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Sustainable coconut water value chain

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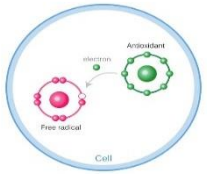
Significance of coconut in human health

Improves glycemic conditions
(Narayanankutty et al.,2016)

Reverse fatty liver disease
(Narayanankutty et al.,2017)



Antioxidant - prevent pro-oxidant mediated cell death (Soorya et al., 2017)

Memory enhancement
(Rahim et al., 2017)

Scientifically Proven Health Benefits

55 Million Tonnes! of coconut produced on a global level annually

Coconut: Utilization and Value Addition

Coconut Water

Desiccated Coconut Powder

Coconut Chips

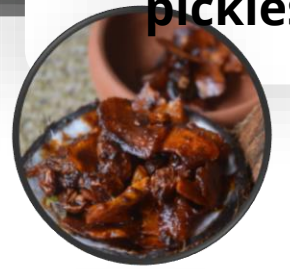
Coconut Honey

Coconut Milk

Coconut Cream

Coconut Oil

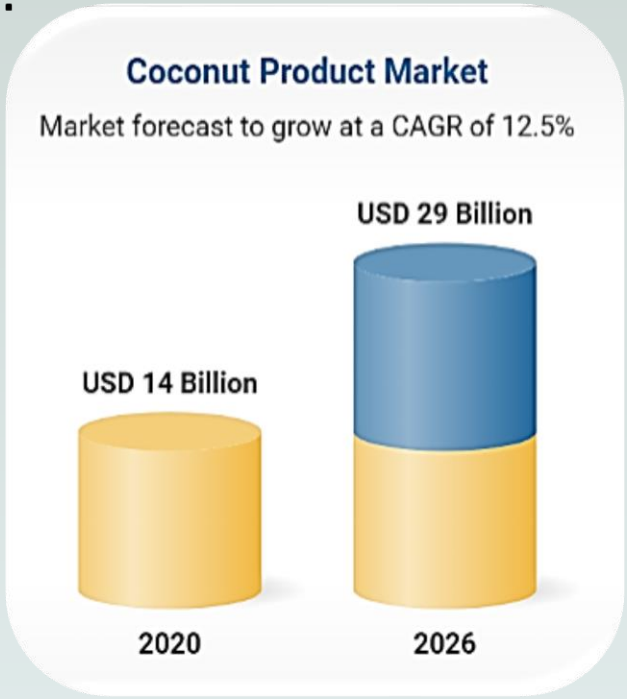
Traditional foods such as pickles

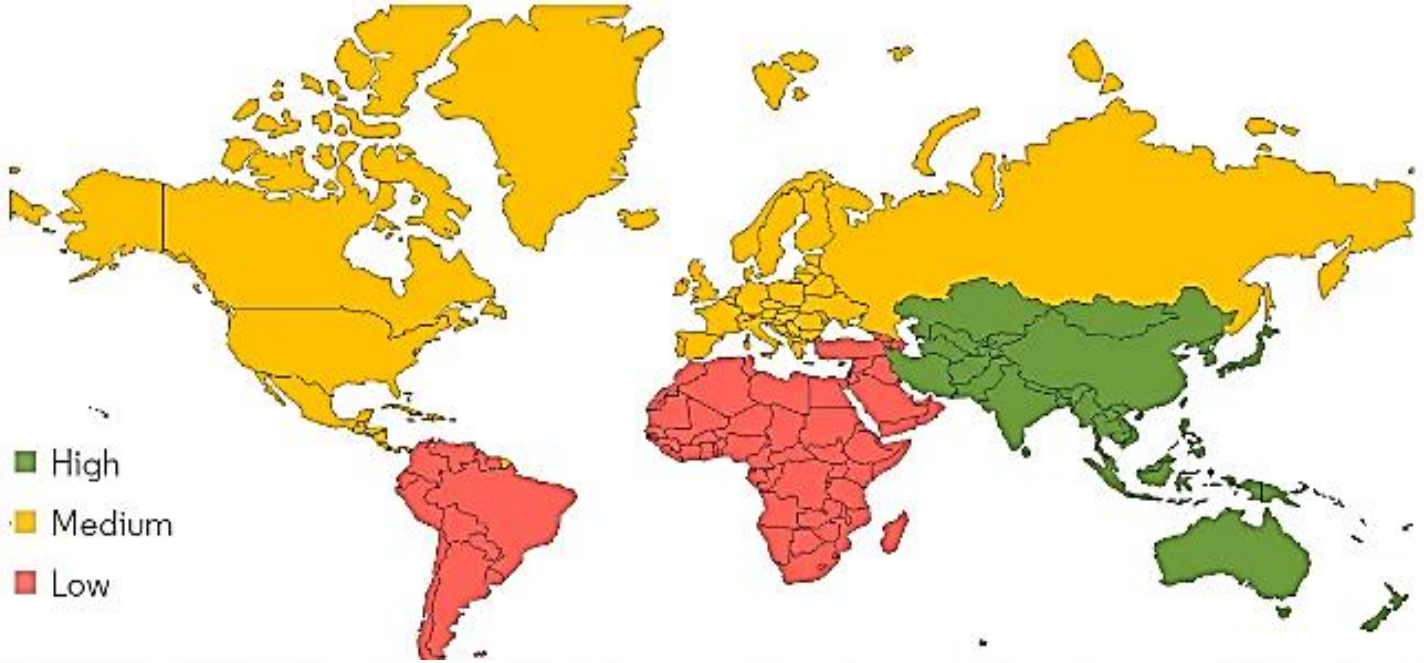


Coconut-based sweets

Coconut Sap Sugar

Global Market Potential of Coconut Products





The global coconut product market to grow with a

CAGR of 12.50%

over the forecast period from **2020-2026**

Asia-Pacific is the largest market growing at a CAGR of 14.3% from 2019-2026.

Source: **Mordor Intelligence, 2020; Research and markets, 2021**

Sustainable Coconut Water

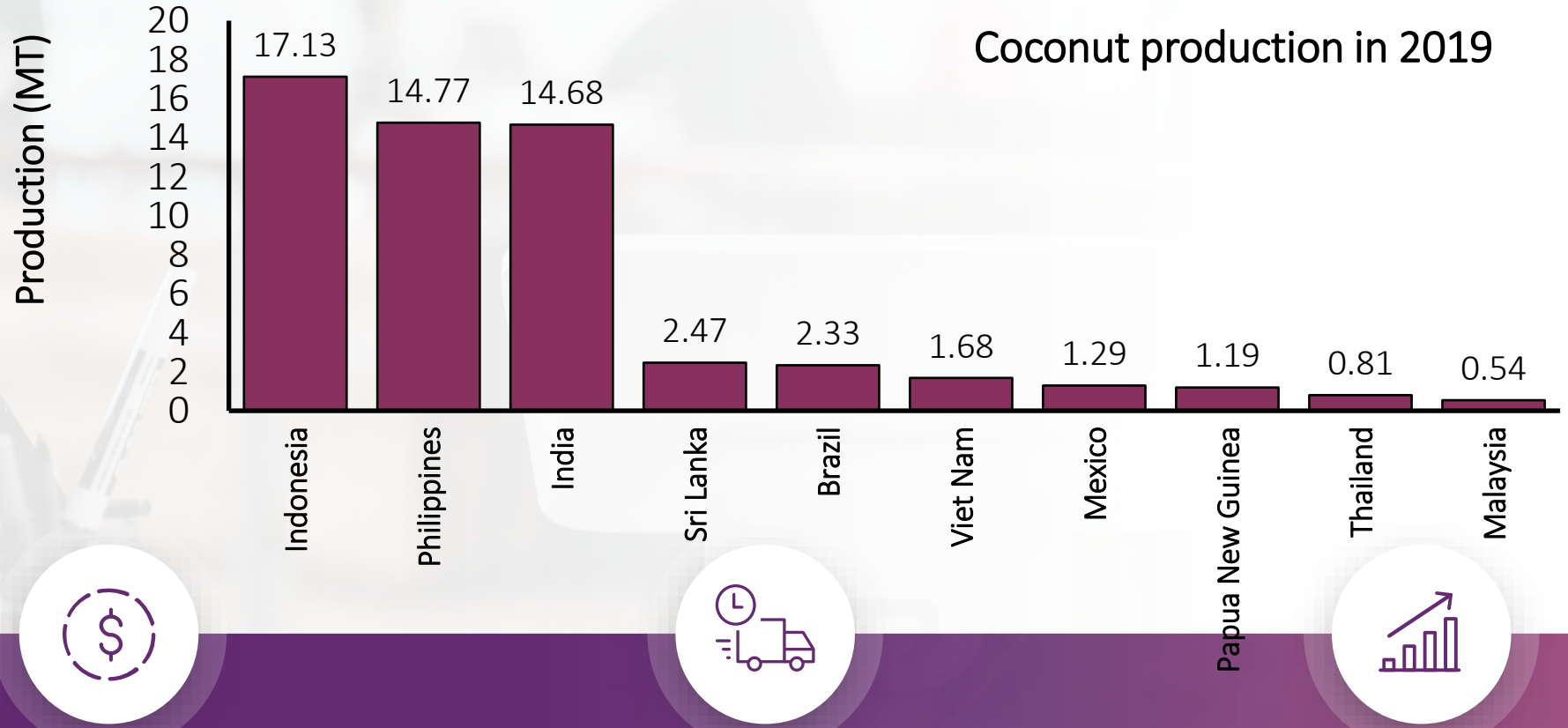
Raw Materials

Processing & Preservation

Marketing Potential

Regulations & Consumer Trends

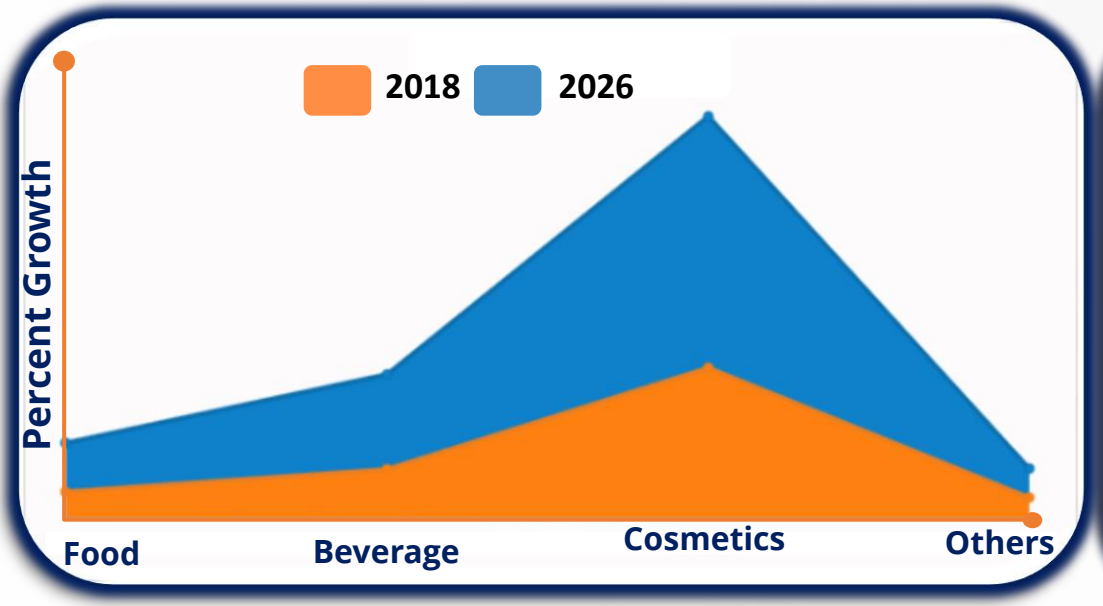
Global Coconut Production

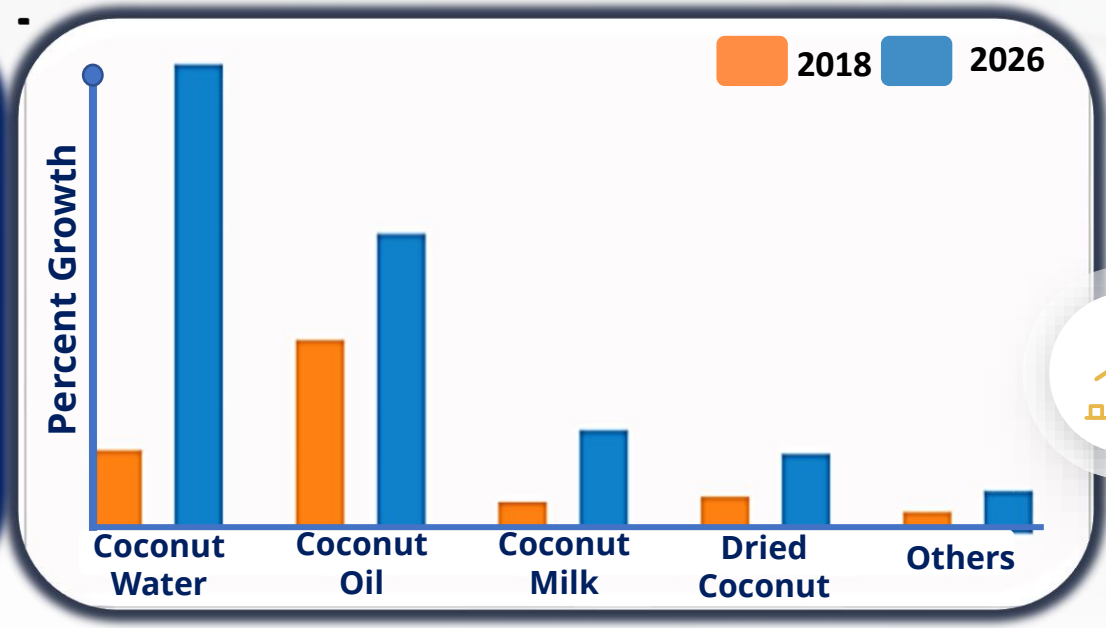


- In 2019 Indonesia was ranked number 1 in Coconuts Production,
- Since 2014 India Coconuts Production rose 1.1% year on year reaching 11,718,608.95 Metric Tons
- In 2019, Coconuts Production in Sri Lanka rose 1.3% from a year earlier.

Source: **FAO, 2019; Allied Market Research, 2019**

Coconut Products Market by Application/ Segment





- Beverage segment would witness the fastest growth, registering a CAGR of **14.7%** during the forecast period

- The Coconut water segment would witness the fastest growth, registering a CAGR of **23.8%** (2019-2026)

Source: **Allied Market Research, 2019**

Coconut Water

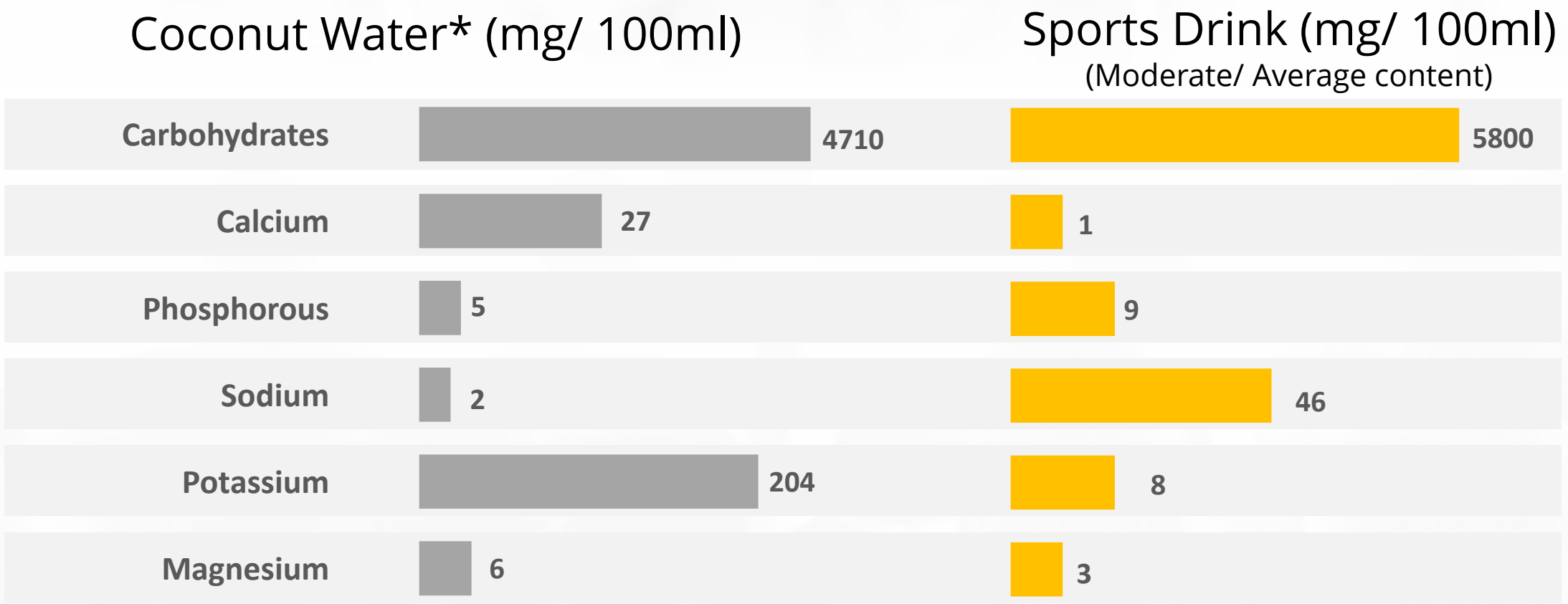
Fresh Bottled Coconut Water on the markets

- Good Source of several nutrients
- Rich in antioxidants and good for diabetic patients

- Delicious source of hydration
- Natural beverage

Source: Walter et al., 2014

Coconut Water Vs Sports drink



*The composition may change according to the variety, climate and other environmental factors

Source: **Walter et al., 2014**

Sustainable Coconut Water

- Raw Materials
- Processing & Preservation
- Marketing Potential
- Regulations & Consumer Trends

Factors affecting the storage life and marketing potential of coconut water (CW) quality

Microbial

CW is **highly sensitive** to **microbial attack** within a few hours after its extraction from the nut, which in turn results in the **loss of nutritional components** as well as a shortened shelf-life

Enzymatic

Food enzymes such as **polyphenol oxidases (PPO) and peroxidases (POD)** play a vital role in diminishing the storage life and market potential of CW

Heat-sensitive bioactives

The **heat sensitive compounds** change the product quality by **formation of pink color, browning, awful flavors, and odors** during traditional preservation activities

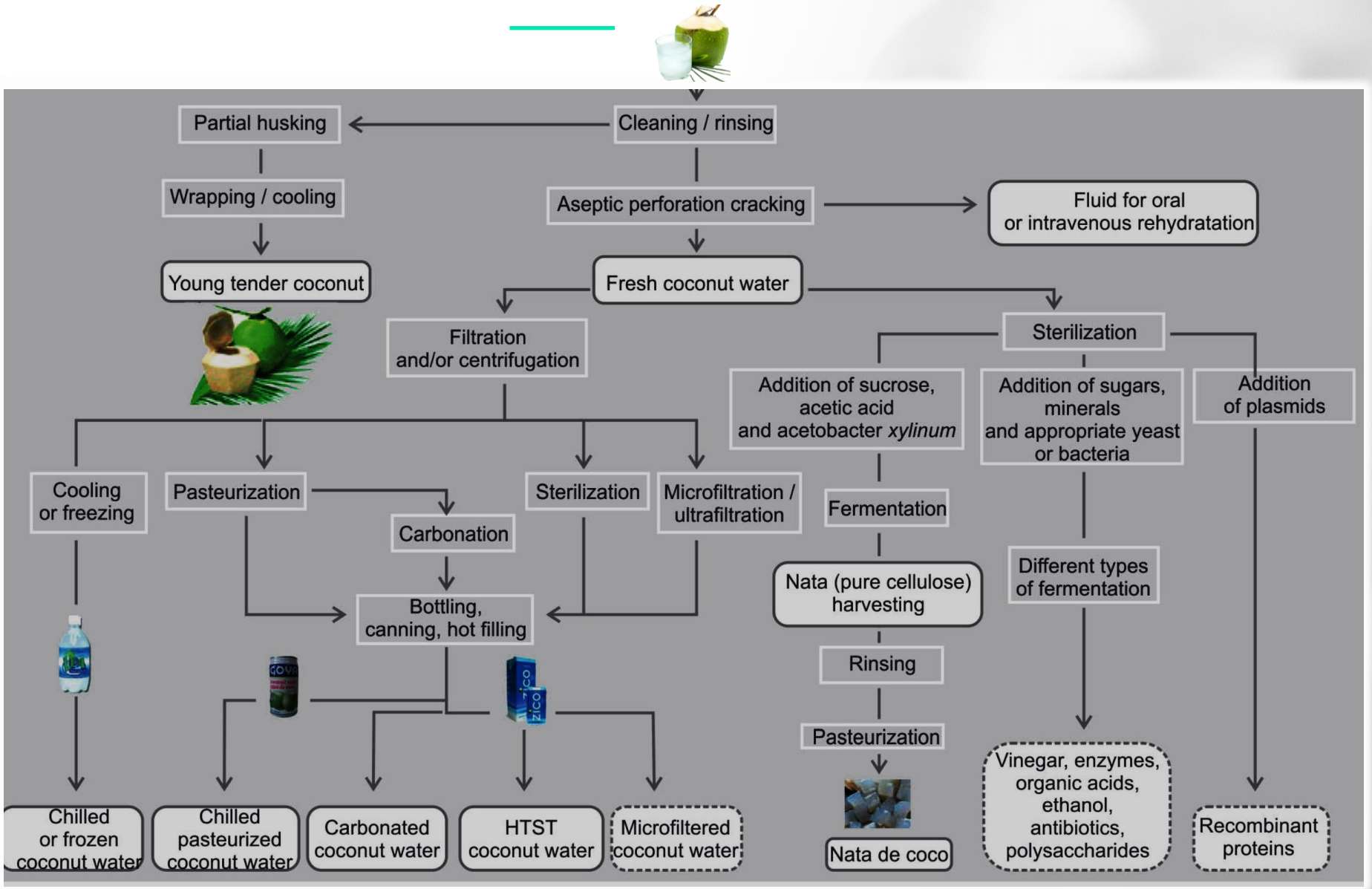
- Thermal treatments (Traditional operations) cause detrimental effects on color, clarity, and sensorial properties.
- Cold plasma (Mahnot et al., 2019), Ultrasound (Rojas et al., 2017), Ultraviolet (Yannam et al., 2020), Ozone (Vardharaju & Chandrasekar, 2016), High-pressure processing (Raghubeer et al., 2020), and Microfiltration (Mahnot, Gupta & Mahanta, 2019) have been successfully employed to enhance the storage life of CW w/o affecting sensorial properties.

Source: **Prithviraj et al., 2021**

Conventional processing techniques in coconut water preservation

Chemical/ Biological Preservatives

- **Nisin**
- **Sodium sulfite**
- **Sodium metabisulfite, etc,**



Source: Pradas et al., 2012

Alternative non-thermal technology

- Protects volatile compounds/ Nutrients & Flavour
- Better quality and acceptance
- Increases shelf life of the food
- Reduce thermal losses
- Increases profits in industries

Non Thermal Technologies

01 High Pressure Processing

02 Ultraviolet treatment

03 Pulsed Electric Field

04 Oscillating Magnetic Field

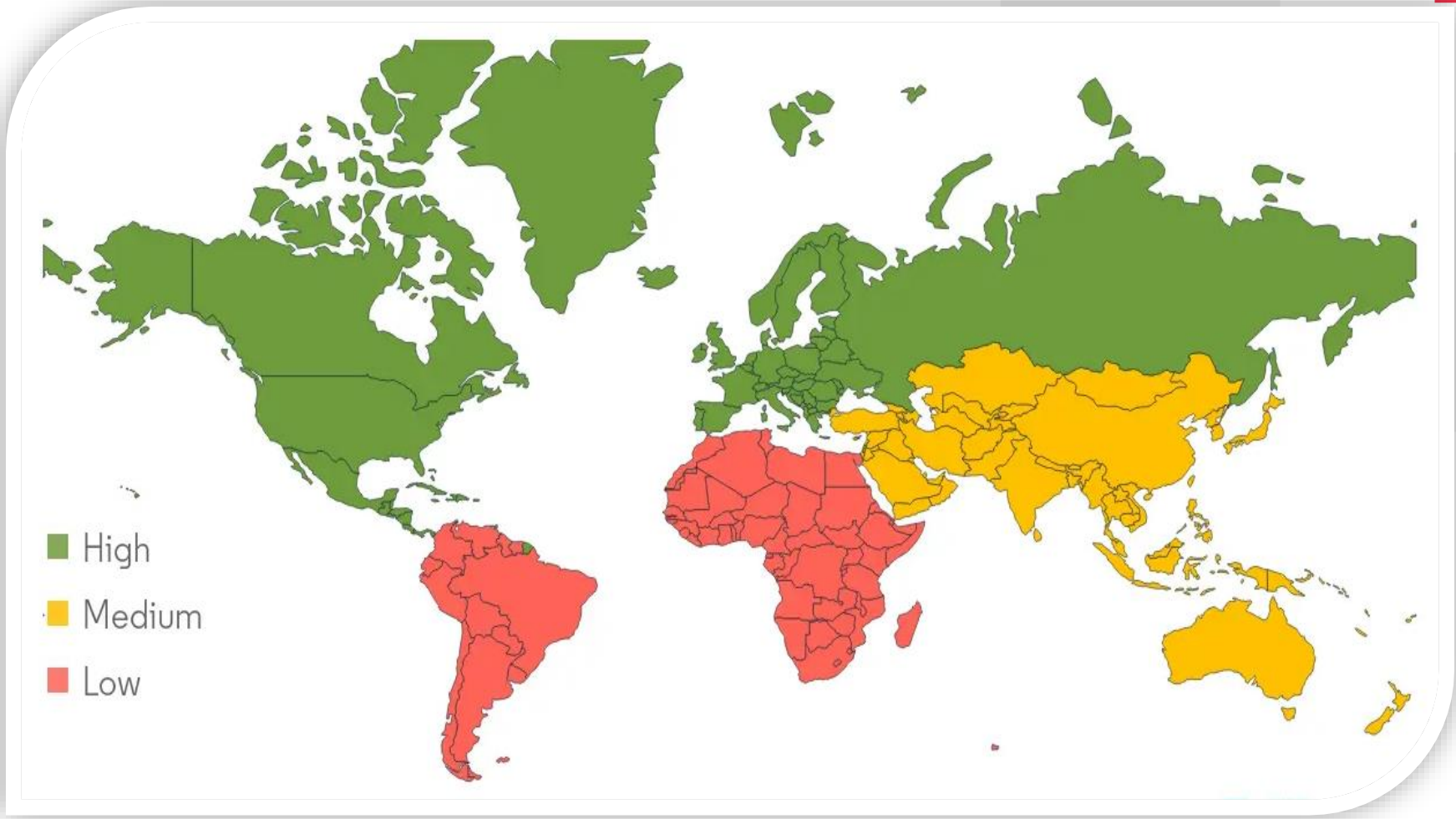
Power Ultrasound 05

Pulsed Light Technology 06

Cold Plasma 07

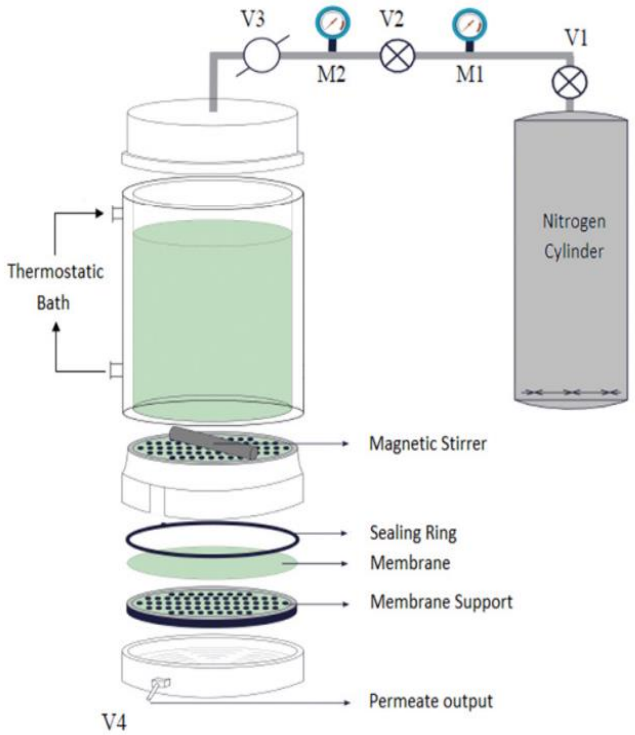
Irradiation 08

Global Non-Thermal Processing Market



Source: Mordor Intelligence

Membrane Filtration

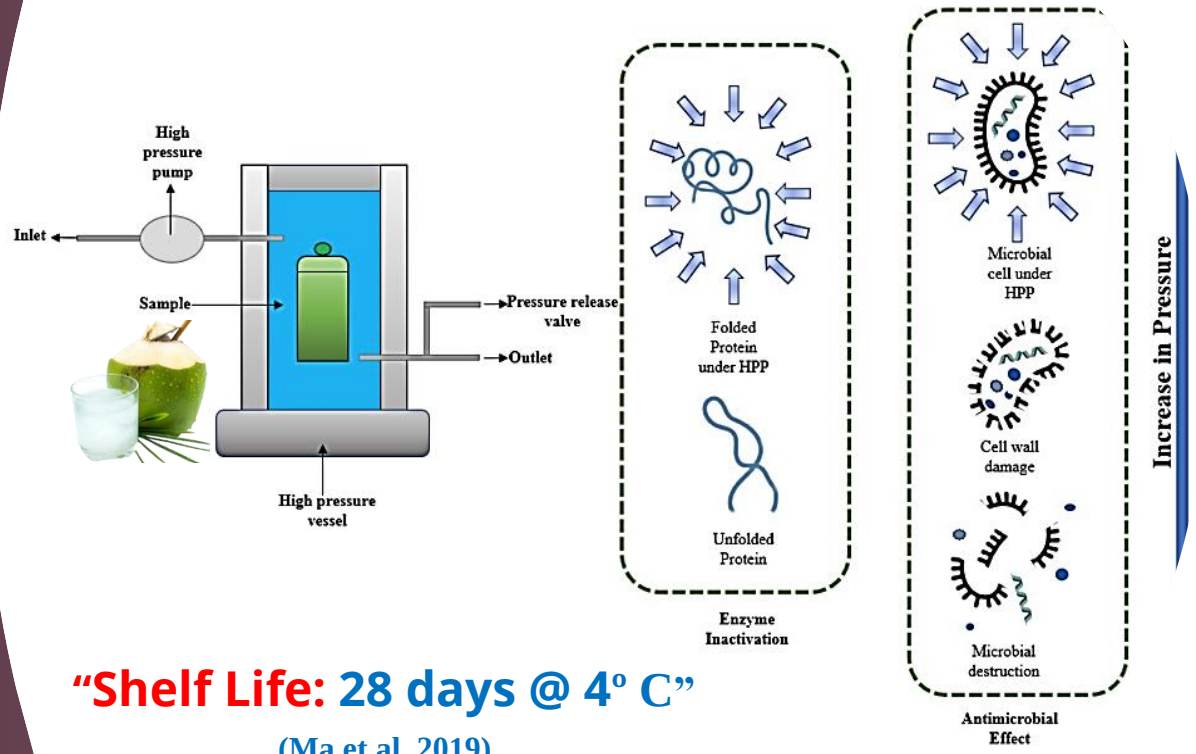


Source: **Choudhary et al., 2016**

- Cold sterilization / Membrane Filtration process protects the physicochemical properties of the coconut water with extended shelf-life of around 90 days at refrigerated condition (Mason et al., 1998).
- Owing to the advantage of non-thermal preservation technique, the membrane filtration is widely adopted in coconut water industries.
- At the same time product quality is improved since there was a marked reduction in suspended solids, greater than 86% (Mason et al., 1998).

High-pressure processing (HPP)

- HPP inactivates microbes and enzymes while retain color attributes, volatile, non-volatile compounds, and bioactive compounds
- HPP generally don't affect low molecular weight compounds having covalent bonds,Thus, it preserves the fresh-like attributes of foods



"Shelf Life: 28 days @ 4° C"

(Ma et al. 2019)

High-Pressure Processing (HPP) or High Hydrostatic Pressure (HHP) **involves exposure of coconut water to isostatic pressure (100–800 MPa)** for a few seconds

Source: **Prithviraj et al., 2021**

For **coconut water (a low-acid food),** which is very sensitive to thermal treatment, **pressure-assisted thermal sterilization** can be used to obtain commercial sterilization.

Investigation with HPP treatments at 593 MPa for 3 min efficiently inhibited the microbial activity of ***E. coli*** O157:H7, ***Salmonella*** spp, and ***L. monocytogenes*** in coconut water (Raghubeer et al., 2020).

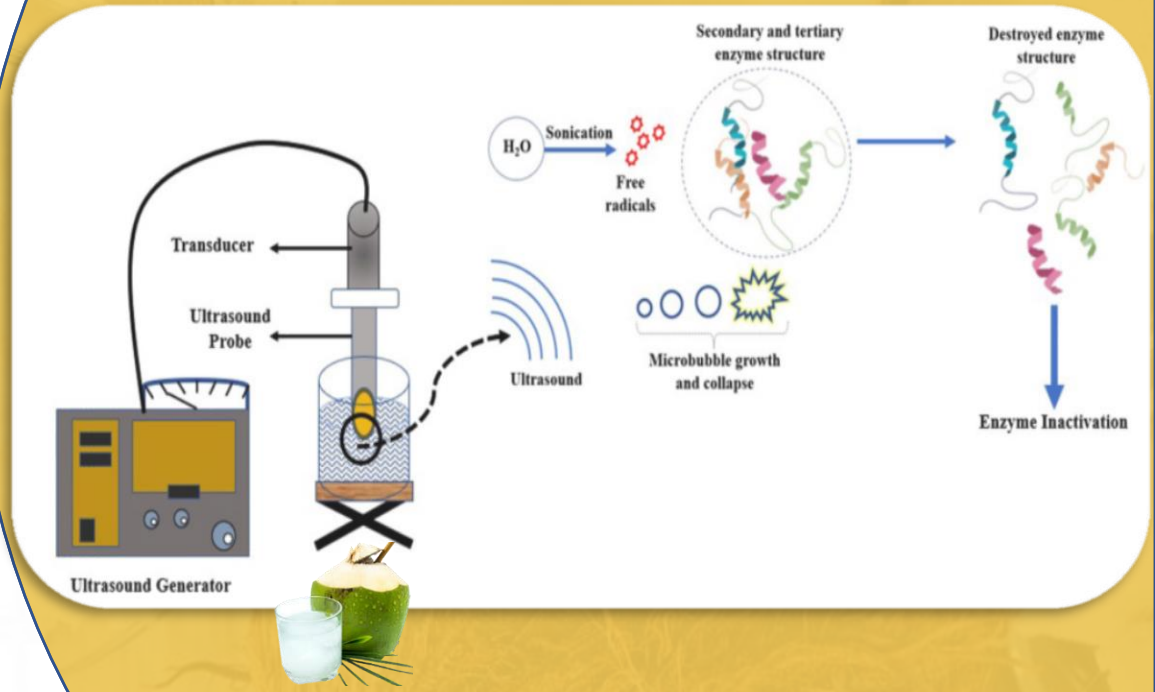
HPP is the most appropriate method for the preservation of TCW, but hurdles such as the addition of preservatives or heat are needed to achieve longer shelf stability of TCW at the industrial level

Ultrasound/ Ultrasonication

1. Ultrasound alters food properties by **inducing pressure, shear, and temperature difference** and **produce cavitation that can inactivate microorganisms and enzymes** through structural changes in coconut water,

2. The vibrational energy is produced by ultrasonic transducers that convert electrical energy to sound energy, The effect of ultrasound on enzymatic activity in coconut water is dependent on **amplitude, time, and specific acoustic energy.**

3. **Ultrasonication was followed** to cover up the demerits of one technology with the other or **increase the easiness of processing**. For e.g. US followed by mild heat treatments inactivated the enzymes in coconut water and protected the sensorial properties (Rojas et al., 2017).



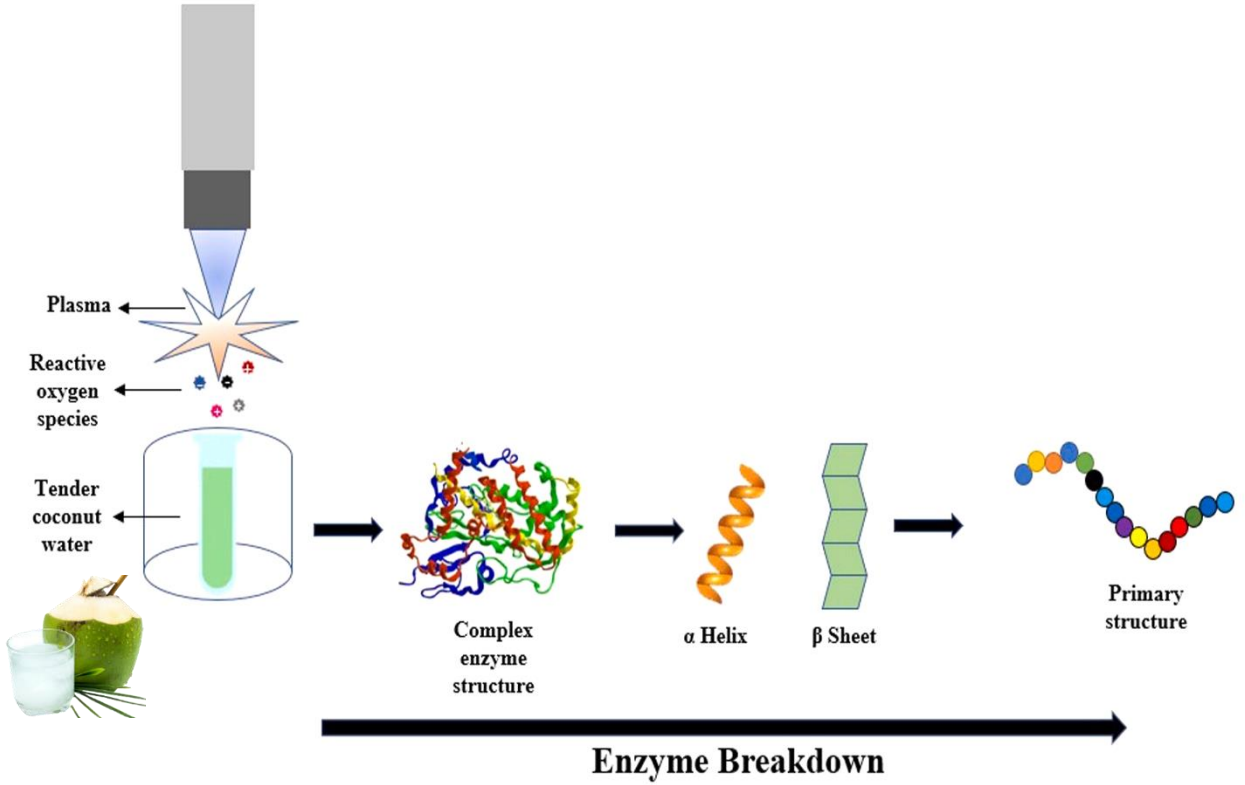
"Shelf Life: 14 - 28 days @ 4° C"

(Cappelletti et al. 2014; Rajashri et al., 2020)

Source: **Rajashri et al., 2020**

Cold Plasma

Cold plasma inactivate microbes and enzyme in coconut water **based on the generation of highly reactive gaseous molecules/species**. The mechanism behind cold plasma inactivation of enzymes follows the destruction of the second helix and ordered β sheet elements,

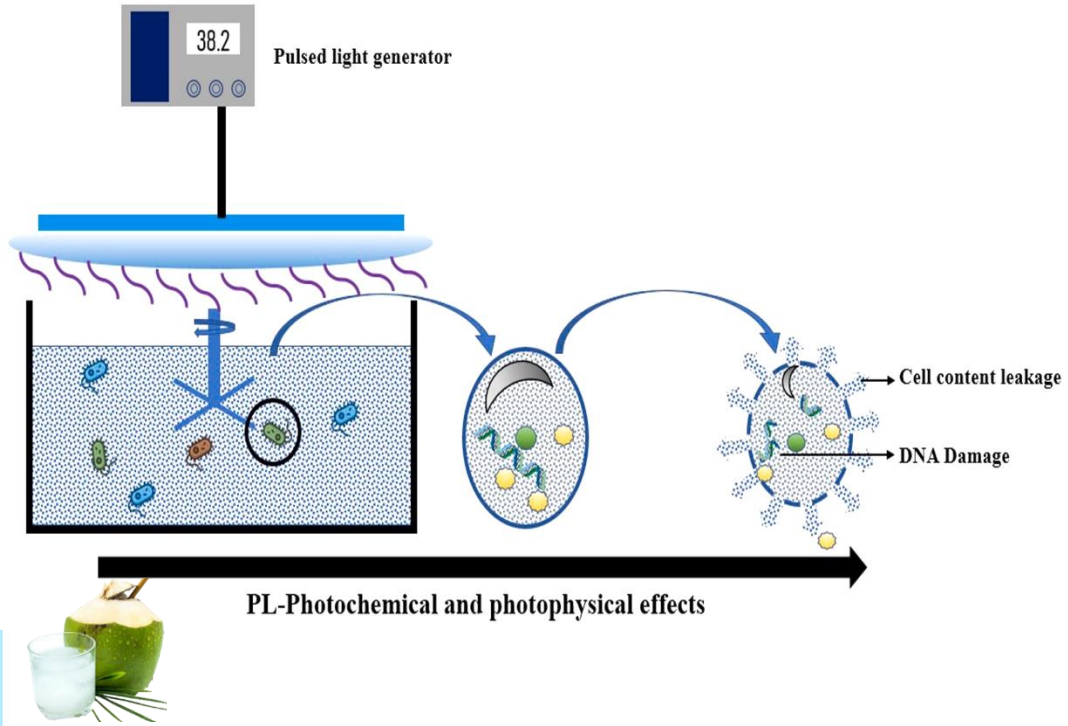


"Shelf Life: 48 days @ 5° C"

(Nahnoti et al., 2019)

- The cold plasma treatments achieved 5 log reductions of pathogens (*Salmonella, E. coli, L. monocytogenes*) as specified by US-FDA guidelines.
- Since, cold plasma treatment addresses both the enzymatic and microbial activities, making it one of the effective non-thermal treatments.
- The atmospheric cold plasma treatment (730 Hz, 20 kV, 15 min) of coconut water reduced more than 70% of POD without altering pH, TSS, acidity, and colour (Porto et al., 2020)

Pulsed Light / Pulsed Electric Field



"Shelf Life: 25 days @ 5° C"

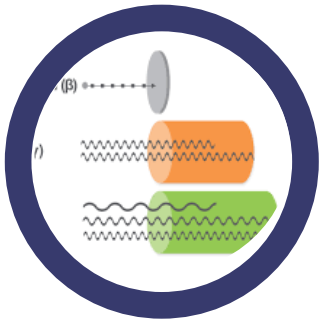
(Saranya and Suchitha et al., 2016)

- **Electric current acts as a destroyer** of microorganisms through electroporation and high voltage pulses typically provide electric field intensifying in the range of 10–80 kV/cm.
- **Coconut water blended with *Hemidesmus indicus*** extract processed at 31.2 kV/cm electric field, 20 pulses width at 100 Hz frequency **showed inactivation of natural microflora similar to the thermal treatment** (Kathiravan et al., 2014).
- **Colour stability and antioxidant scavenging activity** were **not affected** by the PEF treatment, and quality parameters remained unchanged **during 120 days of storage at room temperature** (Rajashree et al., 2020)
- Pulsed light was **very effective for coconut water** providing effective ***E. coli* destruction** characterized by a **log reduction of up to 5.33.** (Prithviraj et al., 2020)

Other emerging techniques

Ozonation

- Onsite generation and **has GRAS status**
- Destroy microbes & reduce enzyme activities
- **Acceptable sensory score** of the product
- **Low energy** inputs
- **No deleterious effect** on TSS

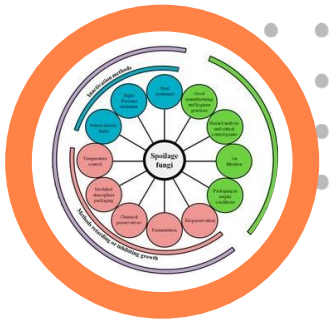


Irradiation

- **Inactivates microbes and enzymes**
- **Prolong shelf life** in conjunction with safety aspects
- UV-C doses had great potential for reducing microbial load by 5-log reductions (Bhullar et al., 2019)

Carbonation

- **Improve sensory attributes** and enhance shelf-life
- **Minimal or nil changes** in **acidity and colour** of the coconut water



Hurdle Technologies

- **Acoustic field-assisted Ultrafiotration** (Lamdande et al., 2020).
- Blending **cold plasma** treated coconut water with **1–4% orange juice** (Chutia et al., 2020).
- **HPP** with **natural preservatives** (Lucas., 2013)

Sustainable Coconut Water

- Raw Materials
- Processing & Preservation
- Marketing Potential
- Regulations & Consumer Trends

Issues in coconut water quality affecting its market potential

The coconut water rich in phytohormones, vitamins and also high catalytic enzymes **rely on international market**

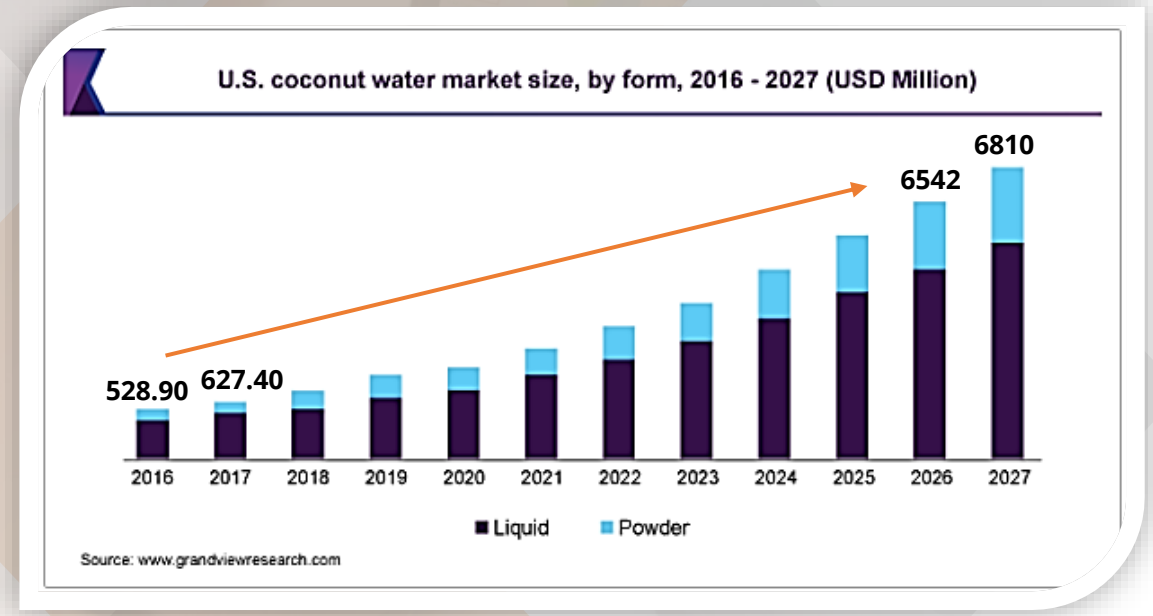
Quality control problems in these products includes: microbial contamination, discolouration, coagulation, soapy flavour, greasy feel, etc.

Lack of technical knowledge on value addition, user-friendly equipment, and limited quality control measures/ standards in novel coconut products

Lack of attractive and safe packaging techniques for coconut products

Source: **FnB News, 2021**

Coconut Water Market Potential



Coconut water market anticipated to reach $6.81 billion by 2027, with a CAGR of 18.9%

In 2019,

- Global pure coconut water market size was valued at $2.04 billion.
- The original flavor segment accounted for more than half of the total pure coconut water market share.
- Central and South America held the largest revenue share of over 25.0%

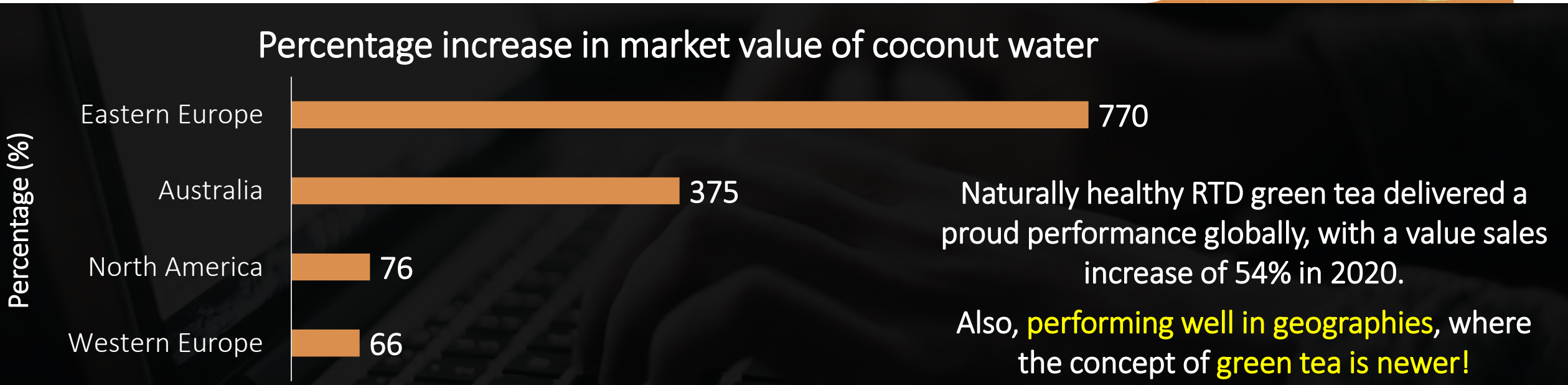
- Coconut art of everyday diet in Brazil and other neighboring countries.
- Europe is expected to expand at the fastest CAGR of 17.6% from 2020 to 2027

Source: **Grand View Reseaerch, 2020**

Coconut Water can be the next green tea…

Emerging market comparable to Green Tea !

Statistics such as these show that there is great demand for innovative beverages, and coconut water may well turn out to be the next RTD green tea.



Naturally healthy RTD green tea delivered a proud performance globally, with a value sales increase of 54% in 2020.

Also, performing well in geographies, where the concept of green tea is newer!

Source: **Euromonitor International, 2021**

COCONUT WATER MARKET POTENTIAL

- **Opportunities**
  Emergence of new applications & products
- **Drivers**
  Growing health consciousness among people.
  Increased demand from food and beverage industry
- **Restraints**
  Availability of substitutes

Key Coconut Water Market Players…

PEPSICO

marico

Unilever

DANONE
ONE PLANET. ONE HEALTH

P&G
Procter & Gamble

ADM

the CoConut Company

Nestlé

Cargill

Coconut Water Market Potential : Driving Factors

Best Rehydration Drink

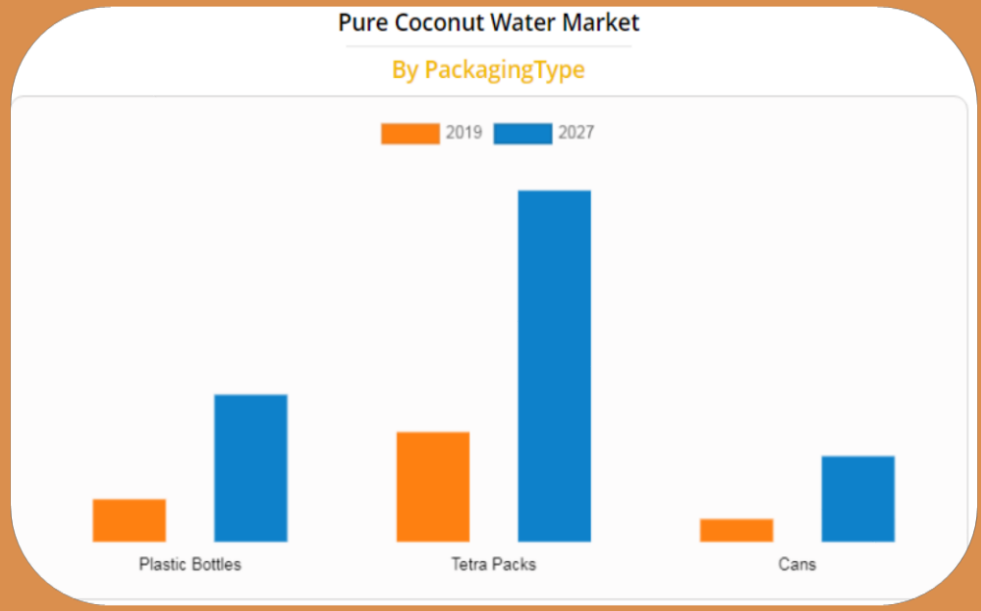
- Best rehydration drink
- Excellent source of various nutritional ingredients (including fiber, minerals, vitamins, magnesium, calcium, sodium, and potassium)

Nutritional Drink

- Over the past few years, people worldwide are increasingly adopting several healthy and nutritional drinks to maintain a healthy lifestyle
- Nutritious health drink, the drink is being largely used for curing a hangover

Substitute for sugar rich & carbonated beverages

- Healthy substitute for sugary and carbonated beverages
- Weight management

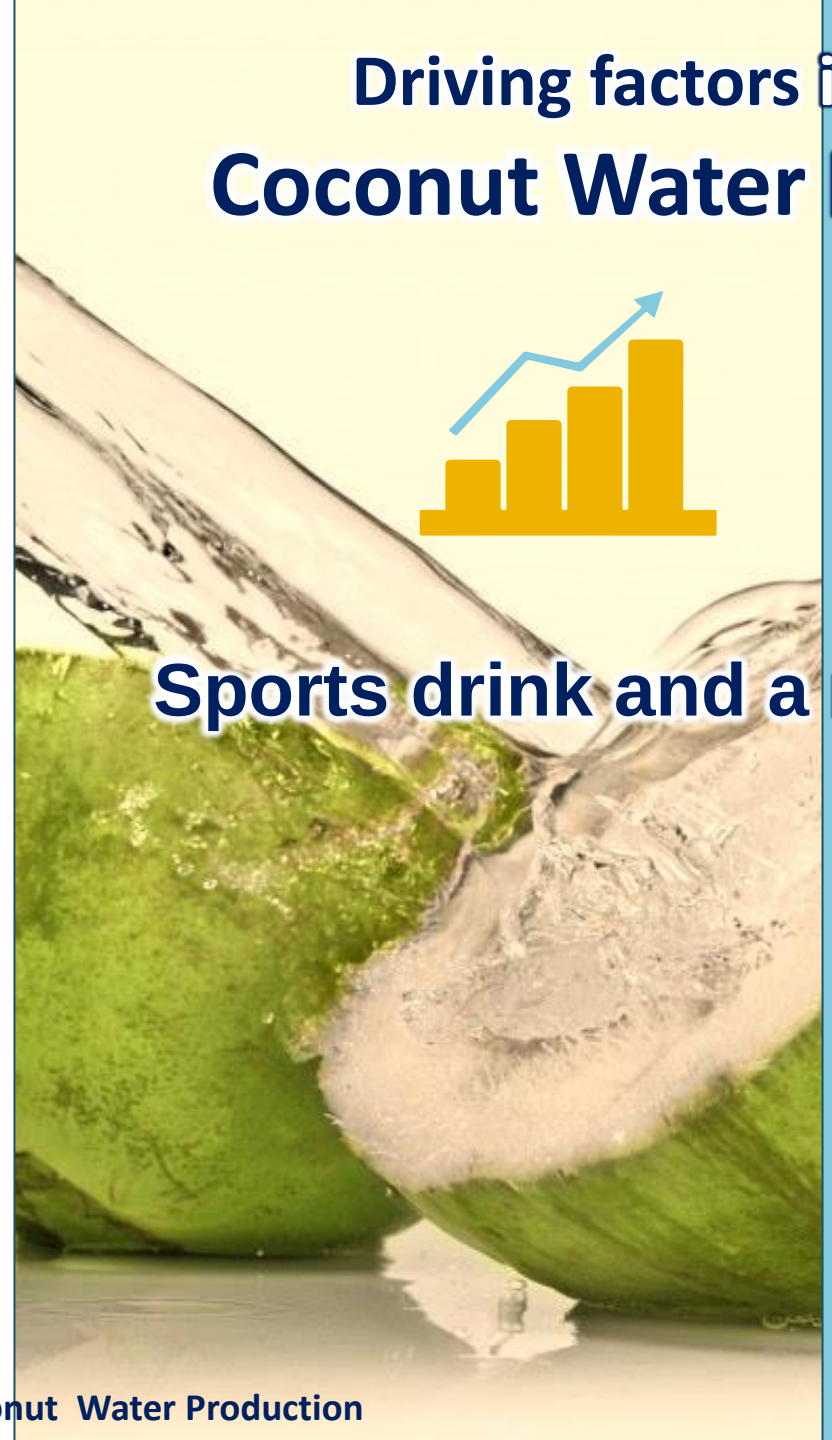


The Tetra packs segment held the major share of 62.68% in 2019

Source: **Allied market research, 2020**

Driving factors increasing the Coconut Water Market Potential

- **South America and Asia** reportedly accounted for over **90%** of world consumption **in 2018**.
- However, **European sales** of coconut water **seem likely to increase** from a low baseline.
- Indeed, in recent years there has been **a dramatic increase in the UK and global demand for coconut water** due to its reputed potential as a sports drink and a natural isotonic drink
- In 2016 some **45% of the UK supply** of coconut water **originated in Thailand**



Sports drink and a natural isotonic drink

Organic Coconut Water is expected to grow at a **CAGR** of roughly **15.0%** over the next five years, will reach **4560 million US$** in **2024**, from **2270 million US$** in **2019**.

Source: **World Atlas (2020) The World Leaders in Coconut Water Production**

Coconut Water Market Potential: Case Study

TAJA Coconut : Consumers prefer it **5:1** vs. the competition.

Why

- Non-GMO
- Sugar-free
- Bottled coconut water
- Cold-filtered—a patented oxygen-free production process
- Preserve all the nutrients
- No heat, air, or additives while preparing the product
- Balanced flavors

Source: **Persistence market research, 2020**

Case Study: Coconut water Processing through HPP

RAW Pressery (India)

- Started with an initial investment of **Rs. 1.5 crore in January 2014**, the company **has raised** more than **Rs 150 crore in 2018.**
- Today, RAW products has presence in 14 cities in India.

Asia's first high pressure processing (HPP) unit for coconut water and other juices.

Shelf life of 6 months without adding sugar or preservatives

Vision: Organic and hygienic beverages

High Pressure Processing is one commercially successful technology applied in tender coconut industries

Source: **CNBC TV 18, 2018**

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- Raw Materials
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Coconut Water Quality Requirements

Good practice for the small-scale production of bottled coconut water (FAO, 2007)

- **Washing and removing of soil**
- **Sanitization of the washed coconuts**
- **Sanitation and sterilization of bottles and caps**

Sterilizing of bottle caps and bottles

Hygienic environment

Filtration
Coarse filter using sanitized silk screen/cheese cloth

Coconut water cooled to 4 °C (temp should not be higher) and Bottling

Rapidly seal bottle and maintain at 4°C within 3-4 hrs

Labeling
*Name.,. *Volume, *Ingredients
*Best before date, &
*Date of manufacture

Storage at 4°C away from light, keep bottles on ice

Source: **FAO, 2007**

Coconut Quality & Certification Requirements

Quality standard

International Code Council (ICC) Standards

- SNI (Indonesia National Standard) 01-2902-1992
- IS (Indian Standard) 542:1968
- PNS (Philippine National Standard)/BAFPS
- MS (Malaysian Standard) 239:1987
- TIS (Thailand Coconut Industrial Standard) 203-1977

Food Safety Certification

- International Featured Standards (IFS)
- British Retail Consortium Global Standards (BRCGS)
- Food Safety System Certification (FSSC 22000)
- Global Food Safety Initiative (GFSI)

Sustainability and corporate social responsibility (CSR)

- Supplier Ethical Data Exchange (SEDEX)
- Ethical Trading Initiative (ETI)
- Business Social Compliance Initiative code of conduct (BSCI)
- BCorp or Fair for Life.

Coconut Water Quality & Certification requirements

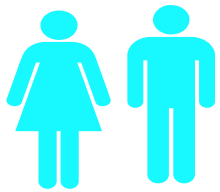
California Certified Organic Farmers

High Value-added Products: Super Foods

- Fermented foods
- Avocados, blueberries
- Non-dairy milks
- Green tea
- **Coconut water**
- Turmeric, black garlic
- Hemp
- Chia
- Quinoa
- Millets

Triple-digit growth on restaurant menus!

Adults interested in eating more superfoods



Source: Sloan, 2020

Consumer Preferences

- Food for Soul
- Nutrition
- Novel product range and value

- Convenience and taste
- Ethical food choices
- Brand trust

Our Vision

LET's MAKE

Hunger Free

&

Healthy WORLD

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