**DEAG:** Department of Agricultural Extension provides training and technical assistance to cassava producers.

**DIA:** Department of Agricultural Investigation is responsible for the development and transfer of production technologies.

**FCA:** The Faculty of Agricultural Sciences, National University of Asunción trains professionals for the agricultural sector and provides services in specific areas to professionals and producers.

## **PROJECT MANAGEMENT**

CIAT will be responsible for financial and technical progress reports to the donor. CIAT will develop specific research and implementation activities in collaboration with its NARS partners.

DEAG, DIA and FCA are co-authors of this proposal and will be responsible for major areas of execution in Paraguay.

## PROJECT BUDGET

Paraguay : Requested funds

	(US\$ 1000)				
	1998	1999	2000	2001	TOTAL
Diagnostics	41.8	11.4	10.7	11.9	80.0
Training	75.1	20.5	19.2	21.4	143.6
Technical Research	79.8	21.8	20.4	22.7	152.5
On-farm Research	48.1	13.1	12.3	13.7	91.9
Pilot Processing Plants	145.2	39.6	37.1	41.3	277.5
Project Coordination	20.5	5.6	5.2	5.8	39.1
<b>TOTAL</b>	<b>410.6</b>	<b>111.9</b>	<b>104.9</b>	<b>116.7</b>	<b>784.6</b>

CIRAD: Requested funds

	(US\$ 1000)				
	1998	1999	2000	2001	TOTAL
Economics	67.6	67.6	67.6	67.6	270.4
<b>Total</b>	<b>67.6</b>	<b>67.6</b>	<b>67.6</b>	<b>67.6</b>	<b>270.4</b>

CIAT: Requested funds

	(US\$ 1000)				
	1998	1999	2000	2001	TOTAL
Entomology	34.0	35.5	38.7	44.1	152.2
Plant pathology (root rots & bacteriosis)	34.0	37.0	40.4	44.1	155.5
Virology + Biotechnology	28.0	29.2	32.1	35.4	124.6
Postharvest processing + Economics	33.6	29.5	30.9	34.1	128.0
Farmer participatory Research	10.0	9.4	9.8	10.3	39.5
Project Coordination	10.0	8.6	8.7	12.5	39.7
CIAT Overhead (23%)	34.4	34.3	36.9	41.5	147.1
<b>Total</b>	<b>184.0</b>	<b>183.4</b>	<b>197.5</b>	<b>221.8</b>	<b>786.6</b>
<b>GRAND TOTAL</b>	<b>662.2</b>	<b>362.9</b>	<b>370.0</b>	<b>406.2</b>	<b>1,841.7</b>

**PROJECT OFFICERS:**

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**LIST OF ACRONYMS:**

CERAT	Centro de Raizes y Tuberculos, UNESP, Botucatu, Brazil
CGM	cassava green mite
CIAL	community-based farmer research committee
CIAT	International Center of Tropical Agriculture, Cali, Colombia
CIDA	Canadian International Development Agency
CIRAD	International Center for Cooperation in Agronomic Research for Development, Montpellier, France
CNPMA	the Brazilian national research center for monitoring and evaluation of environmental impact, Jaguariúna, São Paulo
CNPMF	the Brazilian national research center for cassava and fruit crops, Cruz das Almas, Bahia
CsCMV	cassava common mosaic virus
DEAG	Department of Agricultural Extension
DIA	Department of Agricultural Investigation
EMBRAPA	the Brazilian national agricultural research agency
ESCaPP	acronym for "Ecologically Sustainable Cassava Plant Protection"
FCA	Faculty of Agricultural Sciences, National University, Ascuncion
FPR	farmer participatory research
ICM	integrated crop management
ICRDP	integrated crop research and development project
IDRC	Canadian International Development Research Center
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture, Biological Control Center for Africa, Cotonou, Republic of Benin
IPM	integrated pest management
NARS	National Agricultural Research System
PROFISMA	Portuguese acronym for AEcologically Sustainable Cassava Plant Protection@
UNDP	United Nations Development Programme
USAID	United States Agency for International Development

# Paraguay Work Breakdown Structure

by L. Smith, 26 Aug. 1997

**Goal:** To contribute to the alleviation of rural poverty and increase food security in cassava-based agricultural production systems in Paraguay.

**Purpose:** To develop the capacity of small-scale farmers to increase cassava production and produce value-added postharvest products and to develop national program capacity to conduct farmer participatory research.

	Diagnostics	Training	Technical Research	On-farm Research	Pilot Processing Plants	Project Coordination
<b>O U T P U T S</b>	Characterization of systems and identification of constraints and opportunities to cassava production, processing and commercialization	Trained national scientists, extensionists and farmers in crop production, plant protection, postharvest processing and farmer participatory research (FPR) methods	Identification of existing technologies and development of new technologies for crop production, plant protection, and postharvest processing	Organization of farmer research committees (CIALs); introduction, selection and adaptation of crop production and plant protection technologies by farmer participatory research	Validation of new/ improved processes and products in pilot plants	Coordination, monitoring and evaluation of project activities
<b>A C T I V I T E S</b>	1.1 Organize and train survey team 1.2 Conduct extensive diagnostic survey (60 communities) 1.3 Conduct intensive diagnostic survey (15 communities) 1.4 Conduct market studies	2.1 Train CIALs, extensionists and scientists in FPR methods 2.2 Train in sustainable crop management, postharvest processing, utilization and commercialization 2.3 Conduct farmer field days on principles and practices for sustainable crop management, processing, utilization and commercialization	3.1 Develop methods to control plant pathogens 3.2 Develop biological control agents for arthropod pests 3.3 Test different companion crops to reduce soil erosion 3.4 Develop improved cassava varieties 3.5 Develop new crop management methods 3.6 Develop new and improved postharvest products and processing methods (fresh roots, dry chips, starch)	4.1 Organize and train 15 farmer research committees (CIALs) 4.2 Plan, conduct and evaluate CIAL crop production and plant protection experiments	5.1 Select and organize 6 CIALs for pilot plants 5.2 Plan, build, operate and evaluate 2 processing plants to produce dry chips for commercial sale 5.3 Plan, build, operate and evaluate 2 processing plants to produce dry chips for on-farm use 5.4 Plan, build, operate and evaluate 2 processing plants to produce fresh roots for sale 5.5 Plan, build, operate and evaluate 2 processing plants to produce "improved artisanal" starch extraction	5.1 Conduct planning workshop 5.2 Develop and implement goal-oriented work plans 5.3 Coordinate, monitor and evaluate project activities 5.3 Prepare annual financial and technical reports

PARAGUAY						
BUDGET TOTAL FOR ALL ACTIVITIES (US\$)						
Item		1998	1999	2000	2001	TOTAL
<b>PERSONNEL</b>						
<b>International</b>						
FPR trainer (0.2)	A	4,500	4,725	4,961	5,209	19,396
<b>National</b>						
Per diems for training	B	2,250	750	750	750	4,500
Per diems technical assistance	C	12,920	6,920	6,920	6,920	33,680
Students/Technicians (5)	D	25,000	27,500	30,250	33,275	116,025
Secretary	E	6,000	6,600	7,260	7,986	27,846
<b>Total personnel</b>		<b>50,670</b>	<b>46,495</b>	<b>50,141</b>	<b>54,140</b>	<b>201,447</b>
<b>OPERATIONS</b>						
Supplies, services		34,400	27,200	18,000	18,000	97,600
Vehicles (fuel, maintenance)		11,600	8,000	8,000	8,000	35,600
Communications		4,000	3,000	2,300	3,000	12,300
Publications/presentations		5,000	3,000	3,000	5,000	16,000
Contingencies	G	2,800	2,000	1,500	1,700	8,000
<b>Total operations</b>		<b>57,800</b>	<b>43,200</b>	<b>32,800</b>	<b>35,700</b>	<b>169,500</b>
<b>TRAVEL</b>						
International (trips: 6, 3, 3, 6)	H	9,000	4,500	4,500	9,000	27,000
National	I	5,100	1,800	1,800	1,800	10,500
<b>Total travel</b>		<b>14,100</b>	<b>6,300</b>	<b>6,300</b>	<b>10,800</b>	<b>37,500</b>
<b>CAPITAL</b>						
Vehicles	J	50,000				50,000
Laboratory equipment	K	6,000	4,000	2,000	2,000	14,000
Field equipment	L	2,000	2,000	2,000	2,000	8,000
Mass-rearing facilities	M					0
Computers, software (2)	N	10,000				10,000
Audiovisual material	O	8,000				8,000
<b>Total capital</b>		<b>76,000</b>	<b>6,000</b>	<b>4,000</b>	<b>4,000</b>	<b>90,000</b>
<b>OTHER CAPITAL</b>						
Seed money for CIAs	P	1,600				1,600
2 Pilot plants, commercial dry cassava	Q	65,000				65,000
2 Pilot plants, on-farm dry cassava	R	60,000				60,000
1 pilot plant for starch	S	80,000				80,000
1 pilot plant for fresh roots	T	10,000				10,000
<b>Total other capital</b>		<b>216,600</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>216,600</b>
Consultants	U	10,000	10,000	10,000	10,000	40,000
Overhead (CIAT 4%) (not including consultants)	V	16,607	4,080	3,730	4,188	28,602
<b>GRAND TOTAL</b>		<b>441,777</b>	<b>116,075</b>	<b>106,971</b>	<b>118,826</b>	<b>783,648</b>
<b>Activities:</b>						
1   Diagnostics						
2   Training						
3   Technical Research						
4   On-farm Research						
5   Pilot Processing Plants						
6   Project Coordination						

## Paraguay Budget Notes

- A. FPR Training Specialist from CIAT (who will work extensively within the country).
- B. Training of technicians and producers: through short journeys of 1 day, field days, etc.
- C. TECHNICAL ASSISTANCE: several of the technicians that will be supporting the project, but whose work headquarters is in Asuncion or San Lorenzo. To cover expenses that represent their participation to carry out work in different areas like, surveys, installation of pilot plants, evaluation of pests and diseases, installation of experimental plots, monitoring and evaluation, etc.
- D. Support for students or technicians at the University, (FCA) collaborators.
- E. A secretary in Paraguay to help project coordination and execution.
- F. Supplies and services - operational costs associated with project execution and management including laboratory, office and miscellaneous expendable supplies, communications, computer and vehicle maintenance, fuel, and document preparation.
- G. 5% of operations to cover unexpected contingencies.
- H. Airfare, ground transportation and per diem associated with international travel. International workshops are planned for the first and last year of the project.
- I. Ground transportation and per diem associated with regional travel, including for visiting CIAT scientists.
- J. VEHICLE: the type of vehicle for the places selected for the project, mainly for San Pedro Dept., should be powerful vehicles with 4 wheel drive and high clearance because this place has difficult access, with sandy unpaved roads in bad conditions, which are too difficult for small low vehicles. Furthermore the duration of the project (4 years) and the many activities are arguments to buy vehicles with these characteristics: 1 (one) 4 wheel drive pick-up truck and one 4 wheel drive passenger vehicle.
- K. LABORATORY MATERIALS: they consist of test tubes, petri dishes, forceps, cotton, alcohol, reagents and chemical products for experiments.
- L. FIELD EQUIPMENT: they include: back micronizer, machetes, hoes, shovels, marketing stakes, measuring tape, magnifiers, string, wooden rake, scale, paint, etc.
- M. REQUIREMENT FOR MULTIPLICATION OF VIRUS TO CONTROL HORMWORM: the DIA can use a laboratory equipped for the multiplication of virus to control *Anticarsia* sp. in soybean.
- N. 2 Computers and 1 printer with basic software for writing, data analysis and accounting.
- O. EQUIPMENT AND AUDIOVISUAL MATERIALS: they consist of overhead projector, slide projector, videotape equipment, photographic camera, video camera, etc.
- P. Start-up money to finance farmer research committees (CIALs).
- Q. Construct and operate 2 pilot plants to produce dry cassava chips for commercial markets.
- R. Construct and operate 2 pilot plants to produce dry cassava chips for on-farm use as animal feed.
- S. Construct and operate 1 pilot plant to produce starch for commercial markets.
- T. Construct and operate 1 pilot plant to produce fresh roots for commercial markets.
- U. CONSULTANTS: for specific cases in the area that the technical team needs the support of a specialist; i.e.: training in software for survey analysis, surveys analysis and design, animal nutrition, soil, pilot plant, surveys for training and carry out work.
- V. Project management costs charged by CIAT (4% of budget, excluding consultants).

PARAGUAY							
TOTAL BUDGET FOR 4 YEARS ( 1000 US\$)							
	Diagnostics	Training	Technical Research	On-farm Research	Pilot Processing Plants	Project Coordination	
PARAGUAY BUDGET	Activity I US\$	Activity I US\$	TOTAL US\$				
<b>PERSONNEL</b>							
<b>International</b>							
FPR trainer (0.2)		19,396					19,396
<b>National</b>							
Per diems-training courses	750	3,000		750			4,500
Per diems technical assistance	6,000		5,600	16,080	6,000		33,680
Students/technicians (5)		58,013	58,013				116,025
Data manager							0
Project coordination							0
Secretary (1)	4,641	4,641	4,641	4,641	4,641	4,641	27,846
<b>Total personnel</b>	<b>11,391</b>	<b>85,049</b>	<b>68,254</b>	<b>21,471</b>	<b>10,641</b>	<b>4,641</b>	<b>201,447</b>
Personnel/Total	0	1	0	0	0	0	0
<b>OPERATIONS</b>							
Supplies, services	14,000	21,600	28,000	6,000	8,000	20,000	97,600
Vehicles (fuel, maintenance)	600	2,400	4,800	19,800	4,000	4,000	35,600
Communications	450	3,400		450		8,000	12,300
Publications/presentations	4,000	4,000	4,000	4,000			16,000
Contingencies	1,000	1,000	2,000	2,000	2,000		8,000
<b>Total operations</b>	<b>20,050</b>	<b>32,400</b>	<b>38,800</b>	<b>32,250</b>	<b>14,000</b>	<b>32,000</b>	<b>169,500</b>
Operations/Total	25%	23%	25%	35%	5%	82%	22%
<b>TRAVEL</b>							
International	4,500	4,500	6,000	6,000	6,000		27,000
National	2,000	1,500	2,000	2,000	2,000	1,000	10,500
<b>Total travel</b>	<b>6,500</b>	<b>6,000</b>	<b>8,000</b>	<b>8,000</b>	<b>8,000</b>	<b>1,000</b>	<b>37,500</b>
<b>CAPITAL</b>							
Vehicles	25,000			25,000			50,000
Laboratory equipment			14,000				14,000
Field equipment			8,000				8,000
Mass-rearing facilities							0
Computers, software	5,000	5,000					10,000
Audiovisual material	8,000						8,000
<b>Total capital</b>	<b>38,000</b>	<b>5,000</b>	<b>22,000</b>	<b>25,000</b>	<b>0</b>	<b>0</b>	<b>90,000</b>
<b>OPERATING CAPITAL</b>							
Seed money for CIAs				1,600			1,600
2 Pilot plants, commercial dry cassava					65,000		65,000
2 Pilot plants on-farm dry cassava					60,000		60,000
1 pilot plant for starch					80,000		80,000
1 pilot plant for fresh roots					10,000		10,000
<b>Total operating capital</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,600</b>	<b>215,000</b>	<b>0</b>	<b>216,600</b>
Consultants		10,000	10,000		20,000		40,000
<b>Overhead (CIAT 4%)</b> (not including PARAGUAY TOTAL)	<b>3,038</b>	<b>5,138</b>	<b>5,482</b>	<b>3,533</b>	<b>9,906</b>	<b>1,506</b>	<b>28,602</b>
<b>PARAGUAY TOTAL</b>	<b>78,979</b>	<b>143,587</b>	<b>152,536</b>	<b>91,854</b>	<b>277,547</b>	<b>39,147</b>	<b>783,648</b>
	10%	18%	19%	12%	35%	5%	

PARAGUAY							
TOTAL BUDGET FOR 4 YEARS ( 1000 US\$)							
	Diagnostics	Training	Technical Research	On-farm Research	Pilot Processing Plants	Project Coordination	
CIRAD BUDGET	Activity I	Activity II	Activity II	Activity I	Activity V	Activity VI	TOTAL
<b>PERSONNEL</b>							
<b>International</b>							
Economist, CIRAD (0.5)	65,000	65,000	65,000		65,000		260,000
Overhead (CIAT 4%)	2,600	2,600	2,600	0	2,600	0	10,400
<b>CIRAD TOTAL</b>	<b>67,600</b>	<b>67,600</b>	<b>67,600</b>	<b>0</b>	<b>67,600</b>	<b>0</b>	<b>270,400</b>
<b>CIAT BUDGET</b>							
	Activity I	Activity II	Activity II	Activity I	Activity V	Activity VI	TOTAL
<b>PERSONNEL</b>							
<b>International</b>							
International coordinator (33%)							0
Postharvest specialist (20%)			55,150		55,150		110,300
Farmer Participatory Res. Specialist (50%)		21,600					21,600
<b>National</b>							
Technicians (3)			272,400				272,400
Data manager							0
Secretary (0.33)							0
<b>Total personnel</b>	<b>0</b>	<b>21,600</b>	<b>327,550</b>	<b>0</b>	<b>55,150</b>	<b>0</b>	<b>404,300</b>
<b>Personnel/Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>
<b>OPERATIONS</b>							
Supplies, services			109,300			20,000	129,300
Vehicles (fuel, maintenance)							0
Communications			10,000			8,000	18,000
Publications/presentations		5,000	10,000			2,000	17,000
Contingencies							0
<b>Total operations</b>	<b>0</b>	<b>5,000</b>	<b>129,300</b>	<b>0</b>	<b>8,000</b>	<b>30,000</b>	<b>172,300</b>
<b>Operations/Total</b>	<b>0%</b>	<b>11%</b>	<b>22%</b>	<b>0%</b>	<b>9%</b>	<b>61%</b>	<b>1</b>
<b>TRAVEL</b>							
International	9,000	9,000	15,700	12,000	7,500	9,700	62,900
National							0
<b>Total travel</b>	<b>9,000</b>	<b>9,000</b>	<b>15,700</b>	<b>12,000</b>	<b>7,500</b>	<b>9,700</b>	<b>62,900</b>
<b>CAPITAL</b>							
Laboratory equipment							0
Computers, software							0
<b>Total capital</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Consultants/contingencies							0
<b>Overhead (CIAT 23%)</b>	<b>2,070</b>	<b>8,188</b>	<b>108,687</b>	<b>2,760</b>	<b>16,250</b>	<b>9,131</b>	<b>147,085</b>
<b>CIAT TOTAL</b>	<b>11,070</b>	<b>43,788</b>	<b>581,237</b>	<b>14,760</b>	<b>86,900</b>	<b>48,831</b>	<b>786,585</b>
	1%	6%	74%	2%	11%	6%	
<b>GRAND TOTAL</b>	<b>141,009</b>	<b>252,895</b>	<b>793,052</b>	<b>94,134</b>	<b>432,046</b>	<b>87,978</b>	<b>1,801,113</b>
	8%	14%	44%	5%	24%	5%	

PARAGUAY					
TOTAL BUDGET FOR 4 YEARS ( 1000 US\$)					
	Diagnostics	Training	Technical Research	On-farm Research	Pilot Processing Plants
CIAT: Requested funds	(US\$ 1000)				
	1998	1999	2000	2001	TOTAL
<b>Entomology</b>	34.0	35.5	38.6	44.1	152.2
assistant (1)	19.0	21.3	23.8	26.7	90.8
supplies	12.0	12.6	13.2	13.9	51.7
travel (2,1,1,2 trips x 10 d)	3.0	1.6	1.6	3.5	9.6
<b>Plant pathology (root rots &amp; bacteriosis)</b>	34.0	37.0	40.4	44.1	155.5
assistant (1)	19.0	21.3	23.8	26.7	90.8
supplies	12.0	12.6	13.2	13.9	51.7
travel (2,2,2,2 trips x 10 d)	3.0	3.2	3.3	3.5	12.9
<b>Virology + Biotechnology</b>	28.0	29.2	32.1	35.4	124.6
assistant (1)	19.0	21.3	23.8	26.7	90.8
supplies	6.0	6.3	6.6	6.9	25.9
travel (2,1,1,1 trips x 10 d)	3.0	1.6	1.7	1.7	8.0
<b>Postharvest processing + Economics</b>	33.6	29.5	30.9	34.1	128.0
postharvest specialist (20%)	25.6	26.9	28.2	29.6	110.3
supplies	5.0	1.0	1.0	1.0	8.0
travel (2,1,1,2 trips x 10 d)	3.0	1.6	1.7	3.5	9.7
<b>Farmer participatory Research</b>	10.0	9.4	9.8	10.3	39.5
training specialist (20%)	5.0	5.3	5.5	5.8	21.6
supplies	2.0	1.0	1.0	1.0	5.0
travel (2,2,2,2 trips x 10 d)	3.0	3.2	3.3	3.5	12.9
<b>Project Management</b>	10.0	8.6	8.7	12.5	39.7
International coordinator (33%)		0.0	0.0	0.0	0.0
supplies	7.0	7.0	7.0	9.0	30.0
travel (2,1,1,2 trips x 10 d)	3.0	1.6	1.7	3.5	9.7
<b>Overhead (23%)</b>	34.4	34.3	36.9	41.5	147.1
<b>Total</b>	<b>184.0</b>	<b>183.4</b>	<b>197.4</b>	<b>221.8</b>	<b>786.5</b>