CAVA2

CASSAVA: ADDING VALUE FOR AFRICA PHASE II

# What to know before buying a

# CASSAVA GRATER

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## What you need to know before buying:

# CASSAVA GRATER

### 1. Cassava size-reduction

After being peeled and washed, cassava roots need to have their size reduced into a smooth mash, with particles of uniform size. Size reduction is a unit operation widely used in several industries and many types of equipment are available. For cassava, size reduction is done mainly with a rotating drum grater or with a hammer mill.

### 2. Rotating drum graters

Rotating drum graters are similar to roll crushers, but with a single rough cylinder. The design varies widely, but in general, they are composed of a drum with a grating surface that rotates inside a housing with a feeding hopper on top. The grating surface can be made of a nail-punctured stainless-steel sheet, bent into a cylindrical shape, with the protrusions facing outwards. The grating surface can also be made of longitudinally arranged saw-tooth blades.

Roots are fed into the hopper on the top of the housing and size reduction is done by attrition. The size of the particle is determined by the clearance between the drum and the housing walls. Some models allow changing this clearance and thus permit controlling the size of the particles. Depending on the adjustment made, particle size can range from 0.5 mm to 1.0 mm.

Drum diameter usually ranges between 200–300 mm and drum length ranges between 400–500 mm. It rotates between 100–1500 revolutions per minute (rpm), powered by an electrical or internal combustion engine. Optimum rpm, the ideal size of the drum and the best profile of the grating surface have not yet been established for cassava grating.

| **Rotating drum grater** | |
|---|---|
| *Advantages* | *Disadvantages* |
| Relatively lower cost | Rapid wear of the grating surface |
| Relatively lower power consumption | Inconsistent particle size over time |

### 3. Hammermill

Hammer mills are composed of a high-speed rotor, hammers, a cylindrical housing with a feeding hopper on top, and a perforated sieve on the bottom. The hammers are attached to the periphery of the rotor and swing through a circular path inside the housing.

The roots are fed into the hopper and are hit by the quickly rotating hammers, reducing root size by the impact. The product leaves the housing when it can pass through the sieve on the bottom. Particle size is, therefore, controlled by the speed of the hammers and the aperture of this sieve. Sieve aperture should be larger than the desired particle size because particles that pass through it are usually considerably smaller than the aperture. Depending on the adjustment, particle size can range from 0.05 mm to 10.00 mm.

The diameter of the rotors varies between 300–1000 mm and the hammers usually rotate between 50–3000 rpm, powered by electric motors, or internal combustion engines.

| **Hammermill** | |
|---|---|
| *Advantages* | *Disadvantages* |
| Less prone to wear | Relatively higher cost |
| Relatively consistent particle size over time | Relatively higher power consumption |

## 4. Performance indices

When selecting a piece of equipment to reduce the cassava size, to turn it into a smooth mash, the main performance indices are *throughput*, *specific energy consumption* and *particle size coefficient of variation*.

*Throughput* is the capacity of the equipment, i.e. how many kilograms of peeled cassava roots can the machine grate per hour of operation.

For the units driven by an electric motor and for the units driven by an internal combustion engine, electric energy consumption and fuel consumption, respectively, are key factors to take into account. *Specific energy consumption* is the amount of energy needed per kilogram of cassava grated into a mash.

After being grated, the size of the cassava grits should be uniform. The *particle size coefficient of variation* is a measure of relative variability in the size distribution of the particles. Preference should be given to a piece of equipment that can produce grits with a narrow particle size distribution.

In general, *throughput* ranges from 300 to 6000 kg of peeled cassava per hour. Benchmarks and ranges for *specific energy consumption* and *particle size coefficient of variation* have not yet been determined.

## 5. Quality and safety

All parts that come directly in contact with the roots should be made of food-grade stainless steel. The only exception would be the hammers from the hammer mill, which can be made of manganese steel. Manganese steel has the advantage of being much harder-wearing while having all the other necessary characteristics from stainless steel, i.e. it does not exchange components with the food, does not react with detergents, and can be cleaned easily. Parts that do not come into direct contact with food don't need to be made of stainless steel but must be of a material that is resistant to corrosion.

All belt drive components should be enclosed under a safety guard. Do not purchase equipment that has exposed belts.

## 6. Summary: check before buying

- ☑ Is the equipment *throughput* suitable for the factory operation?
- ☑ Is the *specific energy consumption* of the equipment adequate?
- ☑ Is the *particle size coefficient of variation* suitable?
- ☑ If opting for a rotating drum grater, can the grating surface be easily replaced? Has this cost been accounted for?
- ☑ If opting for a hammer mill, are the hammers made of manganese steel?
- ☑ Are all the parts that come in direct contact with the food made of stainless steel (or manganese steel for the hammers)?
- ☑ Are all the parts of the equipment resistant to corrosion?
- ☑ Are all the belt drive components enclosed under a safety guard?