

## Training in good practices for the use and maintenance of equipment at a tomato processing unit in Ouahigouya in the northern region of Burkina Faso

Siédouba Georges Ye<sup>1</sup> and Abdel Kader Hounsouho Lingani<sup>1, 2, \*</sup>

<sup>1</sup> National Center for Scientific and Technological Research, Research Institute in Applied Sciences and Technologies, Laboratory of Renewable Energy Systems, Environment, Mechanical and Industrial Engineering, Ouagadougou, Burkina Faso.

<sup>2</sup> Polytechnic School of Ouagadougou, Institute of Industrial and Textile Systems Engineering, Burkina Faso.

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### Abstract

The objective of this work is to train tomato processors in good practices for the use and maintenance of processing equipment at a pureed tomato processing unit in Ouahigouya in the northern region of Burkina Faso. It responds to the realization of a training book containing all the following information, namely: The technical and operational presentation of the unit's equipment, the treated products and the bio-parameters of use of the equipment and finally the methods of care or maintenance of the equipment before and after use. This fieldwork allowed us to transfer technology from the processing equipment we produce in the Mechanical Engineering workshop of the Mechanization Department of the Institute for Research in Applied Sciences and Technologies. This work is a beginning of the dissemination and popularization of the results of the research work carried out within the Mechanization Department that seem to be unknown to the general Burkinabe public.

**Keywords:** Vegetables; Tomatoes; Processing; Equipment; Use; Maintenance

### 1. Introduction

Vegetables feature prominently in many culinary recipes because of their use as ingredients [1]. They are used in culinary preparations as ingredients for their flavor, nutritional value, and prebiotic and medicinal properties [2-5]. However, we note some bottlenecks in their value chain, more precisely at the milling level. Indeed the milling operations are a little tedious and long and are often done in a rudimentary / archaic way or with equipment not adapted to food (pestles) [6]. To compensate for this, a tomato processing unit is built and installed in Ouahigouya in the northern region of Burkina Faso within the Simplified Sahelian Women's Cooperative. This unit makes it possible to transform the tomato into paste, puree or dry powder, which is used in the preparation of local dishes. The products obtained (paste, puree, dry powder) can also be preserved in the medium term. The unit is intended for post-harvest processors of vegetables including tomatoes, eggplants, etc. who come here for a paid service. At the end of the installation of the unit, training in good practices for the use and maintenance of processing equipment was initiated for processors of pulses and tomatoes. This training made it possible to transfer technologies of the processing equipment produced within the Mechanical Engineering workshop of the Mechanization Department of the Applied Sciences and Technologies Research Institute.

\* Corresponding author: Abdel Kader Hounsouho Lingani

National Center for Scientific and Technological Research, Research Institute in Applied Sciences and Technologies, Laboratory of Renewable Energy Systems, Environment, Mechanical and Industrial Engineering, Ouagadougou, Burkina Faso.

## 2. Material and methods

The training method was to provide practical knowledge on the use and maintenance of the processing unit installed equipments. These equipments are: a fresh products mill, a dried products moulinex, a solar dryer, a mixed gas/electricity refrigerator, kitchen utensils and a gas fireplace. To do this, we first proceeded to the technical and operational presentation of each piece of equipment, then we listed the treated products and their treatment methods in synergy with the bio-parameters of use of each equipment. And finally we gave the maintenance methods of each piece of equipment after used.

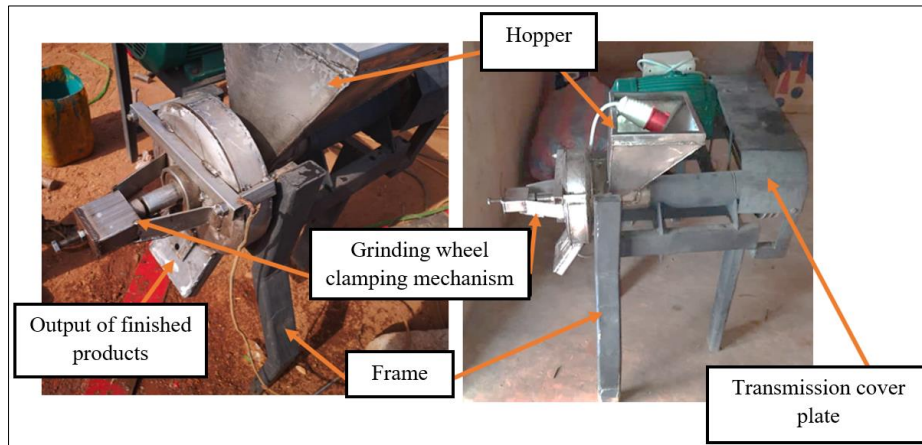
## 3. Results and discussion

### 3.1. Fresh products Mill

#### 3.1.1. Technical and operational presentation of the mill

The mill (Fig. 1) for fresh produce has a motorization of the product loading system in the grinding chamber with wheels by helical screws. It includes:

- a frame on which the grinding chamber, the helical screw and the feed hopper sit;
- a grinding chamber with stone grinding wheels;
- a mechanism for adjusting the degree of grinding by tightening the screw;
- a transmission mechanism with electric or thermal motor depending on the choice: in this case the choice is an electric motor;
- a recovery output of tomato paste or any other fresh product worked;
- a chassis on which is the engine.



**Figure 1** Mill for fresh produce

#### 3.1.2. Fresh produce mill settings

The adjustments to be made on the equipment before any work operation are: the adjustment and tightening of the two bolts of the grinding cage, the adjustment and tightening of the helical grinding screw (Fig. 1).

#### 3.1.3. Operational start-up of equipment

The operational start-up of the equipment consists of:

- stabilize the machine on the floor by levelling it to zero;
- clean dirt and debris if it exists in the hopper and on the loading screw;
- open and clean the grinding chamber and check the tightness at the closing to see if there is no water leakage, the water introduced into the hopper must come out through the recovery outlet of the crushed products;
- place an aluminum, stainless steel, or plastic tray under the finished product recovery outlet;
- clean fresh produce (fruits and vegetables) that need to be processed;

- before feeding fresh produce, peel the products (tomato, orange, lemon, mandarin, cherub, banana, etc.) and cut the long vegetables;
- start the engine to test the fresh produce mill and check if the helical screw at work feeds the grinding chamber and that there is no leakage in the grinding chamber.

#### 3.1.4. Technique for supplying the mill with fresh produce

The product to be grinded is loaded into the hopper directly when the engine is started, the cut product is conveyed into the grinding chamber using the helical screw. The operator therefore feeds the grinding chamber manually through the hopper.

#### 3.1.5. Verification and quality control at work

The quality at work is given by the sound noise of the machine which must not squeak and the quality of the finished product obtained at the exit is judged by the fineness of the dough obtained observed with the naked eye by the processor. The fineness is about 600  $\mu\text{m}$ .

#### 3.1.6. Maintenance of the mill after use

The maintenance of the mill for fresh products after use consists of:

- clean the chamber and screws after the extraction operation;
- grease the bearings;
- adjust belt tension and alignment of drive and lead pulleys.

### 3.2. Dried products Moulinex

#### 3.2.1. Technical and operational presentation of the moulinex

The moulinex (Fig. 2) is a hammer mill whose functional organs are summarized as:

- an electric control that includes the contactor, the thermal relay and the push buttons that allows the motor to be energized;
- an electric motor that generates the working power and rotational movement of the hammers;
- a propeller rotor in the form of hammers makes it possible to beat the product;
- counter-beaters that crush the product;
- a sieve that allows fine products to pass through, the fineness of the product is a function of the fineness of the mesh of the sieve;
- a clamping system that centers the lid of the grinding cage to prevent any leakage of the product;
- a hopper that feeds the grinding chamber with product;
- a hatch that regulates the feeding of the product inside the grinding chamber.

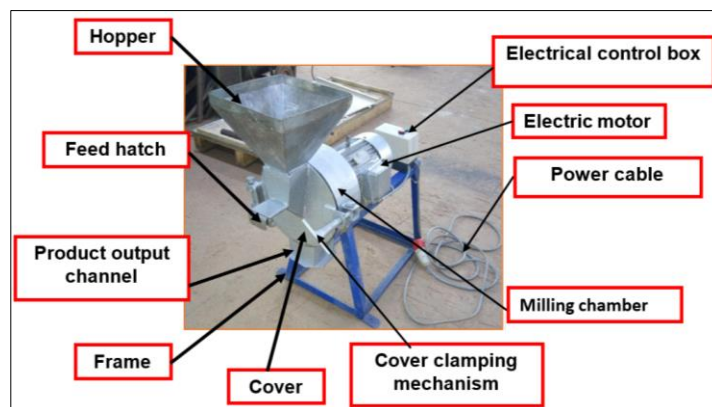


Figure 2 Moulinex for dried products

### 3.2.2. *Equipment settings*

The equipment settings are as follows (Fig. 2):

- install the equipment on a flat work surface;
- make sure the sieve is tight;
- close the lid properly with the screw of the grinding chamber cover;
- close the feed door of the grinding chamber.

### 3.2.3. *Operational start-up of the moulinex*

For start-up, the following actions must be followed chronologically:

- Connect the three-phase power outlet to a powered three-phase outlet;
- operate by pressing the green button to start the equipment engine;
- Place a collection container for the finished product under the outlet chute of the finished product.

The red push button allows the equipment to stop.

### 3.2.4. *Plant feeding technique to be milled in equipment*

To introduce the dried product into the milling chamber, the hopper is first filled with plant material which is regulated by the feed hatch towards the inside of the milling chamber.

### 3.2.5. *Verification and quality control at work*

Verification and quality control of work consists of:

- check the fineness of the product obtained, which must be homogeneous;
- check that the product comes out properly ground;
- check that the residue has not clogged the emails of the sieve.

### 3.2.6. *Post-use maintenance of equipment*

Maintenance of equipment after use consists of:

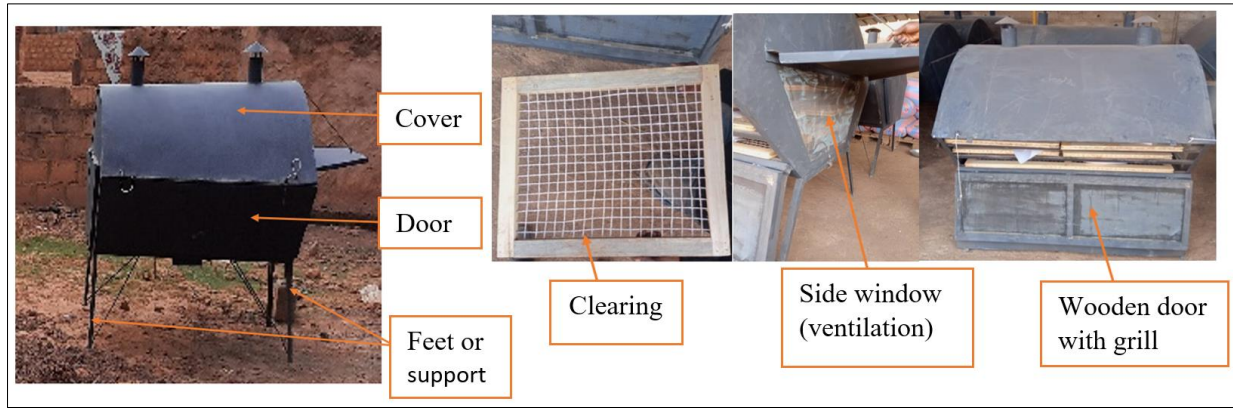
- properly clean the sieve and hopper after use;
- clean the grinding chamber properly;
- close the lid and power door properly.

## 3.3. **Solar dryer**

### 3.3.1. *Technical and operational presentation of the equipment*

The solar dryer (Fig. 3) is intended for drying agricultural products and consists of:

- feet to support the entire dryer;
- box that constitutes the body of the dryer;
- mesh aeration;
- door;
- door;
- blanket;
- Racks.



**Figure 3** Solar dryer

### 3.3.2. Operational start-up of equipment

The drying is direct, just expose the dryer to the sun in the direction of the sun's rays.

### 3.3.3. Technique for introducing the material into the equipment

The products treated by the dryer are wet cereals and oilseeds. After cleaning the racks and the inside of the dryer, to introduce the product to be dried, it is necessary:

- Open the door;
- Remove a rack;
- Spread the product evenly on a white cloth spread on the rack. It must be spread out well for maximum use of the surface of the rack while leaving small spaces for air circulation;
- Push the rack inside, making sure no parasites go inside;
- Close the mesh wooden door (not the tin door) and open the side windows. Leave the dryer this way, making sure to always leave it in the sun.

The drying status of a product is checked through its taste, color and flavor.

### 3.3.4. Post-use maintenance of equipment

The maintenance of the solar dryer consists of:

- Rigorously clean racks, the box and the ventilation doors;
- Check the condition of the side window grilles so as not to infect the product. It must be cleaned every time it is clogged. (Sand, splashes,).

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## 4. Conclusion

This work to train tomato processors in good practices in the use and maintenance of tomato processing equipment in Ouahigouya in the northern region of Burkina Faso, has strengthened the technical capacities of processors in operational and technical management of the equipment of the tomato processing unit. It focused on the technical and operational presentation aspects of the equipment, the products treated and the bio-parameters of use of the equipment, and the methods of maintenance of the equipment after use. At the end of the training the practical knowledge of the learners was assessed and the results obtained are very satisfactory. Each operator masters the settings of the machines, their start-up, mode of use and maintenance. A trainee's notebook containing the various points of the training as conducted is given to each trainee as a reminder for better use and maintenance of the unit's equipment.

## **Compliance with ethical standards**

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### *Disclosure of conflict of interest*

The authors state that there is no conflict of interest.

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