

INTEGRATED CASSAVA PRODUCTION, PROCESSING
AND MARKETING PROJECTS

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SUMMARY

This paper examines the role that cassava can play in meeting the development goals of Latin American and Caribbean countries, and outlines a strategy for implementing effective cassava development programs through the execution of pilot projects that integrate production, processing and marketing activities. Integrated cassava pilot projects, which are carried out in a representative area of a cassava producing region, aim to determine the technical and economic feasibility of developing traditional or establishing new end uses for cassava. Specifically, these projects serve to apply existing cassava production and processing technology, determine critical aspects that require further research and to identify and promote suitable marketing channels. They also function as a learning process so that the project may be replicated effectively in the entire cassava producing region once a viable production, processing and marketing systems has been devised. With the objective of assisting national institutions in setting up integrated cassava pilot projects, CIAT has formed a team of an agronomist, a processing specialist and an economist. Experiences to date in Colombia, Panama and Mexico indicate that this integrated approach to cassava development is leading to country wide benefits in terms of import substitution and the creation of employment in rural areas.

RESUME

Cette communication examine le rôle que peut jouer le manioc pour répondre aux objectifs de développement des pays de l'Amérique Latine et de la Caraïbe. Elle dégage une stratégie pour l'exécution effective de programmes de développement du manioc à travers la

réalisation de projets pilotes qui intègrent les activités de production, de traitement et de commercialisation. Les projets pilotes de production intégrés de manioc qui sont entrepris dans un secteur représentatif d'une région de production de manioc, visent à déterminer la faisabilité technique et économique de développement d'utilisations traditionnelles du manioc ou de l'établissement de nouvelles utilisations. Ces projets servent plus particulièrement à mettre en pratique les technologies actuelles de production et de traitement, à déterminer les aspects critiques qui nécessitent une recherche ultérieure et à déterminer et promouvoir des circuits de commercialisation convenables. Ce sont également des processus d'enseignement de sorte que le projet peut effectivement être repris dans toute la région productrice quand on a conçu un système viable de production, de traitement et de commercialisation. Dans le but d'aider les institutions nationales dans l'établissement de projets pilotes pour le manioc, le CIAT a formé une équipe comprenant un agronome, un spécialiste du traitement et un économiste. En Colombie, au Panama et au Mexique, cette approche aboutit déjà à des succès importants dans la réduction des importations et la création d'emplois à la campagne.

INTRODUCTION

One of the most interesting consequences of economic development in Latin America and the Caribbean is the concentration of the population in and around major cities. This population grouping has resulted in an unequal allocation of the countries' financial resources. The periphery, where the majority of farm activities are located, receive comparatively less attention and investment than the more densely populated and industrialized core. In spite of the comparatively large investment in the urban industrial sector, this has not been able to provide full employment for the increasing number of rural migrants principally because the development of the manufacturing sector has been based largely on capital intensive technology, with much of the capital loaned from abroad. The domestic markets have often been too small for these industries and the external markets restricted by irregular quality, lack of marketing infrastructure and noncompetitive pricing.

For many years the resources allocated to the agricultural sector of Latin American and Caribbean countries were mostly invested in export commodities produced by capital intensive systems. This tendency has resulted in the frequent need to import food, feeds and raw material to supply internal market demand. The recent foreign trade deficits that have characterized the economies of most of the less developed countries have brought about a change in agricultural policies in order to incentivate not only the export market but the production of foods and feeds for the internal market in an attempt to substitute imports and save foreign currency.

The concentration of the population in major cities has also had important implications for the food consumption patterns of the countries. Due to transport and handling costs, crops such as cassava, potatoes, plantains and some fruits and vegetables have been replaced by urban staples such as rice and wheat-based products. In addition, there has been a marked increase in the consumption of livestock products such as eggs, milk, chicken and pork, which are suitable for intensive production close to urban centers. The increased demand for these products has led to a rapid expansion of the animal feed concentrate industry whose growing demand for raw materials has not been met by either the traditional or modern agricultural sector, resulting in a rapid increase in imports of feedstuffs into the region.

With foreign debt problems on one hand and an ever increasing demand for food on the other, the development objectives of the majority of tropical Latin American and Caribbean countries include one or more of the following : to produce more food using as far as possible local resources; to produce greater quantities of raw materials for the agro-related industries and to decentralize industrial activity in an attempt to control the flow of rural migrants.

THE ROLE OF CASSAVA IN ECONOMIC DEVELOPMENT

Cassava has certain inherent characteristics that make it extremely suitable for low-input agriculture. Its ability to grow well on poor soils plus the efficient use of water make this plant one of the most well adapted crops for small farmer production systems. Cassava has traditionally been used as a human food both in the fresh and processed form. However it is increasingly finding a new role as an agroindustrial crop. The uses with greatest potential in the Latin American and Caribbean region are fresh cassava for dried human consumption, cassava flour for the food industry and dry cassava chips for incorporation into livestock feed.

Fresh cassava. Fresh cassava is widely consumed throughout the tropics particularly in rural areas but consumption is comparatively lower in urban areas. This fact suggests that consumption will tend to decrease as the developing countries continue the process of urbanization.

Risky quality and difficulty of storage are the more frequently cited causes for low cassava consumption in urban areas. However, simple technology that makes it possible to store cassava roots for periods of up to two weeks has recently been developed. The adoption of this technology should decrease marketing margins, improve root quality and cassava convenience as an urban food crop and lower the price to the consumer.

Dry Cassava Products. Traditional dry cassava products are mostly made in regions with a long history of cassava production. They are consumed by the economically lower strata of the population and any decrease in the price of fresh roots that leads to a decrease in the price of the final product could have enormous social benefits for the very poor in the region.

Dry cassava can also partially substitute for cereal flours used in a whole range of food products destined for human consumption. The major constraints to expanding the demand for these products are the cost of the fresh roots and their drying process. Another major problem to increasing the use of dry cassava as a substitute for cereal flours is that often many of the competing products are heavily subsidized. However, the potential for cassava to enter this market is much greater now than a few years ago due to the foreign exchange problems that most of Latin American countries face at present.

Animal feed. A great deal has been said about the potential for cassava to enter the animal feed market in the form of dried chips or pellets. The major constraints on cassava playing an important role in this market are the availability of roots at a competitive price, the general lack of information about energy efficient drying processes, the lack of institutional support for farmers willings to enter this market and frequent subsidies on competing grains for animal feed. The experience of the Thailand dry cassava industry and the more recent case of Colombia, are examples of the great potential for cassava in this market.

CASSAVA DEVELOPMENT PROJECTS

Although several Latin American & Caribbean countries have recognized the potential cassava has in contributing to their economic development, many projects that have attempted to use cassava either as a vehicle for increasing small farmer incomes or for substituting costly grain imports have had a marked lack of success. Projects in Brazil, Colombia, Costa Rica, Guyana, Jamaica, Panama and Venezuela, among others, have all ended in failure. The reason for these failures are diverse but in general they can be summarized as follows :

- In the cases where cassava production has been promoted as a means of increasing small farmers income, the traditional markets have not been able to absorb the increased supply, prices have dropped and the farmer has resulted as being the loser.

- Where cassava has been promoted as an agro-industrial crop, poor selection of the processing technology to be employed has often been the critical factor.

- In all the attempts to promote either production or processing of cassava, there has been a lack of integration and coordination between the incentives to increase production by applying better agronomic practices, the design and operation of the processing activities and the marketing of the products.

From the above failures a great deal can be learned and many mistakes can be corrected for the future. Inter-related activities such as production, processing and marketing can not be considered independently in the formulation of a cassava development project. The identification of the product (s) be it fresh or processed, with the greatest demand potential ; the most appropriate way to market it ; the selection of the industrial process and the potential and actual ability of the region to produce cassava need to be studied and analyzed simultaneously for specific production areas within the countries.

INTEGRATED CASSAVA PILOTS PROJECTS

An integrated cassava pilot project is a research and development activity carried out on a reduced scale in a representative area of a cassava producing region. In this area the selection, testing and evaluation of production and processing technology are carried out, together with the identification and promotion of suitable market channels. The aims of an integrated project are to, on the one hand, determine the technical-economic feasibility of either further developing a traditional market or establishing new cassava end uses, and, on the other, generate information which will enable the implementation of a cassava development program in the entire region. This information also includes what is required in terms of institutional support, government policies, farmers organization etc. The specific objectives of these projects are :

- To apply existing technology for the production and transformation of cassava to the specific socio-economic and ecological conditions of the pilot region, or to modify such technology when appropriate.

- To develop small scale cassava-based industry on a pilot scale and extrapolate the information to other areas with similar socio-economic and physico-biological conditions.

The methodology to implement these cassava based pilots projects consists of several phases. The first phase is an analysis of the potential role of cassava and its products in a country. In this phase a multidisciplinary team

of economists, utilization experts and agronomists assesses the potential production of cassava, its production costs, its ability to compete with other products and the potential demand. This analysis pays careful attention both to strict project feasibility and to the social implications such as increased rural employment, improved welfare of producers, stimulus to develop local industries and others.

After several regions of the country have been evaluated according to the possibilities of benefiting from a cassava-based project, a final selection of the region is made considering criteria such as land availability, soils, climate, possibilities of mechanizing, institutional presence etc. In the case of establishing a cassava drying industry, the drying technology road infrastructure, market and competing products are also considered. Within the chosen region, a specific site is then selected where the pilot project may be implemented. The feasibility of extrapolating information from this site to the rest of the region is the main criteria used in the selection of this site.

Once the site for the pilot project has been selected, the principal activities to be undertaken can be summarized as follows :

Marketing. Since the most important objective of a pilot project is to channel traditional or new cassava products into improved or new markets, the first step in the pilot project is to identify and characterize the actual and potential market channels. To do this the following aspects should be taken into account : the size of the market, the trading or market costs, the possible need for assembly and packing, the relation between production costs and market value and finally the government support policies which may favor products that substitute imports. Requests regarding price and quality in potential market channels are transferred to the experts in charge of technology design while at the same time potential buyers are approached and made aware of the advantages in the use of cassava or its processed form. Buyers that are willing to participate in the experimental stage of the project are invited to do so.

Processing. The type of processing technology to be selected is a crucial aspect. Selection will depend on a number of factors, the margin between raw material costs and production price being probably the most important. Apart from purely economic considerations, there are technical aspects that have to be considered such as product quality, amount and quality of water required, fuel availability etc.. Social factors such as availability and capability of labor, tradition of communal work and availability of government services must also be considered.

Having taken into account these factors, the operation of the plant passes through three stages.

- Experimental. This is the "trouble shooting" in which operating problems are resolved and a sufficient quantity of the product is produced to be able to test market reaction and possibly carry out utilization experiments.

- Semi-commercial. This stage is used to consolidate the market and reliable data on capital and operation costs for a complete feasibility study are obtained. The plant also serves as a demonstration and training unit.

- Commercial. At this stage the plant is handed over to those that are going to manage it. The capacity of the plant is usually increased according to the needs of the market and the possibilities of management. At this stage critical areas of operation that may require further development are identified.

Production. The opening of a new market will have an effect on the cassava production technology that farmers are applying. A processing plant will probably modify the current volume of cassava produced in the area, the quality of the roots produced and probably the timing of harvests so as to supply the plant with a continuous flow of raw material.

Within the concept of pilot projects the developing of improved production technology with farmers is one of the most important aspects. It will allow better use of the available resources and improve the production capacity of the farm as a whole. This technology development activity is done by following a well known methodology comprising :

- Characterization and description of production systems.
- Design of improved production options.
- Field testing and evaluation of these options.
- Diffusion and transfer of the best production options.

In the descriptive phase we are looking to identify the most important constraints in the existing production systems and agronomic potential that has not been sufficiently exploited ; the wishes and aspirations of the farmers themselves must also be identified. This information, together with the selection of technological components that can resolve the constraints, is used to design several production alternatives which are then field-tested with the farmers. The most promising ones are validated and later transferred to a large number of farmers throughout the area.

As a back up to this agronomic work the selection of the most appropriate germplasm by means of regional trials is conducted close to the processing plant as longer term type of activity.

EXPERIENCES WITH PILOT PROJECTS

At present (July, 1985) three countries are developing integrated cassava projects following the approach described above, these are Colombia, Mexico and Panamá. A brief description of these projects follows :

COLOMBIA

In Colombia, the Programa de Desarrollo Rural Integrado (DRI) is the national institution that in collaboration with CIAT is developing this project on the Atlantic Coast. The financial support of the Canadian International Development Agency helped to initiate the activities. After the processes of region and site selection, the natural drying of cassava chips for animal feed was selected as the processing technology to be used in the project. The experimental phase begun in 1981, when 19 t of fresh roots were dried to obtain 7 t of dried chips in a pilot plant operated by a group of 15 farmers. The following year, during the semi-commercial phase, a total of 38 t of dried chips were obtained from 111 t of fresh roots. Data on labor input and operational costs were collected during these two years as well as experience in the organization of the farmer's group. With the experience and information accumulated in these two phases, economic feasibility studies were conducted in order to initiate the third phase which included the expansion of the existing plant and the building of plants elsewhere.

The success of the first cassava drying plant stimulated the construction of 7 additional plants that resulted in a total drying surface of 4,000 m² where 2,395 t of fresh cassava were processed between November 1983 and June 1984 to yield a total of 946 t of dry cassava. At present there are 20 drying plants in different areas of the Atlantic Coast with a total drying surface of about 18,000 m² on which 3,000 t of dried cassava were produced during the 1984/85 drying season. Another 18 plants are planned for construction this year.

MEXICO

In 1980, the Mexican Secretary for Agriculture and Water Resources initiated an ambitious program to develop the acid soils of the State of Tabasco. Cassava development was among the activities selected for this production effort. Research results obtained by INIA, the National Agricultural Research Institute, were available for the area as a starting point.

Several facilities have been constructed to process cassava. Eleven silos for silage, each with a capacity of 1200 t, and 10 natural drying plants of 2000 m² are in the last stages of construction. To complete this a Bresilian plant for the production of cassava flour and a drying system designed by Mexican engineers that make use of different sources of energy are also being tested. The production of these plants is intended to satisfied first the demand from within the state of Tabasco and later the demand from other states.

At present, a total of 800 ha are in the process of being harvested and 2,400 ha are already planted to be harvested next year. For the harvest season of 87/88 they are expanding the area sown to 10,000 ha with an expected average yield of around 15-16 t/ha.

PANAMA

The National Research Institute of Panama (IDIAP) in coloboration with CIAT initiated an integrated production, processing and marketing pilot project in the region of "Los Llanos de Ocù". This region is the most important cassava production area in the country. Cassava is mostly produced by small farmers that are frequently faced with marketing problems. In 1983 most of the preliminary studies were conduced and it was decided that natural drying of cassava was the most promising alternative for the farmers in the area. With the finantial coloboration of USAID a 500 m² drying concrete floor was built and a chipping machine and motor installed.

During the harvest season corresponding to 1984 approximately 36 t of fresh cassava were dried, yielding 14t of dry cassava chips that were sold to local feed industries. In the drying season corresponding to 1985, a total of 49 t of dried cassava chips were sold to the feed industry. This drying plant is being operated by a single farmer's association and it is expected that in the next few years more farmers will get involved in the drying of cassava for animal feed.

