Value Addition to Coconuts (Food, Beverage,

Pharmaceutical & Spa industries)

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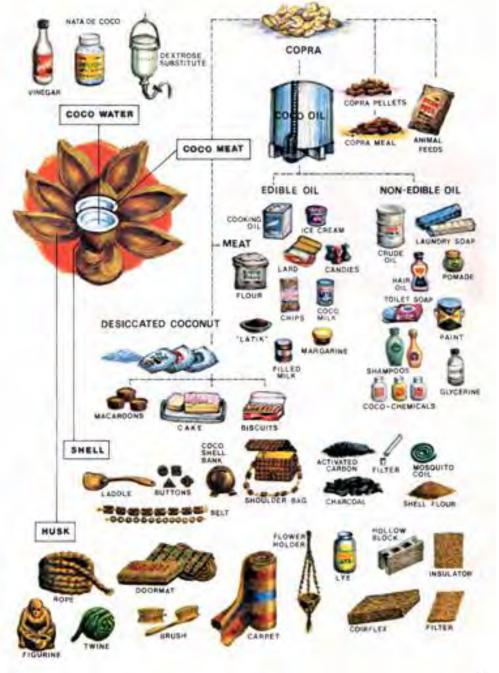
Topic for presentation

- The Tree of Life
- Value addition of coconut Edible or inedible
- Food- Coconut milk, coconut sugar, etc.
- Beverages coconut water, coconut sap, young coconut,
 vinegar, etc.
- Pharmaceutical & spa-VCO, VCO based products





The coconut, properly utilized, has the highest economic value among the various palm trees. Every part of the coconut tree and its fruit can be utilized for man's or converted into valuable products.



The main commercial usage of coconuts at present is the processing of the fruit into various products.

MEAT - desiccated coconut, coconut milk & cream powder, coconut chips, copra, coconut oil & copra meal, coconut flour, etc.

SHELL - charcoal & activated carbon

HUSK - coir dust block, coir fiber & downstream products like geotextiles, fascines etc.

WATER - vinegar, coco water beverage

Mature Nut

Composition

Coconut Hust	35	%
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COCONUT MILK





Coconut Milk





CLEANING & SORTING











We double check the quality of the coconut meat again while coconut meat is being washed and cleaned with softened water at the temperature of 25 - 35 c.



We soak coconut meat in a blanching machine at the temperature of 75 c. or higher for 1.5 minutes.





We extract coconut milk from coconut pulp in this process.





We separate coconut milk and coconut pulp using the vibration filter.



This process call heat exchanger machine under the temperature of 85 c.





For the process of ingredients mixing, we add all ingredients into coconut milk extract to adjust the taste and its appearance. One mixing tank is for one formula.





Process for homogeneous coconut milk. that before product through this unit system must be pass stainless steel sieve filter 60 mesh.





The process of packing coconut milk in the cans











The process of Closing the lid by seamer and inspection work in process by visual check and tear down.



We sterilize coconut milk in still horizontal retort













A team of staff put a label on a coconut milk can, as well as, ink — stamp the can code on the lid.







We double check the labeling quality on every can before putting the finished coconut milk products into a carton box. Finished products then will be stacked on a pallet, and stored in a closed warehouse.

We load finished product into container by container yard at factory. We checked empty container during loading until closed container door.











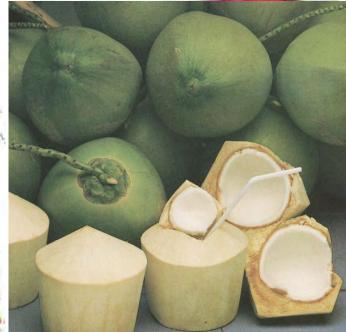


Coconut water



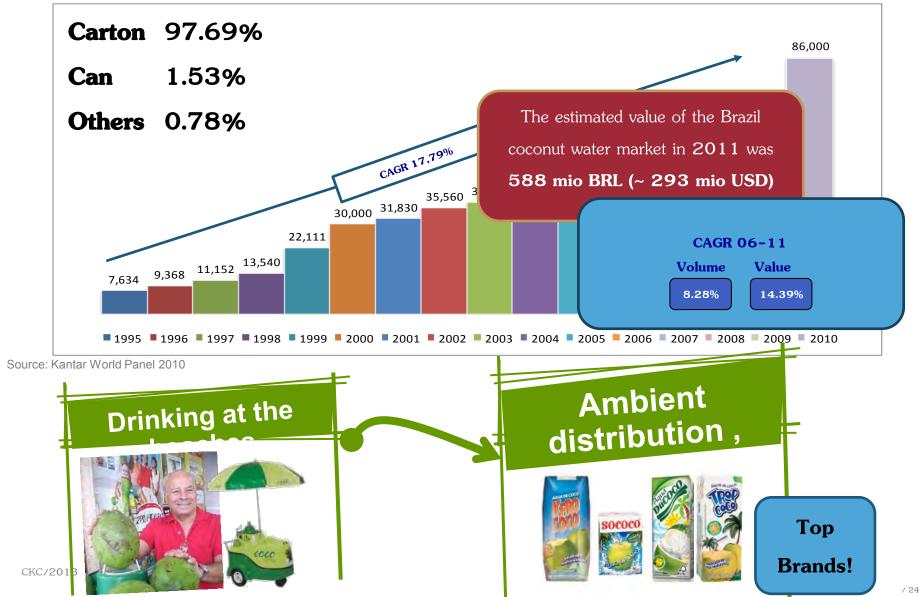






Brazil - where it all started...

Packed coconut water started as early as 1995!!! About 10% of all harvested coconuts are processed for coconut water



Brazil Market

Multiples possibilities, positioning and uses

Partnership with fashion brands

Partnership with restaurants













Focus on naturalness



40%



On the go consumption

Special editions







Explore new usages



Salada de Verão

Sal a gosto

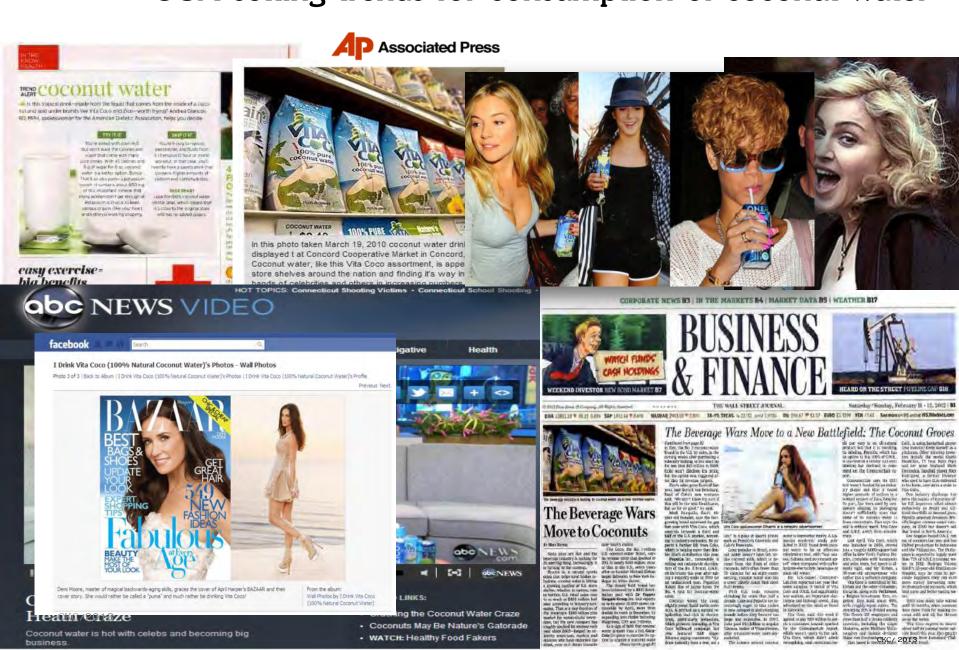


60%



In-home consumption

USA setting trends for consumption of coconut water



Coconut water is hot with celebs and becoming big

Demi Moore, master of magical backwards-aging skills, graces the cover of April Harper's BAZAAR and their cover story. She would rather be called a "puma" and much rather be drinking Vita Cocol

· Coconuts May Be Nature's Gatorade

· WATCH: Healthy Food Fakers

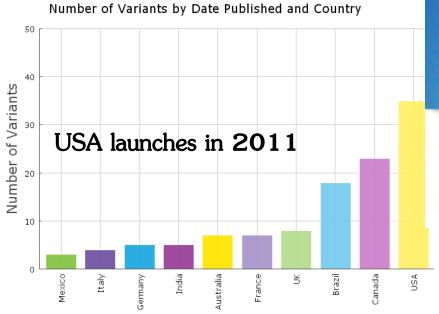
LINKS:

Wall Photos by I Drink Vita Coco

(100% Natural Coconut Water)

ing the Coconut Water Craze

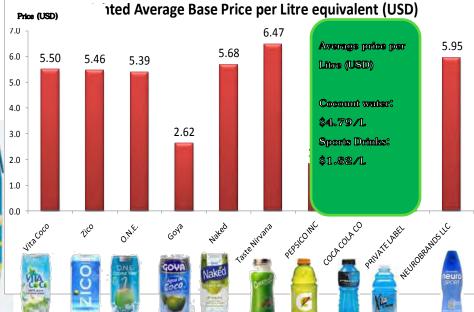
USA Market











COMPOSITION OF COCONUT WATER AT DIFFERENT GROWTH STAGES^a

	Without	With soft	With semi-	With hard
	kernel	kernel	hard kernel	kernel
		(0 - 4 mm)	(2 - 6 mm)	(10 – 12 mm)
Ph	4.8	4.9	4.9	5.3
NaCl, Per Cent	0.280	0.252	0.268	0.383
Reducing Sugar,	3.95	5.25	5.26	5.24
Per Cent				
Sucrose, Per Cent	0.148	0.329	0.484	0.160
Vitamin C	2.5	3.71	3.44	2.24
mg/ml water				
Volume Water, ml	295	230	235	210

^a Ganguli, S.K. (1936)

^{*} Average of 48 samples of each variety

India: Analysis of Mature and Tender Coconut Water

	Mature Coconut Water	Tender Coconut Water
Total solids%	5.4	4-6.5
Reducing sugars %	2	4.4
Minerals %	0.5	0.6
Protein %	0.1	0.01
Fat %	0.1	0.01
рН	5.2	4.5
Potassium mg%	247.0	290.0
Sodium mg%	48.0	42.0
Calcium mg%	40.0	44.0
Magnesium mg %	15.0	10.0
Phosphorous mg%	6.3	9.2
Iron mg%	79.0	106.0
Copper mg%	26.0	26.0

Source of Data and Photo: Mathew (2008)

Coconut water collecting processes

De-husk coconut Cracking/Cutting Filtering Cooling **Cold Storage** Heating **De-Oil Pastuerizing** Cooing

Cold Storage

Starting from personal hygiene.

- The collector must understood and process coconut water with their personal hygiene.
- Third parties must training, improve and audit collectors about hygiene.
- Personal, tools and environmental cleaning procedure are very important.
- Normally if the collector concern and processes coconut water collecting processes same like prepare and cook meal for they and their family will be important aim.

Materials for contact part with coconut water.

- For primary collector, 2 basic concept as presented are enough for gathering and collecting coconut.
- About tool, equipment and method to used for collecting coconut water for primary collector.
- The tools, equipment as contact with coconut water must be food grade stainless steel.
- The stainless steel tools and equipments are easy to clean and treatment by disinfectant and food grade chemical cleanser.
- In coconut water have some chloride content will effect with steel when contact in long time.
- Suggestion to use contact part material for food grade stainless steel and food grade plastic material.

Mature coconut water collecting.

- On this topic will prefer only mature coconut water collecting only.
- Mature coconut water are 90% for produce beverage and another kind of coconut products from water.
- Young coconut water market are major in fresh consumption products and local consumption.
- Season is the problem to control productivity and price of young coconut products.
- Difficult to used young coconut water in huge volume and the price is not compete to produce commodity beverage products.

PROCESSED COCONUT WATER FROM TENDER YOUNG NUT



Pasteurization is done by high temperature short time (HTST) process at about 72 °C for 15 seconds

Shelf life ranges from 2 – 3 weeks under refrigeration temperature of 7 °C and below



Supply is limited because young coconut as a raw material is more expensive than mature nuts. In this case, coconut water is not a waste material. It is the young coconut meat which is a by-product.







PROCESSED COCONUT WATER FROM MATURE NUT

Disposal of big volumes of coconut water used to be a big problem before to desiccated coconut companies.

Treatment of the coconut water before disposal to comply with environmental regulations is one of the major cost in DC processing.

Now, processing coconut water is fast becoming a gold mine after all the promotions extolling its health benefits and as a better alternative to existing sports drink.



TYPES OF PROCESSED COCONUT WATER FROM MATURE NUT



- 1. Coconut water concentrate
- 2. UHT processed and aseptically packaged coconut water beverage





COCONUT WATER CONCENTRATE

- Concentration of the water is done through vacuum evaporation so that the taste and flavor of coconut water will not change very much
- The coconut water is concentrated from 5 ⁰Brix to 60 ⁰Brix
- Coconut water concentrate is converted into beverage in the importing countries or it can also be used in various applications as a syrup or in making sauces



UHT PROCESSED COCONUT WATER BEVERAGE

- Ultra High Temperature (UHT) processing is a pasteurization system wherein a substance after proper pre-treatment is subjected to temperatures ranging from 130 145 OC with holding times between 2 and 45 seconds (Damar, 2006)
- The product is aseptically packaged after UHT processing in order to obtain a stable product with a shelf life of at least 1 year at ambient condition.
- UHT processing and aseptic filling are done in a very sterile environment. The filling area is even flooded with nitrogen gas to prevent airborne micro organisms from re-contaminating the product

Cracking/Cutting and primary filtering processes.

- After cracking/cutting whole coconut to collect coconut water will have small piece of coconut husk and shell fall into collecting tank with coconut water.
- Must have filter to protect most of coconut pieces and another foreign materials.
- Normally for small primary collector they used muslin cloth cover bath/tank to collecting coconut water.
- In the concept it can filtered all foreign materials but must have cleaning and treatment processes for Muslin cloth.
- The muslin cloth is natural material easy to infected by mold/fungi and bacteria.
- The processes to clean muslin cloth are very important for this step.
- Food grade disinfectant are necessary for clean this filter.
- For upgrade and improved this processes, must used materials as food grade and easy to clean.

Cracking/Cutting and primary filtering processes.

- Standard material for make filter is foods grade stainless steel.
- The properties as tolerance with strong acid, salt and chemical treatment and easy to clean drive the SUS material popular to used in many collectors



Cracking/Cutting and primary filtering processes





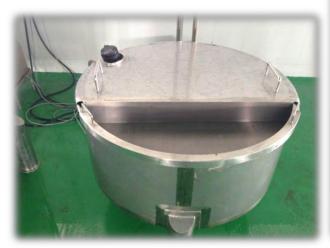
- On this step if can check some properties after pass the filter to check quality of coconut water are make sure for coconut water as will processes in next step will have good quality.
- The basic method as must check are pH, Brix, Temperature, Sulphite and Sensory+Visual test.

Cracking/Cutting and primary filtering processes











Coconut water Keeping/Pre-storage condition

- After filtering processes must have the treatment condition to keep coconut water before delivery to factory/buyer.
- Some of collectors used plastic pail (Gallon) to keep coconut water but very difficult to clean.
- Not suggestion to used plastic pail because of not easy to clean, easy to contamination and cannot declare grade of plastic.
- Some collector used re-used pail as original from non-foods chemical.
- Normally for small collector plant fill coconut water in to food grade plastic bag and closed with elastic.
- And then put in to cooling bath and cool with ice and water.
- Suggest to used double bags (2 layers) for packed coconut water before put into cooling bath.
- For bigger collector as could collect big volume used SUS tank connect with Plate/Tubular heat exchanger to keep their coconut water chilled.
- This processes will cool down coconut water in short time and homogeneously.
- Easy to clean/CIP and control temperature of coconut water and can keep longer.

Coconut water Keeping/Pre-storage condition







Coconut water Keeping/Pre-storage condition















Keeping coconut water in Huge/Bulk storage tank.

- After cooling in small tank and temperature cool reach the keeping target temperature.
- Transfer to big/Bulk insulated storage tank to keep chilled coconut water in target temperature.
- Standard size of big/bulk tank is around 10 MT., this size is economized scale for big storage tank.
- The insulated tank with full level of chilled coconut water can keeping for 24 hours temperature will increase less than 3 C.
- When the temperature increase higher than target temperature must return coconut water to cooling system to cool down coconut water and transfer to insulated tank again.
- Suggestion temperature to keep coconut water around 24 36 hours is around 5 C.
- Any thing the keeping time depend on quality of coconut water before pass the filtering processes.
- The collector must random to check every 2-3 hours about pH and Brix changing and odour test.

Keeping coconut water in Huge/Bulk storage tank.











De-Oil and Pasteurization processes.

- The final step to treatment and keep coconut water in longer time before UHT processes and fill into consumer packaging are De-oil and pasteurization processes.
- In coconut water, normally in mature coconut water have oil content around 1-2% inside.
- This oil is very easy to rancid and will effect with coconut water smell when keep in long time.
- The de-oil processes is very important to treatment coconut water in high quality and nice appearance.
- After passed the de-oil process by high speed 3 phase separator machine, the final coconut water will had nearly 0% oil content and very clear.

De-Oil and Pasteurization processes.

- And then pass the coconut water in the pasteurization step to reduce TPC (Total Plate Count) around 3-4 log phase.
- Suggestion about pasteurized step for coconut water at 75 C for 1 minute and keep cooling at 5 C.
- After this processes can keep coconut water more than 48 hour before processes in the next step.
- The next step are final processing depend on market and demand, some pass the UHT processes to filled in carton box, some pass evaporator to produce coconut water concentrate, many collector filled in plastic bag and put in steel drum to sell in semi raw materials and etc.

De-Oil and Pasteurization processes.









- As presented, hope you to know and concern for concept, basic, method and processes to collecting coconut water in term of hygienic.
- Hygienic not meaning only processes, equipment and tools.
- The personal hygienic and concern about them are important more than machine and equipment.
- Please try to convince your coconut collectors to concern their personal hygiene and cleaning procedure.
- Training and advising about GMP concept and regulation with them.
- Audit and frequency to visit collectors to advise and suggestion.
- Most as previous presented will improve knowhow, knowledge, skill and attitude of collectors to produce pure high quality coconut water to support global demand.







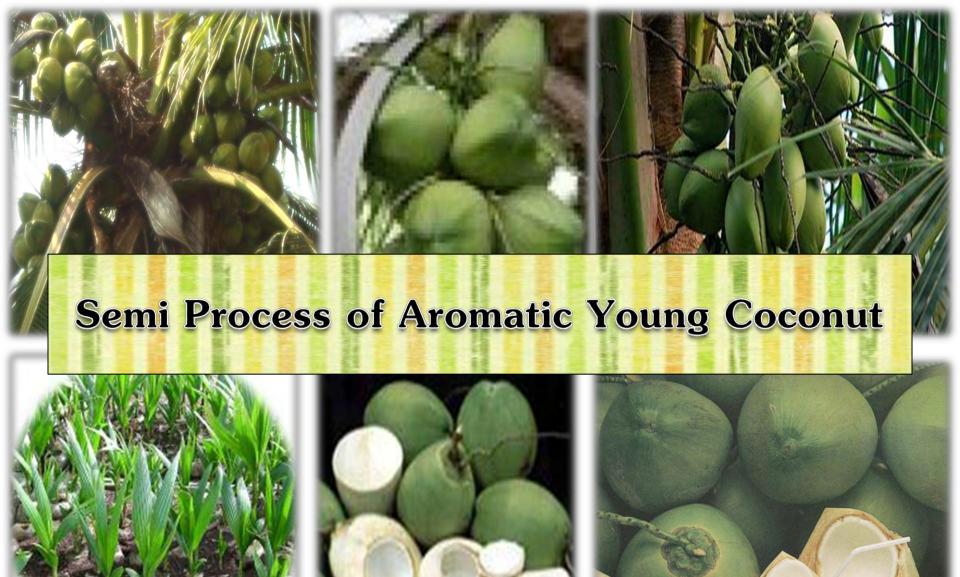














Harvesting

- Varieties: aromatic young coconut (Nam Hom Variety) and Nam Wan (sweet Variety)
- Maturity integrate methods
 - Harvesting index from flowering 6.5 to 8 months
 - External appearance



Aromatic coconut Farm





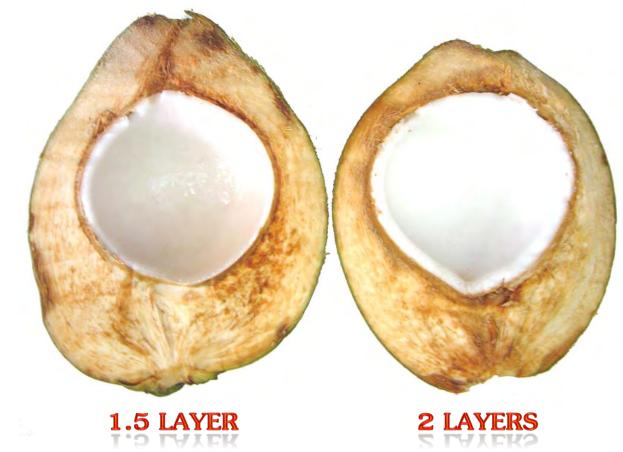
Harvesting Time











Maturity at harvest depends on:

- market requirement
- transportation
- duration/distance to market

Collecting/transport

collect on

Cart

Truck



Transport by truck to packinghouse



Packinghouse operation

- Unloading
- Defruiting
- Trimming
- Maturity testing
- Packing
- Precooling and
- transport





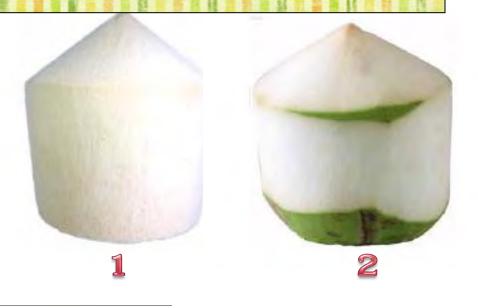


Cutting and Trimming





Trimming styles







- 1. Trimmed coconut with all green exocarp removal
- 2. Part of exocarp is cut; trimmed into tapered-cylindical form with cone cover-top
- 3. Part of exocarp is cut; top is trimmed into cone-cover shape
- 4. Polished coconut with cone cover stem end
- 5. Polished coconut with cylindrical mesocarp stem end flat base



Trimming 1













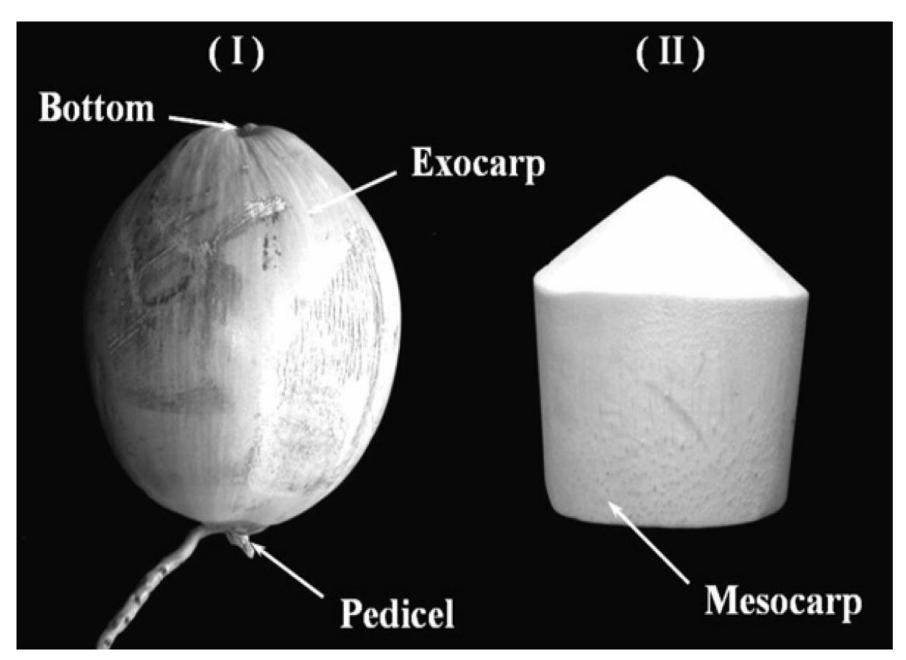


Trimming 2

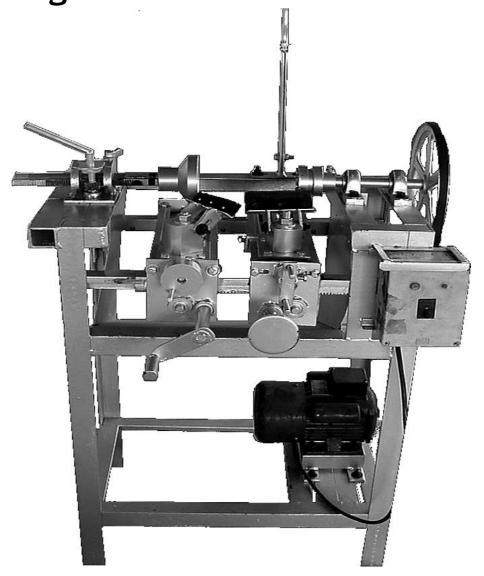








Coconut peeling machine





Postharvest treatment



Dip in 1-3% sodium metabisulphite solution for 1 to 3 min to prevent browning and mold infection.

Soaking and drying



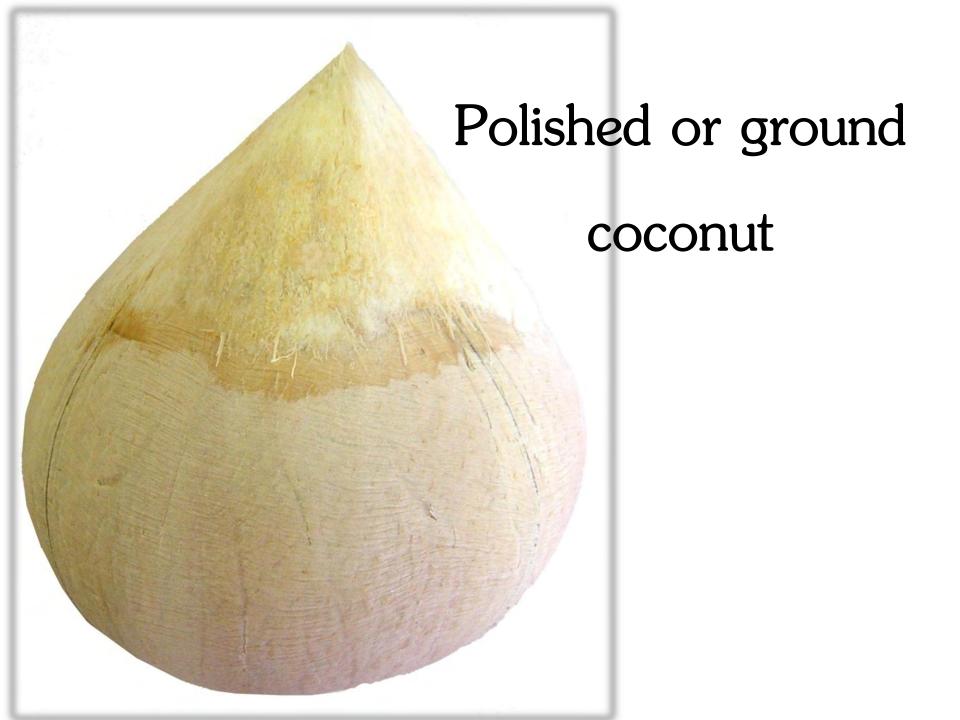




Individual pack in polypropylene bag

Packed in HDPE bag



















9 or 12 fruits/box



Distributed by : Best Oriental Produce,Inc. 2929 Leonis Bld, Vernon, CA 90058 ben@bestorientalproduce.com Tel: (323) 923-1660 Fax: (323) 923-1666



Packed By: K FRESH 66/7 Srisamutr rd. Pak-nam Samutrprakan 10270 Thailand Tel. (662) 702-7992, (661) 832-9942 Fax. (662) 702-9599 www.coconuttoday.com

Nutrition Facts

Serving size 330 ml. Serving per container: 9

Amount Per Serving

Calories 90 Caldwinn from Fat O Total For U.S. Saturated Fat D a Chairstend O mg Sattem 45 mg Felar Carbobydrate 23 c

Vitarriio A	.0.5	Vibranii C	2.70
Catolium	45	- Street	26.1





Young tender coconut with aromatic water and soft sweet flesh. That is distinctive from any other coconuts in the world. Produce of Thailand











16/24/28/32

fruits/box





Transport sea/land



Store at 2-4°C

for 2-5 weeks



Virgin Coconut Oil Processing Technology and VCO-Based Products



Coconut Oil

RBD Coconut Oil – produce from copra, pale yellow, oil extraction, Refined, Bleached and Deodorized

Virgin Coconut Oil – produce from fresh coconut meat, no high temp, clear water appearance, odor and flovor of coconut

Coconut Oil

Coconut Oil saturated oil,



Medium Chain Fatty Acids - MCFE,

 $C6 - C12) \sim 64\%$

- stimulate metabolism
- no Cholesterol
- high lauric acid 48-53 %



Identity Characteristics

Common name	Composition	%
Caproic acid	C 6:0	ND-0.7
Caprylic acid	C 8:0	4.6-10.0
Capric acid	C 10:0	5.0-8.0
Lauric acid	C 12:0	45.1 and above
Myristic acid	C 14:0	16.8-21
Palmitic acid	C 16:0	7.5-10.2

Identity Characteristics

Common name	Composition	%
Palmitoleic acid	C 16:0	7.5-10.2
Stearic acid	C 18:0	2.0-4.0
Oleic acid	C 18:1	5.0-10.0
Linoleic acid	C 18:2	1.0-2.5
Linolenic acid	C 18:3	ND-0.2

RBD Coconut Oil

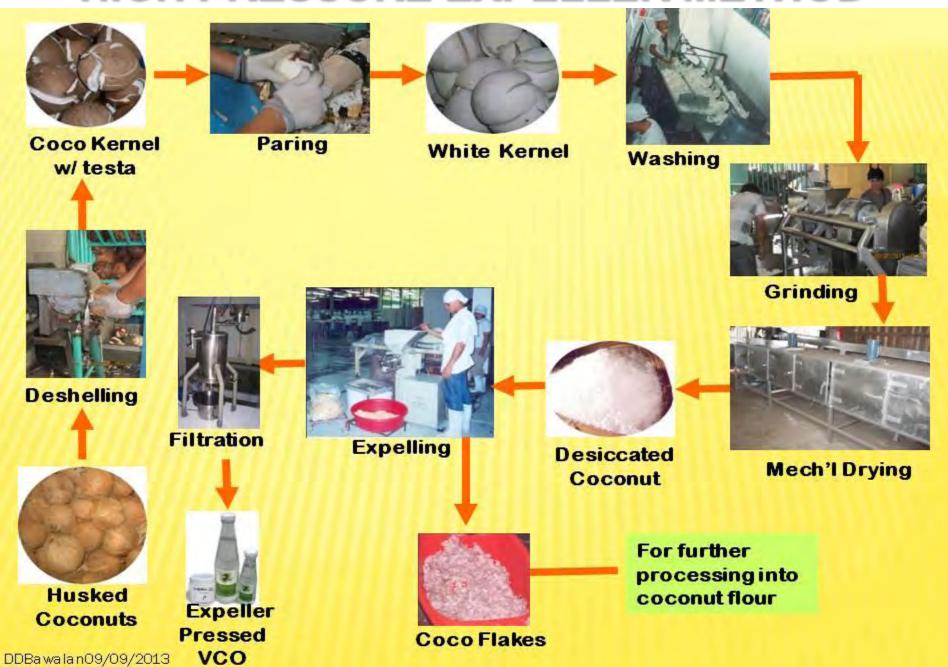
- From Copra grind in small pieces
- To Screw press or hydraulic press
- Or solvent extraction
- Get crude oil
- Refining, Bleaching and Deodorizing
- RBD coconut Oil

VIRGIN COCONUT OIL PROCESSING TECHNOLOGIES

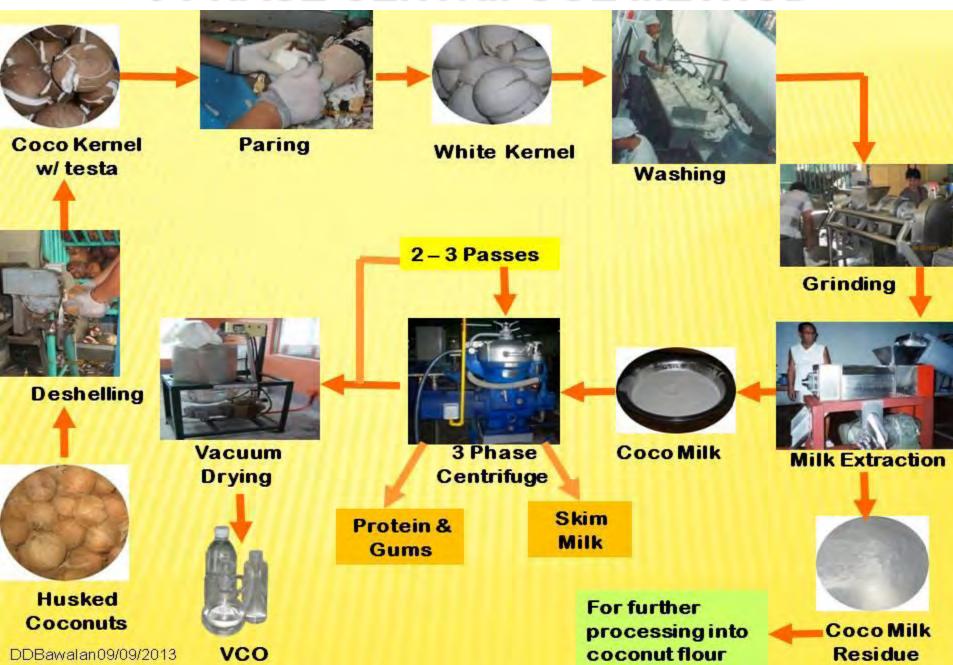
Commercial production of VCO is done through the following methods:

- High pressure expeller method (desiccated coconut route)
- Centrifuge method (coconut milk route)
- Natural fermentation method (coconut milk route)

HIGH PRESSURE EXPELLER METHOD



3 PHASE CENTRIFUGE METHOD



NATURAL FERMENTATION METHOD



CRITICAL CONTROL POINTS IN VCO PROCESSING



Maturity of the nut



Handling of Coconut Water



Sanitation and Handling of Equipment



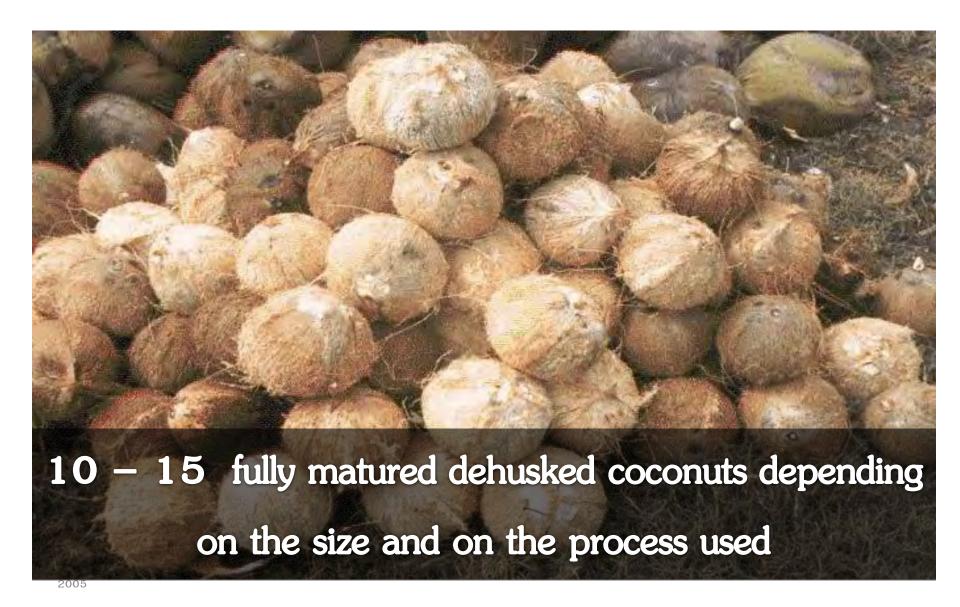
Handling of VCO

PLEASE NOTE . ..

The choice of technology to adopt depends on the following:

- Scale of operation
- Amount of investment that an entrepreneur is willing to spend
- Demand of the buyer

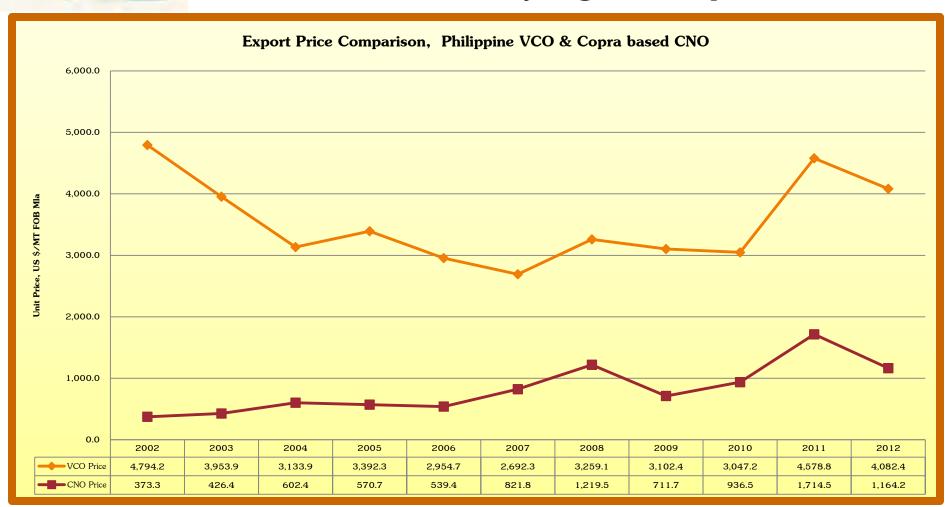
Number of coconuts required to produce one (1) liter of VCO





VIRGIN COCONUT OIL MARKETING ADVANTAGE

VCO is a very high value product



Raw Material

- Select new dehusking coconut
- Dry coconut meat in 4 hrs, don't leave more than 12 hrs, Microorganism can make coconut meat spoilage and make bad odor and flovor in VCO

VCO Processing





Coco milk

Traditional

Fermentation

Centrifugation



VIRGIN COCONUT OIL MARKETING ADVANTAGE

VCO has multi-functional uses thereby providing flexibility in marketing.

VCO can be utilized in all edible and non-edible applications where the copra derived refined, bleached and deodorized (RBD) coconut oil is generally used. In addition, it has special uses which is distinct from the known traditional uses of coconut oil.

Special Uses of VCO

MAS A NUTRACEUTICAL AND FUNCTIONAL FOOD

- a lot of people all over the world are now ingesting VCO as a food supplement to boost their immune system, assist in mitigating symptoms of several diseases and other health benefits that it can do to the human body as reported in published books and literatures.









VCO Products from Drying method

VCO from Centrifuge

- Thaipure is the Thai Company achieving the 1st NIA national award for producing Virgin Coconut Oil from fresh coconut milk using state-of-the-art centrifugation technology.
- Distinct from those other conventional technique, our proprietary innovative processes take only 5 minutes with chemical-free and no heat or fermentation is involved resulting in clear, precipitation-free, mild good-odor premium quality of coconut oil.

VCO from Centrifuge















VCO-Based Products

- Shampoo
- Conditioner
- Soap
- Shower gel
- Suntan oil
- Cleaning lotion
- Washing gel
- Toner
- Intensive serum

- Day Cream/Night Cream
- Coconut foot cream
- Lip palm VCO
- Lotion/Cream
- Coconut pulling oil
- Coconut hair mask
- Anti hair loss
 shampoo/conditioner/hair
 oil/tonic

Special Uses of VCO

As a base oil for hypoallergenic cosmetics, soap and skin care products



Coconut soap













VCO Based Products









VCO Based Products

















Address to contact VCO supplier in Thailand

• Tropicana oil: sale@tropicanaoil.com

: info@tropicanaoil.com

Website:www.tropicanaoil.com

• Thai pure: www.thaipurevco.com

Standard of VCO

International Standard: APCC

Relative density 0.915 - 0.920

Refractive index at 40°C 1.4480 - 1.4492

Moisture % wt.max. 0.1 - 0.5

Insoluble impurities % by mass max. 0.05 %

Saponification value 250 - 260 min

Iodine value 4.1 - 11.00

Unsaponifiable matter % by mass.max. 0.2 - 0.5

Specific gravity at 30°C 0.915 - 0.920

Acid value max. 0.5

Polenske value min. 13

Standard of VCO

International Standard: APCC

GLC range of fatty acid composition (%):

C 6:0

0.4 - 0.6

C 8:0

5.0 - 10.0

C 10:0

4.5 - 8.0

C 12:0

43.0 - 53.0

C 14:0

16.0 - 21.0

C 16:0

7.5 - 10.0

C 18:0

2.0 - 4.0

C 18:1

15.0 - 10.0

C 18:2

1.0 - 2.5

C 18:3 - C 24:1

< 0.5

Quality Characteristics

Colour water clean

Free Fatty Acid $\leq 0.5\%$

Peroxide Value ≤ 3 MEQ/KG OI

Total Plate Count < 10 CFU

Odour and Taste Free from foreign and rancid odour and taste

Contaminants

Matter volatile at 105°C 0.2%

Iron (Fe) 5 mg/kg

Copper 0.4 mg/kg

Lead 0.1 mg/kg

Arsenic 0.1 mg/kg

Food Additives: None Permitted

Hygiene: It is recommended that the product be prepared in accordance with the GMP and HACCP standards.

Thai Standard for Coconut Oil/VCO

Coconut Oil (No. 670/2004): Community level

VCO for spa (No. 915/2005): Community level

Coconut Oil (No.203-1977): Industrial level

Ministry of Health, Food and Drug Depart.: 271-

2003 : for consumption

Standard of Coconut Oil

National Standard: Food and Drug Depart.

Moisture % wt.max. 0.1 - 0.5

Insoluble impurities % by mass max. 0.05%

Saponification value

Iodine value 7.0 - 11.00

248-264 mg

0.915 - 0.920

Unsaponifiable matter % by mass.max. 8

Specific gravity at 30°C

Acid value max. 4.0

Quality Characteristics

Colour water clean

Free Fatty Acid \leq 0.4%

Peroxide Value ≤ 8 MEQ/KG OI

Odour and Taste Free from foreign and rancid odour and taste

Contaminants

Matter volatile at 105°C 0.2%

Iron (Fe) 5 mg/kg

Copper 0.4 mg/kg

Lead 0.1 mg/kg

Arsenic 0.1 mg/kg

Food Additives: None Permitted

Hygiene: It is recommended that the product be prepared in accordance with the GMP and

HACCP standards.

Standard of Coconut Oil: Consumption

National Standard: Office of Industrial Standard

Relative density 0.915 - 0.927

Refractive index at 40°C 1.4480 - 1.450

Moisture % wt.max. 0.1 - 0.5

Insoluble impurities % by mass max. 0.05%

Saponification value 248 - 260 min

Iodine value 7.1 - 11.00

Unsaponifiable matter % by mass.max. 0.2 - 0.5

Specific gravity at 30°C 0.915 - 0.920

Acid value max. 0.5

Polenske value min. 13

Quality Characteristics

Colour water clean

Free Fatty Acid $\leq 0.5\%$

Peroxide Value ≤ 3 MEQ/KG OI

Total Plate Count < 10 CFU

Odour and Taste Free from foreign and rancid odour and taste

Contaminants

Matter volatile at 105°C 0.2%

Iron (Fe) 5 mg/kg

Copper 0.4 mg/kg

Lead 0.1 mg/kg

Arsenic 0.1 mg/kg

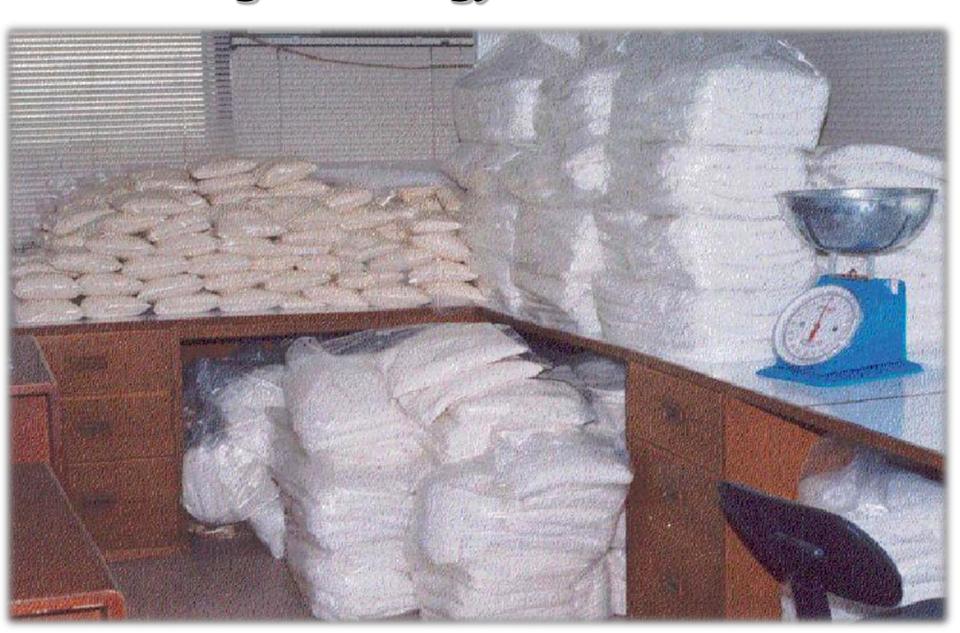
Food Additives: follow recommened

Hygiene: It is recommended that the product be prepared in accordance with the GMP and HACCP

standards.

Physical/Chemical Properties	Standard No. 670/2004
Physical	Water Clear
Color	Natural for coconut oil
Acid Value Max.	4 mg. KOH/g
Peroxide Value	< 10
TOTAL PLATE COUNT	< 1.5 x 10 ³ cfu/cc.
Volatile matter at 105 C	Not more than 0.2 %
Additives	Not allow
Contaminants	Lead 0.1
	Arsenic 0.1

Processing Technology for coconut Residue

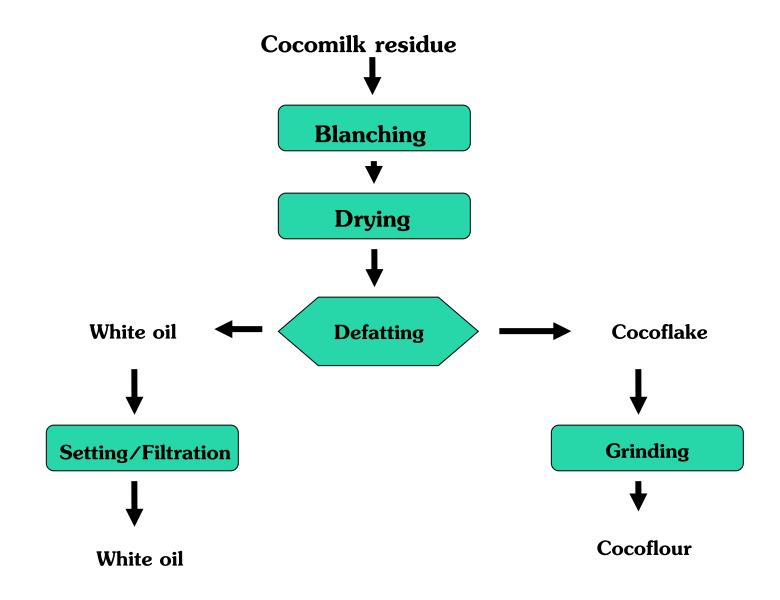


Dried Coconut residue

Composition

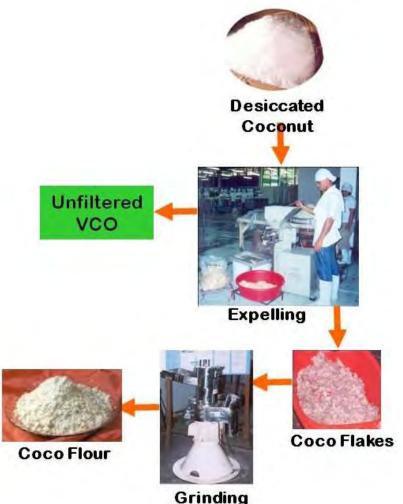
Protein	5.1	%

Processing Technology for coconut Residue





TYPES OF COCONUT FLOUR



Full protein coconut flour processed from fresh coconut meat. It is obtained by grinding the coconut flakes generated when VCO is produced using the freshdry high pressure expeller method. This flour contains all the proteins, nutrients and sugar that is present in fresh coconut kernel.

TYPES OF COCONUT FLOUR **COCONUT FLOUR** Coco Milk **Drying** Residue Unfiltered VCO Defatting w/ **Special Condition** Coco Flakes Coco Flour Grinding

2. High fiber coconut residue is obtained by further flour defatting the dried coconut milk residue in a high pressure expeller or by the use of a combination grinder and basket type centrifuge. This flour has low protein content but with a much higher dietary fiber than full protein coconut flour.

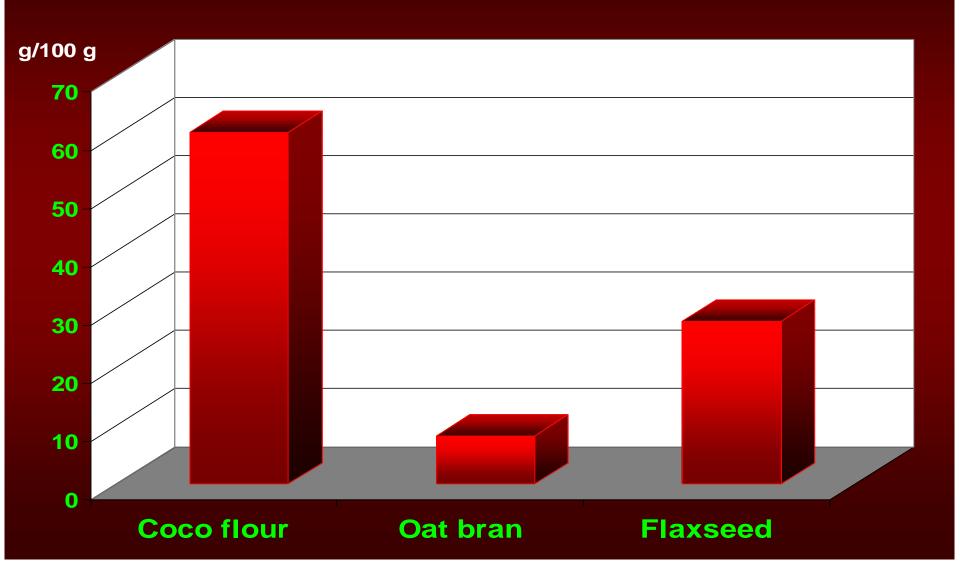


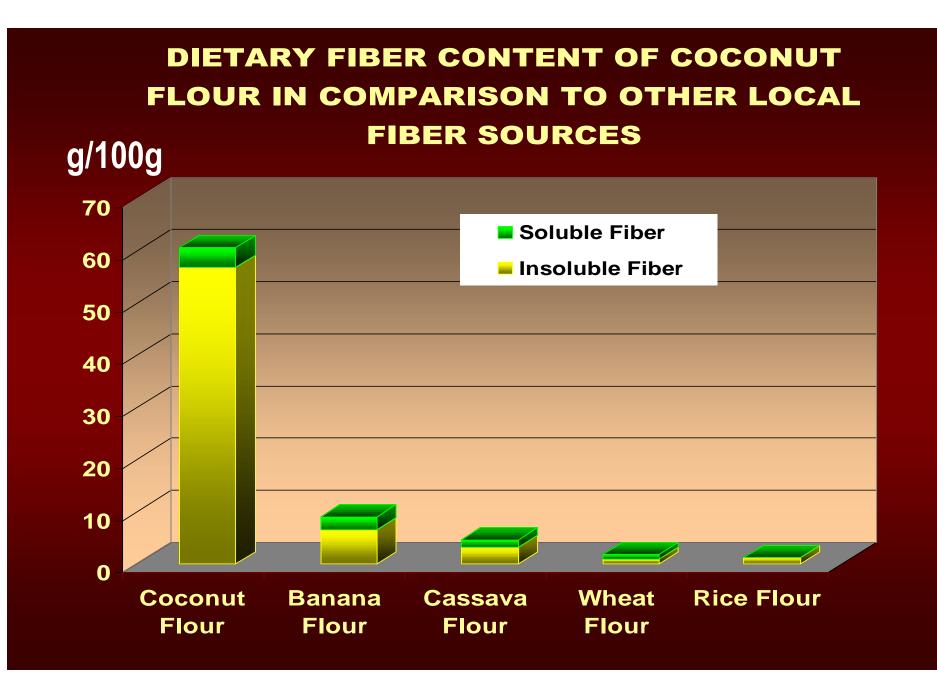
COCONUT FLOUR MARKETING ADVANTAGE

Has high dietary fiber content (as much as 60 %), much higher than oatmeal (8.3 %) and flaxseed (28 %) which the Americans are promoting as a product good for the heart.

- Studies on coconut flour have shown that dietary fibers from coconut flour are effective in elimination of wastes from the human body, lowering cholesterol and are recommended for better control and management of diabetes mellitus (non-insulin dependent).

DIETARY FIBER CONTENT OF COCONUT FLOUR, OAT BRAN AND FLAXSEED





Coconut Sap, Sugar

Background

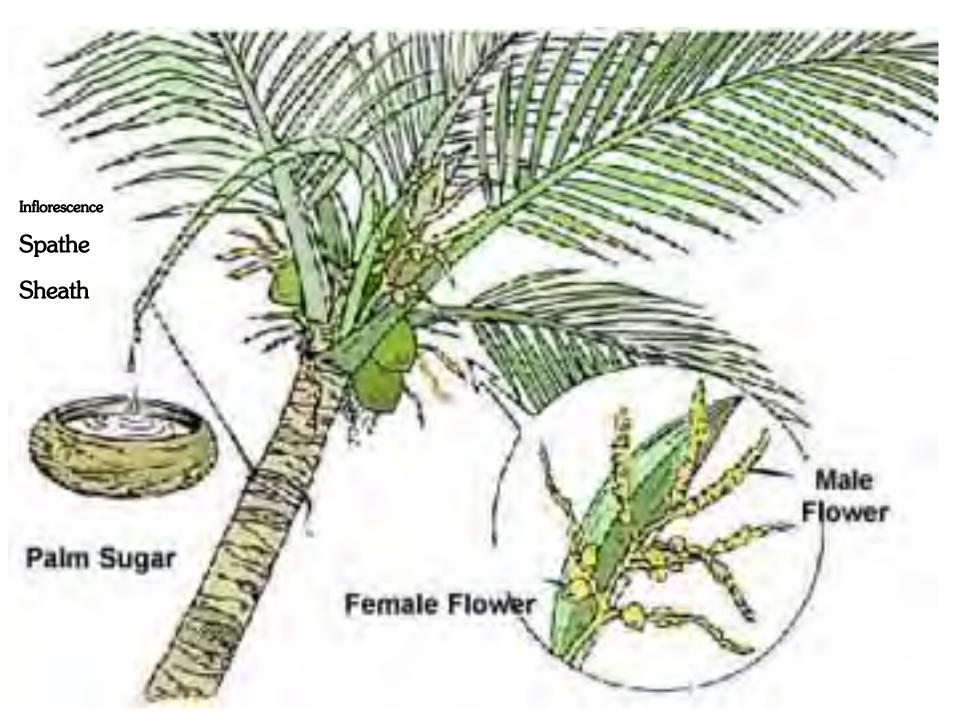
- necessitate exploring other possibilities of products that can be derived from the palm.
- Sugar is one such product that has high earning potential, particularly in Thailand.
- The demand for coconut sugar is expected to increase because of increasing population and health consumption.

Background

- The coconut sugar is mainly used in cooking desserts and other food products.
- In Thailand, coconut sugar is one of the most important ingredients in Thai food and it can not be replaced by other product because of its unique flavour.

Background

- The coconut sugar is mainly used in cooking desserts and other food products.
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coconut sugar and other products that could be produced from inflorescence sap





CHEMICAL COMPOSITION OF COCONUT SAP

PARAMETER	RANGE	MEAN VALUE
Total Solids (% w/w)	15.02 – 18.90	16.88
Sucrose (% w/v)	14.89 – 18.40	16.63
Reducing Sugar (% w/v)	0.23 - 0.31	0.27
Nitrogen-free Extract		
other than sugar (% w/w)	0.38 - 0.66	0.53
Crude Protein (% w/w)	0.19 - 0.30	0.23
Ash (% w/w)	0.25 - 0.38	0.33
Fat (% w/w)	0	-
рН	6.00 - 6.75	6.40
Titratable Acidity (% w/v)	0.07 - 0.10	0.09
Alcohol (% w/v)	0	-
Specific Gravity	1.060 - 1.075	1.070

Samples Analyzed - 33

Source of Data: Fandialan and Fernandez, 1983

Amino acid content of freshly gathered coconut sap (Kosaki, 1974 as cited by Fernandez, 1984)

Amino Acid	Value (g/100g)
Trytophan	1.27
Lysine	0.30
Histidine	1.19
Arginine	0.35
Aspartic Acid	11.22
Threonine*	15.36
Serine*	8.24
Glutamic Acid	34.20
Proline	3.52
Alanine	2.57
Valine	2.11
Isoleucine	0.38
Leucine	0.48
Phehylalanine	0.78

Glutamic acid – the most common stimulating neorotransmitter in the nervous system, plays a role in the normal function of the prostate gland (male reproductive organ) (Trinidad, 2006)

Vitamin content of freshly-gathered coconut sap

(Kosaki, 1974 as cited by Fernandez, 1984)

within the body

Vitamin	Value
(mg/dl)	
Thiamine*	77.00
Riboflavin	12.20
Pyridoxine*	38.40
Para-aminonobenzoic acid*	47.10
Pyridoxal*	38.40
Pantothenic acid*	5.20
Nicotinic acid*	40.60
Biotin	0.17
Folic acid	0.24
Inositol*	127.70
Choline	9.00
Vitamin B.	trace

INOSITOL – highest of all vitamins, its beneficial effects:

- Component of phospholipids in the brain, skeletal, heart and male reproductive organ
- Functions in nerve transmission, regulation of enyzme activity and transportation of fats
- ✓ Helps reduce high cholesterol and important
 for the heart
- Also beneficial for treatment of eye abnormalities, eczema and some cases of obesity (Trinidad, 2006)

Analysis	Per 100 G	Chiuradi Consent array and hate
	161 100 0	Chiwadi Coconut s <mark>ugar</mark> products Low G <mark>I</mark> Sugar, Good for Diabetics
Calorie (Kcal)	310	160-
Protein (N*6.25)	1.19	140-
Carbohydrate (include fiber)(g)	76.37	120- Glucose Coconut flower syr
Fiber(g)	0.13	80-
Sugar (g)	61.00	60-
Sodium (mg)	97.68	(ID) Bu
Calcium (mg)	6.68	Blood de (mg/dl) Coconut suga
ron (mg)	0.22	Blood g
Potassium (mg)	964.58	Awarded, Food Design Contest, National Innovation Day
Copper (mg)	0.22	Table from clinical study on Chiwadi Coconut Flower Syrup, Chiwadi Coconut sugar, Institute of Nutrition, Mahidol University 2012.
Magnesium(mg)	18.31	30 60 90 www.chiwa
Phosphorus (mg)	44.28	C VIII W TO THE TOTAL STATE OF THE TOTAL ACTOR TO T
Zinc (mg)	0.82	The second of th

COMMERCIAL PRODUCTS FROM COCONUT SAP







Coconut Sugar



Coconut Sugar Powder







Coconut Nectar





Coconut Vinegar

Coconut Flower Syrup



Coconut Candy

Coconut Custard



Coconut palm sugar production and marketing

- Coconut sugar is mostly used for cooking, desserts, curries and some as raw material for food industries, e.g. confectionery.
- Coconut sugar production is mainly a household industry in areas where coconut is grown.
- The demand for export of coconut sugar is increasing. The United States of America is the biggest importer of the palm sugar, others are Australia, Japan, United Kingdom, France, Canada, Saudi Arabia, Germany, Hong Kong, Netherlands, Malaysia, etc.

Areas and suitable varieties

- Coconut palms for sugar production are planted mostly in the provinces of Samut Songkram (Ampawa, Bangkontee, Muang), Samut Sakorn (Amphoe Ban Paew), Rajchaburi (Amphoe Wat pleng, Pag-toh) and Petchaburi (Amphoe Ban Laem).
- These provinces have many rivers and canals, close to the sea, and represent an ideal environmental for coconut growth.

Areas and suitable varieties

 There are many varieties of coconut for sugar making, which are mostly Dwarf,

e.g. Moo-sri (Yellow Green Dwarf), Aromatic coconut (Nam hom, Nam wan), Sawi

hybrid No.1 (MAWA) and some Tall varieties, e.g. Thale Ba, Suricha and Saibuaw.





Characteristics of desirable coconut palm for sugar processing

- High concentration of sugar in sap, high yield
 (4 litres/spathe)
- Thick and long inflorescence
- Produce inflorescence regularly and frequently
- Soft spathe to facilitate pulling down
- Strong semi-dwarf trunk







Inflorescence Spathe Sheath

Factors affecting quality of coconut sugar

- Cleanliness must be maintained through all stages of sugar production.
- The spathe must be kept clean to prevent insect infestation.
- The tools used must be thoroughly washed in hot water.
- The syrup is filtered twice, firstly when gathered from the Field and then again
- when boiled before evaporation. The sugar is usually stored in aluminium or zinc containers which are filled over a period of several days ensuring even consistency of the product.

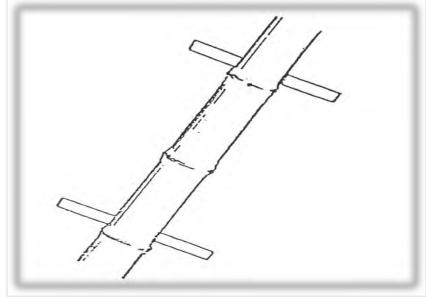
Machinery tools and equipment





a) Tapping and collecting tools for coconut sap





NATURAL SPOILAGE RETARDER

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Dipterocarpaceae



K. apiculata

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Coconut sugar processing device/equipment





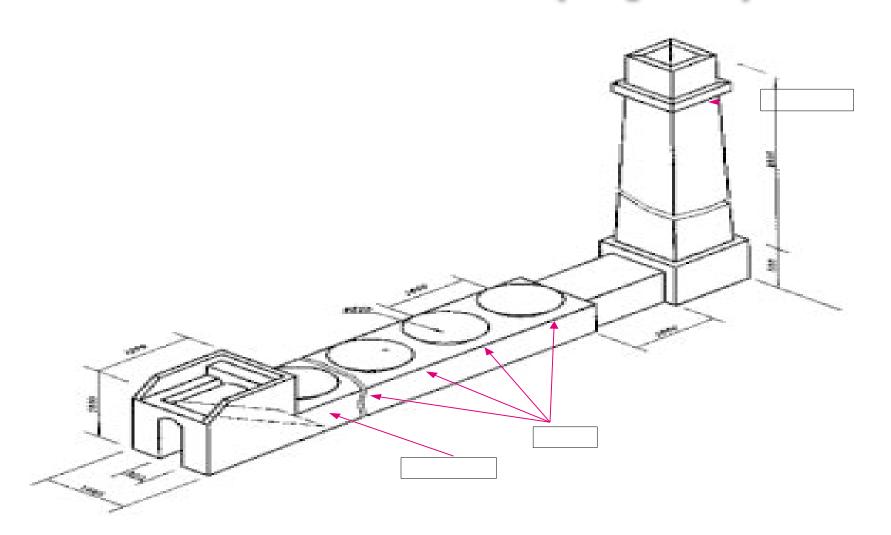








Economical kiln (4 pans)



Tools and equipment for making granulated sugar











Or use mechanical stirrer to stir syrup

Step-by-step description of the production process



Tapping of coconut sap

- The palm is first tapped for sugar when the second spathe emerges
- When the spathe is 40 cm long, it is gradually pulled down and held in place with string



Tapping of coconut sap

After about six

days the spathe

should be correctly

positioned for

tapping



The spathe iscut about 6 cmfrom the tip



The sheath is peeled off, exposing the spikiest which are then tied down with string



Collecting the sap

- sap is collected between 0600 and 0900 hrs and again between 1500 and 1800 hrs every day
- about 3 mm are trimmed offat every collecting time



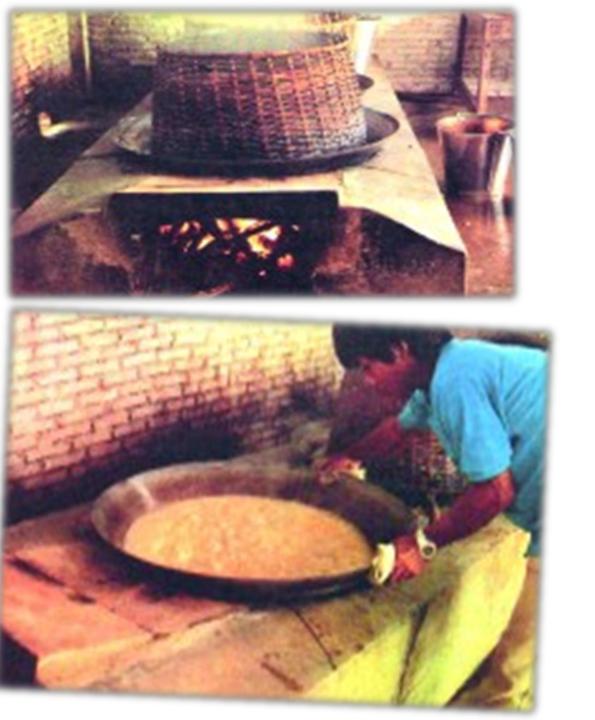
- a cylinder of bamboo or aluminium is placed over the end of spathe
- a single spathe may be tapped for up to one month, and a good variety may have two bunches in production simultaneously





Coconut sugar processing

After filtering, the sap is poured into a large pan holding about 60 litres



-This is heated and bring to boil, so that evaporation takes place and the syrup becomes sticky





The pan is taken from the fire and put on the tire wheel

—Slow continuous stirring to coo





Or use mechanical stirrer to stir syrup







- —Stir the syrup with the stirring device until it nearly becomes hard
- —Pour the sugar into the aluminium container or mould





- —Evaporation takes about 2 hours usually between 1000 and 1200 hrs daily
- The ratio between sap and sugar is about 7:1, and yield is about 9 kg/pan.



B. GRANULATED COCONUT SUGAR

 Collect coconut sap and heat until 80 %
 concentration is attained



While heating coconut sap to 80% concentrate, turn the pan right and left





 Stir with stirring device, then bring the pan down from the furnace

Continue stirring with fork—like spatula



- When sugar is nearly dried, stir vigorously
- Keep stirring until the syrup turns into granulated sugar



Then pass through a sieve to obtain uniform size

Packing is done by putting the granulated sugar in bottles or metalized film with size
4.5 X 8 cm, hexagonal longitudinal shape. Heat-seal the sachet or the bottle.

Coconut Nectar Processing

Coconut Sap



Filtration



Boiling



Standardization (14 Brix)

Filling 90-100 C

Seaming

Sterization 121 C, 15 Min

Cooling, Labeling

Packing

Coconut Nectar



























FOOD AND NUTRITION VALUE OF COCONUT SUGAR

Nutrition Parameter	Value	
Total energy content ¹ , cal/100g	369.4	
Total carbohydrate ¹ , g/100g	92.3	
Moisture ¹ , %	2.2	
Ash ¹ , %	2.2	
Crude protein ¹ , %	1.3	
Crude fat ¹ , %	0.12	
Vit.C ¹ , mg ascorbic acid/100g	23.4	
Thiamine ¹ , mg/100g	0.41	
Glycemic Index ² (GI)	35	

¹ Analyzed by the SGS, Philippines

GI- measures how much one's blood glucose increases in 2-3 hours after eating a certain food, Low GI=55 or less, Med GI=56-59, High GI =70 or more

Low GI food- is good for proper control and management of diabetes mellitus and has been shown to lower total and kll cholestrol.

Source of Data: Secretaria et al, 2003

² Analyzed by the DOST-Food & Nutrition Research Institute



COCONUT SUGAR MARKETING ADVANTAGE



It is a sweetener which can be safely used by people with diabetes because of its low glycemic index (GI) of 35

GI- measures how much one's blood glucose increases in 2-3 hours after eating a certain food, Low GI=55 or less, Medium GI=56-59, High GI =70 or more

Low GI food- is good for proper control and management of diabetes mellitus and has been shown to lower total and bad cholesterol (LDL)



COCONUT SUGAR MARKETING ADVANTAGE

- It is rich in micro minerals needed by the human body

Nutritional Elements (ppm) in dry matter	Coco Sap Sugar**	Brown Cane Sugar**	Refined White Sugar**	
Nitrogen (N)*	2,020	100	0	
Phosphorus (P)*	790	30	0.7	
Potassium (K)*	10,300	650	25	
Calcium (Ca)	60	240	60	
Magnesium (Mg)*	290	70	10	
Sodium (Na)*	450	20	10	
Chloride (CI)*	4,700	180	100	
Sulfur (S)	260	130	20	
Boron (B)	6.3	0	0	
Zinc (Zn)*	21.2	2	1.2	
Manganese (Mn)	1.3	2	0	
Iron (Fe)*	21.9	0.6	0.6	
Copper	2.3	12.6	1.2	
* Important micro mineral and nutrients in coconut sugar				

^{*} Important micro mineral and nutrients in coconut sugar

** Analyzed by PCA-PTAL. Sept. 11.2000 (Secretaria et al. 2003)







ชีวาดี น้ำหวานดอกมะพร้าวอินทรี

Food Design Contest

Award 2011

Technology transferring to research fund 2012





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ชาวการสารค่อง 2 คือ ชาวการสาระได้เห็นก็อ

THE 激励能源 HIN Published: July 5, 2012 01:32 IST | Updated: July 5, 2012 01:33 IST KOCHLJuly 5, 2012

Reviving fortunes of coconut-based products



John V. Tucker Sarapee Yundyong Uraia Waibuta

John V, Tucker is keen to enlist the help of APCC to get the U.S. FDA stamp on the health qualities of coconut-based food products.

"..... Sarapee Yuadyong and John V. Tucker are members of a growing legion of crusaders for coconut as health food. One makes social interventions that touch people's lives in poor Thai villages.

Ms. Sarapee works with small Thai communities in Samutsong Kram, helping coconut farmers increase their income through diversifying products.

She says she devised a method to extract sugar from inflorescence sap, which is now fetching rich dividends.

With a big market for the product in Singapore, Farmers' income level has risen 40 per cent with value addition, says Ms. Sarapee, whose company Chiwadi markets other innovations too"



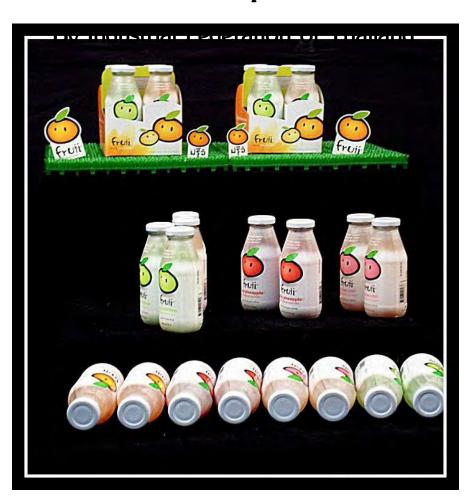




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Innovation Coupon 2012











เลขที่อนุสิทธิบัตร 6609



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อนุสิทธิบัตร

อาศัยอำนาจตามความในพระราชบัญญัติสิทธิบัตร พ.ศ. 2522 งแก้ไขเพิ่มเติมโดยพระราชบัญญัติสิทธิบัตร (ฉบับที่ 3) พ.ศ. 2542 ริบดีกรมทรัพย์สินทางปัญญาออกอนุสิทธิบัตรฉบับนี้ให้แก่

มหาวิทยาลัยเทคในใลยีพระจอมเกล้าพระนครเหนือ

จุฬาลงกรณ์มหาวิทยาลัย

สำหรับการประดิษฐ์ตามรายละเอียดการประดิษฐ์ ข้อถือสิทธิ และรูปเขียน (ถ้ามี) รากฏในอนุสิทธิบัตร

เลขที่คำขอ

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วันขอรับอนุสิทธิบัตร

31 สิงหาคม 2553

ผู้ประดิษฐ์

รองศาสตราจารย์นฤมล เครือองอาจนุกูล และคณะ

ชื่อที่แสดงถึงการประดัษฐ์

หัวจีดแบบแกนร่วมเพื่อใช้ในการปั่นและพ่นด้วยใฟฟ้าสถิต

จรนี้มีสิทธิหน้าที่ตามกฎหมายว่าด้วยสิทธิบัตรทุกประการ ให้ผู้ทรง

ออกให้ เดือน กันยายน W.ff. 2554 เดือน หมดอาย ก็งตาลม W.Fl. 2559 (avva) นายสมศักดิ์ พณิชยกุส รองอธิบดี ปฏิบัติราชการแทน ฮสินต์กรมทรัพย์สินทางปัญญา น้ออกสิทธิบัตร

พนักงานเจ้าหน้าที่

ทมายเหตุ 1, ผู้ทรงอนุสิทธิบัตรต้องสำระค่าจรรมเนียมรายปีเริ่มแต่ปีที่ 5

- 2. ผู้ทรงอนุสิทธิบัตรจะขอสำระค่าธรรมเนียมรายปีส่วงหน้าโด
- ภายใน 90 วันก่อนวันสิ้นอายอนุสิทธิบัตร ผู้ทรงสิทธิบัตร มีกำหนดคราวละ 2 ปี โดยอื่นคำขอต่ออายุ
- การอนุญาตให้ใช่สิทธิตามอนุสิทธิบัตรและการโอนอนุสิทธิบัต

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เจ้าหน้าที่

010803

Global standards









First Launch in the country

- Low GI
- Good source of potassium
- A Lifestyle Coco sugar

Healthy gift from nature





Coconut

Coconut Chip





























Nata de Coco































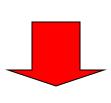


Honey Roasted Coconut

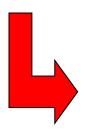


























Dehydrated Sweet Coconut



Conclusion

- More value addition of coconut products based on consumer market, more benefit to coconut farmers.
- Innovation or new products should concern with health and beauty.
- Standard /GMP/Organic /GAP need by global or niche market.



Thank you for your attention