



PROTOCOL FOR MANGO JUICE PREPARATION

**for
Trainers and Processors**

**Prepared
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**PROCESSING
FOR COMMERCIAL
EXPLOTATION OF SELECTED
TREE FRUITS AND
VEGETABLES IN TANZANIA
AND RWANDA PROJET
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1. INTRODUCTION

Fruits are an important crop in Eastern and Central Africa, just as they are the world over. They are a source of essential vitamins, minerals, antioxidants, fibres and carbohydrates which our bodies crucially need. These nutrients improve the quality the human diet and protect us from chronic diseases. Fruits, however, are highly perishable leading to drastic nutritional and economic losses. This means that during the off-season, households face shortage of fruits and vegetables due to lack of knowledge on how to preserve and process them for year-round consumption. The long term implication is that supplies of locally processed products are inadequate and do not meet the required quality standards for domestic and international markets. These challenges have spurred ASARECA to invest in research and development on fresh produce technology to add onto their value and increase incomes.

In response to this particular challenge, ASARECA initiated a project; “*Processing for commercial exploitation of selected tree-fruits and vegetables in Tanzania and Rwanda*” to validate the existing protocols for processing fruit juices, among other products, on commercial but small scale basis. The project is focusing on ready-to-drink single or mixed fruit mango and passion fruits, and the vegetable *Amaranthus* sp. The project is implemented by scientists from Sokoine University of Agriculture, Tanzania; Institut des Sciences Agronomiques du Rwanda, Mikocheni Agricultural Research Institute, Tanzania, the Kigali Institute of Science and Technology, Rwanda, and the Community Food Processing and Training Centre, Morogoro Tanzania. It is managed by ASARECA’s High Value Non Staple Crops programme. The project has identified a number of key cost-effective technology packages for small scale fruits and vegetables processing to produce quality products that meet safety demands of

target markets. It has fostered linkages amongst stakeholders along the fruit/vegetable value chain to promote best handling practices and standards, and sensitized consumers to appreciate the value of locally processed fruits and vegetable products. The project has also facilitated the training of farmers, transporters, processors and traders on suitable agronomic practices, quality assurance and appropriate technologies.

Processing mango into juice is one of the technologies that were validated in order to benefit food processing entrepreneurs and consumers as well. This training manual is therefore, prepared to guide trainers and processors on good manufacturing/hygienic practices in mango juice production. This manual also serves as a training guide for disseminating fruit juice making. Most of the practices described in this manual have been practically tested by 45 participating processors in the project. We have also included a typical line-up of equipment for juice production and estimated cost from suppliers in China.

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2. GETTING STARTED

1. Fresh and fully ripened mangoes without bruises and any signs of rotting must be used.

- Unripe mangoes usually bring difficulty in extracting pulp from the thread like fibres.
- Those with bruises, blemishes or any signs of rotting may be a source of microbial spoilage organisms which will endanger the health of the ultimate consumer.

2. Sort the mangoes by removing any foreign matter and discarding those which are rotten or bruised. Wash the mangoes with safe portable water. Peel and cut them to approximately 8-10mm slices using a stainless steel knife and transfer the slices into a clean dish previously washed with portable water.



Under-ripe mangoes- undesirable for juice making



Ripe mangoes- desirable for juice making

- Mangoes which are rotten bruised or with blemishes are major sources of microbial

contamination.

- Portable and safe water (e.g. boiled or treated) is that which has no microbial contamination that may lead to diseases.
- Use of knives which are not stainless steel may develop rust due to reactions caused by acids present in the fruit and the metal; these may enter the food which can be hazardous to the consumer.



Proper tools and dress is necessary

3. Dismantle the mango fruit pulp extractor machine and clean it inside and outside using clean and safe water. Assemble the machine and let it drain.

- Despite being previously cleaned after a processing activity, it is very important to dismantle the machine during cleaning as it contains small openings which may allow entrance to flies, cockroaches, ants, spiders and other insects or dust. It very difficult to remove these insects in cleaning in place operation without dismantling the machine. This may lead to grinding of the insects together with the pulp during extraction, thus affecting quality of the end product



Appropriate machines are necessary for achieving quality and efficiency

4. Switch on the machine; add about a small amount (about 2kg) at a time (approximately every 30 seconds) of the sliced mangoes.

➤ To attain efficient extraction by the machine from the sliced mangoes it is proper to use 2kg and an interval of 30sec before progressive addition of another 2kg.

Note

- The weight of slices and time may be reduced or increased depending on the efficiency of the machine.
- If the machine is run continuously it produces heat, it should therefore, be switched off for at least 5min between consecutive extractions.
- The machine should well clean after usage.

5. Store the extracted pulp (9.5% Brix) in a safe and clean container before mixing it to obtain desired juice concentration.

➤ It is important to use safe and clean utensils so as to prevent hazards associated with microbial contamination especially at these final stages for juice production.

6. To prepare 1 litre of juice/nectar mix 280ml of the mango pulp together with 720ml of portable and safe water to make 1litre of mango juice.

- Portable and safe water is that which has no microbial contamination which may lead to diseases e.g. boiled or treated water.
- It is important to use portable and safe water so as to prevent microbial contamination especially at these final stages for juice production.

7. Add 5g of baobab powder to every Liter of mango juice and mix well.

- Baobab powder is added to increase the acidity and viscosity and vitamin C of the juice.
- If more than 7g of the baobab powder is added it imparts a very bitter taste and increases the viscosity above normal.

8. Measure the amount of Brix (Total Soluble solids as sugar) in the juice by using a *Refractometer* (This should be about 2.7% Bx) and gradually add white sugar (73g) juice while stirring until a level of 10% Brix is reached.

- A brix of 10% has shown to be accepted by many people.
- You may reduce or increase the amount of sugar depending on the consumer preference.



Quality control a very important component of the value chain

9. Sieve the juice by using a clean stainless steel sieve immediately after heating before it starts to cool down.

➤ It is important to sieve the juice while it is still hot and use a clean sieve so as to prevent contamination by microorganisms which may cause health hazards to consumers especially at these final stages of juice production.

10. Pasteurize the juice at a temperature of 80°C for 10min while stirring continuously in a stainless steel pot or pasteurizer.

➤ Heating the juice at 80°C for 10min is sufficient to destroy a majority of the microorganisms which may cause health hazards to consumers.

➤ Boiling the juice at a temperature less than 80°C or for a shorter time than 10min is insufficient to destroy a majority of the microorganisms which may cause spoilage and health hazards to consumers.

➤ It is important to stir continuously during boiling to avoid localized heating so as to achieve uniform heating throughout the juice.

➤ Heating for more than 10min at 80°C will lead to loss of volatiles like flavor compounds and impart a burning taste thus not attracting consumers.

11. Store the pasteurized juice in a clean container and cover with a clean lid until it reaches a temperature of 60-65°C. Add 0.02g of Sodium metabisulphite and 0.1g of Potassium sorbate as preservatives to 1 litre of the juice and stir to mix using a clean that has been dipped in disinfectant or hot water.

➤ Adding the preservatives at a temperature of 60-65°C of the juice reduces vaporization losses and hence increases the ability to react and destroy the microorganisms thus increasing the shelf life of the juice.

➤ Covering the juice is important to avoid foreign contamination by microbes and dirt.

12. Pack the juice at a temperature not less than 45°C into clean bottles or plastic cups which have been washed by safe portable water or disinfectant.

➤ The juice is packed at a temperature of not less than 45°C so to attain the effectiveness of the preservatives in combating microorganisms.

➤ Packing the juice at higher temperatures may cause melting or shrinking of the packaging material; lower temperature can result in growth of microbial contaminants



13. Label the products so as to conform to the required labeling standards and store in a cool dry place for 5 days for monitoring.

- A Label that which conforms to the required labeling standards is that which has: manufacturing and expiring dates, batch number, net content, ingredients, products name, manufacturers address, targeted consumers and how to use the product.
- It is important to note that the labeling and packaging describes the quality of the product thus they should attractive so to reduce the marketing costs in advertising.
- It is important to monitor the product for 5 days so as to assure it conforms to the quality and safety standards and to prove that it can not spoil in the market before its shelf life.

14. If the products show good results they can be marketed or stored for future use.

- Storage and transportation conditions of the product should consider factors such as light and surrounding humidity.
- In case 30% of the batch is seen to show spoilage signs such as gas accumulation or color changes, the whole batch should be recalled and disposed off safely.

15. Put 2 samples in the laboratory for every batch

- It is important to store two samples in the laboratory for every batch so as to resolve any complaints associated with the product quality arising from consumers.

NOTE

1. Juice which has been produced by this method has the following qualities:
 - Titratable Acidity of 1-1.2% as malic acid
 - pH of 3.7-3.9
 - 10% Brix of sugar as Total soluble solids

2. If all the steps are carefully followed, the mango juice can stay for 6 months without spoiling.

3. GOOD HYGIENIC PRACTICES

3.1 Personal hygiene

Human beings (food handlers) are natural carriers of many micro-organisms and can often be a major source of contamination. The main sources include the hair, skin, mucous membranes, digestive tract, wounds, infections and clothing. Good personal hygiene is primarily directed towards preventing both disease and discomfort. Therefore, food handlers should be clean and practices high level of hygienic habit. They are expected to attend training programmes on food handling hygiene when these are available. Basic requirements for personal hygiene include:

3.2 Health status

- ❖ Food handlers should have health certificates from recognized health department.
- ❖ Routine medical examination of food handlers is generally recommended
- ❖ Sick food handlers should be exempted from processing if suffering from an illness that includes symptoms such as jaundice, diarrhoea, vomiting, fever, coughing, sore throat, skin rash or skin lesions such as boils or cuts. They should report this to their supervisor before starting work

3.3 Hands

- ❖ Hands should be washed regularly with soap in clean water, but especially before starting to handle food, after going to the toilet or changing a baby, receiving a phone call and after handling raw food, food waste or chemicals
- ❖ Finger nails should be kept short, clean and free from nail polish during processing

- ❖ Jewellery such as rings and bangles should be removed as dirt can become lodged under these and may be difficult to remove

3.4 Dressing and body cleanliness

The food handler should do the following:

- ❖ Dress appropriately e.g. wear laboratory/dust coats, gloves, head covers gumboots etc. depending on the nature of processing.
- ❖ Avoid walking to the streets with processing clothes.
- ❖ Avoid rubbing their hands on coats and apron.
- ❖ Maintain personal cleanliness including body and clothes.

3.5 Personal behaviour

The food handler should do the following

- ❖ Minimise talking in the processing room and encourage use of mouth masks.
- ❖ Not tasting or eating food being processed or other food during processing
- ❖ Avoid coughing into their hands, food or touching their hair, nose or mouth while handling food without washing their hands afterwards.
- ❖ Not smoking in food processing area

3.6 Training

All personnel should receive appropriate hygiene training and be made fully aware of their individual responsibilities. Such training should be repeated and updated as required.



Medical check up



Hand washing



Proper dressing



No smoking



Training

Good personal hygiene practices

3.7 Equipment hygiene

The following should be done to ensure equipments' hygiene

- ❖ All equipment, utensils, and seams with which food comes into contact or may come into contact with, should be properly cleaned before and after use
- ❖ Wooden equipment, e.g. tables and benches should be scrubbed with soap, water and brushes and then rinse thoroughly.
- ❖ Equipments and utensils should be dried on a dish rack or wipe them dry with a clean cloth and store them in a dust free place.

3.8 Water quality

Water is used in the food industry as an ingredient, a processing aid, for cleaning and washing and drinking. Adequate water of a high microbiological and chemical quality (i.e. wholesome and potable quality) should always be available for use during processing. Water from various sources (tap, rain well etc) should be boiled and cooled or/and or treated with chemicals before used in processing if the source is not certain.

4. EQUIPMENT AND MACHINES BY VARIOUS MANUFACTURERS



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Juice production line (0.6Ton/Hour)

No.	Product name	Technical parameter	Quantity	Note
Water treatment				
1	Water tank	1ton/hour	3	Clean the raw water
	Water filter system		1	
	Water reverse osmosis system		1	
	Ultraviolet sterilizer		1	
	Control system and pipelines		1	
Apple pre-processing system & treatment part				
2	Fruit crusher	0.6T/H	1	
3	Pre-cooker	0.6T/H	1	
4	Pulper	0.6T/H	1	
5	Enzyme tank	0.6T/H	1	Enzyme the pulp
6	Centrifugal filter	1ton	1	Extract the juice
7	mixing tank	0.6T/H	1	Mix water & juice
8	Homogenizer	0.6T/H	1	
9	Juice pasteurizer	0.6T/H	1	
10	Juice tank	0.6T/H	1	
Bottle filling line(for PET bottle)				
11	Bottle washing machine	2000BPH	1	Wash bottle inside
12	Bottle filling machine	2000BPH	1	Fill
13	Capping machine	2000BPH	1	Seal the cap
14	Sleeve labeling machine	2000BPH	1	Labeling
15	PE film packing machine(semi-auto)	2000BPH	1	Pack bottles with film



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1. Water treatment

Equipment list and description

This whole series includes the raw water tank, water pre-treatment unit (including quartz sand filter, active carbon and water-softener), middle exchange water tank, main machine unit (including micro filter, high pressure pump and refining membrane), ultraviolet sterilizer clean water tank and the control system and pipelines.
Water pre-treatment unit tank material: fiber glass



2. Apple crusher

Mainly used in the crushing of the pre-boiled fruit.



3. Pulper

This is mainly used in the juice extractor after the fruit is crushed.



4. Pre-cooker

Model: GD-MPH-1

Dimensions: 2700x600x1350(l*w*h)

Rating capacity: 500kg/h

Steam required: 200kg/h

In-feed at normal temperature and outlet at 60~85°C adjustable

Tubular structure with end plates

Heat exchanging area: 2.25 square meter



5. Centrifugal filter machine

Filtering tank inner diameter: 800mm

Tank volume: 100L

Max. Loading weight: 140kgs





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9. Bottle washing machine

Technical Features

This can cleaning machine is used in the cleaning of bottles before beverage filling. It works automatically with high efficiency.

Principal parameter

Model: GD-CP-12

Production capacity: 2000B/H

Height of bottle: 90-135mm

Diameter of bottle: 40-80mm

Washing nozzle: 12

Motor Power: 0.75kw

Outer size: 1200×1200×1700mm



10. Juice filling machine

This machine is specially designed for PET bottle filling, for juice it is hot filling.

Model: GD-GZ-12

Production capacity: 2000B/H

Height of bottle: 90-135mm

Diameter of bottle: 40-80mm

Filling nozzle: 12

Motor Power: 1.1kw

Outer size: 1200×1060×1700mm

Weight: 1500kg



11. Screw capping machine (screw cap)

This machine is designed for plastic bottles or glass bottles with screw caps.

Model: GD-XG-1

Working nozzle: 1 nozzle

Suitable bottle size: 1200×900×2300mm

Main power: 0.75KW

Production capacity: 2000B/H

Fit for: non-carbonated beverage





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12. Sleeve labeling machine

Performance:

1. The machine is made of stainless steel and high quality Aluminum alloy, perfect in structure, conveniently adjustable.
2. No need ground feet bolts, move conveniently, flexible assort production field.
3. Shrink film label stand, adjust according to different label size.
4. Transmission machine can be adjusted conveniently without tools, which make it more suitable for bottle sizes.
5. Forced insertion design proves reasonable and convenient.
6. Equipped with inspection system to inspect the cutting size, accurate and efficient.
7. Special designed cutter head, no need adjustment of the cutting plate in certain range.
8. Using Japanese servo motor and high-delicacy photo electricity, cutting labels precisely.



13. Semi-auto film wrapping machine





Zhengzhou Amisy machinery & trading Co.,Ltd

TEL: 0086-371-65903478 FAX: 0086-371-65903401

Contact point: Penny sun EMAIL:sunlijie1@hotmail.com



This fruit pulping machine is used to many fruits,such as apple, pear, tomota, grape, mango, peach etc.

There are two working room, the first step is for pitting, and the second for pulping.

The machine is made of stainless steel with good quality.



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Specification

Model	Capacity (t/h)	Scree cloth specification (diameter×length)m m	sieve mesh diameter (mm)	Running speed (rpm)	Power (kw)	size (L×W×H) mm
MDJ1-2.5	1.5t/h	350×700	1.1	970	7.5	1535×1420×1533


Price of the machine: FOBQingdao 5850USD per set

III . Remark:

- I. Delivery time: One week after payment.
- II. Payment term: 40% as down payment by T/T, 60% by seeing the faxed B/L by T/T.
- III. Valid time : This quotation is valid for one month.
- IV .Quality Guarantee Terms:



Food
Processing
Machine
From



Kishore & Company



Kishore & Company

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Suitable for washing fruits and vegetables. The jet spray action thoroughly washes the products while in tumble rotation.

Capacity : 2-3 T/hr
Total length of drum : 8 x 3 feet
Total electric load : 2 HP



Juice / Pulp Extraction Equipments



Fruit Mill (Crusher)

Suitable for crushing hard seedless fruits before pulping or juice extraction.

Available in 1hp, 3hp, 5hp.



Pulper

Suitable for extraction of pulp from vegetables and fruits like mango, litchi, guava, pear, tomato, passion fruit, grape etc.

Pulpers are available in following capacities :

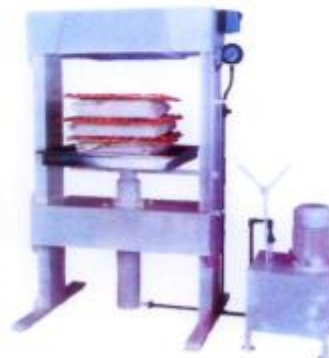
KC-120	2.5-3 T/hr	7.5HP
KC-117	1-2T/hr	5.0 HP
KC-114	1.0 T/hr	3.0 HP
KC-111	0.5 T/hr	1.0 HP
KC-108	80 Kg/hr	0.5 HP



Hydraulic Juice Press

Suitable for extraction of juice from crushed fruits like pineapple and apple etc. After crushing then in fruit mill.

Available in 40 and 50 tonnes pressure capacity. (Also available roll-in-roll-out type and rotary type presses for higher capacity utilization).



Canning & Bottling Equipments

Semi Automatic Volumetric Bottle Filling Machine

Suitable for filling of any kind of bottles from 50ml to 1000ml



Automatic Volumetric Bottle Filling Machine

Suitable for filling of any kind of bottles from 50ml to 1000ml

Automatic Bottle Capping Machine

Suitable for Capping of any kind of bottles.



Sachet Filling & Sealing Machine

Suitable for filling of any kind of Liquid like Juices, Wines, water etc.

Semi Automatic Capping Machine

Suitable for Capping of any kind of bottles.



Filling & Sealing Machines



Automatic Tube Filling & Sealing Machine



Semi Automatic Past Filling Machine



Cream Filling Machine



Automatic Sticker Labeling Machine

Automatic Bottle Filling & Sealing Machine



Automatic Glue Labeling Machine



RO P. P. Cap Sealing Machine



Screw Capping Machine



Pouch Fill & Seal Machine

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Industrial jam kettle

Industrial double-walled jam kettle with heavy duty mixer and heater in a double wall. With digital thermostat. All stainless steel construction and mounted on a wheeled stand.



Art.no.	Content	Description	Price
123.150.	100 l	Electric, 9 kW	€ 9.500,00
123.150.	200 l	Electric, 15 kW	€ 10.600,00
123.150.	300 l	Electric, 15 kW	€ 12.500,00
123.150.	200 l	Gas, 35 kW	€ 11.400,00

Pasteuriser ECO

A juice pasteuriser in stainless steel with large juice tank on top and a spiral pasteuriser below. Can be used on gas heaters and burners. The capacity of a domestic electric burner is not sufficient. Comes complete with ball valve, thermometer for juice temperature and thermometer for hot water temperature. Dim. (Ø x H) : 45 cm x 70 cm. Capacity : up to 1000 l/h.



015.406.2 € 1.159,00

Pasteuriser PA90

Compact pasteuriser with water bath and spiral (indirect heating = no caramelisation), for professional usage. Equipped with high capacity heating elements (6kw, 380 volt), ensuring a capacity up to 90 l/hour.



015.410.4 € 1.179,00

Pasteurising kettle

These professional kettles are equipped with a double wall, a powerful heating element and a digital thermostat. It is possible to pump cold water through the double wall after boiling, with an accelerated cooling as result. Because of this, they can be universally used as pasteurising kettle for milk or juice, as a mash kettle in breweries etc. Entirely made of stainless steel. Tilting kettle with tap, 2-part lid and mounted on a wheeled base. Powerful heating element with digital thermostat. Available with several options : cud cutting unit for cheese rooms, filter bottom, programmable thermostat etc. Also available with a gas kettle.



Art.no.	Content	Heating capacity	Price
090.370.50	50 litres	4 kW	€ 4.860,00
090.370.100	100 litres	10 kW	€ 5.200,00
090.370.200	200 litres	18 kW	€ 6.120,00
090.370.300	300 litres	20 kW	€ 6.900,00
090.370.400	400 litres	30 kW	€ 8.670,00
090.370.500	500 litres	30 kW	€ 9.310,00
090.370.650	650 litres	45 kW	€ 10.330,00
090.370.800	800 litres	45 kW	€ 11.850,00
090.370.1000	1000 litres	45 kW	€ 12.110,00

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