

Capitalization sheet

Juice processing



- **Aloe Vera juice processing**
- **Production of Roselle juice**
- **Results**

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Capitalization sheets produced within the framework of the Agro-ecological Intensification and Diversification of Peri-urban Agriculture Project in Siem Reap Province, Cambodia (IADA phase 1)



The development of juice processing business is aimed for the local market and serves 3 main causes:

On the one hand, extend the scope of activities (hitherto focused on crop production) in order to diversify the sources of income and thus ensuring economic security for producers.

On the other hand, contribute to skills building capacity within the group of producers.

Finally, participate in the preservation and safeguarding of denigrated plant species by valuing them through their economic potential.

The juice project is based on two flagship products, Aloe Vera juice and Roselle juice. These plants, particularly adapted to the tropical climate, require little maintenance and are recognized for their medicinal properties, which give them a preferential status in the choice of development.

Description methods/tools

Aloe Vera juice processing

Its process requires the harvesting and preparation of the leaves of 2 plants that are Aloe Vera (*barbadensis miller*) and Pandanus (*Amaryllifolius*). The leaves chosen are wide and neither too old nor too young.

Juice preparation has 4 main steps:

- ⇒ Step 1: Harvesting of Aloe Vera and Pandan leaves
- ⇒ Step 2: Preparation of the Aloe Vera Gel
- ⇒ Step 3: Juice preparation
- ⇒ Step 4: Bottling, labeling and storage

The entire process (steps 1 to 4) is carried out on the same day to ensure the freshness of the product.

Proportion table for each ingredient

Ingredient	Quantity
Aloe Vera leaves	1kg
Pandan leaves	250g
Water (groundwell)	5L
Sugar	350g
Salt	10g



Aloe Vera barbadensis Miller



Padanus Amaryllifolius



Analysis elements

- > Aloin can cause stomach upset and a bitter taste, it is important to get rid of it
- > Bleaching of Aloe Vera leaves is necessary for removal of residual bitterness.



Step 2.1



Step 2.3



Step 2.4



Step 2.6

Step 1 : Harvest of Aloe Vera and Pandan leaves

Aloe Vera leaves are cut as close to the base of the plant as possible with a knife. After harvest, it is important to keep the cut end down, so that, the yellowish sap can flow. This prevents the gel from having a bitter taste.

In the same way, Pandan leaves are cut at their base with a knife.

For each harvest, the leaves are placed in containers for direct use or transported immediately in bags at the place of processing after being weighed according to the quantities requested.

Step 2 : Preparation of Aloe Vera gel

After harvest (or upon receipt), Aloe Vera should be prepared according to the following procedure, so that it can be used in Step 3. Two people are sufficient for stage 2, but the human resources are to be adjusted according to the quantity to be prepared. Approximate times are given for 90L of beverage, 18kg of Aloe Vera or 255 bottles of 350ml.

Steps	Material	Time
⇒ Step 2.1: The leaves are cleaned with clear water	Bowl or basket to dispose the leaves after cleaning	10 min
⇒ Step 2.2: The leaves are weighed for preparation according to the quantities indicated by the recipe	Scale	5 min
⇒ Step 2.3: Outer peel is removed from the leaves	Peeler or knife	20 min
⇒ Step 2.4: The gel is cut into 1cm ² cubes	Knife, cutting board easily cleaned, stainless steel bowl	30 min
⇒ Step 2.5: The gel is blanched in boiling water for 2min	Stainless steel pot and stove	32 min
⇒ Step 2.6: The gel is removed from water and filtered	Stainless steel ladle and sieve, bowl	5 min



Step 3.1



Step 3.4



Step 3.5



Step 3.6

Step 3 : Preparation of juice

The preparation of the juice requires first the infusion of the pandan leaves, then the mix of the different ingredients. Only one person is sufficient at this stage of the process.

Steps	Material	Time
⇒ Step 3.1: The leaves are cleaned with clear water	Bowl or basket to dispose the leaves after cleaning	20 min
⇒ Step 3.2: The leaves are weighed for preparation according to the quantities indicated by the recipe	Scale	5 min
⇒ Step 3.3: The water according to the quantities indicated by the recipe is brought to a boil	Stainless steel pot, measuring cup, stove	30 min
⇒ Step 3.4: Pandan leaves are blanched in boiling water for 15min	Stainless steel tongs, stove	15 min
⇒ Step 3.5: The leaves are removed and juice is filtered	Stainless steel kitchen tong, ladle and sieve, cloth filter	5 min
⇒ Step 3.6: The filtered juice is brought to a boil then salt and sugar are added in	Stainless steel ladle, stove	7 min
⇒ Step 3.7: After dissolution, stop the ebullition and add the gel	Stainless steel ladle	2 min

Step 4 : Bottling, labelling and storing

Steps	Method/Material	Time
⇒ Step 4.1: The bottles are cleaned with hot water	Boil the water and let it cool down to 40 ° C, controlled by thermostat. Dip the bottles one by one in hot water and shake. Use the stainless steel tong to remove the bottles.	20 à 25 min
⇒ Step 4.2: Cool down the juice to a temperature just below 40°C	2 possible techniques: take the juice out of the heat and let it cool to room temperature or put cold water in a pot and place the smaller pot of juice inside this first one containing cold water.	-

Analysis elements

- > The amount of sugar is adjustable according to the customer's taste.
- > Do not boil the pandan leaves for more than 15 minutes, otherwise you will change the taste.
- > Do not put too much water in the cooling pot because there is a risk of overflow in the juice, when placing the juice pot in the other one.



Analysis elements

> Avoid to cool down the juice in a windy area as there is a risk of air contamination of foreign bodies and particles in the juice.

> The temperature of the juice at bottling depends on the type of bottles used. For PET, it should not exceed 40 ° C, otherwise the bottle melts.

> Without pasteurization, the shelf life of the product is limited.

Steps	Method/Material	Time
⇒ Step 4.3: Bottling	Hand filling of 350ml bottles up to 2 cm from the edge. Stainless steel ladle and funnel.	30 - 40 min
⇒ Step 4.4: Labelling	The label contains the product name, volume, expiration date, conditions of use, logo, bar code and origin. The label is placed in the center of the bottle	30 - 40 min
⇒ Step 4.5: Storing	The product is stored in a cold room or refrigerator at 4 ° C	-



Step 4.3



Step 4.4



Step 4.5



Analysis elements

> The ingredients are sourced in the immediate vicinity of the place of transformation (example of the neighborhood) to guarantee their freshness.

> Hygiene is paramount: equipment (machines and tools) must be cleaned with alcohol after each cycle of production, and utensils sterilized in boiling water before use. The juice processing premises are also cleaned after each cycle.

> Staffs must equip themselves with a clean apron, remove their shoes or wear shoes specific to the production area, cover their hair, wear gloves (disposable for the process), and wash their hands before starting production and after going to the bathroom.

> Local legislation does not subject small-scale artisanal groups to the obligations of forward flow principle, labeling ... but attention is to be paid to compliance with the procedures of forward flow principle with (display of hygienic rules), bacteriological analyzes and batch traceability.

> Thus, the water used is analyzed by a laboratory and must be certified of good quality (physicochemical and bacteriological) for the production of juice. Similarly, product samples should be periodically analyzed for bacteria (for example every 6 months). Information on costs and contacts are given here after.

> The dry ingredients are stored in airtight and clean boxes to prevent contamination by germs and intrusion of pests.



Analysis elements

> The costs are only approximate and depend both on the various tests requested and tariffication of 2018.

Informations on quality analysis

Type of analysis	Contact	Cost
Physico-chemical analysis	Industrial Laboratory Center of Cambodia National road N 5, Boeung Chhouk, Km 6, Russey Keo, Phnom Penh, Cambodia Tel: (855) 12 826 035/ 12 820 475/ 12 794 688 hcs_cambodia@yahoo.com	Ask directly
	Siem Reap water quality laboratory 0085 Treang Village, Slorkram Commune, Siem Reap, Cambodia Tel: 097 714 88 11 (lab), 096 335 35 95 waterlab@waterforcambodia.org	Btw 42 and 57\$
Microbiological analysis	Siem Reap water quality laboratory	Btw 45 and 60\$



Hibiscus sabdariffa



Chalice of Roselle

Production of Roselle juice (also called Bissap)

Its process requires the harvesting and preparation of Roselle's chalice (Hibiscus Sabdariffa). The harvest being done once a year, when the days are decreasing (in Cambodia from October to the end of February), it is necessary to dry it to keep it over the year.

The juice preparation has 4 main stages:

- ⇒ Step 1: Harvest of Roselle's chalice
- ⇒ Step 2: Drying of the chalice
- ⇒ Step 3: Juice preparation
- ⇒ Step 4: Bottling, labeling and storage (similar to Aloe Vera juice)

Proportion table for each ingredient

Ingredient	Quantity
Dried chalice	100g
Water (groundwell)	5L
Sugar	350g
Salt	10g

Step 1 : Harvest of Roselle's chalice

The fruits harvested at maturity are easily plucked from the stem. They are especially easier to pick up in the morning. If the harvest is late and the stems harden, it is possible to use pruning shears. The crop is placed in a basket and transported directly for drying. It takes 2 hours for the harvest of 10kg by one person.

Step 2 : Drying of chalice

After harvest, the chalice must be dried to allow storage throughout the year and until the next harvest. One person is sufficient for this step.

Steps	Material	Time
⇒ Step 2.1: The chalice are cleaned in clear water and sorted out	Stainless steel bowl	10 min
⇒ Step 2.2: The seeds are removed to keep only the sepals	Bowl and stainless steel tool to remove seeds	4h
⇒ Step 2.3: Drying in solar tunnel at 50 ° C for 12 to 14h, at the hottest hours of the days (then if storage: in plastic bags in opaque hermetic boxes)	Solar drying tunnel (see sheet N°4), opaque hermetic boxes, plastic pockets	12 to 14h spread over 2 days



Analysis elements

> The harvest stimulates the regrowth of the chalice, it is recommended to carry it regularly on the flowering period.



Step 2.1



Step 2.2



Step 2.3



Step 3.1



Step 3.3



Step 3.4



Etape 3.5

Step 3 : Juice preparation

The preparation of the juice requires beforehand to proceed to the infusion of the chalice, then to the addition of the other ingredients. Only one person is sufficient at this stage of the process.

Steps	Material	Time
⇒ Step 3.1: The dry chalice are weighed for preparation according to the quantities indicated by the recipe	Bowl and scale	5 min
⇒ Step 3.2: Water is brought to boil	Stainless steel pot, measuring cup, stove	30 min
⇒ Step 3.3: When the water is boiling, put the dry chalice and let it infuse for 20min while maintaining the boil and stirring regularly	Stainless steel pot, stove	20 min
⇒ Step 3.4: Chalice are removed and the juice is filtered	Stainless steel ladle and sieve, cloth filter	10 min
⇒ Step 3.5: On low heat, the sugar and salt are added to the filtered juice and mixed for 2min	Stainless steel ladle and stove	5 min



Analysis elements

> It is advisable to check the quality of Roselle (without mold, right moisture content) before putting it in boiling water.

> Residues of roselle must be removed before adding the other ingredients as they can absorb the sugar. They can be reused as inputs to make jams.



To remember...

The application of good hygiene practices and rules is essential throughout the production, storage and distribution cycle to ensure a quality product.

Water quality is a parameter to be monitored especially in risky areas.

The staff is trained and has the management tools necessary for the proper process (stock book, purchase and sales book, hygiene rules, step-by-step production checklist).

Results

	Aloe Vera juice	Roselle juice
Key elements of Demand		
Quantity sold	minimum order for delivery 10L or 30 bottles of 350mL	minimum order for delivery 10L or 30 bottles of 350mL
Price (usd)	0,80 per 1L and 0,36 per bottle of 350mL	
Quality requirements	Product certified safe by the analysis laboratory	
Technical results		
Yield (%)	92%	98%
Volume produced/cycle	90L in 8h of work (1day) with 2 workers	
Economic results		
Production cost (usd)	0,416 per Litre 0,262 per bottle of 350mL	0,45 per Litre 0,27 per bottle of 350mL
	Production costs vary according to input prices. The cost of production is calculated without taking into account investment costs in machinery and premises because they are covered by the project and are therefore not counted as depreciation. Besides, the cost of labor is calculated on the profit and does not intervene in the calculation of the production cost.	
Profit (usd) before subtraction of labor charges	0,38 per Litre ie. 92% of production cost 0,10 per bottle of 350mL ie. 37% of production cost per bottle	0,35 per Litre ie.77% of production cost 0,009 per bottle of 350mL ie. 31% of production cost per bottle
Volume sold/period	From March to December 2018: 1307L averagely smoothed at 130.7L per month	In 1 month: 88L (product launch)

Input prices: Aloe Vera = 1,125 usd/kg ; Roselle = 15 usd/kg ; Sugar = 0,62 usd/kg ;

Electricity = 0,25 usd/kw ; Gas = 1,075 usd/kg ; Ice (transport) = 0,075 usd/kg ; Delivery = 0,05 usd/kg

Labor cost = 50% of the total profit generated, whatever the juice

The yield is calculated, considering that the roselle chalices (infused), the pandan leaves (infused) and 25% (outer skin) of the aloe vera are not included in the final product.

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