

the weight of the drying racks. One end of the drying rack is placed on the ground and the other is leant against the top of the rail, thus causing the drying surface to set at an angle of 30° towards the sun (Figure 1, Picture 3).

Re-crushed wet cake is then spread over the surface of the rack to a maximum loading of 5kg per m² of drying surface. This gives a single drying rack a capacity of 10kg of wet cake, which will dry to yield 5kg of dry product (equivalent to approximately 4kg of HQCF per rack). It is tempting to overload the racks, but this should be avoided as this reduces drying efficiency and results in a poor-quality product. To produce a sufficient volume of dried product, processing groups will normally have ten or more racks (Figure

2). With ten racks, a processing group can produce 50kg of dried product per day, which equates to approximately 40kg per day of HQCF.

To help with drying, the product should be turned frequently using hand brooms. If rain is expected, the racks should be taken under cover immediately. Using this type of rack, drying should be completed within six to eight hours.



Figure 2 Set of eleven racks angled at 30° towards the sun



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Cassava: Adding Value for Africa (C:AVA) Project

A Guide to the Sun Drying of Pressed Cassava Mash



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Introduction

Fresh cassava roots are highly perishable and contain 65–70 per cent moisture (water), whereas high-quality cassava flour (HQCF) contains only 10–12 per cent moisture and has a much longer shelf life. Reduction of moisture is a key step in processing cassava roots into HQCF and must be done quickly to avoid lowering product quality.

Preparation for sun drying

Efficient removal of moisture requires airflow and heat energy, which can be provided by the sun or artificially by burning oil to generate hot air. Artificial drying is expensive and sun drying depends on availability of sunlight. For these reasons, it makes good sense to remove as much water as possible from the product before drying. This is achieved by pressing the grated cassava mash in a jack press for a period of approximately two hours.

The efficiency of moisture removal depends on the size of jack used. Small car jacks (2- to 5-ton capacity) are the least efficient and should not be used, whereas lorry jacks (32- or 50-ton capacity) are the most efficient.

Using a 32- or 50-ton jack, the moisture content of the product can be reduced to 35–40 per cent, thus making drying quicker, easier and less expensive. Smaller jacks should be avoided as these are not efficient enough to remove the desired amount of moisture within two hours.

To maximise the efficiency of drying, it is essential for the pressed cassava cake to be broken up into fine particles, thus providing the maximum surface area for moisture removal. This is achieved by passing the pressed cake back through the motorised grater to create fine particles ready for drying.

About C:AVA

The Cassava: Adding Value for Africa (C:AVA) project is currently developing value chains for HQCF in Ghana, Tanzania, Uganda, Nigeria and Malawi. This will improve the livelihoods and incomes of at least 90,000 smallholder households as direct beneficiaries, including women and disadvantaged groups. It promotes the use of HQCF as a versatile raw material for which diverse markets exist.

C:AVA
Cassava: Adding Value for Africa



The project is led by the Natural Resources Institute of the University of Greenwich, working closely with the University of Agriculture, Abeokuta, Nigeria; the Food Research Institute, Ghana; Tanzania Food and Nutrition, Tanzania; Africa Innovations Institute, Uganda; Chancellor College, University of Malawi; the International Institute of Tropical Agriculture; and a range of other partners.

Sun drying

Sun drying offers the simplest way to dry pressed cassava cake and is best suited for small-scale rural operations where product volumes are low (50–100kg of dry product per day). Efficient sun drying requires a combination of sunlight, dry air (low humidity) and good airflow over the product. Simple approaches to sun drying involve spreading the wet product on a concrete drying floor or a black plastic sheet laid on top of a concrete drying floor.

Drying is enhanced by turning over the product frequently using brooms or rakes. This approach has the disadvantage of exposing the product to dust and contamination by domestic animals and provides a very limited airflow over the product. Raised platforms with solid drying surfaces can reduce contamination by dust and animals but do not improve airflow significantly.

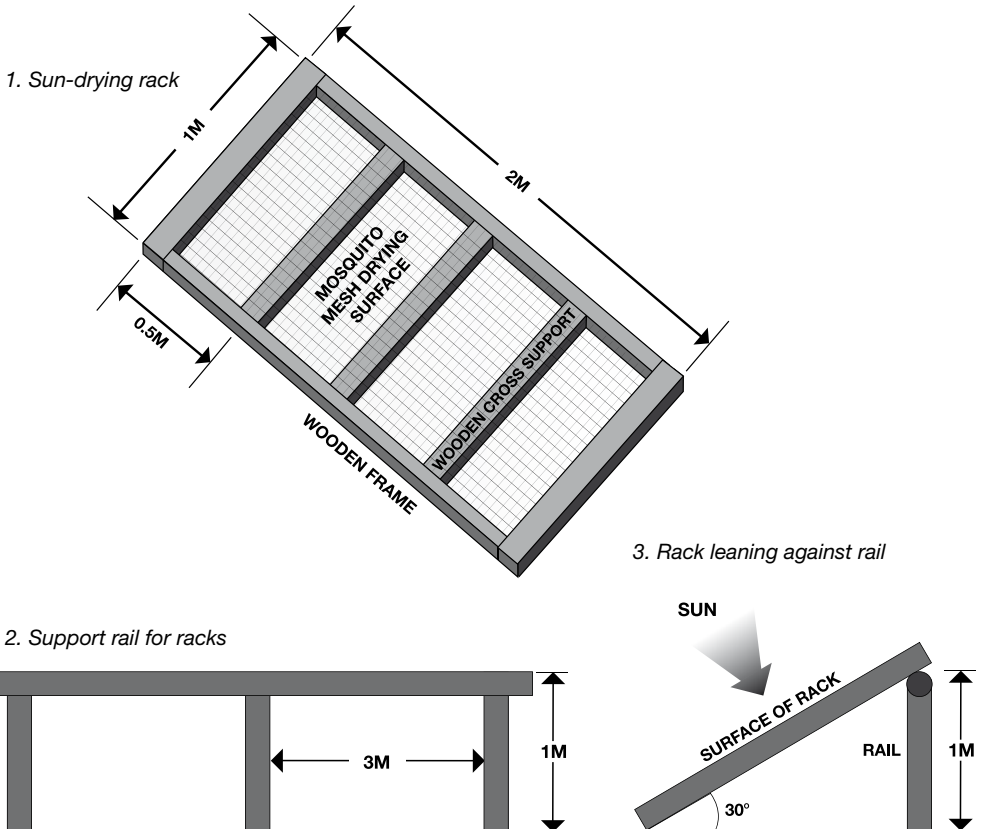


Figure 1 Construction of a sun-drying rack and support rail

Why use the improved sun-drying racks?

You should use the improved drying racks in place of conventional drying on concrete floors, black sheets or raised racks with a solid top because the raised racks offer a much more efficient removal of moisture when compared to the older methods. This helps to ensure rapid drying and the production of a high-quality product.

The Natural Resources Institute compared different methods of sun drying under field

conditions (Jones, 1994) and found that average moisture loss from wet material spread on raised racks was 0.18g of moisture per second per m² of drying area. In contrast, drying on concrete floors (with and without a black plastic sheet) yielded an average moisture loss of 0.02g of moisture per second per m². The dramatic increase in rate of moisture removal seen with the improved sun-drying racks has serious implications in terms of shortening drying times and reducing microbial levels in the dried product, thus helping to ensure product quality.

Construction of improved sun-drying racks

A much better approach is to spread the product on special drying racks that have a porous drying surface to improve airflow. The drying surface for these racks is made from mosquito mesh stretched over a rectangular wooden frame 2m-long by 1m wide (Figure 1, Picture 1). The main frame is made from timber (8cm x 2cm section is sufficient) of sufficient strength to maintain shape when wet product is loaded on to the mesh. The four parts of the frame are screwed together to make maintenance easier.

The drying surface is made by stretching mosquito mesh (fine mesh which has NOT been treated with insecticide) over the frame and tacking along the edges, ensuring that the mesh surface is taut. Three cross supports (6cm x 0.6cm section is sufficient) are then attached across the width of the frame space 0.5m apart along the length of the frame. These cross supports prevent sagging of the mesh when the product is loaded; they

must be screwed into position to allow for easy removal when the mesh needs replacing. The completed rack will have an effective drying area of approximately 2m².

Using improved drying racks

To maximise efficiency of sun drying, it is necessary to ensure an unobstructed airflow and to place the drying surface at the optimal angle to maximise exposure of the product to sunlight. Experimental trials have shown that racks should be pointed towards the sun and set at an angle of 30° from horizontal. With a 2m long rack this is easily achieved by constructing a wooden rail raised 1m above the ground (Figure 1, Picture 2).

The length of the rail is determined by the number of drying racks in use. To support five racks, a rail of at least 5m long is required. For longer rails, it is necessary to place additional supporting posts approximately 3m apart along the length of the rail to prevent the rail sagging under