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Strategic alliances of cassava farmers with private and public sectors: a new approach for development of the cassava crop in Latin America

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Abstract

In Latin America, the population is now over 70% urban and this has led to rapid changes in food consumption habits, with declining per capita consumption of traditional staple crops, such as maize, cassava and beans. At the same time, demand for more convenient processed foods, livestock products and fresh fruits and vegetables has increased.

While there have been considerable attempts to 'modernize' agriculture in Latin America through land reform and technological change, there persists a small-farm sector in most countries that continues to make a large contribution to food production. These farmers, especially those that are situated in marginal agro-ecological regions distant from urban markets, still depend on traditional staples for their livelihood. The identification and development of market opportunities to diversify and add value to the production of these farmers is a strategy that has considerable importance in improving the living standards and vitalizing rural economies through income generation. This paper looks at evolution in the approaches to the transformation of cassava—a typical smallholder crop—from a traditional rural staple food to a multipurpose carbohydrate and protein source for food, feed and industrial purposes.

This evolution has gone through two major phases. The first, which began in the late 1970s, was based on institutional interventions that were aimed at linking smallholder farmers to emerging feed and food markets through the establishment of processing plants in rural areas. This approach, which was successful in a number of Latin American countries, depended to a large extent on the protection of local agricultural production through tariffs on competing imports and the state provision of technical assistance for the formation of cooperatives and processing enterprises.

During the early 1990s, the majority of Latin American countries adopted policies of trade liberalization and the decentralization and privatization of service provision to the agricultural sector. Import tariffs were reduced, subsidies removed and government extension services dismantled. Consequently, in the mid to late 1990s, a new approach to cassava research and development was proposed in order to confront the urgent need to achieve a greater level of competitiveness in the cassava sector, without marginalizing the small cassava producer from the process. The approach has been based on the establishment of strategic alliances and partnerships between cassava farmer groups and the private and public sectors. In 1998, the Latin American and Caribbean Consortium to Support Cassava Research and Development, CLAYUCA, was formed as a regional planning and coordination mechanism that currently involves the participation of eight countries in the region.

The paper explains the operational principles of CLAYUCA and describes a selection of its activities and the results achieved to date in Latin America. The principles involved in the CLAYUCA approach are currently being tested and adapted to local conditions in pilot scheme in Tanzania and Malawi, through the Southern African Root Crop Research Network, SARRNET.

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Introduction

INDIAN tribes of the Caribbean region and the northern South American regions were probably some of the earliest cultivators of cassava in Latin America and the Caribbean (LAC). From the American continent, cassava was taken to the rest of the world after the arrival of the European conquerors. Cassava in LAC, with the exception of southern Brazil and Paraguay, is usually grown in the most marginal environments, especially those areas with limited rainfall, acid soils and poor soil fertility. Most of the time, cassava is found as part of small-scale farming systems in which farmers use very little external inputs, and, as a consequence, average yields are well below the potential yields that the crop can produce.

Trends in the LAC cassava sector

THE cassava sector in LAC has been undergoing some very marked changes during the last 40 years. During the 1960s, the area planted to cassava in the region expanded rapidly from 1.8 million to 2.6 million hectares, mainly as a response to greater demand by in increasing population. Since 1970, at the same time that cassava production in Asia and Africa increased significantly, in LAC it has remained stable, changing its share of the total world production from 21% in 1973 to only 15.7% in 1995 (Table 1). Among the main factors causing this decline are government policies and trends in food demand resulting from urbanization. During the 1970s and 1980s, governments needed to constrain rises in food prices and one of the strategies employed was to introduce subsidies, especially on imported cereals like wheat and maize. However, during the 1990s, a wave of major market reforms was felt across the region. Free market dynamics started to dominate both internal production and trade. The other important aspect in which there was a major reform during the last decade was in the public sector. *State support for agriculture was drastically reduced in the region. Small farmers faced a new challenge of becoming more self-sufficient and reducing their dependency on public sector support to establish and consolidate links with private sectors and markets.*

CIAT's experiences in cassava research and development in LAC

THE International Center for Tropical Agriculture (Centro Internacional de Agricultura Tropical; CIAT) has been a leading institution in LAC during the last 30 years in activities related to cassava research and development (R&D). Experiences obtained during this period have resulted in the development of a generalized methodology for linking farmers to growth markets via new processing and product development technology (Figure 1). This methodology is better known as the Integrated Cassava Research and Development Projects (ICRDP) (Ospina et al. 1994). The ICRDP methodology or concept for cassava grew out of a series of studies commissioned by CIAT to determine the future potential of cassava in the LAC region. These studies identified dry cassava chips as the most promising market (Pachico et al. 1983). The strategy implemented was to try to link small cassava farmer groups with the expanding market for animal feed concentrates. The hypothesis was that cassava farmers, with a more secure, profitable market would be more likely to adopt improved, cost-reducing production technologies, thus improving their cassava production and, as a consequence, increasing their incomes.

ICRDP's experiences

THE first country in which the ICRDP methodology was tested was Colombia. In 1981, in collaboration with the Colombian Government, CIAT initiated a pilot project with a small farmers' association. In a few years, it grew out to become a regional project (Figure 2). The experiences obtained in Colombia helped to

Table 1. Cassava production trends in selected regions.

Region	Area ('000 ha)			Growth (%/year)	
	1973–75	1983–85	1993–95	1973–75 to 1983–85	1983–85 to 1993–95
Africa	7030	7518	10,158	9.7	3.1
Asia	2928	3730	3775	2.5	0.1
Latin America and the Caribbean	2722	2592	2593	–0.5	0.0
LAC production as a percentage of the total world production	21.4	18.7	15.7		

Source: FAO (2002).

refine the ICRDP methodology, which was then transferred to Ecuador and Brazil where it was adopted with great success. Data obtained from surveys conducted in Colombia, Ecuador and Brazil to analyze adoption patterns for production and processing technologies and the economic impact resulting from adoption are summarized below.

Adoption of the dry cassava agro-industries approach

In Colombia, by 1992, there were more than 140 agro-industries operating, with an annual output of around 35,000 t of dry cassava chips. The estimated total value of this production approached USD6.2 million (Henry et al. 1994). In Ecuador, by 1992, there were 17 farmer-based associations with a total of 320 members. In Brazil, the dry cassava chips processing technology was adopted very rapidly. From 1989 to 1992, the number of cassava-based agro-industries established rose to 158.

Distribution of benefits

Estimates made by CIAT showed that, during the period 1984–1991, the cassava sector in northern Colombia benefited by almost USD22 million when research to improve cassava crop management was integrated with research on processing, marketing and consumer preferences (Gottret et al. 1993). Cassava producers were the group that most benefited from the ICRDP project, gaining 69% of the total benefits (Table 2). In Ecuador, the annual average income earned by farmer members of the cassava agro-industries was USD225 over a 6-year period, whereas non-members gained only USD85. In Brazil, total income gained by farmers during the 3 years of the project reached USD163,689, of which nearly 40% corresponded to sales of cassava roots, 10% to processing wages and about 50% to profits obtained from the commercialization of the dry cassava chips. These benefits were distributed among smallholders (60%), renters (32%) and sharecroppers (8%) (Ospina et al. 1994).

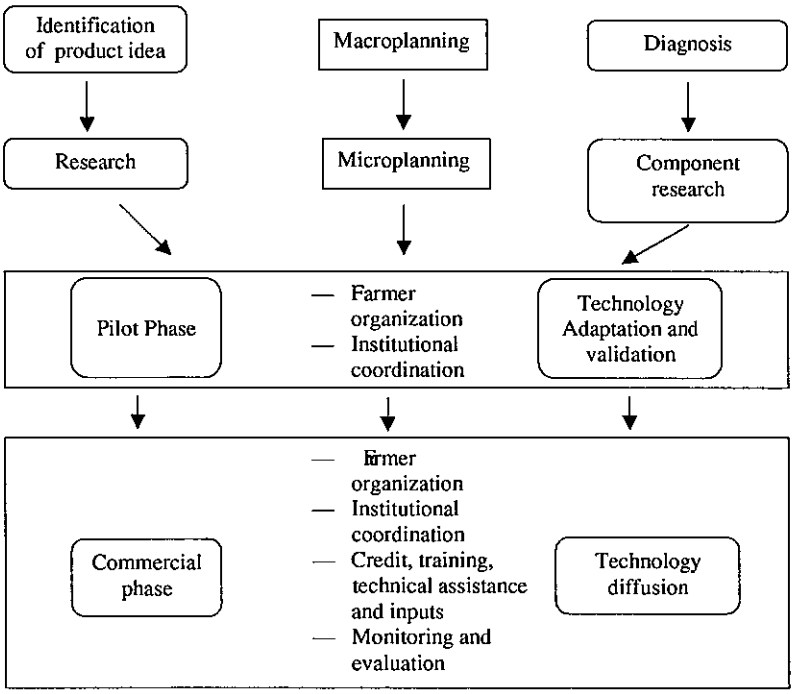

Figure 1. The Integrated Cassava Research and Development Projects (ICRDP) methodology.

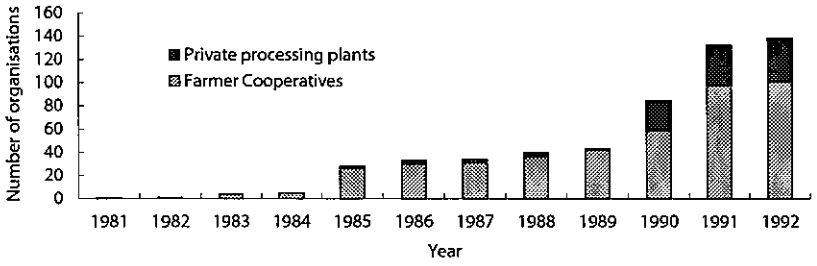

Figure 2. The growth of the Integrated Cassava Research and Development Projects (ICRDP) project in Colombia, 1981–1992. Source: Gottret et al. (1993).

Adoption of improved production technologies

In Colombia, studies indicated the adoption levels were significantly higher for areas with improved market access and institutional support compared to those areas with only the traditional cassava market. In Ecuador, farmers' adoption of an improved cassava variety, in whose development they participated, resulted in increased yield and better quality of the roots for the processing operations.

Table 2. The dry cassava agro-industry in Colombia, distribution of benefits, 1984–1991.

Beneficiaries	USD ('000)	%
Cassava producers	15,013	68.6%
Feed manufacturers	4,334	19.8
Fresh cassava consumers	2,039	9.3
Dry cassava processors	1,150	5.3
Intermediaries	–0,662	–3.0
Total benefits	21,874	100,0

Source: Henry et al. (1994).

Lessons learnt

SOME factors identified as crucial for the successful implementation of cassava-based R&D projects are:

- *Inter-institutional organization.* Inter-institutional coordination mechanisms must be defined and established to facilitate the building of interdisciplinarity among participating institutions and farmer groups.
- *Human resource development.* In Latin America, the deficiency of persons and institutions specialized in postharvest research, development and marketing has been highlighted. A great demand exists for training opportunities in these areas for researchers, extension personnel and farmers.
- *Crop production technology research.* To be able to successfully develop and consolidate new markets, products and uses for the cassava crop, the production costs need to be reduced and the productivity of the production systems has to be increased.
- *Product and market development.* The long-term viability of cassava-based projects in LAC will depend on the ability of the farmer organizations to move their products into a wider range of markets and end uses, especially those than can offer a higher added value.
- *Policy support and decisions.* Policy decisions and support closely affect the implementation of any ICRDP project. For example, most countries in the LAC region are net importers of cereals and most governments have tried to resolve this increasing demand for carbohydrates through policy interventions and subsidized production schemes that have distorted markets. For cassava, it has meant competing with grains at a substantial disadvantage.

From the aspects discussed above, two main conclusions can be drawn as the 'mega messages' from the ICRDP's experiences: first, the need for a very close articulation and integration between the production technology research agenda and the postharvest research agenda; and second, the need to develop and consolidate strategic alliances and partnerships among all the actors involved, including the international and national institutions, the farmer groups and the private sector.

Some new models for strengthening the cassava sector have started to emerge recently in the region and need to be considered as potential mechanisms to garner the resources required for sustaining a long-term R&D effort. CLAYUCA, described below, is one of these new approaches.

Justification for a new model

THE model for cassava research in LAC used by CIAT and collaborating institutions during the last three decades has been financed mainly with public-sector funds. During the 1990s, this model was no longer viable mainly because many public-sector institutions went through radical changes. CIAT also established a portfolio of projects instead of the commodity-based approach that had been using since the early 1970s. These changes affected the synergies and close relationships that CIAT had built with cassava-producing countries in the region.

Countries and institutions interested in cassava in the region felt the need to organize and establish strategic alliances that could lead to the establishment of new models for financing and supporting cassava R&D activities. The formation of a consortium was proposed to finance and support R&D of the cassava crop, strengthen transfer of improved technologies, and enhance exchange of experiences, information and technologies among LAC countries. Based on these considerations, the Latin American and Caribbean Consortium to Support Cassava Research and Development, CLAYUCA, was formed in April 1999.

Rationale

THE establishment of joint effort mechanisms between the public and private sector to support R&D activities is justified on the grounds that it allows countries to have more control of the research agendas and the benefits obtained. The investors gain control and assume responsibilities on the agenda, which becomes a regional agenda. The work is planned and conducted

based on common interests and prioritized problems. For CIAT, the benefits accrue from the possibility of gaining again an active presence in a regional, cassava-based R&D agenda, with a relatively low investment. The work of the consortium goes beyond the traditional research domain and becomes a regional forum. Finally, private and public sector institutions find an improved access to technologies generated by international and advanced research centers.

CLAYUCA's objectives

CLAYUCA aims to establish a self-financing, sustainable regional mechanism to facilitate:

- organized participation of public and private sector institutions, including universities, non-government organizations, and farmer groups, in the discussion and identification of priority issues and the definition of a regional agenda
- collaborative, participatory execution of the agenda in each country member
- seeking additional financial support that could benefit all country members
- strengthening national capacity in each country member.

CLAYUCA's work plan

The topics and activities prioritized by the members of the consortium and that are currently under implementation include those discussed below.

Technical assistance and promotion

Based upon specific requests from country members, CLAYUCA offers in-country technical assistance and support.

Transfer of cassava germplasm with high-yielding potential to member countries

The consortium collaborates with CIAT in this activity. Important advances have been obtained in the adaptation of a scheme for rapid multiplication of cassava plantlets, based on the temporary immersion system and improved hardening methods for plants produced through *in vitro* technologies (Figures 3 and 4).

Mechanization

CLAYUCA has made important advances in the adaptation of mechanized planting and harvesting systems for cassava that were developed originally in Brazil. The combination of these two practices allows for up to 20% reduction in cassava production costs (Figures 5 and 6).

Cassava drying

Different from the technology developed in Thailand—based on large cement floors and natural solar drying, with capacities of up to 1000 t of cassava roots per day (Figure 7), the option that CLAYUCA is following in LAC is based on the development of artificial drying systems, and small to medium scale processing plants, with processing capacities of around 50–100 t of cassava roots per day (Figure 8). Countries such as Colombia are expected to import, in 2002, more than 2 million t of maize to be used in balanced animal feeds. If cassava can be produced and converted into cassava flour at competitive costs (around 70% of the cost of the imported cereal), and using reasonable substitution levels of maize by cassava flour in the balanced feeds (around 10–20%), an important increase in the demand for cassava roots and new cassava areas will be obtained, almost equivalent to half of the area planted currently in the country, with benefits for cassava farmers even better than those currently obtained by cassava farmers in Thailand (see Tables 3 and 4). Every tonne of maize that is brought into the country is contributing to diminishing rural employment and increasing foreign exchange deficit. Conversely, every additional tonne of cassava that can be produced in the country helps to reactivate rural economies, create employment and save foreign exchange. Implicit here is the concept of tropicalization of animal production systems in LAC, a full-time challenge in which CLAYUCA, with active support from some of its country members, is deeply engaged.

Conclusions

- The promotion of joint ventures between public and private sector institutions and enterprises with the aim of supporting R&D activities with one specific crop is not a process that occurs overnight. A good solid initial thrust has to be developed based on clearly specified objectives, methods, and operational procedures. Thus, private-sector investors recognize the importance of sharing risks and responsibilities in supporting and financing research activities, but at the same time, are able to clearly recognize the benefits they will get.
- The presence and participation of the public sector is essential in this type of arrangement. Although they usually lack the funds needed, their importance is based on the wealth of knowledge and information they have about the appropriateness and adaptation of the technologies at the local level. They also have a strong capillarity that facilitates the implementation of activities.

Figure 3. Temporary immersion system for the rapid multiplication of cassava plants.

Figure 4. Hardening method for cassava plants produced using the in vitro system (temporary immersion system).

Figure 5. Mechanized system for cassava planting.

Figure 6. Mechanical harvester for cassava.

Figure 7. Cassava drying system in Thailand. Top: cassava chipper; bottom: natural cassava-drying floor.

Table 3. Cost structure for cassava pellets exported from Thailand to Holland, December 2000 (USD/t).

Price of cassava pellets (FOB[a] Rotterdam)		80
FOB cost Rotterdam	2	
Import levy (6%)	5	
Sea freight (Bangkok–Rotterdam)	18	
FOB cost Bangkok	2	
Local transportation cost	10	
Price of cassava pellets (in Bangkok)		43
Drying, pelletizing costs	14	29
Price of 1 t of cassava roots (assuming 2.6 conversion factor)		11

[a] FOB = free-on-board.
Source: CLAYUCA, unpublished data

Table 4. Cost structure for cassava flour produced in Colombia, September 2002.

Item	Cost (USD)
Price of maize, ex-port, Buenaventura[a]	180
Transport Buenaventura–Buga[b], per t	12
Price of maize at Buga, per t	192
Price equivalent with cassava flour for poultry feeding (70%)	137
Processing costs, per t of cassava flour	20
Price of cassava flour, per t	117
Conversion factor, fresh to dry, 2.6	45
Local transport costs (estimated 20 km)	5
Maximum price of 1 t of cassava roots at farm gate	40

[a] Principal port of Colombia on the Pacific Ocean.
[b] Poultry-producing region.
Source: CLAYUCA, unpublished data.

- International and advanced research centers are also key players in these consortiums. Over the years, they have accumulated knowledge, information and experiences related to technology generation and dissemination. In most cases, problems prioritized by country members already have technological alternatives tested or in the process of generation.
- Experiences obtained throughout the last three years by CLAYUCA indicate the potential of promoting joint ventures of private and public sector institutions, with scientific backstopping from the international and advanced research centers, with the common objective of increasing competitiveness, efficiency and profitability of the cassava sector.

Figure 8. CLAYUCA model for cassava flour processing: artificial drying, continuous process.

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