



**National Agricultural Extension and Research Liaison Services
Federal Ministry of Agriculture and Water Resources
Ahmadu Bello University, Zaria**

CONSTRUCTION AND USE OF MULTI-PURPOSE ROASTER



**EXTENSION BULLETIN NO 88
Agric. Engineering Series No 4**

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1. INTRODUCTION

Groundnut oil, the most sought vegetable oil in Nigeria, is largely produced by rural women processors. These women employ primitive tools, which limit their capacity and yield and make their tasks arduous. Research findings show that, of the six basic processes of groundnut oil extraction (decortication, winnowing, roasting, grinding, kneading and pressing), roasting remains one of the most difficult tasks without ready solution.

The problems associated with roasting groundnut as reported, include sustenance of burns by the processor, low capacity and general inefficiency. An attempt at alleviating these roasting problems resulted in the development of an equipment called “a Multi-purpose Roaster”. The multi-purpose nature of this new Roaster was guided by the fact that roasting is a common food processing activity.

The equipment has been successfully used to roast groundnut and can similarly be used to fry gari, pop corn and other similar functions.

This publication is put together to assist equipment fabricators and manufacturers to produce the Roaster as well as oil processors and other users to efficiently use and maintain it.

2.0 THE MULTIPURPOSE ROASTER

2.1 General Description

The roaster (fig. 1) consists basically of two parts viz: the roasting chamber and the support.

The roasting chamber consists of a semi-circular trough covered at the two ends by two end-plates which carry a shaft. Onto this shaft are attached paddles for stirring the material being roasted and a handle for turning the shaft. The paddle arrangement can be used to stir the material being roasted and to evacuate it from the roasting chamber.

The support consists of a frame with covers on three sides. Apart from carrying the roasting chamber, it houses the heat source (gas burners, kerosine burners or fuel tray for firewood, charcoal or coal) and also carries the chimney which directs smoke, (which could be quite offensive) away from the user.

The prototype reported has a capacity of 18kg/hr, 15kg/hr and 12.5kg/hr when roasting groundnut with gas, kerosine and firewood, respectively. This is a marked improvement over the traditional capacity of 10kg/hr. It should be noted however that larger capacity units can be produced on request.

2.2 Material Selection

The choice of materials for making the various components and parts of the equipment were guided by their function, durability ready availability and cost among other factors. The different materials used for the various parts are as stated on the part-diagrams.

3.0 CONSTRUCTION AND ASSEMBLY

3.1 Tools and Equipment

The tools and equipment required to produce a unit of the Roaster are as listed below: -

- i. Measuring tape
- ii. Shear cutter
- iii. Hack saw
- iv. Tri-square
- v. Scriber
- vi. Center punch
- vii. Divider
- viii. Snip cutter/scissors
- ix. Drilling machine and drill bits
- x. Arc welding machine and electrodes
- xi. Riveting machine and nails

- xiii. Files
 - xiv. Spanner
 - xv. Chisel
- 3.2 Construction and Assembly

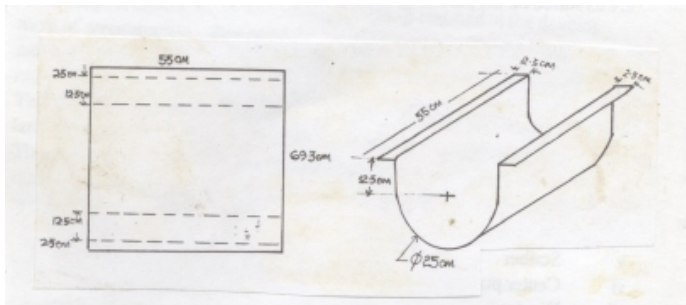
To construct the Roaster, follow the instructions given below very carefully ensuring that measurements are correct and cutting, joining and all other activities are done correctly. Deviations from using materials not recommended should be avoided as much as possible.

I. ROASTING CHAMBER

1. Roasting Trough

Material: 1.5mm mild sheet (m/s) sheet

Job: Cut a piece of 1.5mm m/s sheet with the dimensions given and fold as shown.

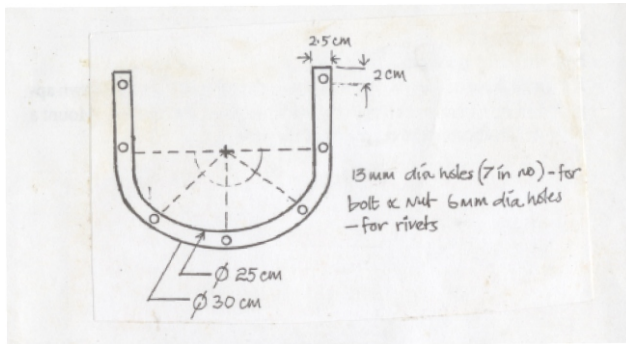


(Fig 1:)

2. Trough Connectors. (To end plates)

Material: 1.5mm m/s sheet

Job: Cut two pieces of m/s sheet. Drill seven 13mm diameter holes on one for bolts to pass through and seven 6mm-dia holes on the other for rivets.. If there is no riveting machine, make all holes 13mm diameter.

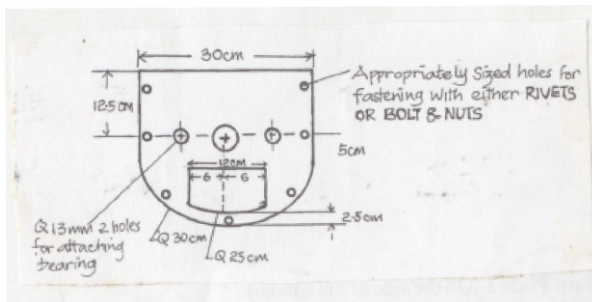


(Fig: 2:)

3. End Plate 1 (On the side of the handle)

Material: 2mm m/s sheet

Job: Cut a piece of the material with the given dimensions. Drill the 10 holes shown as specified. Mount a 6304 ball bearing (+ housing) on the outer end of the plate.



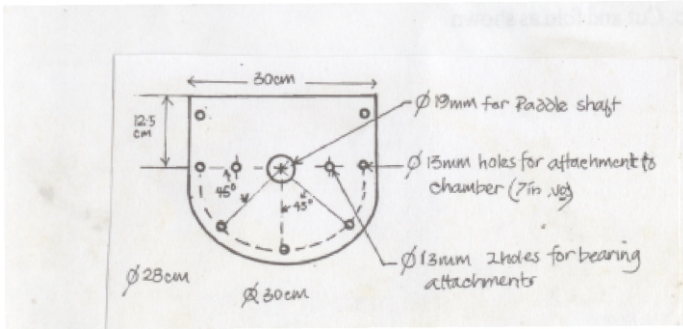
(Fig 3:)

4. End Plate 2

Material: 2mm m/s sheet

Job: Cut a piece of the material as shown. Drill the 10 holes shown

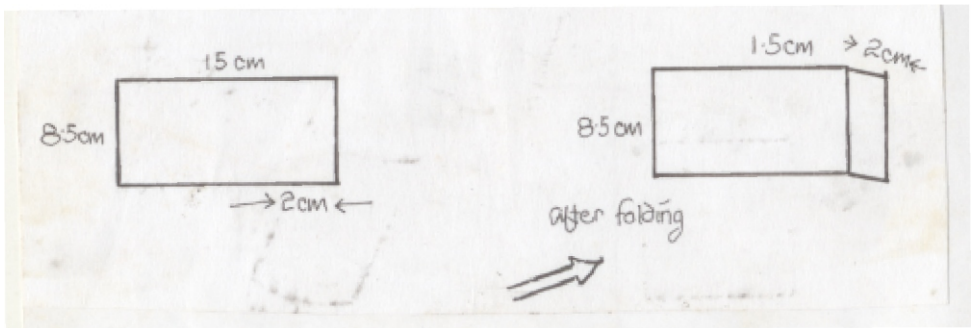
appropriately. Chisel out an opening with the given dimensions. Mount a 6304 ball bearing on the outer end of the plate.



(Fig 4:)

5. Gate Cover

Material: 1.5mm m/s sheet
Job: Cut and fold as shown

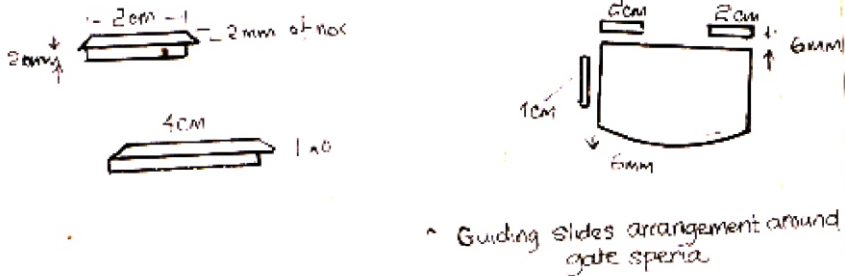


(Figure. 5:)

6. Gate Sliding Guides

Material: 2mm m/s sheet

Job: Cut five pieces with the given dimensions and attach to end plate 2 as shown.

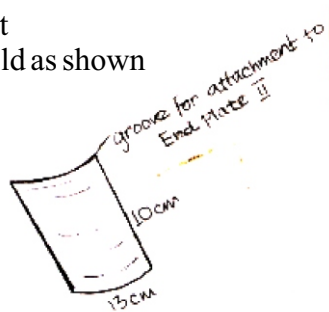
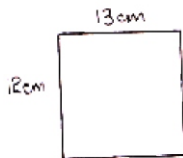


(Fig. 6:)

7. Out-let Chutes

Material: 1.5mm m/s sheet

Job: Cut, bend and fold as shown

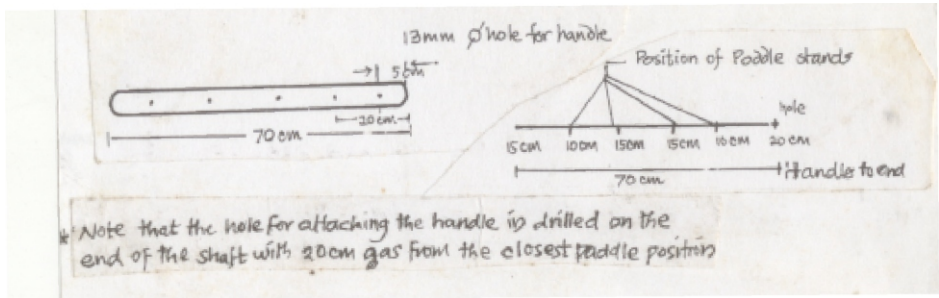


(Fig. 7)

8. Paddle Shaft

Material: 19mm rod (: rod)

Job: Cut one piece and mark as shown. Drill a 13mm diameter hole 5cm from the handle end as shown.

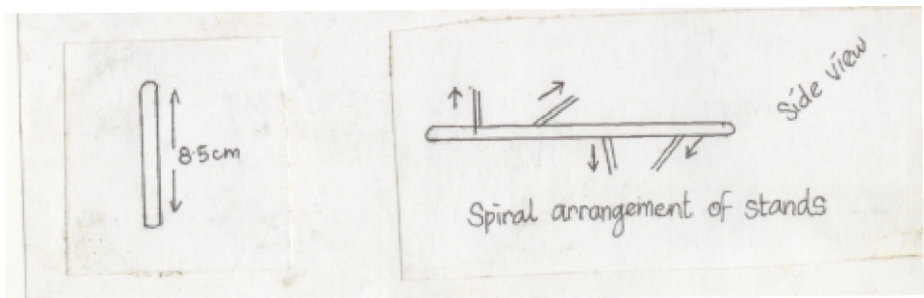


(Fig. 8:)

9. Paddle Stand

Material: 9.5mm rod (3/8" rod)

Job: Cut 4 pieces of the given length and weld to the paddle shaft at the marked points. Note the spiral arrangement of the stands



10. Paddles

Material: 25.4mm flat bar (1" flat bar).

Job: Cut 4 pieces of the given length and mark as shown for positioning the paddles on the paddle stands. Weld the paddles to the stands ensuring that they are tilted at an average angle of about 30° to the horizontal, joined at their centers (as marked) and parallel to the paddle shaft.



— 8.5cm — Mark for Positioning the paddle before attachment

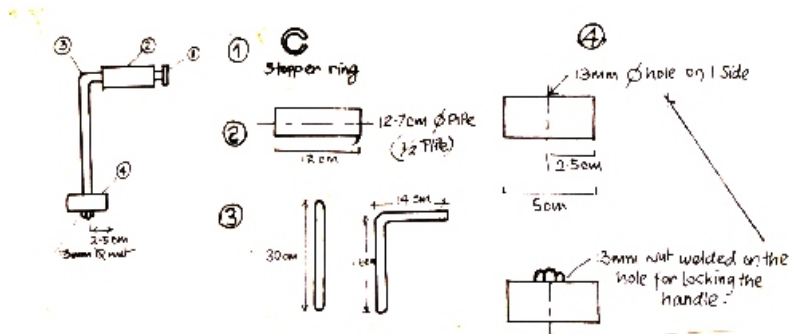
* Note the spiral arrangement of Paddles and their stands

(Fig. 10:)

11. Handle

Material: c" rod, 2 pipe, d" rod, : pipe, 13mm nut as shown.

Job: Cut the various pieces as shown, bend, drill, weld and assemble as shown.

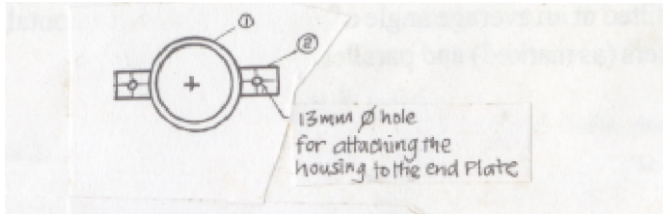


(Fig. 11:)

12. Bearing Housing

Material: 52mm pipe (galvanized); 1" flat bar.

Job: Cut and join as shown



Pipe of int diameter = 52mm
25mm (1) flat bar of 4cm length
Bearing - 6304

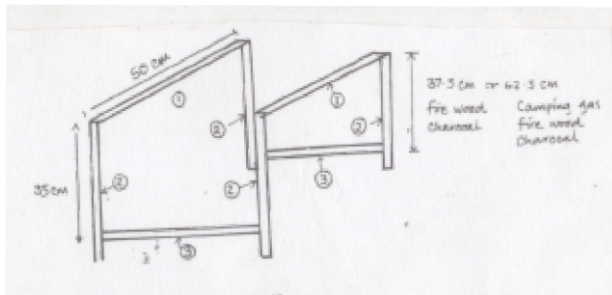
(Fig. 12:)

II. SUPPORT

13. Frame

Material: 1" x 1" or 1.5" x 1.5" angle iron.

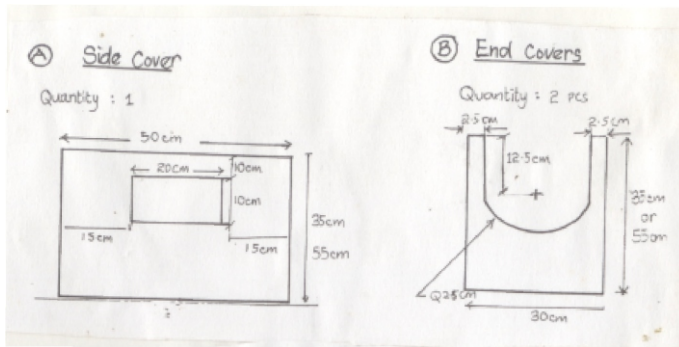
Job: Cut 8 pieces of the material appropriately and join by welding



- (1) 2 pieces of 50 cm length
- (2) 4 pieces of either 37.5cm or 62.5cm length
- (3) 2 Pieces of 25cm length.

(Fig. 13:)

Job: Cut the material for 1 side cover and two end covers as shown.
Chisel out the opening specified on the side cover.



(Fig. 14 here)

15. Chimney

Material: 1.5m/s sheet

Job: Cut the pieces shown with the appropriate dimensions. Join using light welding and assemble as shown.

16. Fuel Tray

Material: 1.5mm m/s sheet; 1" flat bar

Job: Cut, fold and weld as shown

3.3 Assembly

1. Assemble parts 1 to 12 for the roasting chamber as shown
2. Assemble parts 13 to 16 for the support as shown.
3. Assemble parts 1 to 16 for the Roaster as shown.

4.0 USE AND MAINTENANCE

4.1 Use

Before using the equipment, first ensure that all nuts and bolts are properly tightened and that the support is on firm ground. Next, check that the paddles are moving freely with minimal clearance from the roasting trough when the handle is turned. Once these are in order, introduce the heat source (Gas burner, kerosine burner, firewood or charcoal) at the appropriate level beneath the roasting chamber. With the gate locked, pour the material to be roasted into the trough. Turn the handle continuously in a to and fro motion until the material is properly roasted. Now, open the gate and turn the handle in a clockwise direction to evacuate the roasted material from the chamber.

4.2 Maintenance

In order to ensure reliability and safety at all times; the following maintenance procedure should be followed strictly.

1. Remove and quench heat source from the equipment immediately after use.
2. Clean the equipment properly after each use ensuring that no material is left in any crevix. They form potential sources of contamination.
3. Ensure that all nuts are fastened tightly always.
4. When not in use, let the roasting chamber face downwards so that no liquid whatsoever can collect in it.

N.B.

NAERLS will not accept liability for any loss that may result from wrong manufacture or usage of the equipment.

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