

DRAFT

# Start Your Small Industry

## Transformation of cassava for human consumption

Small Enterprise Development Programme

RAS/92/306

(A UNDP/UNIDO/ILO Regional Programme for the Pacific)

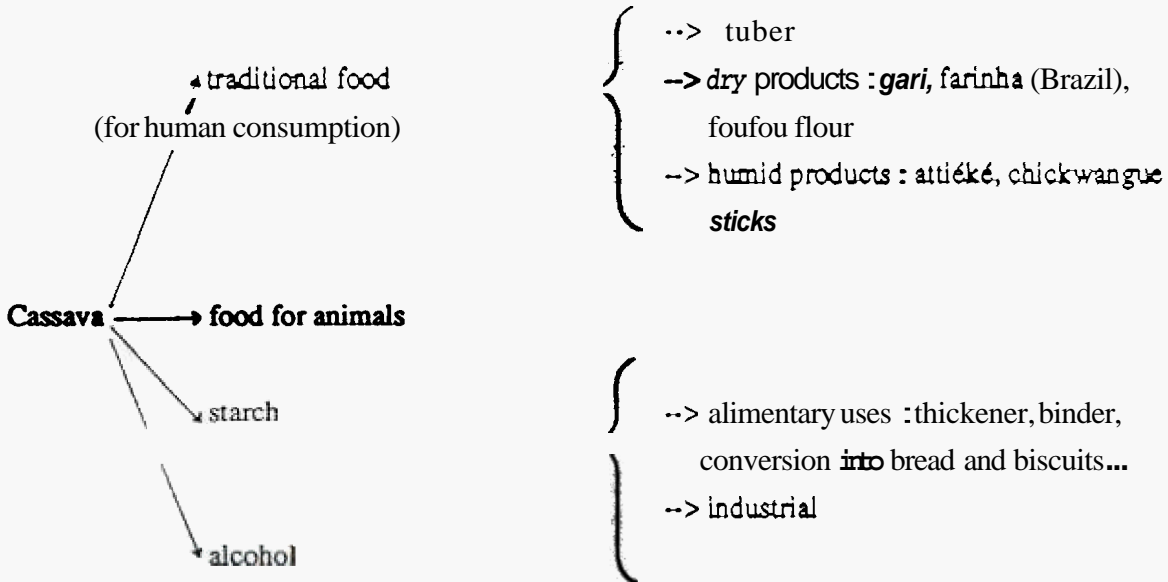


# A GUIDE FOR A UNIT DESIGNED TO MECHANIZE THE TRADITIONAL TRANSFORMATION OF CASSAVA FOR HUMAN CONSUMPTION

## 1 - PRESENTATION

### 1-1 Nature of the Activity

One of cassava's uses will be considered in this guide : food for human consumption.



The cassava tuber can be kept only 2 days after harvesting (unless it is retted and dried). This is why it is difficult to supply fresh cassava to areas that are distant from the areas of production.

Traditional dried products such as gari (a dry semolina resembling Brazilian farinha) and fufu flour (a fermented flour) can be preserved at room temperature and are easily transported and marketed.

For regions that traditionally consume gari or fufu flour, an activity of transformation which takes place in homes has been developed to feed the urban areas. The project described here calls for mechanizing the transformation of cassava to create either an artisanal unit (in villages) or an industrial sized unit.

## 1-2 Alternatives

### \* Finished Products

Gari : dry semolina.

Foufou flour : leaves the unit either in the form of **cossettes** or **as** flour. If it is in **cossettes**, the consumer will do the crushing.

There is a third dry cassava-based product, which ~~has~~ recently been developed. It is dry **attiéké** (with 10 % humidity, whereas traditional attieke has **55** % humidity). Therefore dry **attiéké** is a variation of the traditional product: . .

Foufou flour producing units can be used to make yam **flour**. The "retting" operation is omitted.

### \* Technology

The processing consists of the following steps : preparation, "retting", wringing drying, crushing, straining, and packaging.

Technological options are linked to the size of the unit concerned

- Preparation : peeling and cutting the tubers

All preparatory operations can be either manual, semi-mechanized, or fully mechanized.

For small units, the most important choice is between manual and mechanized peeling.

Mechanized peeling needs few people but has several inconveniences : maintenance of the machine, the supplementary operation of washing and **regular** supply.

- "Retting" : is a matter of fermentation during which the taste, the acidity and the flavour specific to foufou flour are developed ; it can be practiced either **by** immersion in water (traditionally in a watering-hole or a tank) or **by** "burying" (in case of weak water supply ).

- Wringing      elimination of water with different types of presses.

• Drying :

**Foufou flour :**

- Traditional drying **on** wattles or the ground ,

• Amplified **solar** drying (greenhouse or oven).

- Hot-air drying (different types of heat generators).

Traditional drying does not **require** a large investment- but calls for regular sunlight (a problem during rainy seasons), offers **no protection** for the product, and requires a great deal of labour.

Furthermore, rehumidification of the product during **the night** affects its quality-

Amplified solar drying provides **protection for the product**-and- shortens drying time, but this type of drying still has trouble during periods of limited sunlight.

Hot-air drying, because of its cost, is only appropriate for semi-industrial or industrial units.

**Gari :**

The cooking and drying process **calls** for an oven or “garifier” with a heat generator, regardless of the unit’s size.

- Crushing-straining : different types of crushers.

### **1-3 Types of Possible Units**

We have limited ourselves to the manufacturing of foufou flour and will consider three types of units :

**Unit A :** unit for artisanal transformation of foufou flour (capacity of **0.4 tons/hr** of fresh tubers), in a non-continuous process with manual preparation and amplified solar drying (solar greenhouses). Production : **80 kg** of flour per hour.

**Unit B :** small unit for industrial transformation of foufou flour ( capacity of **0.7 tons/hr** of fresh tubers) in a continuous process. Production : **150 kg** of flour per hour.

**Unit C :** big unit for industrial transformation of foufou flour ( capacity of **3 tons/hr** of fresh tubers) in a continuous process. Production : **660 kg** of flour per hour.

Note that the traditional regions of consumption of foufou and gari are distinct. Therefore, a multi-purpose unit is not possible.

## 2 - TECHNICAL AND ECONOMIC ANALYSIS

### 2-1 Description of Unit

#### 2-1-1 Finished Products

LINE	A	B	C
Range of products	flour	same as A	same as A
Type of packaging	25 or 50 kg sacks	25 or 50 kg sacks	25 or 50 kg sacks
Production			
- daily	640 kg*	2,4 t*	10,5 t*
- annual	120 t	500 t	2000 t

\* These figures are approximate because the actual production varies with the maturity and water content of the cassava, etc.

2-1-2 Technological Choices

OPERATIONS	TECHNOLOGICAL OPTIONS	SOLUTIONS		
		UNIT A	UNIT B	UNIT C
Reception Cleaning-destoning End removal-sorting	Manual or mechanized Manual or mechanized Manual	Manual	opper manually rotated washing drum manual	Same as B
Peeling and cutting	Manual or mechanized	manual-feeding, Peeling and cutting in cubes (fixed or mobile peeler)	Same as A	One post for cutting in quarters Distribution belt. 4 posts for peeling
"Retting"	In sacks or barrels that are immersed in water or "buried"	in immersed sacks	Same as A	Same as A
Wringing	Different types of presses	Hydraulic press	Screw press	Screw press
Drying	- on hurdle - solar greenhouse - drying with hot air	Solu greenhouse	Drying with hot air	Same as B
Crushing and straining	Different types of crushers ; straining optional	Crusher	Crusher + sieve	Same as B
Packaging and storage	Sacks, baskets. etc.	In sacks	Same as A	Same as A

### 3 - KEY FACTORS TO THIS PROJECT'S SUCCESS

#### Supply

The industrial units in particular should have regular year round supply. This demands adequate organization of production, harvest, deliveries, etc...

Supply for the unit is in competition with auto-consumption, the market for fresh cassava and artisanal transformation;

Supply contracts are a possible solution. This would assure some of the needs.

Transportation of cassava from the field to the unit is a delicate point, and so it must be organized. .

#### Technology and Equipment

The artisanal units necessitate an empirical how-how in order to control the different steps (especially the drying, depending on the humidity of the air). In the industrial units, the process of drying is mastered more easily, but it remains the most delicate operation.

#### Personnel

It is a relatively rustic technology that requires only the presence of a maintenance person and a training program for the rest of the personnel.

#### 3-4 Quality Control

There are no major microbiological problems.

Only the checking of the organoleptic quality is done daily, by the personnel who taste the product.

The organoleptic characteristics of the finished product constitute, in effect, the crucial element of the project : the taste of the industrial fofou flour must come as close as possible to the taste of the artisanal fofou flour in order to take its place on the market. One can cite several cases of failure, in particular the industrial attieke that was abandoned by African clients who called it "toubab attiéké" (white man's attiéké).

### 3-5 Distribution and Commercialization

Industrial fofou flour competes with local artisanal fofou flour, and occasionally with fofou flour imported cheaply from neighbouring countries.

A local market study will determine competing products and acceptable pricing for industrial fofou flour.

### 4 • INDUCED ACTIVITIES

Development of contracts with producers.

At a rate of 3 t/hr, **16** hours per day and **250** days per year, the unit consumes 12,000 tons of tubers per year.

Permanent hiring to keep the unit functioning.

The unit **also** creates sub-contracts (minor mechanics, construction, transportation...).