Peri-urban Farming Systems and Food Processing in the Congo

J. Brochier, G.Boukambou, O. Legros, and S. Trèche[1]

Abstract

AGRICONGO (*Institut de recherche et d'appui pour le développement agricole en zones tropicales*) developed a project entitled new farming systems (NSF). This project is intended to implement peri-urban agriculture for city dwellers who want to go into small farm businesses. Because the Congo is importing a large part of its food, the project's first goal was to identify products for development. A basic project assumption was that the best way to reduce these imports was to modernize traditional foods. There was also a need to develop appropriate technologies in agronomy and food science. Work was done to design both a 1.5 ha NFS farm and an integrated food processing facility. Farming techniques were tested at the research station level and the study included socioeconomic issues and farmer-level implementation of product marketing and commercialization.

This report presents preliminary findings from 20 pilot NFS farms that were tested near Brazzaville. Food processing lines and their management are also described. Processed products made available to urban markets through the project were *chikwangue* (cassava bread) and cassava-based mixed flour for infant food.

Key words: processing, traditional, rehabilitation, integration, farming system, modeling.

Introduction

In recent years, the Congo has had very rapid migration from rural to urban areas. Presently, more than two-thirds of the population live in cities. This population is very young; and although most of the city dwellers have been educated, most are unemployed. Farm production in the countryside has not been able to cope with high food demands from the cities and, therefore, the Congo is importing most of its food.

The attempts to develop large mechanized farms have failed because of management difficulties and technical problems such as soil infertility and pests; the disorganized traditional shifting cultivation system in the rural areas; and desertified forests along the roads and around villages and cities.

A research and development approach was designed in 1986 with the objectives of developing new farming systems (NSF):

- to create job opportunities (in the field of agriculture and related activities) with an attractive financial potential;
- to produce food for the cities and reduce imports; and
- to protect the environment by proposing more efficient systems in the field of soil conservation and income than shifting cultivation.

[1] General Manager AGRICONGO I.G.A.D., B.P. 20423, Libreville, Gabon; Vice President AGRICONGO, B.P. 14574, Brazzaville, Congo; D.E.E. AGRICONGO, B.P. 14574, Brazzaville, Congo; and *Responsable, Lab. d'Études sur la Nutrition et l'Alimentation* (UR4F), *Institut Francais de Recherche Scientifique pour le Développement en Cooperation* (ORSTOM), B.P. 181, Brazzaville, Congo.

The project was headed by the AGRICONGO Center and the AGRISUD Research Institute, through scientific partnerships with the University of Brazzaville, and the *Institut Francais de Recherche Scientifique pour le Développement en Cooperation* (ORSTOM). *The École Nationale Superieure D'Enseignement Technique* (ENSET), Brazzaville, participated in the design of food processing machines. Funding was also provided by ELF-Congo, the People's Republic of the Congo; and French and Canadian aid agencies.

The Project Structure

Project Objectives

Specific objectives identified for the project were to:

- establish a research station near Brazzaville;
- conduct a market survey in the cities to identify demands for specific products which could be economically interesting to produce;
- do crop research using different agronomic approaches on cassava, groundnut, soybean, corn, bananas, pineapple, and forestry products;
- do research on food technologies aimed toward modernizing traditional products;
- develop model farming systems and processing units;
- test the farm and processing units on experimental stations using independent operators;
- test the developed farming system as pilots which would integrate processing and marketing by the farmers; and
- develop, on a large scale, a new farming system in peri-urban areas and along the roads on rehabilitated soils.

Organizational Aspects

AGRICONGO Center of AGRISUD Institute was created as a private non-profit organization. A research and development (R&D) station was established near Brazzaville and research partners were involved in projects in the field of social science, agronomy, nutrition, and food technology. The staff was selected from among young, newly graduated people who also represented the target group.

Development Aspects

The developed farming systems were 2-3 ha parcels with 0.6 ha of their edges used for alley cropping. The food crops planted were divided into short-, medium-, and long-cycle crops. In the short cycle were rainfed vegetables (*solanum* sp. and *amaranthus* sp.) and miscellaneous leafy vegetables. Medium-cycle food crops were groundnut, soybean, *wouanzou*, and corn. Long-cycle crops were cassava, pineapple, banana, and perennial crops, fruits and multipurpose fast-growing trees.

Table 1. Annual harvests from project farms.

Crops	Area	Minimum yield
Cassava[a]	0.5 (ha)	12 t/ha
Groundnut[b]	0.3 (ha)	700 kg/ha
Soybean[a]	0.15 (ha)	700 kg/ha
Pineapple	20,000 (plants)	40,000 fruits/ha
Banana	250 (plants)	12 kg/plant
Acacia mangium	75 (trees)	100 kg/tree

[a]Cassava and soybean are processed for flour and *chikwangue*.
[b]Groundnut is processed into peanut butter.

Two cows were included in the design primarily for draft animal use. Each farm contained a family home, stable, water tank, and storage barn. For every 15 farms there were three processing lines. The average total harvests from pilot farms are shown in Table 1.

Processing Aspects

Chikwangue

Chikwangue processing machines were designed and built in the Congo. The processing line (Fig. 1) requires—under local conditions—two workers and one manager for the transformation of 3 t of cassava or for the production of 1.5 t of *chikwangue*. The yield, after processing, is 40-55 kg of *chikwangue* from 100 kg of fresh roots. Produced *chikwangue* contains 60% water. The level of investment necessary to set-up a *chikwangue* processing unit and the monthly operating costs are shown in Table 2.

Figure 1. Flow chart for processing *chikwangue* using NFS technology.

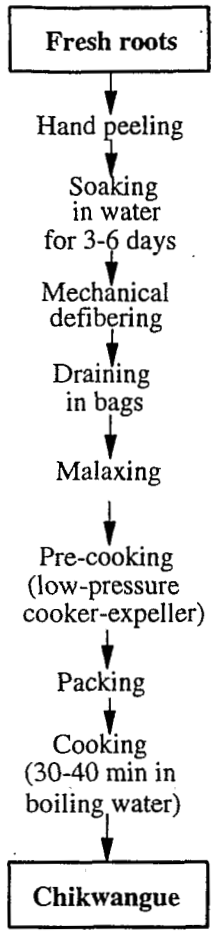


Table 2. Investment and operating costs of a *chikwangue* processing unit (prices given are in local currency)[a].

	Cost (FCFA)
Initial investment cost	
Building	1,550,000
Machinery	2,500,000
Furniture and tools	495,000
Total	4,545,000
Economic survey per month	
Variable costs per month:	
roots	650,000
fixed costs	260,000
monthly sales	1,060,000
monthly income	150,000
Annual cash flow	2,800,000

[a]10 FCFA = US$ 0.36.

Mixed Flours

The project has also experimented with mixed flours. This involves combining cassava-based flour with soybean flour in order to improve the final product's nutritional content (Fig. 2). The mixed flour consists of roughly two-thirds cassava flour and one-third soybean flour.

Economic Aspects

For a production line of 2,695 kg/month of mixed flour packed in 250 g plastic bags and sold for 105 FCFA to retailers, the financial aspects that must be considered are shown in Table 3.

Mixed flour has a good potential for economic returns. It can be used as baby food which has a nutritive value close to that of the imported product and which costs 66% less. Also, it is 40% less expensive than the traditional flour based on corn which has a protein content unsuitable for young babies.

The mixed flour gives good additional value to farmers' products, reduces food imports, and makes traditional food crop production economically feasible when the cost of raw products are calculated at 155 FCFA/kg for cassava pellets and 200 FCFA/kg for soybean.

Commercialization Aspects

Peri-urban agriculture is being developed for many reasons:

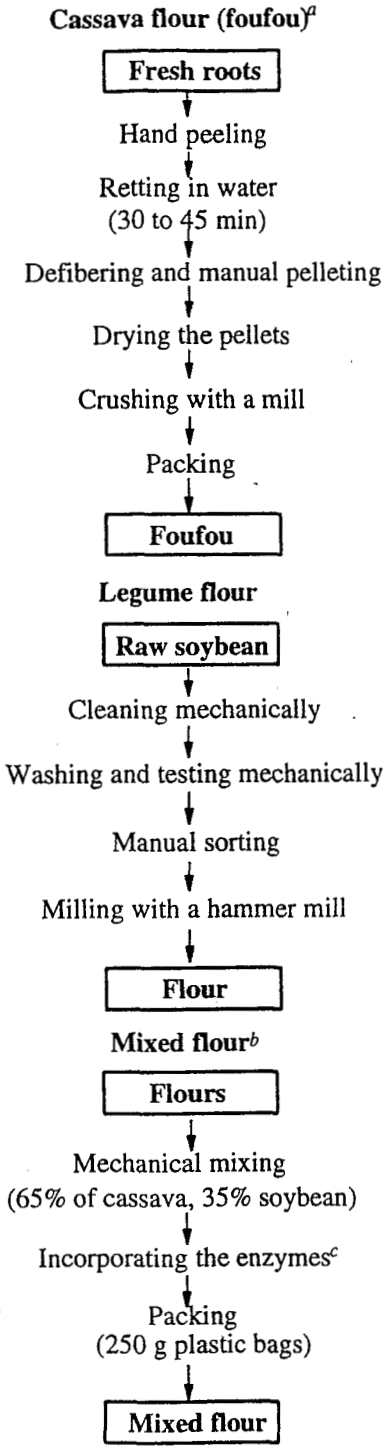
- to give a social choice to young people;
- to create synergy between city and countryside; and,
- to gain market proximity.

Product marketing is done individually by the farmers, through the informal sector and through members of a farmer's family living in town. Socioeconomic studies of these marketing pathways are being conducted to learn more about the potential of these informal methods of commercialization.

Experience to date suggests that the NFS products will find a market niche between locally produced processed foods and those that are imported.

For example, the comparative market prices of products of interest are:

Figure 2. Processing methods for mixed flours and yields of processed products.



[a] The transformation yield is 20-30% (25 kg of flour for 100 kg 100 kg of fresh cassava roots). The moisture content of flour does not exceed 10%.
[b] Care must be taken to keep the flour below 10% humidity.
[c] Amylase (BAN 800 mg from Novo Industry Enzyme SA) 15 g per 100 kg of dry product.

Table 3. Cost of investment and production and return from mixed flour.[a]

	Cost (FCFA)[b]
Investment	
Buildings and facilities	1,525,000
Machines and equipments	2,650,000
Tools and furniture	420,000
Total	4,600,000
Operating Account	
Variable costs:	
raw products	585,000
packing products	55,000
energy	5,000
labor cost	30,000
Distribution costs:	
depreciation	65,000
financial cost	20,000
labor cost	100,000
taxes	70,000
Total expenses	930,000
Sales	1,130,000
Result per month	200,000

[a] The production capacity of this line can be increased from 2.5 t/month to 8 t/month with improved management.
[b] 10 FCFA = US$ 0.36.

Peanut Butter

- local peanut butter 500-900 FCFA/kg
- imported peanut butter 1,700-2,300 FCFA/kg
- modernized peanut butter 1,000 FCFA/kg

Chikwangue

- local *chikwangue* 125-175 FCFA/kg
- modernized *chikwangue* 210 FCFA/kg

Baby Weaning Food

- local *foufou* 175-200 FCFA/kg
- imported baby flour 1,400-2,080 FCFA/kg
- local modernized mixed flour 500 FCFA/kg.

Beyond the profitability of any specific activity, there's the question of the returns to the new farming system units and the project as a whole. In analyzing

the actual data on costs and returns, we were able to make a economic evaluation of the system. These figures are summarized in Table 4. The preliminary estimates clearly suggest that the project is financially viable.

Table 4. Final economic evaluation of the farming system.

Financial requirements	Credit[a]
Grants	1,986,000
Medium-term loans	880,000
Leasing	935,000
Short-term loans	1,300,000
Total	5,151,000
Economic data:	
Average monthly income per farm	80,000
Cash-flow month	120,000
Monthly repayment	45,000

[a]10 FCFA = US$ 0.36.

Conclusion

Through the NSF Project, the experience gained will bring insights for future direction of this and similar projects. Among the most significant findings are the following:

- Peri-urban agriculture on rehabilitated soil is a good way to develop new farming systems because of market proximity, easy communication with services, handicrafts, workshops, banks, and shops.
- Processing food at the farm level is the only way to make agriculture economically feasible for small family farms.
- Locally designed and built food processing machines give better results than imported equipment.
- Integrated research—including social, commercial, and technical aspects—in the field of agriculture and related activities appears to be efficient for new farming system development.

Acknowledgement

This work has been possible because of a good partnership between national and international research institutions and the development project at the AGRICONGO Research Station and pilot farms.

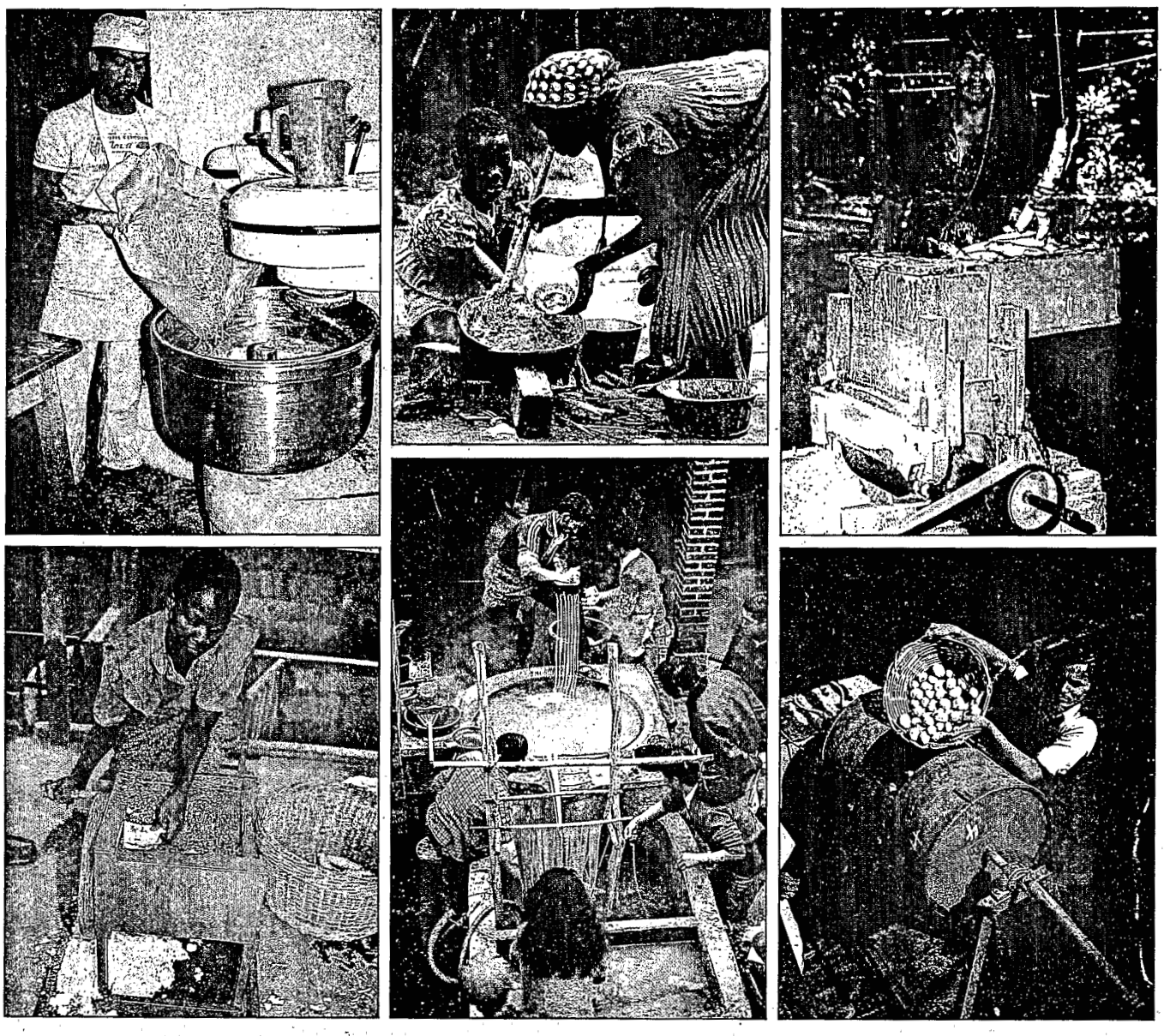
References

Avouampo, E., O. Legros, and S. Trèche. 1991. *Les farines à base de manioc.* Paper presented at the workshop, Weaning Foods in Central Africa. Held at the Regional Office of World Health Organization (WHO). AGRICONGO, *Institut de Recherche Scientifique pour le Développement* (ORSTOM). People's Republic of the Congo.

Masamba, J. and S. Trèche. 1991. Effects of environment on cassava consumption in Congo. Presented at the International Symposium, Food in Tropical Forests. Sep. 10-13, 1991. UNESCO /CNRS. Paris, France.

Institut Francais de Recherche Scientifique pour le Développement (ORSTOM). Use of cassava flour as an energy source for weaning foods. Brazzaville, People's Republic of the Congo.

Trèche, S., Ph. Giamarchi, E. Miambi, and A. Brauman. Use of the cassava flour as energy source for weaning foods. Presentation at the seminar, *Avances sobre almidón de yuca.* Held on June 17-29, 1991. CIAT. Cali, Colombia.



Product Development for Root and Tuber Crops

Volume III - Africa

INTERNATIONAL POTATO CENTER (CIP)

International Institute of Tropical Agriculture

Product Development

for

Root and Tuber Crops

Volume III—Africa

Editors

Gregory J. Scott[1]
Princess I. Ferguson[2]
Jose E. Herrera[3]

[1]Leader, Postharvest Management, Marketing Program, International Potato Center (CIP), P.O. Box 5969, Lima, Peru.
[2]Editorial Consultant, International Potato Center (CIP), P.O. Box 5969, Lima, Peru.
[3]Economist, Social Science Department, International Potato Center (CIP), P.O. Box 5969, Lima, Peru.

This publication is the proceedings of the International Workshop on Root and Tuber Crop Processing, Marketing, and Utilization in Africa, organized by the International Potato Center (CIP), the International Institute for Tropical Agriculture (IITA), and the Centro Internacional de Agricultura Tropical (CIAT), held October 26-November 2, 1991, at the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria, as part of a United Nations Development Program (UNDP) sponsored project on Human Resource Development.

Product Development for Root and Tuber Crops/Développement des Produits de Racines et Tubercules.

Copies printed: 1000

ISBN-92-9060-160-4 set of three vols.
ISBN-92-9060-161-2 Vol. 1-Asia.
ISBN-92-9060-162-0 Vol. 2-América Latina.
ISBN-92-9060-163-9 Vol. 3-Africa.

Correct Citation: Scott, G., P. I. Ferguson and J. E. Herrera (eds.). 1992. Product Development for Root and Tuber Crops. Vol. III—Africa. Proceedings of the Workshop on Processing, Marketing, and Utilization of Root and Tuber Crops in Africa, held October 26-November 2, 1991 at the International Institute for Tropical Agriculture (IITA), Ibadan, Nigeria. CIP. Lima, Peru. 506p. + xxiii.

Key words: Africa/cassava/potato/sweetpotato/yams/new products/processes/equipment/research/ marketing/consumption/developing countries.