VOLUME 22, No. 2 2015 / ISSN 0854-5006

COCOINFO INTERNATIONAL

Cocoinfo International is a popular journal on the coconut industry published twice a year by the Asian and Pacific Coconut Community (APCC)
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Foreign subscription rates including airmail postage for one year (two issues) is US$35.00 (APCC Member) US$ 40.00 (Non-APCC Member Countries)

From the Editor-in-Chief

FAMILY NUTRITION, HEALTH AND WELLNESS FROM THE TREE OF LIFE

A first-time *'International Symposium on Quality Coconut Oil for Nutrition and Health'* held in New Delhi, 28-29 September 2015 was organised and funded jointly between APCC and the Government of India through the Coconut Development Board. The event brought together highly eminent physicians, medical doctors, nutritionists, scientists, industrialists and a handful of leading coconut stakeholders, who together were instrumental in reviewing clinical research work conducted to date on coconut oil including studies under consideration in some countries and enabling the establishment of the APCC Scientific Committee on Clinical Studies to chart the way forward for conclusive studies that would scientifically declare the truth about nutrition and health benefits of coconut oil.

It would be in order for me to fully utilize the clinical statement put out over 20 years ago by the eminent Professor Emeritus, Dr Jon J. Kabara, PhD, of Michigan State University and Consultant to Private Industries, Universities and Government Agencies in Galena, Illinois, USA.

"*Our prediction at an international conference of the American Oil Chemist Society (1995) that these tropical oil derivatives were going to be the new health oils for the next millennium is coming true. Not only does monolaurin have antibiotic and antiviral activity but also these remarkable derivatives have been shown not to cause resistance organisms to appear. In addition, it has now been shown that monolaurin can reduce the resistance of germs to antibiotics.*

Never before in recent times has recognition of the positive health effects of tropical oils been stronger. New and exciting health and industrial uses of monolaurin are available and predictable. Monolaurin derived from coconut and palm kernel oils suggest a bright future for an industry that was once referred to as a "sunset industry".

This means that the oil industry must move quickly to modernize itself in making value added products from these oils which will contribute to a more vigorous and healthy agriculture future."

What the stakeholders of the coconut industry need is assurance of economic viability that would primarily sustain coconut tree population, encourage replanting and development of new coconut lands. To achieve this it is vital that products of coconut are both marketable and profitable in view of the current domestic and international consumer markets. A major setback in the industry was due to the negative health campaigns against coconut oil over a period of 30 years. These campaigns were driven mostly by patrons of opposing vegetable oils based on untruth and falsely fabricated commercial innuendos. The negative impact of these campaigns sent the coconut industry, world-over, reeling back into what was described then as a 'sunset industry'. One of the best positive impact strategies is to declare, with scientific proof and evidence, that the coconut fruit, coconut oil and its many edible products of coconut are nutritious, healthy and safe for human consumption.

The Symposium at its closing considered the theme 'From Diet to Therapy' as a guide for clinical studies as the respective researchers and institutions proceed with study designs in accordance with the gaps identified. The stakeholders of the coconut industry stand to be by the beneficiaries of the results and positive outcomes of the study projects.

APCC is pleased with the outcomes of the Symposium and is committed to working together with the willing institutions and researchers to be able to cross this threshold of knowledge when we reach the much awaited status of scientific declarations needed to impact on international consumers markets.

URON N. SALUM
Executive Director and Editor in Chief

South–South cooperation – The Philippines / Rep. of Fiji

The two countries signed a memorandum of understanding to cooperate in the development of Fiji's coconut industry. Under the agreement, stakeholders in Fiji will receive assistance from specialized partner agencies in the Philippines in the fields of high-quality planting material, inter-cropping practices, and export-oriented coconut product processing.
(www.fao.org/economic/est/en)

Coconut Board urges FPOs to focus on value addition

Given the price fall in copra and coconut oil, the Coconut Development Board has asked Farmer Producer Organisations (FPO) to focus more on value-addition to ensure a steady income.

FPO's can explore the possibility of extracting coconut milk and add value to it considering its demand in urban and rural markets, a senior official in the Board said citing the launch of Flavoured Coconut Milk. He pointed out that the US company 'So Delicious Dairy Free' produces 65 different products from coconut milk.

Initial experiments showed that extraction of 800 ml of milk is possible from an average nut and the processing does not require any high level technical procedure or training. By way of this value addition, he said that a farmer can ensure an income of Rs30-40 per nut rather than selling it at throw away price.

The processing technology neither involves any huge investment and FPO's can avail the know-how from CDB Institute of Technology at Vazhakkulam. Meanwhile, the coconut oil market both in Kerala and Tamil Nadu is in a steady line with slight fluctuation in prices quoting at Rs10,900 (Rs11,200) and Rs10,300 (Rs10,150) respectively. Copra prices are also ruling at Rs7,350 (Rs7,550) and Rs7,300, in the same.

Thalath Mahmood, the new President of Cochin Oil Merchants Association, said that the market is expected to revive ahead of festival demand.
(http://www.thehindubusinessline.com)

Coconut Tree Climbing a Rewarding Profession Also for Women

A report from India's Kerala state says the Kudumbasree Kozhikode District Mission is planning to set up a district level unit of women coconut tree climbers soon. The plan to form the unit came after the district level anniversary celebrations of the mission held in Kozhikode where 15 women from the district took part in a coconut tree climbing competition. The unit will be formed by including all of them.

Priya Biju from Kattippara, who bagged the first place in the district-level competition and third place at the State level said coconut tree climbing was a "highly rewarding profession" even for women. She climbs around 40 coconut trees per day which ends by mid afternoon, allowing her time still to attend to family while at the same time making a living. *(UCAP Bulletin)*

Neera offers windfall for migrant workers

Kerala is proving to be the magnet for migrant labour in an emerging sector. Workers from other States are slowly and steadily establishing their dominance in the Neera production sector in Kerala, even as the Coconut Development Board (CDB) is finding it difficult to find takers from the local population for an immediate requirement of over 2,00,000 Neera technicians.

In the absence of trained tapping workers, entrepreneurs who had turned to Neera production are finding it difficult to meet the growing demand from the market, a report by the board says.

Highlighting the potential of the Neera sector, a CDB pressnote cites the example of Anarol Abdul Razak from Assam, a technician employed at a Neera production company operating from Kaipuzha in Kollam who earns a monthly income of Rs.44,000. The company employs as many as 30 other workers from Assam, Chhattisgarh, and Tamil Nadu.

The pressnote says an eight-week training course for Neera technicians conducted by the CDB offers placement. A batch of 25 workers from Chattisgarh have completed training and are currently employed as Neera technicians at Perambra. Another batch of 28 workers from Nepal is undergoing training in Kozhikode.

CDB says coconut producers' societies are reporting increased earnings through the export of Neera and value-added products to Indonesia, the Philippines, Thailand and Malaysia. The paucity of labour, however, is a stumbling block to their efforts to tap the market. The report says the demand for Neera technicians in Kerala is expected to go up to 10 lakh if 10 per cent of the coconut palms in the States are tapped. With the average monthly income of a technician pegged at Rs.20,000, it offers a part-time employment potential for students. CDB is also exploring means to attract women to the Neera sector as tapping workers.
(http://www.thehindu.com)

Coconut Farmers Form Coop to Build Coco Processing Plant in Batangas

A group of coconut farmers in San Juan, Batangas has formed a cooperative to build a P91-

million coconut processing plant under a public-private partnership model intended to turn out products for exports, increase their incomes, and replant seedlings to replace old coconut trees. Proponents hope to enlist 3,500 farmers as coop members but so far about 300 have signed up. The project is supported by the Philippine Coconut Authority (PCA) which has committed to donate a P30-million processing plant, according to Cristanto Gualberto II, General Manager of the San Juan Coconut Producers & Processing Cooperative (SJCPPC).

A memorandum of agreement was signed between PCA and cooperative officials on August 27, 2015 during the Coconut Week Celebration. The total project's capital cost requirements are to be raised from equity of coconut farmers/coop members (P23.15 million or 25.5 percent); PCA grant for processing plant (P30 million or 30 percent); and loans and investments (P37.67 million or 41 percent).

Gualberto said the proposed processing facility is designed to process 20,000 nuts at two shifts a day, a volume that is less than 11.5 percent of the total coconut production of the town. It will have a daily output of 1,430 liters of virgin coconut oil (VCO) which will be exported to a committed buyer in Japan. This partner Japanese company reportedly has a standing offer to buy the plant's 20 metric ton VCO output per month. At the same time, the plant will undertake processing by-products such as coco water, coconut shell, paring cake, paring oil, coco flour, and coconut charcoal which have ready markets. *(UCAP Bulletin)*

Franklin Baker Expands Coco Manufacturing Facility in Davao

Franklin Baker Co. of the Philippines (FBCOP), the country's pioneer in desiccated coconut production, is investing in the development of an integrated coconut processing plant in the former CJ-Toyota production facility in Darong, Davao del Sur. The plant will provide the biggest production capacity increase across its existing product range, including desiccated coconut, virgin coconut oil and coconut water. In addition, the new facility is designed to expand FBCOP's product range to include new product formats such as retail packs, coconut flour, coconut milk and cream.

The company plans to commission its new manufacturing facility at the end of this year, with coconut milk and coconut water lines becoming operational in the early part of 2016, according to Cesar Galvez, FBCOP Vice President for Operations. Galvez said that FBCOP has spent considerable time and resources in the planning, design and construction management of the new facility including optimized process flows, the identification of state of the art equipment, skills training, systems set-up and detailed market research to ensure that the right product configuration is matched to market demands. *(UCAP Bulletin)*

UCPB-CIIF Finance's Loans to Coco Farmers Reach P276 Million

UCPB-CIIF Finance and Development Corp. released P53.8 million in new loans to coconut farmers in September, bringing its nine-month total to P276.55 million. The loans financed alternative livelihood activities of coconut farmers such as cash crop cultivation, livestock raising, agricultural commodities trading and village-based processing of coconut by-products to enable them to augment their income and build their self-reliant capabilities.

"Given our high collection rate of 97 percent, we believe the coconut farmers are generating sufficient additional income from the livelihood projects we are financing not only to repay their loans but also to save and to improve their quality of life," UCPB-CIIF Finance President Edgardo Amistad said. UCPB-CIIF Finance is the social enterprise development arm of the United Coconut Planters Bank (UCPB) Group and the Coconut Industry Investment Fund (CIIF) companies. It engages in development lending.

The UCPB Group and the CIIF companies organized UCPBCIIF Finance in November 1994 to create an effective channel for delivering credit to coconut farmers, who have difficulty tapping formal sources of financing owing to their small size and the relatively higher risks of their micro-enterprises. Since it started its development lending operation 21 years ago, UCPB-CIIF Finance has infused P7.4 billion in loans into the rural economy, benefitting 390,223 coconut farmer households in 63 coconut-growing provinces of the country. *(UCAP Bulletin)*

Coconut Water Consumption Rose 60% in Ten Years

According to Canadean, global coconut water consumption has risen by 60% over the last ten years, driven mostly by Asia and Latin America. Coconut water has only recently taken off in North America and Western Europe – in the USA volumes have leapt from less than half a million litres to nearly 200 million litres in 2014. This is where most of the branded volumes of this potassium rich drink end up. Most of the coconuts are sourced from Brazil or Thailand, countries who have consumed the drink for many years. Much of the volume sold in countries such as India is unpackaged, or straight from the coconut, sold by street vendors.

Coconut water is heralded as being low in fat, calories and sodium and therefore good for rehydration after moderate exercise. It also has more potassium than a banana which is good for curing a hangover.

World Coconut Day Celebrated on September 2 in India

The World Coconut Day-2015, themed 'Coconut for Family Nutrition, Health and Wellness', was celebrated on September 2 in Vijawada, Andhra Pradesh. The Coconut Development Board had said in an official release that around 500 farmers from coconut-growing states of the country attended the function here. Of the total farmers, around 75 per cent coconut-growers are from Andhra Pradesh.

An exhibition was held at the venue showcasing the latest technologies in the coconut sector and various value added coconut products, including Neera. The Board informed as per the latest statistics of Horticulture division, Ministry of Agriculture, Andhra Pradesh occupies the first place in coconut productivity at 14,997 nut per hectare. The state is at the fourth place in terms of area with 1,21,920 hectares, while in terms of production with 1828.46 million nuts, it is at fourth place in the country, the release said.

Since 1990, the Board has been implementing various development schemes in Andhra Pradesh for expansion of area under coconut, improving the production and productivity. There are 610 coconut producers' societies, 49 coconut producer federations and three coconut producer companies present in AP, it said. During 2015-16, the Board has allocated Rs. 128.432 lakh for implementation of various development schemes in Andhra Pradesh for coconut. *(http://www.ndtv.com)*

ICAR-CPCRI celebrated World Coconut Day at Tumkur, Karnataka, India

World Coconut Day was jointly organized by CPCRI-Kasaragod, Tumkur University and Bhoomi Sustira Abhivradhi Sanste, Hassan on September 2, 2015 at University Campus, Tumkur. The theme announced by APCC for this year's World Coconut Day is 'Coconut for Family Nutrition, Health & Wellness and CPCRI has selected the topic on Kalparasa that fitted well within the APCC theme.

While inaugurating the programme, Shri T.B. Jayachandra, Hon'ble Minister for Law, Justice and Animal Husbandary, Government of Karnataka complimented the efforts of CPCRI to popularize the neera technology and its value added products for empowering coconut producers and wellness of consumers. Hon'ble Minister, after tasting the Kalparasa, said that product has excellent qualities for improving human health and appropriate decision would be taken to evolve neera policy in Karnataka after visiting CPCRI, Kasaragod and further discussions with other stakeholders.

Shri Krishna, former speaker, Karnataka Legislative Assembly, Government of Karnataka released a technical bulletin on Kalparasa and stressed the need for evolving neera policy in Karnataka for the benefit of producers and consumers. He was very optimistic and confidant that neera policy will be implemented soon in Karnataka. Dr. P Chowdappa, Director, ICAR-CPCRI explained that CPCRI Kalaparasa technology could improve the economy of small and marginal farmers and could create green colour jobs in rural areas and can empower rural youth and women. He also said, by tapping just 10% of the trees in the country, the total returns would be to the tune of Rs. 36,000 crores. He stressed that the future of coconut depends on value addition and Kalaparasa could play greater role and it can be sports drink and even diabetic patients can consume as it has low glycemic index. Mr. Jayaprasad, Bhoomi spoke on the benefits of Kalparasa. In his presidential address, Prof. A.H. Rajasab, Vice Chancellor Tumkur University emphasised development of neera policy in Karnataka and urged the scientists to develop a technology to avoid fermentation so as to store neera at room temperature. In the technical session Dr. K. B. Hebbar, Head, PB & PHT, CPCRI, Kasaragod presented a detailed account of Kalparasa collection method, its handling, transportation, quality standards and processing into value added products like sugar, jaggary, honey and other confectionary products. He highlighted success stories.

As part of the programme, an interface session on 'Present status of formation of companies and federations and the way forward for Kalparasa collection and its marketing in Karnataka' was organised involving farmers, scientists and officials of coconut producers' societies. It was told that already six companies were formed in Karnataka and the areas not covered were decided to be included in due course of time. It was also felt that licensing and tapping training should be given to the registered companies for better quality, coordination and marketing. Dr. Nityananda Shetty and Viswanath Anekatte co-ordinated the programme.

CPCRI also exhibited Kalparasa and its value added products and coconut products during the programme. A demonstration on how to collect fresh and unfermented 'Kalparasa' using coco-sap chiller was arranged for the benefit of stakeholders. Kalparasa was distributed to all the participants who attended the programme. Dr. D. Jaganathan, Scientist, CPCRI, Kasaragod coordinated the programme. About 350 coconut growers from

Karnataka participated in the programme. *(www.cpcri.gov.in)*

Disease hits Pomeroon Coconut farmers in Jamaica

Pomeroon farmers are assessing that if effective interventions are not immediately taken by the relevant bodies to address the problem that they continue to face with the prolonged infestation of the Red Palm Mite disease that continues to destroy both the mature and young coconut trees as well as the banana and plantain suckers, the coconut industry is on a brink of collapse. "The problem have gotten worst, if nothing is been done to address the problem by another year, the coconut industry would be gone." Coconut growers have already seen a decline of some 30 percent in their coconut production. They are anticipating a further decline by year end if there is no change in the situation. Babita, who hails from Land of Promise, in the Lower Pomeroon River, said that the situation has worsened. Coconut farming is what she and her family depend on for a living. The frustrated farmer said that the young coconut fruit are falling off. This gives an indication that the coconut tree is dying. The frustrated farmer said that she has been applying "Monocrotophus" to her affected coconut trees but has noticed in some instances that some of the coconut trees continue to worsen. Babita, who owns some eight hundred acres of coconut farm lands stressed that the problem is not isolated to only one particular area in the Pomeroon River. Rather it is widespread in the entire Pomeroon. Farmers are worried over what will happen should the coconut Industry fail. Another coconut farmer, Seigfreid Gill, of Marlborough, in the Lower Pomeroon River said that prior to experiencing the problem with the Red Palm Mite disease, one of his coconut trees at the start of the bearing used to produce a dozen coconuts on one thrush. Today Gill said he has been noticing one and two coconuts on one thrush. He said that almost half of his coconut trees are dying slowly and he is worried. He wants to know what other strategy to apply in order to save his production. His dependence is on coconut. Other farmers including, David Kansinally, Albert Benn, Errol Sam, Julian Benn and Randolph Hammon, who spoke with this newspaper maintained that all coconut farmers shared the same concerns with regard to the serious problem. They face the severe threat of the Red Palm Mite disease. They are appealing to the experts within the Agriculture Ministry to see their plight as a "priority." Farmers who are not applying chemicals to their affected coconut trees have also expressed concerns about those farmers who are applying chemicals to affected trees and are selling those coconuts on the market.

PCA to set up coconut hubs in Mindanao

The Philippine Coconut Authority (PCA) is setting up coconut hubs in the different areas within the year with an allocated budget of P600 million to implement the project in Luzon, Visayas and Mindanao. PCA deputy administrator Roel M. Rosales said Mindanao will get half of the total funds. The coco hub dubbed as Kaanib Agro Enterprise Program is a level support project of the existing Kaanib project that offers livelihood assistance to coconut farmers through coco farmers' village project. He said the project aims to make coco farmers become entrepreneurs making them owners of enterprises. "This will let them engage in several coconut related businesses be it in coco sugar, coco coir, virgin coconut oil and other coco related by-products," he said.

The project will be implemented in three years. He said the first year will be spent for the provision of planting materials consisting of 500 seedling materials per hectare plus organic fertilizer. The second year is the sustenance of fertilization requirement and the third year on marketing and financing. Rosales said small coco farmers don't have financial resources or operating capital and "our focus is to empower them so they would also learn the business and would know how to link with the market." "The government is here to support them," he added. He stressed that their support is through the local government units in collaboration with farmers' association/cooperative. He said this is in the form of acquisition of equipment or building where the hub will be set up. (Panay News)

Samoa: Coconut Tree Planting Day Targets 20,000 Tree

Coconut tree planting day which falls after the White Sunday has injected over 25,000 new trees in the country since it started 4 years ago. A record number would be added this year as the Ministry of Agriculture has set an ambitious target of 20,000 coconut trees to be planted this year. This number is calculated on the increase in the number of interests expressed from schools and the public. The programme initially involved only primary schools but it is now extended to secondary schools. More than 3000 coconut seedlings will be given out to 30 selected schools to plant in this year's Coconut Tree Planting Day. These schools include primary and secondary schools from government, mission and private.

Some schools however seem to be running out of space to grow the trees. Auali'itia Parate Matalavea of the Crops Division of the Ministry of Agriculture said that some of the schools who have taken part in the programme have told the Ministry that there

are no more spaces in the school compound to grow the trees. "We have told them that students can take the trees home if there is space there to grow them," Auali'itia told Newsline. Auali'itia said that the Ministry does not check whether the trees are growing for they trust that the schools are looking after these. More than 100,000 acres of land in Samoa are grown with coconut trees. The 20,000 coconut trees would help to meet the target of a million trees that Samoa would plant in its effort to combat climate change.
(www.newslinesamoa.com)

Tongan youths' coconut oil trade brings communities hope

A project by the Tonga National Youth Congress (TNYC) has already made a difference to communities in the outer Tongan islands. The successful social enterprise involves the collection of fresh coconuts for processing into coconut oil for sale locally and internationally. The programme has had an impact for three men from the village with disability. They are part of the Kolomotua Virgin Coconut Oil (VCO) processing unit located in Sopu, Tongatapu.

Siaosi Vaka has been in a wheelchair since a car accident in 2006. He was married in 2011 and uses the income he earns to cover their daily needs. He told TNYC's Mr Siotame Drew Havea of the huge difference it has made in their lives when he joined the local VCO in April this year. His job at the VCO is splitting the coconuts for crating. He says he loves going to work and meeting other youth and feels he learns new things by working and also building relationships with other people said Mr. Havea. Mr. Havea had approached the Officer in Charge of the VCO Programme to see if people with disabilities wanted to come and see if there is a job they could do at the VCO. When Siaosi's two friends Kiteau Kuliha'a and Samuela Tonga knew Siaosi was working, they also approached the VCO to find work. Mr. Kuliha'apai also told Mr. Havea one day, "It makes a whole difference when you have money and can buy what you need from the shop."

The abundance of coconuts was one of the reasons for taking up coconut oil production said Mr. Havea. "We decided to set up a business focusing on coconut because every family in Tonga have coconuts even if (they) are Royalty or commoner; rich or poor, we all have access." An outfit called the Youth Enterprise Service Unit (YES U) was set up involving 16 communities where YES U buys coconuts from certified organic farmers and delivers them to regional collection centres where it is processed into coconut oil and then taken to the warehouse for export. The project is able to reach remote areas where there is no economic activity and high unemployment. The business is also owned by the community. The model allows for sustainability and is organic, preserving the environment and allows farmers and communities to gain a premium price whilst including the community, Mr. Havea says. The seven villages involved have produced more than a thousand 20-litre buckets earning income for the villages.

TNYC formed a business partnership with the Tauranga based company Heilala Vanilla about a year ago in August 2014 to produce coconut oil under the Heilala brand. The partnership with Heilala Vanilla followed on as a result of the Rural Enterprise for Sustainable Development in Tonga (RESULT) established in 2012 with support from Women in Business Development Inc. (Samoa) and Oxfam. RESULT trades in virgin coconut oil (VCO) and other coconut products including soap. Heilala Vanilla's Jennifer Boggiss, Director and co-founder said, "Partnering with TNYC in Tonga was a natural and perfect fit for Heilala – we have established distribution and marketing channels in the food ingredient category which we have established with Heilala Vanilla that allow us to add Heilala Coconut Oil to. "In addition partnering with TNYC fitted with the values of Heilala, which was founded on assisting the communities of Tonga. And this value continues today as we grow our markets and product range. Partnering with TNYC allows us to partner with additional growers and communities throughout Tonga which is very important to Heilala."

Although building market share for Heilala Coconut Oil has taken longer than anticipated due to the large number of coconut oils on the market – it is very similar to Vanilla having to educate consumers on what makes good quality coconut oil, including the difference between refined and unrefined, which is Heilala Coconut Oil. "Not all coconut oils are equal!" says Ms. Boggiss.

Almost 100 young people are employed with 200-300 involved indirectly. Mr. Havea reported back with some feedback he collected from people in the communities. In Ha'apai (Central Island Groups) families were able to afford school uniforms instead of relying on remittances from overseas relatives. One school leaver said, "When I finish school, if no jobs are available I can make a living working at YES U. Another student said "Coconut oil is ideal because every family has coconut trees."

For women it is a form of independence – "The income from the coconut allows me to support the family and not rely on the husband" she says. A Community Officer from Tongatapu says that the income from the coconut means they are able to meet family and community obligations. Even bad weather does not impact the income of the family, "now with

bad weathers – we have income from the coconut and do not have to go out fishing."

Another aspect of the production of coconut has been the ability to try other alternative livelihoods such as the promotion of eco-tourism. TNYC is the only NGO with branches in the outer islands. It was founded in 1991 by Government, MPs, churches and community leaders allowing one youth group to register with TNYC. There are 6 offices covering the 6 island groups. Each island group elects its own Youth President and the 6 Presidents form the Governing Board and elect a TNYC President. Their mission is to better the welfare of Tongan Youth through programmes that foster responsibility, citizenship, community service and leadership. Pacific Islands Trade & Invest (PT&I) NZ have worked with Heilala Vanilla and continues to support efforts to import products from Tonga. *(www.pacifictradeinvest.com)*

Minister of Environment and Forestry Urged to Introduce Coco Peat as Peat Soil Substitute

Indonesian Coir Industry Association (AISKI) urged Minister of Environment and Forestry, Siti Nurbaya, to introduce coco peat for alternative planting media to substitute peat soil in the nurseries of estate crops and industrial forest. This move was made following the issuance of Government Regulation No. 71, 2014 concerning Protection and Soil Peat Ecosystem Management which stipulates that areas with soil peat of more than 3 meters deep to be declared as protected areas. This regulation has made companies dealing with estate crops and industrial forest feel uneasy. According to Ady Indra Pawennari, Head of AISKI R&D Division, most nurseries owned by estate crop and industrial forest companies use soil peat for planting media, with the issuance of the said regulation they have to find alternative planting media and coco peat could be the solution of this problem. Ady explained further that the use of coco peat in Indonesia is not something new. Some nurseries have used coco peat for example PT. Riau Andalan Pulp and Paper (RAPP) in Riau. Since the issuance of the regulation, two companies have used coco peat for their planting media, they are PT. ITCI Hutani Manunggal in East Kalimantan and PT. Adindo Hutani Lestari in North Kalimantan.

Coco peat is a very good soil conditioner and can retain moisture eight times of its volume. It has pores to enable air circulation and sun ray penetration so that root growth can be faster. Coco peat also contain *Trichoderma molds,* a kind of enzyme which can reduce pest in the soil and maintain the fertility of the soil. It also has various nutrients needed by seedlings such as Calsium (Ca), Magnesium (Mg), Kalium (K), Natrium (Na) and Phospor (P). *(http://www.tribunenews.com)*

Coconut Board to Expand Coconut Area in North-East Region

The Coconut Development Board (CDB) hopes that its focus on North-Eastern States will help it expand the area of coconut cultivation there. TK Jose, CDB Chairman, said last month that coconut cultivation was happening in the seven north-eastern states of India. Stating that coconut was grown previously in some places in the region years ago, he noted that such was not organised cultivation.

Area expansion is happening on a major scale in States such as Assam, Arunachal Pradesh and Meghalaya. He said the expansion of coconut plantations covered around 50,000 hectares in Meghalaya, and around 40,000 hectares each in Arunachal Pradesh and Assam in the last four years. He added that people there were taking up activities such as raising nucleus seed gardens and plants in a big way in the last three-four years. *(UCAP Bulletin)*

Kerala Coconut Farmers to Ramp up Marketing of Neera and Neera Honey

In a move beneficial to nearly nine lakh coconut farmers in the state, the consortium of coconut producing companies has decided to actively market the byproducts of Neera and Neera Honey, whose demand has reportedly increased in both domestic and international markets. To initiate the project, the Palakkad Coconut Producer Limited (PCPL) is negotiating the first round of procedures to ink an agreement with a Mumbai-based firm for a 2.5-tonne deal of Neera Honey.

Neera Honey is a rare natural product containing Vitamin A, B and C and a rich source for iron to anaemic patients. It is also used in pharmaceutical formulations and as sweetener in confectionery like ice creams. "The agreement with the Mumbai-based firm will be signed on August 20. Initially, they have placed an order for 2.5 tonnes of Neera Honey, a deal worth `15 lakh," said B Padmanabhan, a member farmer with PCPL. The company in Mumbai has enough sources to distribute the product in foreign countries also, said Padmanabhan on the prospects of overseas marketing. Regular orders from the company will help PCPL as well as the coconut farmers depending on it, he added.

The consortium of coconut producing companies itself has bagged an order from Delhi for 50,000 bottles of Neera, the unfermented sweet sap from coconut flowers. Initially, the units under the consortium- Kaippuzha, Thiru Kochi and a soon-to-be-operational plant at Kuttiyadi- will undertake the supply of the order.

A project of special purpose vehicle (SPV) is underway and with the implementation of it, the consortium will be able to handle bulk orders. According to Coconut Development Board Chairman T K Jose, the Board is getting enquiries for Neera from overseas destinations including Dubai, Europe and London. "Large scale

export requires proper action plan. The safety standards set by each country will be different. We need refrigerated containers to transport them, first of all. But in India, we would be accountable to the Food Safety Standard Authority of India. Therefore, we plan to tap the domestic market before exploring export potentials," Jose said. *(http://www.newindianexpress.com)*

The Pacific way – turing coconuts into power: The Case of Kiribati

With the assistance of the United Nations Development Programme (UNDP) and the Secretariat of the Pacific Regional Environment Programme (SPREP), coconuts are taking on a new role in the sustaining and progression of livelihoods in Kiribati. Kiribati, a small atoll nation spread across 33 coral atolls in the Pacific with a population of 102,351, has challenges in their fuel and energy supply. In order to solve this, UNDP and SPREP is supporting Kiribati in a new and innovative project which will utilise coconut oil as fuel. Within Kiribati, the copra industry contributes roughly a quarter of the country's GDP. With rising diesel prices, using natural, indigenous resource to lower CO2 emissions and also reduce the cost of power makes a lot of sense. The end goal of this project is to assist the Kiribati Government to replace fuel for generators that is today 100% fossil, with clean, locally produced coconut oil, starting with Abemama island.

A feasibility study on coconut as biofuel was completed in 2012. The results from the study found that using coconut oil (CNO) benefitted the country by saving costs for government and transport agencies, generating a local market and being much more environmentally friendly than other forms of energy production. Based on these positive results, further funding was provided by the Government of Denmark for the creation of the full project which will enable Kiribati to utilise coconut oil as a fuel substitute. The biofuel project will construct a Biofuel Mill on Abemama Island that will produce CNO. There is currently no CNO production on the island, although the island does produce copra. The CNO produced is suggested used at three different sites around the island; Kauma High School, Chevalier College and the Island Council.

At these sites the CNO will be blended with Diesel Oil Fuel (DFO), with the end goal is to have biofuel with 90% CNO/ 10%DFO. It has been estimated that at the target level of 90%CNO/10%DFO, only 1,980 litres of DFO would be used per year. At this production level, the volume of copra consumed (30-35 tons), will represent less than 4% of Abemama production. South Astral of Australia has been contracted to complete the work on island. Currently the company is consolidating the necessary supplies and materials with the goal of shipping this out through Sydney during November and December. The first task will be to commence the construction of the building at the Island Council site. The building, plumbing and electrical work will be given to a local builder, with the aim of having this job completed by November. Immediately follow-ing this the engineer will travel to Abemama to install the expellers and generators. The goal will be to have the construction and installation aspects of the project completed by the end of the year. The local community is excited about the project, and so is Miriam Iakobwa, the project manager: "We look forward to reducing our dependence on imported fossil fuels though production of biofuel from locally available resources. This will make a huge difference to not only the local communities but also the country as a whole."
(www.ws.undp.org)

Mindanao Coconut Farmers Urged to Explore Potentials of Coconut Products

The Philippine Coconut Authority (PCA) in Davao City has urged farmers to explore the full economic potential of coconut by adopting the whole-fruit approach and turn to value-added products for export. PCA Davao Regional Manager Rex B. Buac said, "Coconut farmers can directly participate and get a bigger share of the profits of the industry by adding value to their coconut products instead of being a mere producer of copra." He pointed out that up to 90% of the total production of coconut in the Philippines is devoted to copra and coconut oil, which utilizes only 35% of the whole nut.

Coconut oil has been the country's major agricultural export product for decades. On the other hand, the advent of high value niche market for emerging coconut products such as virgin coconut oil (VCO), coco water and coir fiber presents new opportunities. There are 30 nontraditional coconut export products that contribute to the industry's earnings, of which five are considered as potential export winners: VCO, coco sap sugar, coconut water, coconut flour and coco coir.

He cited the substantial contribution of Mindanao in coconut production, adding that 65% of the total volume of coconut water in the country is in region but only 0.36% of this is being processed and exported. He said about four million MT of coconut husk or 64% of the total volume in the country is in Mindanao but only 5% of the volume is economically utilized. *(UCAP Bulletin)*

Organic Coconut Association of the Philippines is New UCAP Member

UCAP welcomes its newest regular member, the Organic Coconut Association of the Philippines, Inc. (OCAP). Mr. William T. Guido, President, is OCAP's representative in UCAP. The organization's business address: 349 Ortigas Avenue, Barangay Wack Wack Greenhills East, Mandaluyong City. Telephone Numbers: (632) 721-2660, 721-2585 and 721-2878; fax (632) 723-4467; email: corporate@ocap.org.ph
(UCAP Bulletin)

REVIEW OF RESEARCH ON THE DIETARY AND THERAPEUTIC ASPECTS OF COCONUT OIL

Dr. Fabian M. Dayrit

Introduction

The objective of this article is to review the research on the dietary and therapeutic aspects of coconut oil with the objective of identifying areas for further research. Many claims have been made for coconut oil, ranging from its favorable nutritional and functional properties to its curative effects. The challenge for us is to produce the scientific research that will support these many claims. However, this is a wide range of effects and so we should select the strategic studies that will answer the key questions.

The coconut is a part of the diet of people in over 90 countries and well over 1 billion people. It is probably the dietary oil that has the most diverse population of consumers. We must take advantage of this breadth and diversity. The role of the APCC is indispensable in bringing the coconut countries together.

Coconut oil is a versatile product. It has uses as food (as part of coconut-based dishes), as cooking oil, as functional food or dietary supplement, as a component of pharmaceutical preparations, and as an active ingredient in a pharmaceutical product. We should strategize the research that will be needed to support coconut product development. There are three parts to the development of this strategy. First, we should understand each coconut oil product and its market. Second, we should identify the concerns and research needs of each product. Third, we should choose the right type of study and focus our research efforts to yield maximum benefit and impact.

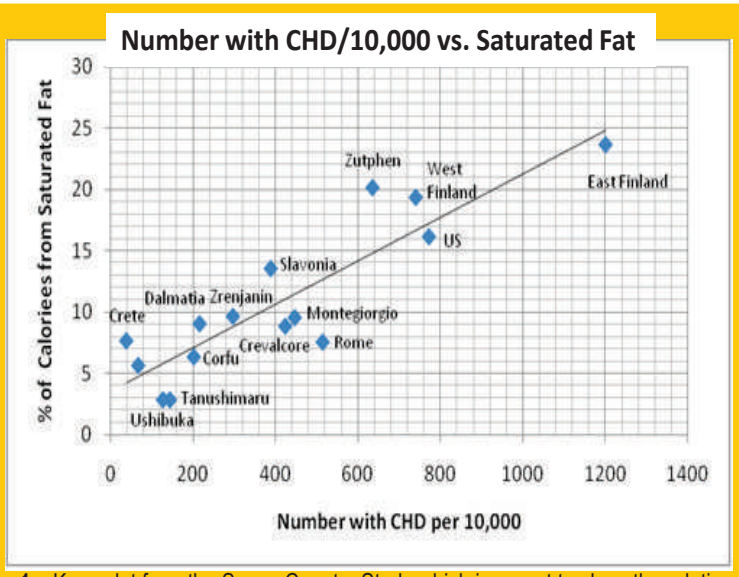

Figure 1a. Keys plot from the Seven Country Study which is meant to show the relationship between amount of intake of saturated fat and incidence of coronary heart disease. In principle, a simple correlation does not constitute a causal relationship.

1. Address concerns regarding coconut oil

Despite the improving image of coconut oil in the health food market, there remain a number of issues that must be addressed regarding the fear of saturated fat and cholesterol. These fears are constantly reinforced by the nutritional labeling guidelines that require the declaration of the saturated fat content right next to the trans-fat content and the strong anti-cholesterol bias of the food and medical industries. In ways both implicit and explicit, the message is that saturated fat and cholesterol are both undesirable. The suggestion that saturated fat and trans-fat are both harmful adds insult to injury because trans-fats were originally produced by the food industry to mimic the desirable qualities of saturated fat without resorting to the use of saturated fat.

Ancel Keys' Seven Countries Study in 1986 was the paradigm-setting paper which proposed the link between saturated fatty acids, cholesterol and coronary heart disease (Keys 1986). This study, which was started in the 1960s, was published in 1986 with the objective of providing the scientific basis for Dietary Guidelines for Americans which had its first edition in 1980.

In this paper, Keys claimed proof for his saturated fat-cholesterol-heart disease hypothesis using an alleged correlation between amount of calories from saturated fat (y-axis) and the incidence of coronary heart disease (CHD) (x-axis) (Fig. 1a). This is an alleged correlation because Keys controversially did not utilize all of the data that he had gathered from the entire study which actually involved 15-countries. He was accused of cherry-picking his data to support his desired conclusions, an accusation which he never

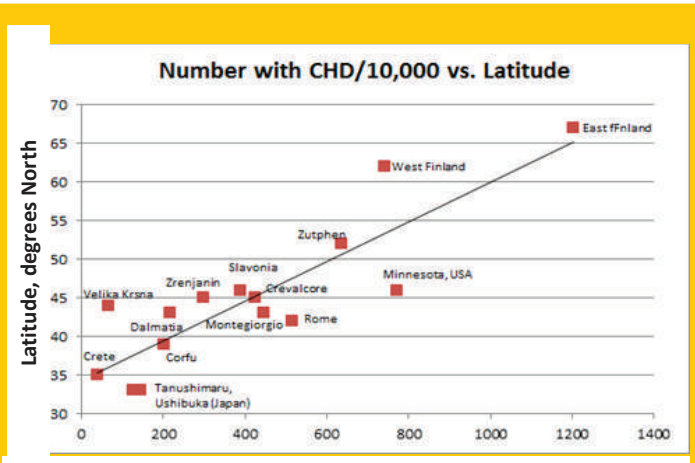

Figure 1b. If one plots the latitudes of the towns included in the Seven Country Study, one also obtains a very similar plot.
Following are the approximate latitudes (°N) of the towns: East & West Finland: 61; Zutphen: 52; Minnesota: 46; Crevalcore: 44; Corfu: 42; Rome: 41; Dalmatia: 40; Slavonia: 40; Crete: 35; Tanushimaru: 33..

satisfactorily answered. Secondly, the principle that a correlation does not prove causation was ignored and the saturated fat-cholesterol-heart disease paradigm has dominated the scientific and popular mindset for the past 30 years. Interestingly, one can draw an almost identical graph if one plots the latitudes of the towns included in the Seven Country Study with incidence of CHD (Fig. 1b)! In other words, a very plausible explanation for the Keys result is that people in high latitude countries tend to lack vitamin D due to lower sunlight and this increases the incidence of CHD. Finally, 2010 data from the World Health Organization (WHO) show that there is no correlation between cholesterol and heart disease (Fig. 1c).

Despite the strong anti-cholesterol position of Ancel Keys, it is quite surprising that early on in his career, he published at least three papers where he concluded that cholesterol is *not* associated with heart disease. In 1952, Keys published a paper in the journal *Circulation* where he concluded that the "cholesterol content of human diets is unimportant in human atherosclerosis." In another 1952 paper published in the *Journal of Gerontology*, Keys showed that serum cholesterol in healthy people normally increases with age, from about 180 at age 20, to over 250 at age 65. This observation was corroborated by a number of other researchers. In a third paper published in 1955, Keys reiterated his earlier conclusions that in healthy individuals, there is a natural increase in serum cholesterol with age and that cholesterol in the diet did not have a detrimental effect on health. It is relevant at this point to mention that a number of papers on French, U.S., and Japanese subjects support the observations that old people with high cholesterol are healthier than those with low cholesterol. It is most curious then that Keys did a turn-around and started linking cholesterol with heart disease. There is no record of him ever publishing an admission that the conclusions in his early papers were in error.

In 1980, the U.S. Department of Agriculture and the U.S. Department of Health and Human Services published the first edition of the Dietary Guidelines for Americans that was largely consistent with the saturated fat-cholesterol-heart disease paradigm. From the first edition, the recommendation regarding saturated fat and cholesterol did not change substantially: "avoid too much fat, saturated fat, and cholesterol". In later editions, the Dietary Guidelines recommended to replace saturated fat with polyunsaturated fat. Following the lead of the U.S., many

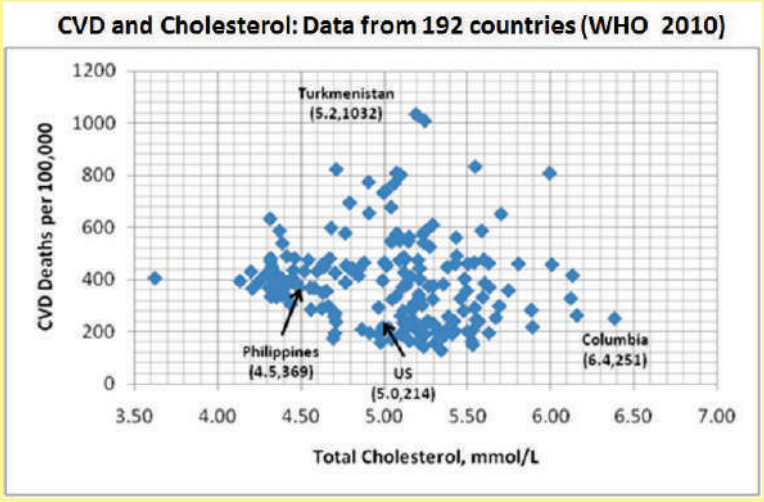

Figure 1c. CVD deaths per 100,000 population plotted against total cholesterol (mmol/L) (WHO 2010).

health agencies all over the world adopted the U.S. recommendation to limit saturated fat and cholesterol and to replace saturated fat with polyunsaturated fat. Even WHO gives a similar recommendation to "limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats and towards the elimination of trans-fatty acids" (WHO website). As a result, coconut oil has been on the retreat for much of the past 30 years.

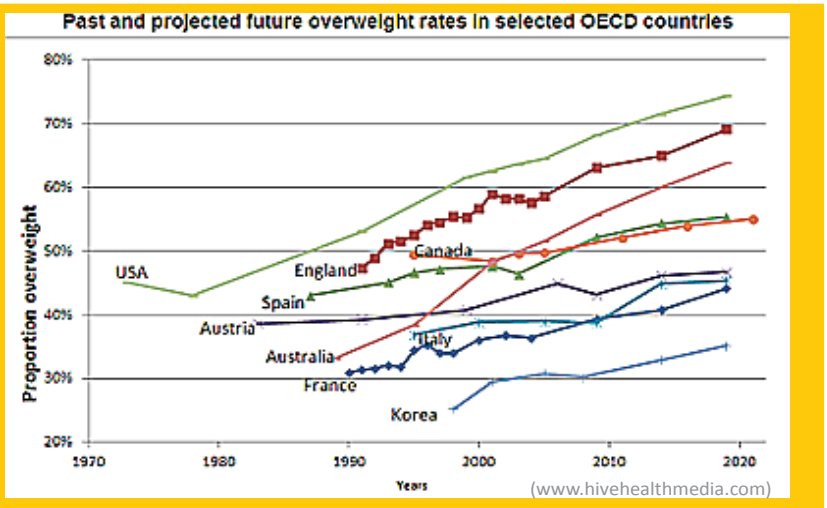

Figure 2b. Many other countries have adopted the Dietary Guidelines for Americans. Obesity has been on the rise globally.

After 30 years and seven editions, is there evidence for the success of the Dietary Guidelines? Ironically, the data from the U.S. Centers for Disease Control (CDC) and the U.S. National Institutes of Health (NIH) show that the obesity in the US has been on the increase and this increase started in 1980, coincident with the promulgation of the Dietary Guidelines in 1980 (Fig. 2a). In fact, global obesity has been increasing mimicking that of the U.S. (Fig. 2b).

But not all scientists have been in agreement with the Dietary Guidelines. In a statistical analysis of U.S. macronutrient data, Cohen and co-workers (2015) highlighted their disagreement in the title of their paper declaring that: "Americans have been following dietary guidelines, coincident with the rise in obesity." Utilizing a systematic review and meta-analysis of randomized control trials (RCTs) published prior to 1983, which examined the relationship between dietary fat, serum cholesterol and the development of CHD, Harcombe and co-workers (2015) concluded that U.S. and British health authorities introduced their dietary recommendations in the absence of supporting evidence from RCTs. In other words, there was insufficient support for the Dietary Guidelines.

To explain the contradicting conclusions regarding cholesterol is the hypothesis that the real problem may be oxidized cholesterol and oxidized LDL. It has been shown that oxidized polyunsaturated fatty acids, oxidized cholesterol, and oxidized LDL are harmful. However, using standard clinical procedures, one cannot distinguish oxidized from non-oxidized cholesterol (this can be done using mass spectrometry). Thus, cholesterol gets all the blame when the problem may be oxidation of PUFA oils which are more widely used in the modern Western diet.

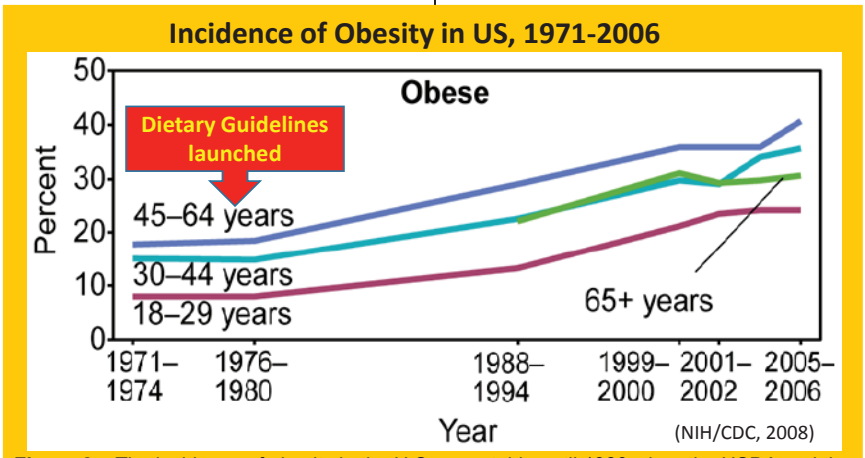

Figure 2a. The incidence of obesity in the U.S. was stable until 1980 when the USDA and the HHS launched the Dietary Guidelines. Today, with 7 editions of the Dietary Guidelines, obesity in the U.S. is at an all-time high.

The fear of saturated fat and cholesterol inevitably makes people doubt the healthful properties of coconut oil. This fear, however, is unfounded: all of the studies that have been done on the health effects of coconut on populations have uniformly concluded that coconut oil does not cause heart disease. Prior (1973) conducted a comparative study on four Polynesian populations: the Pukapukans and the Tokelauans who continued to live on their traditional high coconut diet, and the Maoris and Roratongans who had migrated to New Zealand and who were

already consuming Western food. Prior found that the Pukapukans and Tokelauans had lower hypertension than their Westernized relatives. A study on two coconut-consuming populations – Indians from Kerala (Kumar 1997) and Indonesians from West Sumatra (Lipoeto et al. 2004) – showed no link between coconut and heart disease.

Ironically, many health researchers in the West are oblivious to the importance of coconut oil in the diet especially of people in the tropics and the unique fatty acid profile of coconut oil is often ignored in assessments of saturated fat. For example, in the Cochrane Database of Systematic Reviews of 2015, a reduction in saturated fat intake was recommended to avoid cardiovascular disease without a single citation of a study on coconut oil (Cochrane 2015). Coconut oil is the equivalent of the Black Swan effect. The Black Swan effect is a metaphor that describes a psychological bias that blinds people to see only familiar phenomena and ignore unfamiliar ones. Coconut oil is largely unfamiliar to Western nutritionists and MDs.

Finally, there is one evolutionary principle that must be considered by those who believe that cholesterol is harmful. Cholesterol is the chief mammalian sterol. If cholesterol were detrimental to health, mammals would never have evolved with such high reliance on this compound. The anti-cholesterol lobby is anti-Darwinian.

Today, despite mounting evidence that the saturated fat-cholesterol-heart disease paradigm is in error, many health agencies continue to advise against saturated fat in favor or polyunsaturated fat and carbohydrates. Mark Twain, the American author and humorist, famously said: "It's easier to fool people than to convince them that they have been fooled." He could have very well had this failed paradigm in mind.

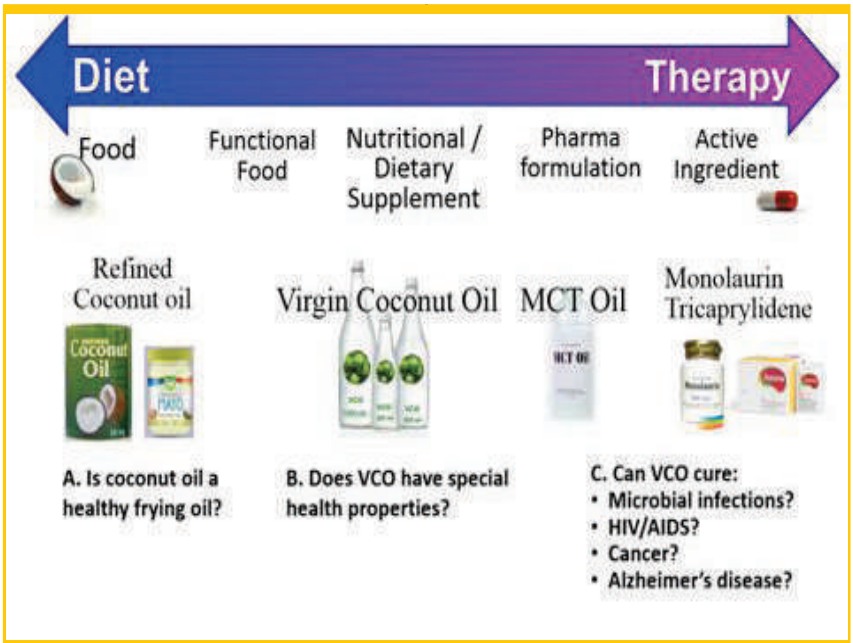

Figure 3. Range of applications of coconut oil with the corresponding coconut oil products. Listed at the bottom of the figure are some key questions that can guide the research that can be done on the coconut oil product

2. Define the coconut oil product

Coconut oil can be prepared into numerous products, each with its own market situation and technical requirements. As described in Figure 3, coconut oil can be consumed as food in the diet, as functional food or dietary supplement, as part of a pharmaceutical formulation, or as the active ingredient in a drug. Each application must meet the requirements relevant to the product and so a specific strategy should be developed for each type of product. There are four general types of coconut oil products: refined coconut oil, virgin coconut oil, MCT oil, and monolaurin and tricaprylidene.

Refined coconut oil represents the biggest market. Refined coconut oil is used as cooking oil and in the preparation of food products. The specifications for refined coconut oil are defined in Codex and the main distinguishing feature is the fatty acid composition. There are active efforts to develop varieties which are high in lauric acid and this will stretch the fatty acid profile of coconut. Since coconut oil competes with lard and other vegetable oils in the cooking oil market, we must develop an appropriate strategy for coconut oil as a healthy cooking oil.

a. Virgin coconut oil

Codex gives the official definition of virgin oils. There are only two main virgin oils in the global market: virgin coconut oil (VCO) and virgin olive oil (VOO). Because VCO and VOO have different fatty acid profiles, these should be considered as complementary healthy virgin oils; there should

be no competition between these two oils.

The fatty acid composition of VCO is the same as coconut oil. However, there are at least 4 methods of making VCO and each type of VCO differs in terms of mouthfeel, as well as minor constituents, such as polyphenols and gums. There is internal competition among VCO manufacturers on claims regarding which type of VCO is best and this has caused some confusion among consumers. This internal competition will not help the VCO industry as a whole. The more important issue for VCO is product quality and customer satisfaction.

b. Coconut-based synthetic products

Coconut oil can be hydrolyzed into its constituent fatty acids, and then re-synthesized into different products. MCT oil is a commercially-available oil containing mainly C8 (caprylic) and C10 (capric). It is recommended as a medical supplement and used by athletes for "clean and quick energy". Other structured lipids have been prepared for specific purposes. Monolaurin and tricaprylidene are synthetic products which use specific fatty acids only, such as lauric acid (C12) and caprylic acid (C8), respectively. These are special-purpose coco fatty acid products.

3. Choose the right type of study

The type of study should match the application that is being targeted, as well as the type of coconut product that will be used. The bottom of Figure 3 lists some questions that we can use to guide our research direction. Figure 4 presents a pictorial guide to the range of research that we should do for coconut oil.

The spectrum of health-related research for coconut oil covers in silico (computer) research and statistical and epidemiological research and meta-analysis; *in vitro* experiments, such as physico-chemical measurements, biochemical, enzyme, and molecular biology studies; *in vivo* experiments covers the range of studies from cells and stem cells, animal, nutritional and human observational studies, clinical case studies, and human clinical trials from phase II to IV. While the objective is to be able to come up with clinical studies which are double blind and placebo controlled in design, there should be a dynamic process whereby the needed *in silico*, *in vitro* and animal *in vivo* experiments are conducted to support the human studies. There should be a dynamic dialogue among all of these studies which can deepen our understanding with each iteration. In addition, research on product quality should also be included in the overall program.

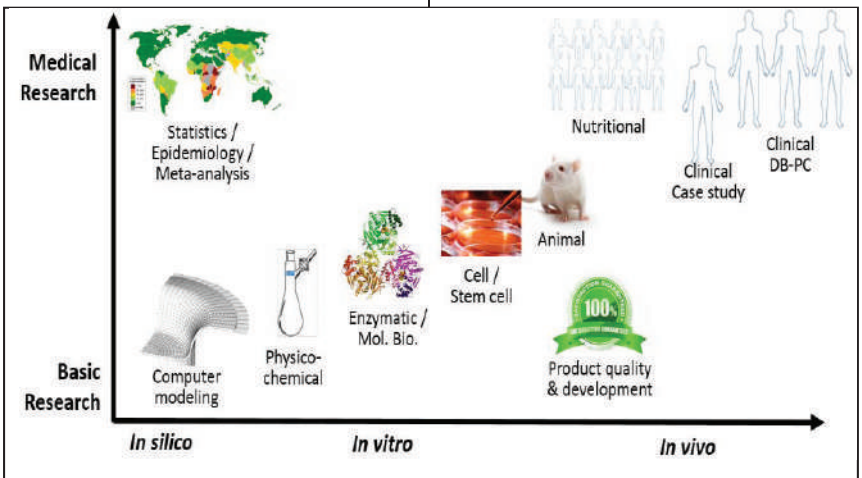

Figure 4. Illustration of the range of researches that we should do to establish the scientific basis for to support health claims for coconut oil products. (note: Clinical DB-PC refers to clinical studies which are double blind-placebo controlled)

a. Is coconut oil a healthy frying oil?

One of the strongest selling points of coconut oil against other vegetable oils, which are all PUFA oils, is its higher stability towards oxidation under frying conditions. For the purposes of cooking, a more stable saturated oil like coconut oil is far superior to PUFA oils, which includes virtually all other vegetable oils. PUFA oils generate peroxides and free radicals which produce polymeric and polar materials which are ingested by the consumer (Choe & Min 2007). Heating PUFA oils also produces carcinogens (Chiang 1999). So coconut oil is the best choice for a stable cooking oil precisely because it is a predominantly saturated oil which makes it stable to oxidation.

Because vegetable oils are often used for frying, the claimed health benefits of many PUFA oils is inaccurately represented. Heating of PUFA oils forms peroxides, aldehydes and trans-fat. However, because most published studies use unheated PUFA oils in their experimental methodology,

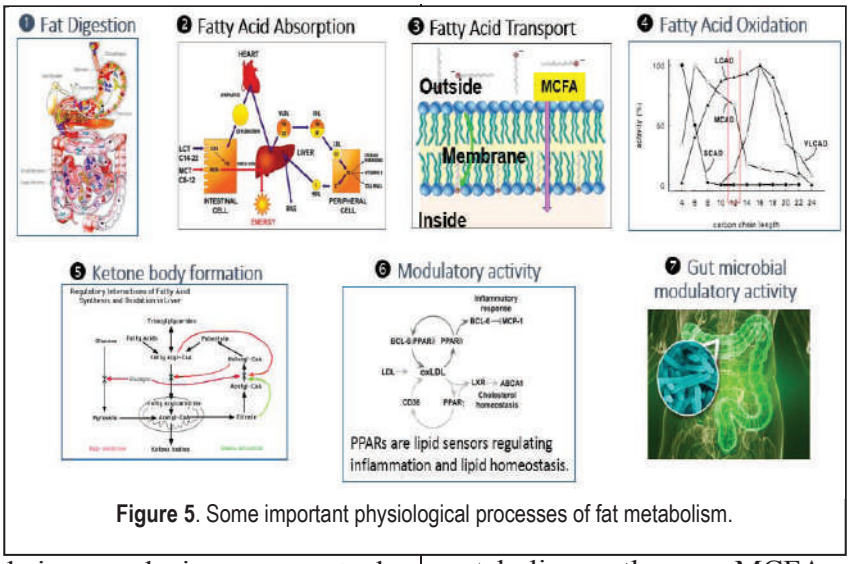

Figure 5. Some important physiological processes of fat metabolism.

their conclusions cannot be applied to real use situations.

b. Does VCO have special health properties?

In order to understand the health effects of coconut oil, it is important to understand the physiological processes of fat metabolism (Fig. 5). Among fats and oils, the digestion of coconut oil is relatively rapid because of the relatively shorter length of the fatty acid chains. This means that coconut oil will emulsify more rapidly that the other longer chain vegetable oils. Fatty acid absorption is also a well-studied process whereby medium-chain fatty acids up to C12 are brought directly to the portal vein and onto the liver for metabolism. The longer-chain fatty acids, from C14 and longer, are resynthesized into chylomicrons and follow the longer route around the blood stream. Similarly, fatty acid transport across the membrane is most rapid for fatty acids up to C12, while longer chain fatty acids are slower and require carnitine for transport. Fatty acid oxidation in the mitochondria is also rapid for medium chain fatty acids because of the presence of at least four enzymes which can metabolize these MCFAs. MCFAs are also known to rapidly form ketone bodies in the liver, which then distributes these to extrahepatic tissues, such as the heart, muscles and brain, for use as energy source. Less well understood are the immune-modulatory effects of fatty acids and their impact on the gut microflora.

What is "Medium Chain"?

The major claim to the healthy properties of coconut oil is its high lauric acid content which is at about 50%. This claim is premised on the definition of "medium chain" which we define as the fatty acids form C6 to C12. Unfortunately, there are, in fact, two definitions of medium chain.
The term "MCT oil" is a synthetic triglyceride mixture composed of ~75 % C8 and ~25 % C10. MCT oil was found by clinicians to be digested and absorbed more readily than vegetable oils like corn oil (LCFAs) and it was found to be useful for nutritional management of patients with impaired fat digestion. MCT oil is a registered pharmaceutical product. MCTs are also GRAS, but the composition is again mainly C8 and C10. The confusion that arises is that while the science tells us that medium chain fatty acids includes C6 to C12, the experiments that are performed in most medical literature use commercial MCT oil which is C8 and C10. While this does not invalidate the definition of medium chain fatty acids as C6 to C12, it limits the literature claims that can be cited. It remains clear from scientific evidence that the C12 is a medium chain fatty acid, notwithstanding the composition of the commercial product. Because about half of the fatty acids in coconut oil is C12, it is reasonable to label coconut oil as a MCT oil.

VCO as Functional Food

Experiments show that coconut oil gives the physiological effects as a low fat diet when compared to lard which is a long-chain saturated fat. For example, Dulloo and co-workers (1995) noted that the diet high in lard resulted in a greater gain in both body fat and protein than the diet high in coconut oil. This provides experimental evidence that coconut oil is a MCT oil. Consistent with this conclusion, numerous reports have been published on the efficacy of VCO in weight reduction. Assunção and co-workers (2009) and Liau and co-workers (2011) reported that VCO is effective for the reduction in waist circumference in both women and men, respectively. The special properties of VCO justify its consideration as a function food (Marina *et al.* 2009).

VCO for therapeutic use

VCO has considerable potential for therapeutic use as antimicrobial, as anti-HIV/AIDS drug, for anti-cancer therapy, and for the management of Alzheimer's disease.

The rise of antibiotic resistant bacteria has made the development of antimicrobials a priority concern. John Kabara pioneered studies on the antimicrobial properties of fatty acids in the 1980s. Two of his most important conclusions are that lauric acid is the most active antimicrobial fatty acid and that monolaurin is the most effective antimicrobial compound that can be derived from coco chemicals (Kabara 1984). Numerous other papers have validated the antimicrobial properties of coconut oil itself, as well as other compounds that contain lauric acid, such as monolaurin (Dayrit FM 2015).

In 1998, Dr. Conrado S. Dayrit and Dr. Eric Tayag conducted the first ever clinical trial using coconut oil against HIV/AIDS. This preliminary trial was conducted on 15 HIV-infected patients at the San Lazaro Hospital, Manila. Eleven subjects gained weight - from 1 k to 23 k - including the 2 who developed AIDS and were recovering. The single AIDS fatality lost 6 k. The other 3 who failed to gain weight had decreasing viral and rising CD4 counts at the end of the 6 month period. This initial trial confirmed the anecdotal reports that coconut oil has an anti-viral effect and can beneficially reduce the viral load of HIV patients. The positive anti-viral action was seen not only with monolaurin acid but with coconut oil itself (Dayrit CS 2000). This study on HIV/AIDS gave very promising preliminary results, but a larger clinical trial needs to be designed and carried out.

VCO may have special use in cancer therapy as an alternative energy source to glucose. Otto Warburg (Nobel laureate 1924) hypothesized that tumor cells generate energy exclusively by non-oxidative breakdown of glucose (glycolysis). In contrast, normal non-tumor cells can generate energy from glucose, as well as from alternative sources of energy such as ketone bodies. Because VCO is able to form ketone bodies, it has been shown experimentally to be effective for the treatment of certain cancers. Normal cells which can metabolize ketone bodies survive, but cancer cells which cannot metabolize ketone bodies die out. This has been shown in *in vitro*, *in vivo* animal and human studies and should be further pursued so that it can be adopted as standard of care (Seyfried *et al*. 2011, Schmidt *et al*. 2011).

Alzheimer's disease is a rising global disease that as yet has to find a cure. Anecdotal reports on VCO have claimed effective management of Alzheimer's disease even at advanced stages. Ketone bodies, as well as the polyphenols in VCO, have been identified as the active agents. Nafar and Mearow (2014) showed that neurons wish amyloid beta plaques survive in cultures co-treated with coconut oil. Coconut oil co-treatment also attenuated amyloid beta-induced mitochondrial alterations. On the other hand, Hertz and co-workers (2015) showed that low doses of ketone bodies can have potentially have therapeutic effect in Alzheimer's disease by enabling ketone bodies to supply a fraction of needed ATP to compensate for the deficiency in glucose metabolism in Alzheimer's patients. Animal and clinical studies are currently being carried out to study the

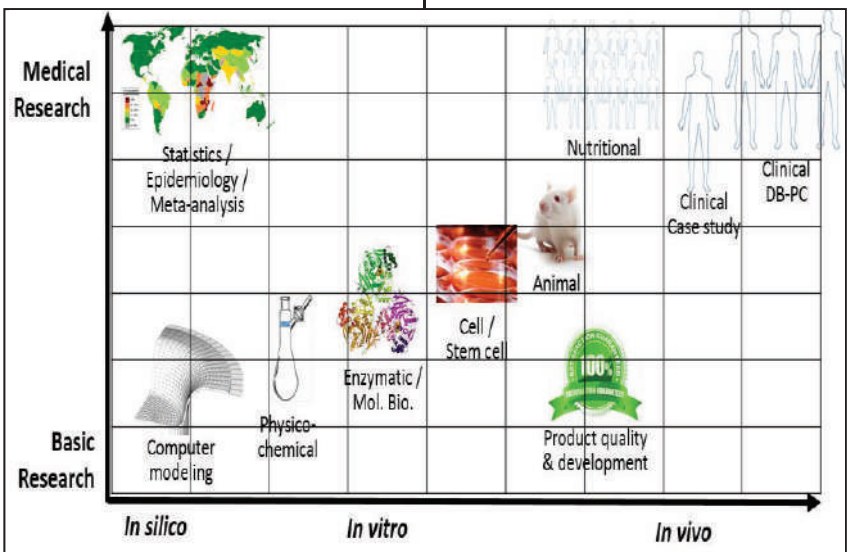

Figure 6. Recommendation for a coconut research matrix.

efficacy of VCO in the management of this dreaded disease.

Compared to other vegetable oils such as olive oil, palm oil and canola oil, much fewer clinical studies have been conducted on VCO. For example, a check of the website www.clinicaltrials.gov last March 2015 yielded a list of 24 clinical studies on VCO, compared with 190 for olive oil and VOO, 55 for palm oil, and 49 for canola oil. It is clear that more clinical studies on coconut oil are needed.

4. Strategy for coconut oil

It is clear that, with the right strategy, coconut still has great potential for further development. However, the research effort has to be raised and new elements have to be added. The research output has to be at the level that is acceptable in the best international journals. The new elements of nutrigenomics and meta-analysis have to be added.

Nutrigenomics is the study of the effects of food on gene expression and metabolism. It aims to identify and analyze molecular-level interactions of diet on the metabolism and health of individual as influenced by genetic variations. It can be used to compare the metabolism of MCT and VCO versus LCT and PUFA, and understand the effects of VCO on diabetes, obesity, cancer, and other diseases.

It never occurred to the Ansel Keys to consider the differences in the genetic make-up of the subjects that were involved in the Seven Countries Study. We now know that the various races and individuals metabolise fats differently depending on the haplotype of their mitochondrial DNA (mtDNA). This results in variations in bioenergetics among people which influence lipid metabolism (Wallace & Chalkia 2013). If the Seven Country Study were to be repeated today, a wider genetic sample and genetic analysis will have to be considered. Consistent with this, in many Asian countries, adult levels of cholesterol are often less than 200 mg dl^{-1}, whereas in Europe and the USA they are greater than 200 mg dL^{-1} (Charlton-Menys & Durrington 2007).

A number of papers have pointed out the importance of considering genetics when assessing the nutrition outcomes of different individuals and populations. In addition, the role of gut microflora also plays an important role in the physiological response of individuals and populations to diet. Clearly, the Seven Countries Study cannot be considered today to have valid wide-ranging conclusions and the singular focus on cholesterol as a biomarker for heart disease is mistaken.

Another methodology of importance is meta-analysis. Meta-analysis is a statistical technique for combining the findings from independent studies. Individual trials may fail to show a statistically significant result. However, when the results from several studies are combined using meta-analysis, significant conclusions may be drawn. A methodology of systematic review is at the heart of meta-analysis. The quality of the design and execution of each study is assessed. A systematic review can provide a valid statistical estimate aggregated over all the included studies. Meta-analysis is now an important part of evidence-based medicine.

A coconut research matrix (Fig. 6) is recommended as a guide for the research on coconut oil. Research projects can be classified according the level of research (from basic research to medical research), and whether the research is *in silic*o, *in vitro*, or *in vivo* (animal or human).

In September 2015, Credit Suisse, an institution that is normally associated with banking and financial investment, came out with a book entitled: "Fat: The New Health Paradigm". This book presented the emerging ideas regarding fat and is significant because it represents the shifting views of the usually conservative banking community towards fat, which in some ways is more progressive than that of the regulatory agencies. The Credit Suisse book ended with an assessment of the expected changes in health perception of the major vegetable oils. It concluded that soybean oil, canola oil and sunflower oil will suffer a lower health perception; olive oil and palm oil will remain unchanged in terms of health perception; and only coconut oil will enjoy a rise in health perception. While this is indeed very good news for coconut oil, it also urges the coconut industry to raise the level of research in order that it can meet the expectations of a more health-conscious society.

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CLINICAL STUDIES IN SRI LANKA RELATING TO CONSUMPTION OF COCONUT OIL

Dr. Asoka S. Dissanayake

Senadheera quoting a work by Nicholas and Paranavitharana states that in Sri Lanka, coconut groves are mentioned in early inscriptions as well as in literary works dating to about the 2nd century AD and that its nuts were eaten when tender (1). Robert Knox in the 17th Century wrote– "Coconut provided toddy, wine, vinegar, oil, milk and honey … all eatables, Besides it affords other necessaries as mats, brooms, bottles, dishes and ropes" – .Knox's statement was probably the first which spelled out the many uses of the coconut tree so vividly.

Research on Clinical studies relating to coconut & coconut oil in Sri lanka cnabe considered as having occurred in two phases. The 1st between 1960 and 2001 concentrating mainly on coconut fats and plasma lipids in relation to Ischaemic Heart Disease (IHD). In 2006 my colleague Lakmali Amarasiri and I published a review on Coconut Fats where we mentioned the lack of support for research in to the topic given the fact that coconut constituted a major part of the Sri Lankan diet. The Coconut Research Institute subsequently provided substantial funds and established the CRI – Medical Faculty of University of Kelaniya Reseach Group on Coconut & Health which I co-chair and today I will present several of their studies and some others that have been published or presented at meetings in the last few years.

To better understand the clinical research that has been undertaken in Sri Lanka, it is important to know the pattern of coconut consumption. Coconut has been

Coconut Oil from Sri Lanka

one of the major dietary components in the Sri Lankan diet for hundreds if not thousands of years. Based on Central Bank reports, in the last few decades, coconut consumption has been declining from around 130 nuts/person/year to now less than 100 nuts/person/year. A 2004 study on coconut oil (CO) by Peiris, Fernando and Samarajeeva have shown that while 91.2% of the sample population in three districts, Colombo, Kurunegala and Nuwara Eliya used CO, in 75% of them the quantity of CO consumed has declined over the last 5 years. The proportion using CO declined with increasing affluence, while 99% of those earning < Rs. 3500/- a month used CO, only 70% of those having an income of > Rs. 5000/- were CO users. They also found that the reasons why high income earners in our country turned to the use of other vegetable oils were the poor quality of CO in the market or its adulteration with cheaper imported vegetable oils particularly palm oil and the "misconception" about the harmful effects of CO. In an unpublished study Kumarendran found that rural sector has significantly higher use of coconuts /person /year than the estate and urban sectors (93.5, 78.8 and 71.6 nuts respectively).

A 1961 study had shown that among medical students living in the hostel males consumed more fat than females and the fat contributed 30 & 24% of the calories respectively, about half coming from coconut. Coconut is consumed in several forms –as coconut oil used for deep frying and sautéing and a major portion of the oil purchased may not actually be consumed being thrown away after repeated use. Coconut is also used as coconut milk in curries and in porridge and in milk rice and as scraped coconut in sambols and salads. There is no reliable information on the relative ratio of coconuts that are used in the different forms. Coconut oil contains >95% fat, while scraped coconut

has about 36% and coconut milk is variable but averages around 24%.

Coconut oil and Ischaemic Heart Disease

Katulanda et al have reported in 2010, the age and sex standardized prevalence of IHD in Sri Lanka to be 9.3% with the main risk factors being hypertension, one or more lipid abnormality, smoking, physical inactivity, obesity, diabetes and a family history of Diabetes. This is a recent phenomenon, Kaunitz mentions quoting from The Demographic Yearbook of the United Nations (1978) that Sri Lanka reported the lowest death rate from ischemic heart disease (IHD) and that Sri Lanka is the only one of the countries giving reliable data where coconut oil (containing over 50% medium chain fatty acids) is the main dietary fat.

Yet as I have already shown coconut consumption has in fact decreased over the last 50 years and is higher among the rural than among the urban population. In one of the earliest studies, Athukorale and Jayawardena looked at lipid patterns in 167 healthy subjects in the age group 28 to 50 years living in an urban area, a suburban area and two rural areas to determine a possible relationship between their serum lipid patterns and food habits. They found that those in the coconut growing rural area consumed significantly less coconut oil than urban dwellers although the contribution of coconut to the fat derived energy was highest. Most of the fat energy coming from coconut milk and scraped coconut.

However, the mean total cholesterol shown in Table 1 was significantly higher for those in urban area subjects than that of other areas while subjects living in suburban area had a higher mean triglyceride level which the authors attributed to higher alcohol consumption among these subjects. They found that the risk of coronary heart disease as assessed by the body mass index, ratios of total cholesterol to HDL-cholesterol, and LDL-cholesterol to HDL-cholesterol, was significantly lower in subjects in rural areas, who were agricultural workers with a high degree of physical activity, subsisting on a diet consisting mainly of plant food, despite a higher consumption of coconut, a saturated fat. The authors argued that the glactomannans and fibre in kernel products used predominantly in rural area 2 may have contributed to the lower TC levels.

	No. of subjects	Total cholesterol	Triglycerides
Urban area	63	5.22 ± 0.10[a]	1.38 ± 0.09
Suburban area	37	4.76 ± 0.15	1.49 ± 0.13[a]
Rural area 1	38	4.78± 0.10	1.17 ± 0.07
Rural area 2	29	4.73± 0.13	1.21 ± 0.11

Table 1. Concentration of total cholesterol and triglycerides in the serum from Atukorale & Jayawardena 1991.

The Coconut Research Institute – Faculty of Medicine, University of Kelaniya research group has done a retrospective study looking at coconut and coconut oil consumption in the Sri Lankan population in relation to all cardiovascular deaths over the period 1961to 2006. Average consumption of coconut including copra was 66.19 kg / capita / year (about 110 nuts / year), average energy supply from coconut products was 271.47 kcal / capita / day and average fat supply from coconut products was 24.46 g/capita/ day.

The relationship between CVD Death Rates (per 100,000 population) and coconut oil consumption in Sri Lanka 1961-2006 are shown in Fig. 1. They concluded that consumption of

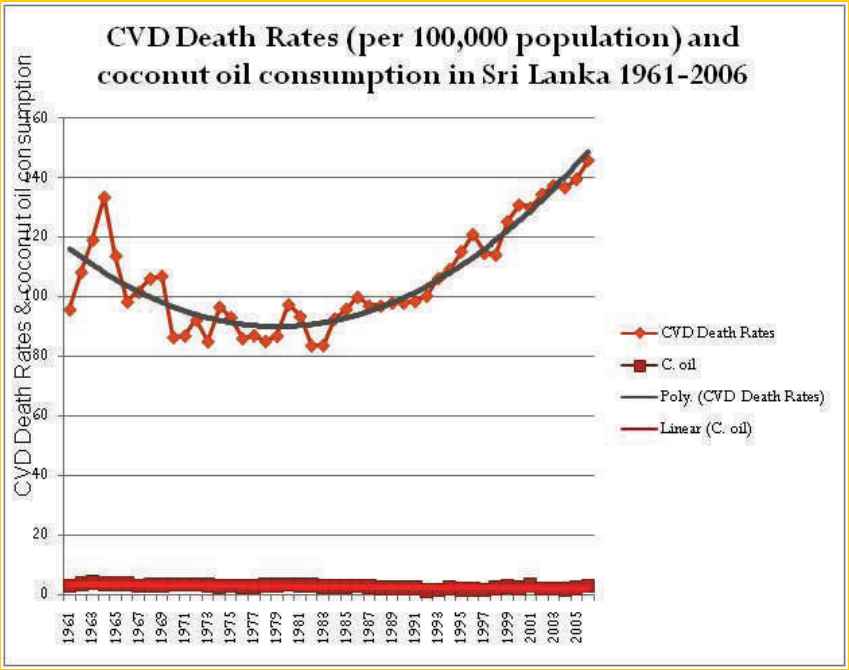


Fig. 1 From presentation by Atauda et al 2014.

coconut and its products have remained unchanged from 1961 to 2006 while CVD death rates and the proportionate mortality rate due to CVDs have increased from 1961 to 2006.CVD death rates were negatively correlated with coconut or coconut oil consumption and there were no lags seen.CVD death rates were correlated with per capita GDP, % urban population. Confirming what Kaunitz had suggested way back in 1986.

A hospital based case control study was conducted at the Colombo North Teaching Hospital, Ragama, Sri Lanka comprising 176 cases and 148 controls. Previously healthy patients admitted with a first incident Acute Coronary Syndrome (ACS) or a Cerebrovascular Event (stroke) were recruited as cases and patients with no previous history of CVD or diabetes mellitus were recruited from surgical wards as controls. There were 136 ACS and 40 Stroke patients as cases. An interviewer-administered questionnaire was used to estimate the average consumption of coconut (nuts and oil) and to obtain information on risk factors of CVD. The results are shown in table 2.

	Nut consump./person/week	CO – ml/person/week
Cases	1.97 ± 0.81	88.44 ± 61.6
Controls	2.11 ± 1.01	81.4 ± 51.52
P value	P = 0.66 NS	P = 0.175 NS

Table 2: Adapted from Results of Coconut and coconut oil consumption among cases and controls – Athauda et al 2015

They concluded that there was no evidence of an association between coconut consumption and incidence of cardiovascular disease or stroke. Use of coconut oil had a protective effect on the incidence of cardiovascular disease.

What of interventional studies?

In a short term interventional study, it was shown that effect of totally replacing CF in the diet with soyabean fat and corn fat (10,11). In one study they investigated the influence on plasma lipids of isoenergetic diets containing 30 % energy as fat, with a PUFA:SFA ratio of 4´00 or 0´25, consumed for 8 weeks by twenty-five young normolipidaemic males. During the soya bean-fat eating period the TC level fell significantly compared with baseline values and during the CF-eating phase TC level increased significantly compared with the soyabean-eating period .P < 0.01.. Concomitant with the lowering of TC and LDL-C, there was also a reduction in HDL-C levels. On the soyabean-fat diet, HDLC decreased by 15 % (range 6±35 %). A long term interventional study in 60 volunteers with no exclusion criteria was reported by the same group in 2001. Where the specific objectives were to examine the short-term and long-term effects on the serum lipoprotein profile when: 1. CF content in the diet is reduced; 2. CF in the diet is reduced and replaced with a combination of soyabean fat (PUFA) and sesame oil (oil of Sesamun indicum seed, containing 40 g MUFA/100 g fat). At the end of phase 1, there was a 7´7 % reduction in cholesterol (95 % CI 23´6, 212´2) and 10´8 % reduction in LDL (95 % CI 24´9, 216´5) and no significant change in HDL and triacylglycerol. At the end of phase 2, the reduction in cholesterol in both groups was only about 4 % (95 % CI 212, 3´2) partly due the concomitant rise in HDL. The reduction in LDL at 52 weeks was significantly higher in group B (group A mean reduction 11 %, 95 % CI 220´1, 22´0 and group B mean reduction 16´2 % 95 % CI 223´5, 28´9). In phase 2, triacylglycerol levels showed a mean reduction of 6´5 % in group 2A and a mean increase of 8´2 % in group 2B. The authors concluded that, a reduction of saturated fat in the diet is associated with a lipoprotein profile that would be expected to reduce cardiovascular risk. Of the 60 subjects 38 were hyperlipidaemics and this may have influenced the outcome. It is important that a long term dietary interventional study be done involving healthy normolipidaemic subjects.

A 2013 study, where 60 healthy volunteers were fed a normal diet supplemented with 200 ml of Coconut milk porridge (CMP) for 8 weeks followed by a washout period of 2 weeks and then 200 ml of Soya milk porridge (SMP) for 8 weeks. Serum lipids were measured at the beginning and end of each phase (4 assays in all). The difference in the mean values between the post and the base HDL levels with the CMP supplementation was 9.6 mg/dL (standard error of the difference between the means (SEM) 1.6 mg/dL), and the difference was statistically significant ($P <$ 0.01).

The difference in the mean values between the post and the base LDL levels with the CMP supplementation was – 14.9 mg/dL (standard error of the difference between the means (SEM) 6.2 mg/dL), and the difference was statistically significant ($P =$ 0.02). The difference in the mean values between the post and the base

Virgin Coconut Oil from Sri Lanka

HDL levels with the SMP supplementation was 1.8 mg/dL (standard error of the difference between the means (SEM) 1.3 mg/dL), and the difference was not statistically significant. The difference in the mean values between the post and the base LDL levels with the SMP supplementation was – 11.8 mg/dL (standard error of the difference between the means (SEM) 6.7 mg/dL) and indicated a marginally significant difference ($P = 0.09$).

Therefore, SMP supplementation seemed to be effective in decreasing the LDL levels but has no significant effect on the HDL levels. The authors concluded that there seems to be experimental evidence to support the view that the lipid effects of coconut milk/kernel would be different from those of the pure oil due to the salutary effects of the fiber and protein. Hence coconut milk and coconut kernel would reduce LDL cholesterol, whereas the oil itself could be neutral, leading to a net reduction in LDL.

These changes were observed despite the CMP meal resulting in an increase of the estimated saturated fat content in the diet from 52g to 75g accounting for 20% of total calories much higher than the 10% recommended from saturated fat!

The fact that grated coconut in the Sri Lankan diet is less likely to elevate serum lipids is also borne out by two animal studies that have been reported in the last few years. In one, a diet containing 2.5% or 7.5% soluble fibre or 10% insoluble fibre derived from the coconut kernel residue obtained after virgin coconut oil is processed was fed to male Wistar rats along with a high saturated fat diet for 90 days. The soluble fibre at 7.5% and insoluble fibre at 5 & 10% were cable of reducing Total cholesterol and Triglycerides. Galactomannans obtained from defatted sugar removed coconut kernel has been reported to significantly lower total cholesterol, LDL cholesterol and to elevate HDL cholesterol.

Samaranayake and colleagues fed white coconut oil (WCO), virgin coconut oil (VCO) or WCO mixed with grated coconut (1:1) or VCO and grated coconut (1:1) for 36 weeks after which blood glucose and serum lipids were measured. The findings are shown in Table 3. A significant hypoglycaemic effect was noted with both a mixture of grated coconut +CO and GC + VCO. While though not statistically significant a lowering of TG and a rise in HDL levels were observed with the VCO diet. This hypoglycemic action of CO plus grated coconut or VCO plus grated coconut could be due to reduced insulin resistance. This topic has been discussed by Fernando et al in their recent review.

Conclusion

Thus in conclusion, we could say that while the prevalence of IHD, type 2 DM and MS are increasing in Sri Lanka, and more so in the urban areas and among the more upper social classes; studies carried out have suggested that coconut consumption particularly coconut oil is decreasing overall and possibly even more among this very same group. Epidemiologiccal evidence is against a positive link between coconut consumption and IHD and coconut oil consumption to acute coronary events and stroke. Grated coconut appears to have an additional benefit from both human and animal studies in being able to improve the lipid profile and possibly reduce blood sugar. Further work needs to be done. Attention will need to be paid to the finding that a variant of HDL known as HDL2b, which is found to be significantly lower in patients with ACS than in patients with stable angina and normal subjects. HDL2b is thought to mediate the good effects of HDL, is low in as many as 93% of South Asian men and 63% of women, the effects of coconut oil and coconut fats on sub fractions of HDL will need to be looked at when planning future studies funds permitting.

Acknowledgements:
The help of Dr. L. Athauda and Dr. B. Kumarendran from The Medical Faculty, University of Kelaniya and Ms. E. Samaranayake of The Coconut Research Institute, in providing data from their work all members of The CRI-Univ. of Kelaniya Research Group on coconut & Health is gratefully acknowledged.

Dr. Asoka S Dissanayake is Co-Chair of CRI – University of Kelaniya Research Group and Former Professor of Physiology, Faculty of Medicine, University of Kelaniya, Sri Lanka.

DERMATOLOGICAL STUDIES ON COCONUTS: TOPICAL, ORAL, AN ANTI-INFLAMMATORY FOOD

Vermén M. Verallo-Rowell, MD

At the Fifth Asian Dermatological Congress in Beijing in 1998, Dr. Kabara talked about his work from the 1970s on medium chain fatty acids, and the uniquely potent ***anti*** -bacterial, -fungal, -viral, and -protozoal properties of lauric monoglyceride (monoalurin) which later investigators in the 1990s confirmed. As a Western-taught dermatologist I found it fascinating that monolaurin comes from coconut oil, an all too common tropical product but not among the active botanicals present in topicals during those years.

Virgin Coconut Oil (VCO) and VCO Soaps from the Philippines

These were laboratory and test animal studies. It was time to do an evidence-based type clinical trial on our first hypothesis that monolaurin is as effective and safe as Isopropyl alcohol in a hand gel. With dermatology residents at Makati Medical Center (MMC) and the Skin and Cancer Foundation, Inc; and with research Fellows at VSRC, we did in succession two randomised double blind clinical trials (RCTs) the results of which accepted our hypothesis! By 2000, these two studies became the very first papers on a coconut ingredient published in a peer - reviewed journal on Microbiology and on Dermatology.

Since then I have reported our coconut oil / -derived, mostly RCTs at Philippine, regional and/or international meetings with published abstracts in meeting proceedings, or published articles in dermatological journals. A few others are unpublished and are in the VSRC Files.

Current Study: VCO as an anti-inflammatory oil. Our first paper on this subject was a pilot study presented at the Forum on Photobiology of the Korean Dermatologic Society Meeting in 2004. Using UVB Erythema, UVA Pigmentation, Sunburn Cells as Parameters, we first showed antioxidant effects of Extra Virgin Coconut Oil in UV-exposed skin.

Meanwhile, our other RCTs were published on coconut oil itself having excellent anti-microbial (like its monolaurin) properties and at the same time a quantified emollient. Since 2000 we began to use VCO at VSRC for patients with dry and often microbially colonised psoriasis, acne, atopic, contact dermatitis and rosacea lesions. We noted that VCO - moisturised skin looks and feels better than equally moisturised skin from other moisturiser types. Since these conditions now belong to what are called Inflammatory Diseases, we wondered if a third effect was at work: on the inflammation itself of the lesions. In still another unpublished paper we showed in a small RCT the rise in blood levels of lauric acid and monolaurin after intake of CO which we suspected might also contribute to anti-inflammatory effects.

Studies now recognize psoriasis as a T-cell mediated

Vermén M. Verallo-Rowell, MD. Gave her Presentation at the International Conference on Quality Coconut Oil for Nutrition and Health

chronic inflammatory disease. Similarly recognized as inflammatory are diabetes, obesity, hypertension, and some neurodegenerative diseases that occur frequently in moderate to severe psoriasis and are called its co-morbidities. Reviews worldwide[1] support this association and studies indicate that inherited susceptibility genes may lead to common inflammatory pathways when exposed to certain lifestyle triggers, especially the diet.

On dietary oils we first reviewed coconut oil's chemical profile that may affect inflammation focusing on (1) Omega -6:-3 Ratio, (2) Saturation, (3) Chain lengths (4) *Trans* fats; (5) Anti-/Pro-oxidant contents, (6) Anti-microbial effects. We then reviewed those of seed oils commonly used in cooking and found several with chemical profiles opposite those of coconut oil.

Our hypothesis: Before and After Markers of inflammation (Clinical Indices; Quality of Life Ratings; Serum and Skin Biopsy Immunohistochemistry in moderate psoriasis and its associated internal disease comorbidites) show that compared with a prototype of the more commonly used seed oils used in or patterned on Western diets, Coconut Oil is significantly more *anti-*inflammatory.

VCO based Pharmaceutical Products

Vermén M. Verallo-Rowell, MD isdjunct Research Professor Institute of Herbal Medicine and Head Skin Study Group U. of the Philippines National Institutes of Health; Founder and Program Director, VMV Skin Research Centre + Clinics (VSRC); Chair Skin and Cancer Foundation, Inc.; Senior Consultant, Past Chair Makati Medical Center Department of Dermatology; Chair Dermatopathology Core Group Philippine Dermatological Society.

Low-Fat Diets Make You Fat

Dr. Bruce Fife

Low-fat diets promote weight gain while high-fat diets can help you lose excess weight.

The prevailing belief over the past 30 years or so has been that the only effective way to lose weight is through a low-fat, calorie restricted diet. Fat has been pegged as the primary villain in our fight against flab because it is believed to be the most fattening component of our food.

It is generally believed that the fat in our diet is somehow automatically absorbed directly into our fat cells, so the less fat we eat, the better. This belief has been pounded into us by the media, bestselling diet books, doctors, weight loss gurus, and even government agencies. Store shelves are filled with no-fat and low-fat foods of every kind. Lean meat, fish, and chicken (white meat only, without the skin) is the preferred choice for diet conscious individuals.

We've been avoiding fat for the past 3 decades and where has it gotten us? Fat, that's where! We are fatter now than ever before. Sixty percent of Americans are now overweight, 30 percent are obese. It is obvious that the low-fat approach to weight loss has not worked. People have lost weight on low-fat diets, at least initially. You may have had some success yourself. But where is all that lost weight now? Is it back on your thighs, hips, and belly? If so, your weight loss diet hasn't done you a bit of good. If your diet was successful, truly successful, you should be at or near your ideal weight right now.

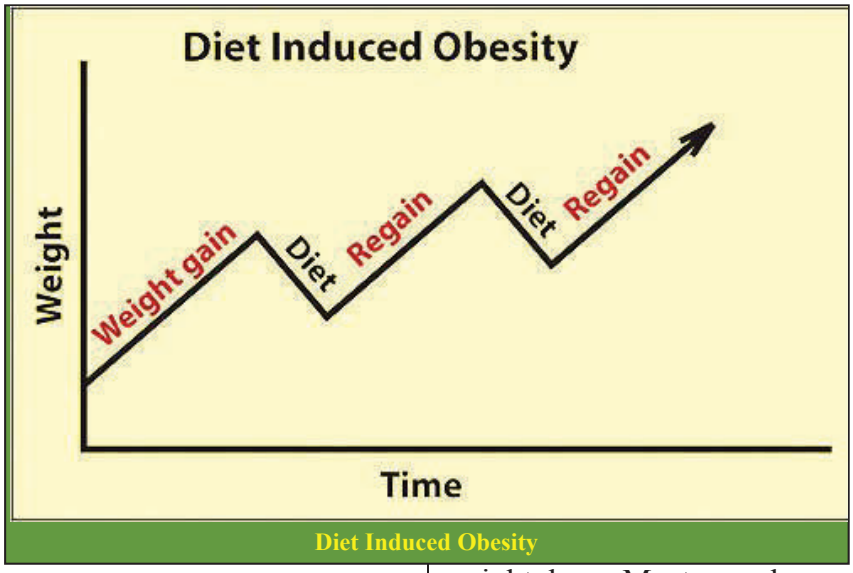
Most people who are overweight have tried dieting. Many have struggled through numerous diets, yet they are still overweight. The sad fact is that low-fat diets don't work. Oh sure, you can lose a few pounds at first, but over time, the weight comes right back.

Virgin Coconut Oil and Coconut Cooking Oil for Healthy Diet

As long as you continue to eat a healthy portion of fat, you metabolism will remain normal. Unlike a low-fat diet, you are not forced to keep reducing your calorie intake time and time again to keep losing weight. Another advantage of eating fat is that it helps satisfy hunger. You don't experience the agonizing hunger pangs you would with severe calorie restriction. It is almost like a non-diet diet.

One out of every three people who go on weight loss diets regains their weight within one year. According to the Mayo Clinic, within 5 years 95 percent of those people who go on weight loss diets regain all the weight they lost. That's a 95 percent failure rate! Those 5 percent who do manage to keep the weight off for more than 5 years continue to carefully watch what they eat and are physically active with a regular workout schedule.

Low-fat diets are not only unproductive, they are harmful because they actually cause weight gain! That's right. The low-fat diet you struggled with was actually one of the causes of your weight problem. In addition to regaining your lost weight, you generally end up adding on a few extra pounds as well. You would be better off not having dieted at all. The more times you diet the bigger you get. Doctors have a name for this. It's called *diet induced obesity. Low-fat diets are one of the primary causes of our obesity epidemic!*



Diet Induced Obesity

If your weight is relatively stable, meaning you are not rapidly gaining or losing weight, the number of calories you consume is about the same as you are burning off. Even if you are overweight, your calorie input and output are fairly equal.

Calories consumed and calories burned are equal, resulting in weight maintenance (no weight gain or loss), see Figure 1. Increasing physical activity will burn off more calories, so we will assume the level of physical activity does not change over time. The first bar represents the number of calories consumed each day. The second bar represents the number of calories use up each day. Since physical activity is held constant, this bar also represents your metabolic rate or the rate at which you burn off calories.

Let's say you start a low-fat, calorie restricted diet by reducing your calorie intake by 200 calories/day (see Figure 2). Since you are now eating fewer calories than you are burning, you experience weight loss. Most people see some positive results when they first start a diet.

Whenever you cut down on your fat and calorie intake for an extended period of time, as you would with a low-fat diet, your body interprets this as a famine. In response to the perceived famine, your body shifts its metabolism into a lower gear. This is a natural survival instinct that is programed into each of us. By slowing down your metabolism you can survive on fewer calories and less nutrients. This way your chances of surviving the famine are increased.

Consequently, when you decrease calorie intake, your metabolism will gradually slow down to match calories you are consuming (Figure 3). Calorie intake again equals

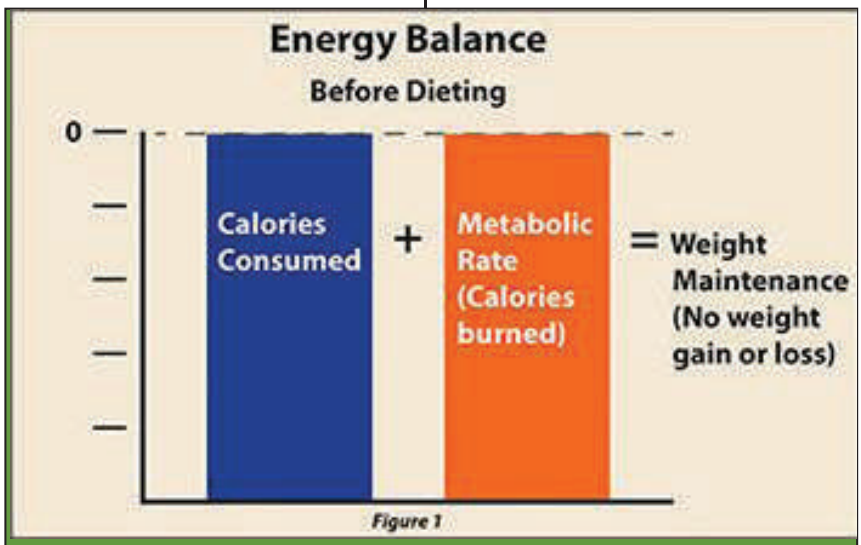


Figure 1

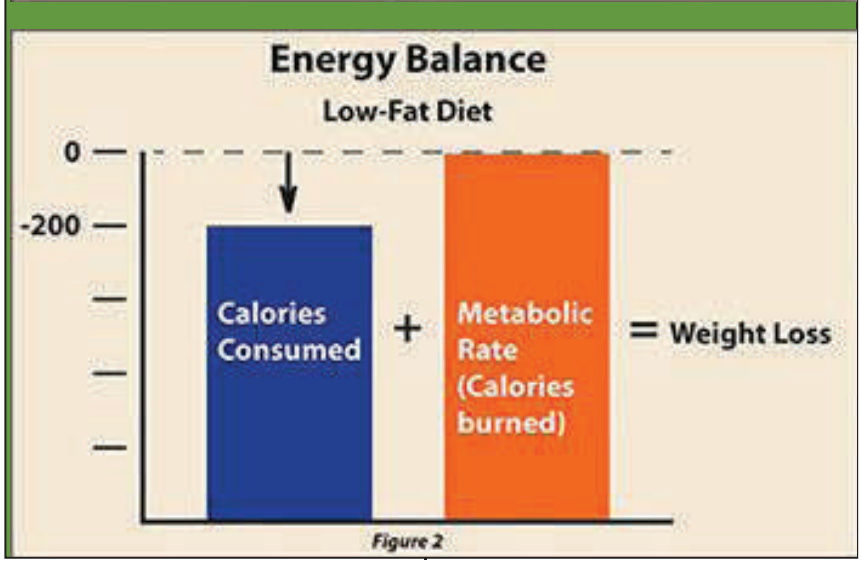


Figure 2

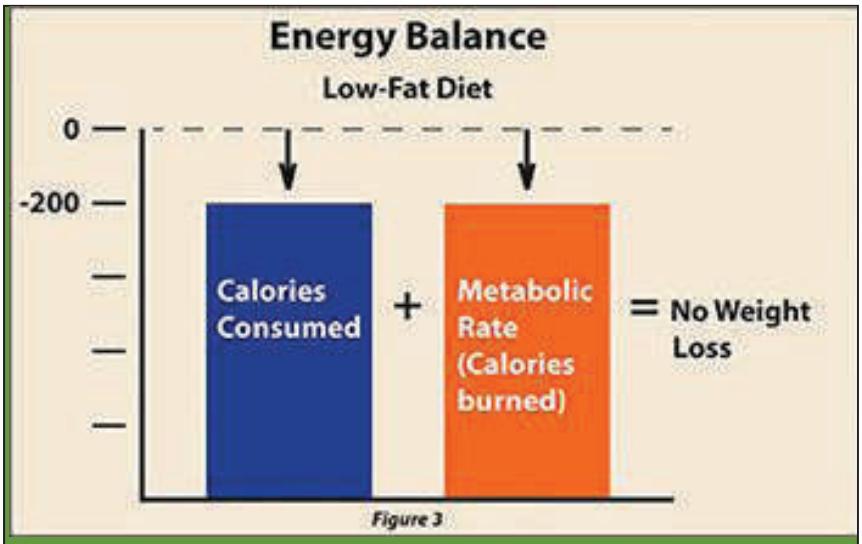


Figure 3

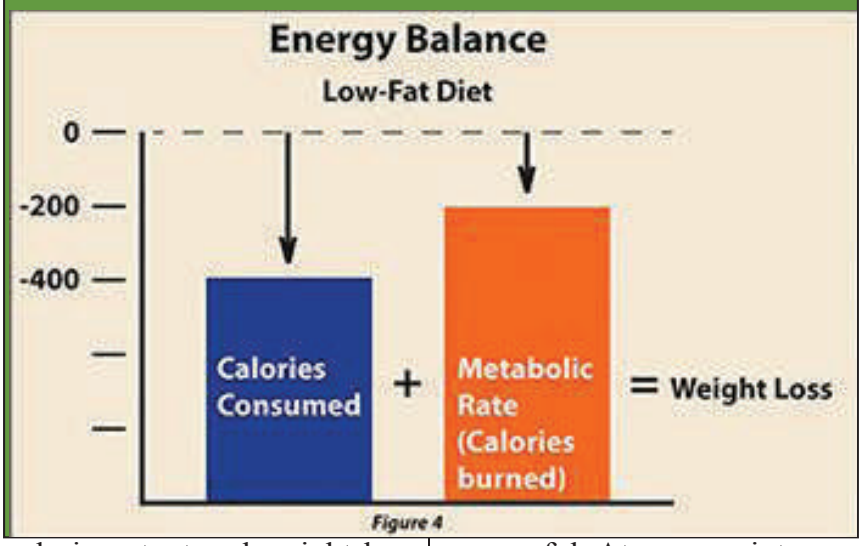


Figure 4

calorie output and weight loss stops. In order to keep losing weight, you need to reduce the number of calories you eat even more (Figure 4). However, in response to the reduced calorie intake, your metabolism slows down even more to maintain an energy balance (Figure 5).

This process continues as long as you remain on the diet. You can reduce the amount of food you eat to starvation levels and still not lose any weight (Figure 6).

As you continue with the diet you must struggle with constant hunger and temptation. It takes a lot of willpower and effort to be successful. At some point, you are going to end the diet. You can't remain on this type of diet forever because not only is it uncomfortable, it is unhealthy and can lead to malnutrition and poor health.

When you start adding a little more food into your diet, your calorie intake increases but your metabolism remains depressed (Figure 7). The result is weight gain. Over time you will gradually relax your food restrictions and eat more. When your body realizes that the famine is over, your metabolism will gradually speed up (Figure 8).

In time, your calorie intake and metabolism will return to the levels they were before you started the diet (Figure 9). Since it takes some time for your metabolism to recover, by the time it normalizes, you have not only regained all your lost weight but generally a few extra pounds as well. The end result is that you are heavier now than before you started the diet. This cycle may take 6 months to complete or it may take 5 years. As noted by researchers at the Mayo Clinic, 95 percent of dieters regain *all* their weight within 5 years. This is why low-fat diets are doomed to failure from the very start.

Since the diet didn't work, you may go on another diet, ending with the same result and then another and another. Each time you diet you get bigger and

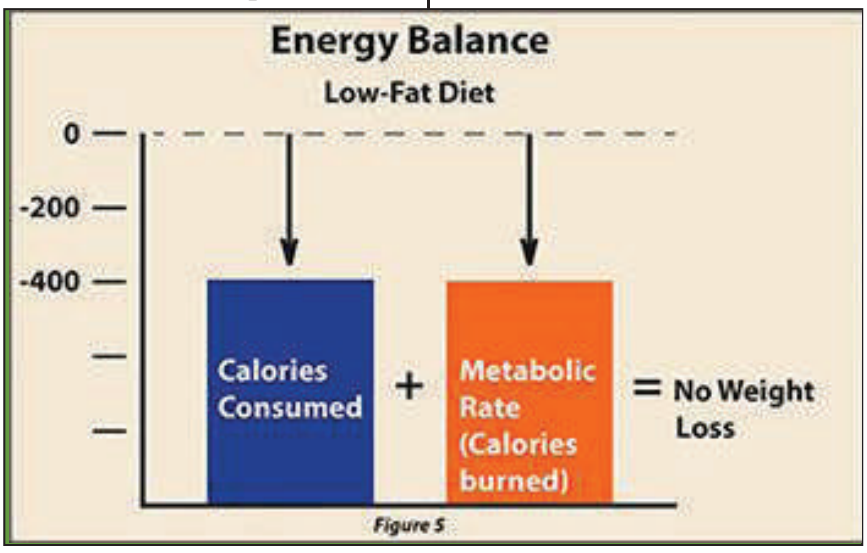


Figure 5

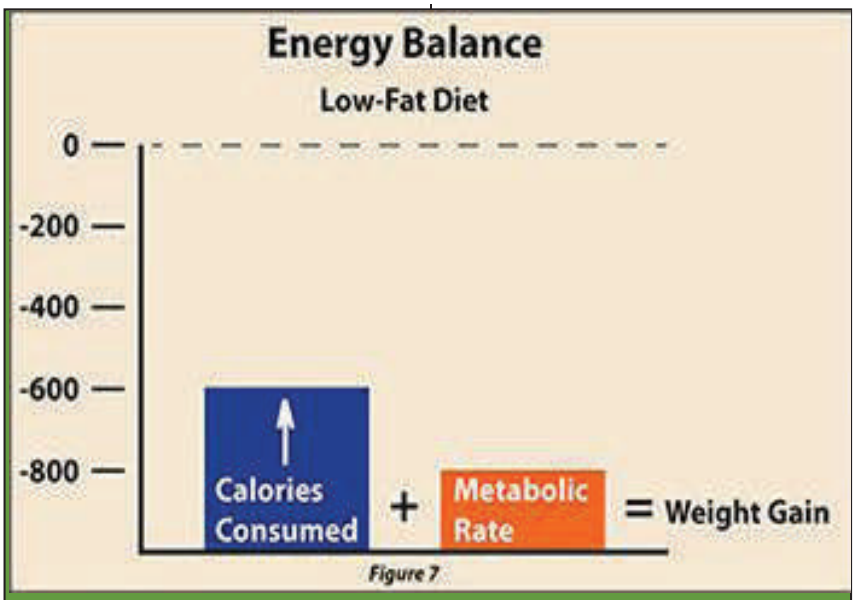


Figure 7

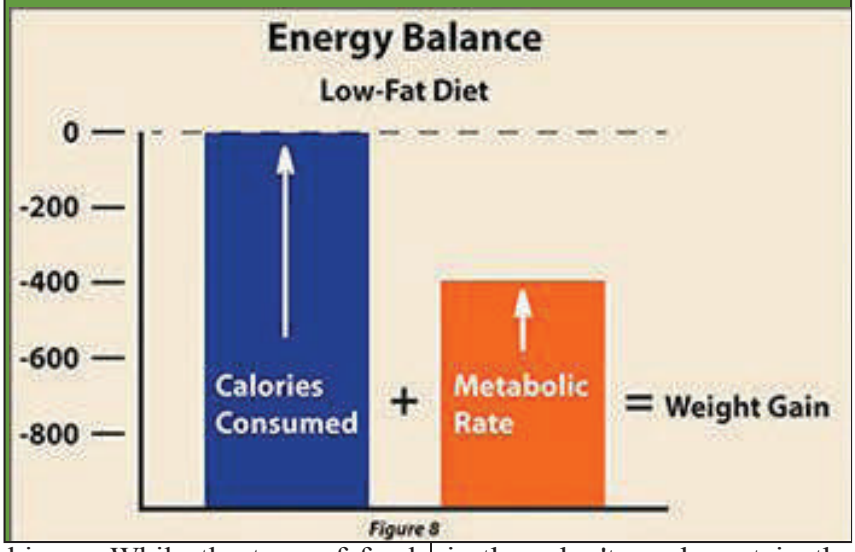


Figure 8

bigger. While the type of food you eat does influence body weight, it can be the dieting itself that is the biggest contributor to your weight problem.

All low-fat diets promote diet induced obesity. Over the years, there have been various twists to the standard low-fat diet, you have the cabbage soup diet, grapefruit diet, macrobiotic diet, lemonade diet, the 3-hour diet, Beverly Hills diet, volumetrics, liquid diets, and on and on. If the low-fat approach to dieting worked, why the need for so many diets? The simple truth is they don't work, not in the long run anyway.

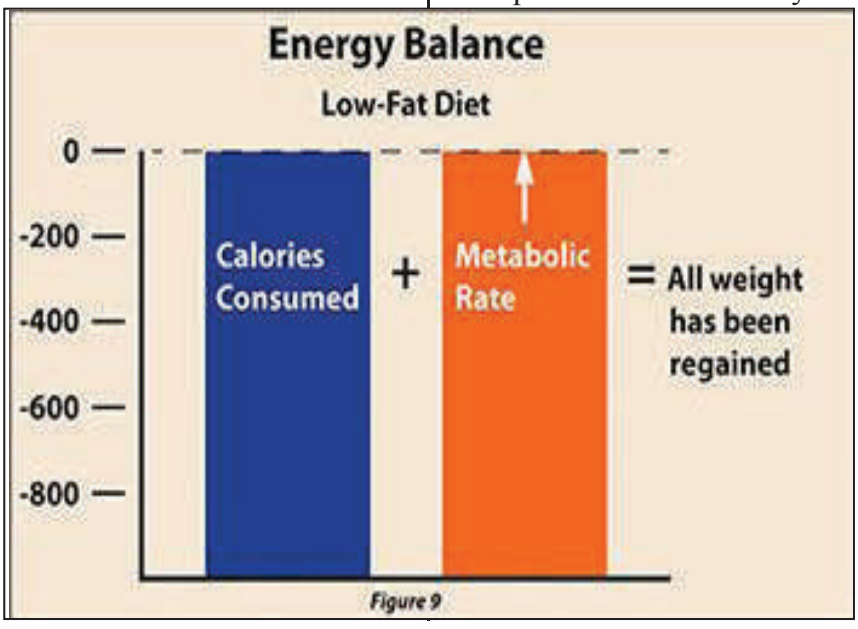


Figure 9

Albert Einstein defined insanity as, "Doing the same thing over and over again but expecting a different result." We have tried low-fat dieting over and over again with the same result. No matter what name you put on it, to keep trying low-fat diets over and over is insane!

The reason why low-fat diets do not work is because they do not include enough fat. Fat is the secret ingredient to successful dieting. Believe it or not, fat is the ideal weight loss aid!

When a calorie reduced diet includes an ample amount of fat, your metabolism does not change much. It remains elevated as if you were eating full meals. Our ancestors had to survive in times of winter and famine when food was scarce. The game they managed to catch didn't provide them with much fat because the animals were lean due to the general lack of food. During the summer, when food was abundant, their game provided a rich source of fat and our ancestors' metabolism remained high. The presence of fat in your

diet tells the body that food is abundant and that the hunting is good, there is no famine.

When you go on a high-fat, calorie restricted diet your metabolism stays normal. You can reduce calorie slightly and loose weight the entire time you are on the diet (Figure 10). When your weight loss goal is reached and you begin to eat more calories, you do not experience weight gain because your metabolism was never depressed (Figure 11). Instead of gaining weight, you simply stop losing it.

Compared to a low-fat diet, a high-fat calorie restricted diet is a breeze and ultimately much more successful. If you continue to eat sensibly, your weight will stay off. Weight loss can be enhanced even further by using coconut oil as your primary source of fat. Coconut oil, more than any other fat, stimulates metabolism, thus helping to keep metabolism elevated during the diet.

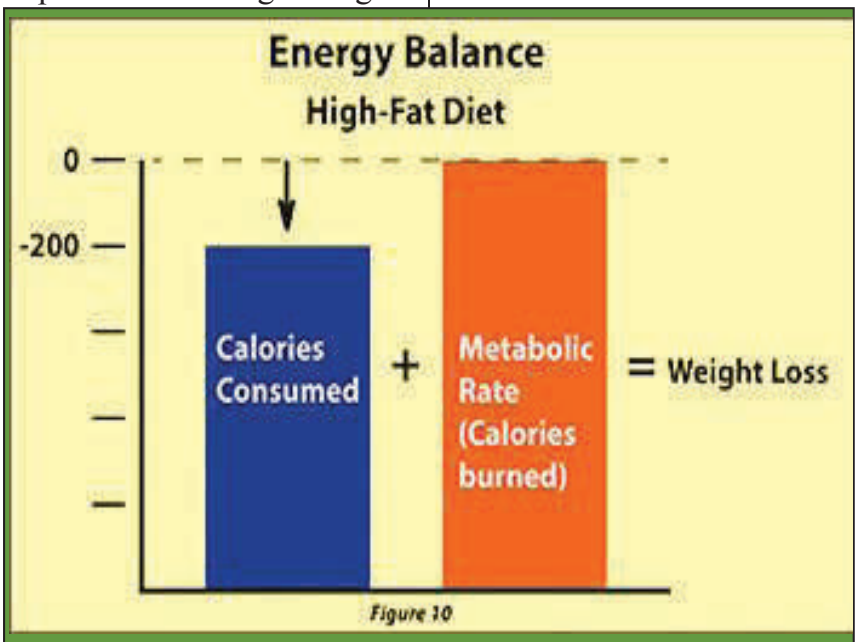


Figure 10

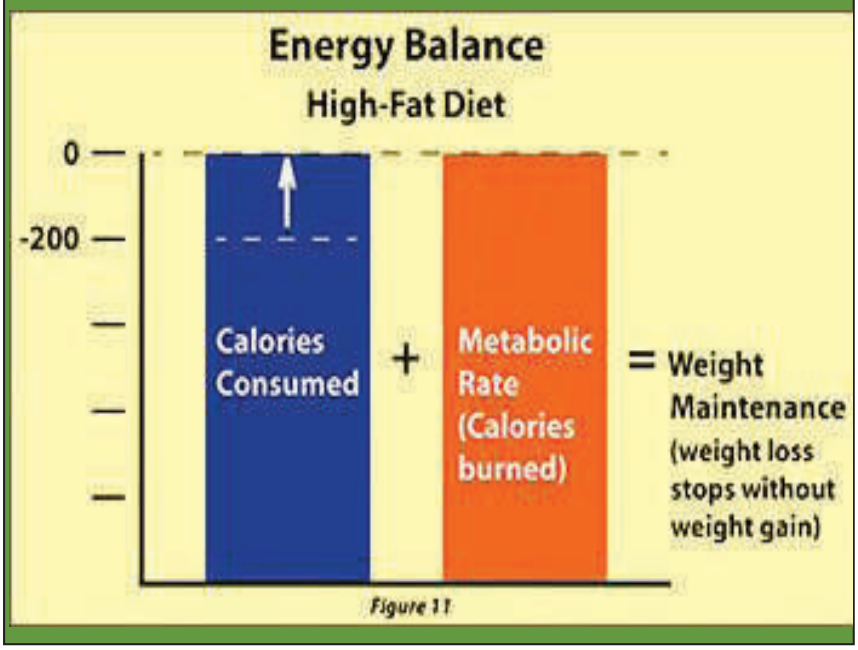


Figure 11

In order to take advantage of the metabolic advantage of fat, you need to incorporate an ample amount into your diet. Adding a couple of teaspoons of fat won't do a thing. You need to let the body know that food is abundant and the hunting is good. This means adding the equivalent of 3, 4, 5 or more tablespoons of fat, preferably coconut oil, into your diet.

The ideal weight loss diet is a reduced calorie ketogenic diet, especially a coconut ketogenic diet, where coconut oil provides the primary source of fat. Fat satisfies hunger and can actually help you feel full on less food. You can add the needed fat, reduce total calorie intake, and still eat fully satisfying meals without experiencing the hunger associated with low-fat diets. That's one of the marvelous effects of a ketogenic diet.

To learn more about weight loss using a ketogenic approach I recommend reading my book *The Coconut Ketogenic Diet*. See the amazing keton diet transforma-tion at http://cocoketodiet.com/?page_id=373

Dr. Bruce Fife is Certified Nutritionist and Doctor of Naturopathic Medicine, and Director, Coconut Research Center, based in USA.

TROPICAL OILS AS RAW MATERIAL FOR SYNTHESIZING HUMAN MILK FAT ANALOG

Dr. Stevie Karow

Coconut and oil palm are important trees in the world, which provide food for millions of people. The main product obtained from coconut and palm oil is oil. Coconut oil is obtained from coconut fruits, by extracting the endosperm (coconut meat). On the other hand, the fruit of oil palm can produce two kinds of oil which are crude palm oil and palm kernel oil. Crude palm oil is extracted from mesocarp, whereas palm kernel oil extracted from its kernel.

Coconut oil can be extracted through various methods, either by dry or wet processing. The dry process is the most widely used form of extraction. In this process, the oil is extracted from copra (dried coconut meat) and then it must be refined, bleached and deodorized. The other process is wet processing which entails the extraction of the cream from fresh nature nuts. This process is more desirable, due to the free of usage of chemical solvent. Thus, it is more enviromental friendly than the solvent extraction. The wet method is much simpler, which can be conducted at farmer or farmers group level. Meanwhile the extraction of Palm oil and palm kernel oil are using dry process in industrial scale.

Tropicals oils such as palm stearin and coconut oil could be utilized as the main raw materials for synthesizing HMF analog. The resulted HMF analog was found to be rich in medium chain fatty acids. The existence of palmitic in the sn-2 position was similar to human milk fat, and the MCFA derived from lauric acid in the sn-1 and sn-3 positions was expected to provide fatty acid energy that can be readily utilized by the body and not stored in the fat muscle.

Coconut oil has unique properties, because it is rich in saturated fatty acids especially medium chain fatty acids (MCFA) ranging from 58.5 to 62.32% in which lauric acid is the major component. In the processing of crude palm oil some products can be obtained and the main products are palm oil and palm stearin. Palm olein is the liquid fraction obtained from fractionation of palm oil and the solid fraction is called palm stearin. Palm oil has a balanced fatty acid composition in which the level of saturated fatty acids is almost equal to that of unsaturated fatty acids. Palmitic acid (43.5%) and oleic acid (39.80%), are the major components of the fatty acids. The major fatty acid in palm

Coconut (left) and Oil Palm (right) as Sources of Tropical Oils

Table 1. Fatty acid composition (%) of palm stearin and coconut oil

Fatty acids	Palm Stearin[a]	Coconut Oil[b]
C8:0	ND	7.41±0.38
C10:0	ND	6.28±0.14
C12:0	ND	48.24±0.07
C14:0	ND	19.26±0.09
C16:0	59.41±1.10	9.29±0.02
C18:0	4.99±1.16	2.44±0.06
C18:1	29.59±0.05	5.83±0.30
C18:2	6.00±0.11	1.26±0.10

Source: Karouw (2013)

stearin is palmitic acid, followed by oleic acid.

Palmitic acid is the main fatty acid in human milk fat, reaching to 44.80%, it is predominantly located in the sn-2 position of triglycerides. Meanwhile infant formulas contain palmitic acid which is predominantly located in sn-1,3 positions. The role of palmitic acid in the sn-2 position of the glycerol backbone is to ease the digestion and absorption of the fats in the infant intestine. Long chain saturated fatty acids, like palmitic acid, esterified to sn-1,3 positions during the digestion, can form insoluble fatty acid complexes with calcium rendering it unavailable.

In recent years, there have been considerable researches conducted on structured lipids containing fatty acid profile which is similar to that of human milk or Human Milk Fat analog (HMF analog). Generally, tripalmitin or lard oil was used as sources of palmitic acid in sn-2 position. Palmitic acid is the major fatty acid in palm stearin (49.6-58.8%), in which 58.3% are mainly located in the sn-2 position. Thus, palm stearin is good source of 2-monopalmitin which could be hydrolyzed enzimatically using specific 1,3 lipase such as pancreatic lipase. HMF analog having high percentage of palmitic acid in the sn-2 and high lauric acid in the sn-1,3 positions could be synthesized by enzymatic interesterification of 2-monoglyceride and medium chain fatty acid (MCFA).

It was found that the MCFA, when included in the diet, prevented obesity and reduced body weight. MCFA was proved to increase body endogenous oxidation by changing the composition of the adipose tissue pool through altered endogenous availability. The capability of Medium Chain Triglyceride (MCT) to increase endogenous fat oxidation could have implications in the reduction of adipose tissue mass by increasing adipose tissue mobilization. Medium chain fatty acids (MCFA) contained in Virgin Coconut Oil (VCO) amounting to 46.6-48.0% could be used for inter-esterification reaction. This article presents the potential of coconut oil and palm stearin as raw materials to synthesize human milk fat analog (HMF analog).

Fatty acid Composition of Palm Stearin and Coconut Oil

Palmitic acid is the major fatty acid in palm stearin (59.41%), followed by oleic acid (29.59%) (Table 1). As shown in Table 1, lauric acid is the main fatty acids in coconut oil. These are similar to the result of Marina et al. (2009), who reported that the lauric acid of coconut oil was about 46.64-48.03%. Based on the fatty acids profile of palm stearin and coconut oil, therefore, these two oils were considered as a good source of 2-monopalmitin and medium chain fatty acids, respectively.

Synthesis of Human Milk Fat Analog

Human milk fat analog (HMF analog) is a structured lipid which has the fatty acids profile and distribution similar to that of human milk fat. Generally, HMF analog is obtained through enzymatic reaction by using specific 1,3 lipase. This lipase selectively cleaves the fatty acids in sn-1 and sn-3 position.

HMF analog is synthesized using palm stearin as the source of palmitic acid and coconut oil. The HMF analog is synthesized through two main reactions. The first step is preparation of 2-monoglyceride from palm stearin and the second step is intereseterification of 2-monoglyceride and fatty acid methyl ester of coconut oil.

Preparation of 2-monoglyceride

Palm stearin was hydrolized through enzymatic reaction with lipase from *Rhizomucor miehei* and pancreatic lipase. Lipase from *R. miehei* and pancreas have different capability to hydrolize palm stearin to obtain 2-monoglyceride at various ratios of substrate: phospate buffer during the same hydrolysis

Table 2. Fatty acids profile of human milk fat analog and human milk fat

Fatty acid	% Fatty acid	
	HMF analog[a]	Human milk fat[b]
C10:0	4.49±0.43	2.35
C12:0	39.37±0.92	13.82
C14:0	16.06±0.39	12.12
C16:0	24.33±1.59	23.02
C18:0	5.37±0.69	4.75
C18:1	8.98±0.74	21.85
C18:2	1.40±0.11	ND
Total MCFA	43.56	16.17

Noted:
[a] Karouw (2013).
[b] Human milk fat from breastfeeding mother in Philippine (Yuhas et al., 2006)

reaction time. The highest monoglyceride fraction was obtained from the following substrate ratios: phospate buffer 10:1 by *Rhizomucor miehei* lipase (9.14%) and phospate buffer 10:4 by pancreatic lipase (15.36%). At similar substrate ratio, phosphate buffer, the monoglyceride fraction obtained by pancreatic lipase was higher than by lipase from *R. miehei* which were 13.12% and 9.14%, respectively.

Enzymes have specific activity to catalyze the reaction, therefore the amount of water was required by enzymes to maintain their catalytic ability depending on the type of substrate and enzyme. The highest monoglyceride fraction was obtained from substrate ratios as the following: phospate buffer 10:4 at 42 hours of incubation by pancreatic lipase (40,45%) and phospate buffer 10:1 at 18 hours of incubation by *Rhizomucor miehei* lipase (21,59%).

Synthesis of HMF analog

The HMF analog was synthesized through enzymatic interesterification reaction by using lipase from *R. miehei* as byocatalist. All of the enzymatic esterification reactions were carried out in a waterbath shaker operating at 120 strokes/minute. The HMF analog markedly increased during the first 6 hours of reaction and continuously increased up 60.24% at 12 hours. This result indicates that the esterification reaction started at the early stage of reaction (6 hours), however, after 12 hours, the reaction was dominated by hydrolysis reaction of HMF analog to diglyceride and hydrolysis of diglyceride to monoglyceride. The diglyceride decreased until 18 hours and then increased slightly to reach approximately 7.57% at 24 hours.

The diglyceride may be formed through hydrolysis of triglyceride or esterification of mono-glyceride. The HMF analog content increased with the raise of enzyme concentration. The HMF analog contents were 48.21, 53.06, 59.38 and 62.25% at enzyme concentration of 2.5, 5.0, 7.5, and 10.0% by weight of total substrate, respectively. At the same duration of reaction, the rising of enzyme concentration resulted in increasing product concentration.

Fatty Acid Profile of HMF Analog

The human milk fat analog derived from interesterification process of 2-monoglyceride of palm stearin and coconut oil, was found to be rich in medium chain fatty acid. The fatty acid profiles of the HMF analog compared to fatty acid of human milk fat are presented in Table 2. The palmitic acid content, thought to be located in the sn-2 position of the HMF analog is comparable to that of human milk fat.

However, oleic acid, which is also thought to be in the sn-2 position, was noticeably lower than that in the human milk fat. The MCFA (lauric acid from coconut oil) was successfully incorporated into the triglyceride. It was reported that human milk fat analog synthesized from tripalmitin and Neobee (the mixture of medium chain fatty acids) contained MCFA of 23.4 g/100g.

Conclusion

Tropicals oils such as palm stearin and coconut oil could be utilized as the main raw materials for synthesizing HMF analog. The resulted HMF analog was found to be rich in medium chain fatty acids. The existence of palmitic in the sn-2 position was similar to human milk fat, and the MCFA derived from lauric acid in the sn-1 and sn-3 positions was expected to provide fatty acid energy that can be readily utilized by the body and not stored in the fat muscle.

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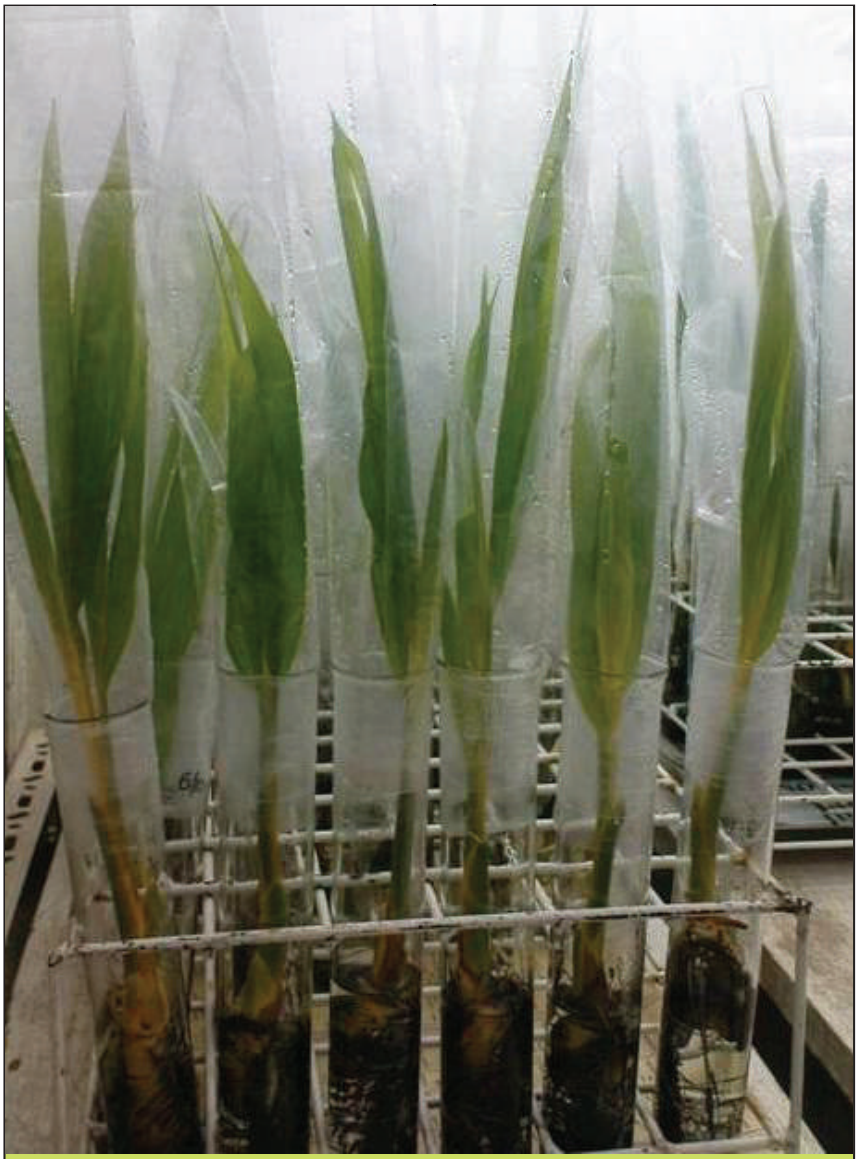
COCONUT GERMPLASM EXCHANGE VIA EMBRYOS: SRI LANKAN EXPERIENCE

L. Perera[1], L.K. Weerakoon[2,3] and W. Widanarachchi[2]

Diverse germplasm of a crop plant is the most basic pre-requisite for a plant breeding because they provide raw material for genetic improvement. A programme for collection and conservation of coconut germplasm has been in place at Coconut Research Institute (CRI) of Sri Lanka since 1980's. With the active involvement of COGENT in 1990, this programme was later accelerated and standard scientific protocols were established for collection, conservation and evaluation of coconut germplasm. CRI in its germplasm programme has so far conserved 152 different accessions comprising of dwarf, tall and intermediate coconut varieties collected by both random and biased sampling techniques. CRI collection of coconut germplasm has been conserved in *ex-situ* gene-banks.

Further collections are done by biased sampling for specific morphological features in local material. The conserved materials are being evaluated by both morphological and molecular means to generate information for the utilization of the conserved material in the breeding programme. The data collected are deposited in the International Coconut Genetic Resources Database (CGRD).

Coconut breeders at CRI had to depend on the available local coconut germplasm for development of new coconut cultivars. The distinct verities of local tall and dwarf as well as a very few early introduction (San Ramon, Cameroon Red dwarf, Brazilian green dwarf) have been successfully used by breeders for developing improved cultivars. The molecular based studies initiated and conducted by CRI, from year 2000 onwards revealed that the genetic base of the Sri Lanka coconut is narrow and thus incorporation of genetic materials from outside the country is necessary for further improvement to the local coconut breeding programme. Further it has also been revealed that the coconut gene pool in South Asia & Africa is different to that of Southeast Asia and the Pacific.



Embryo Plantlets

During the period from 2002 to 2004, coconut embryos from four varieties from India (2002) (Table 01), ten varieties each from PNG (2004) (table 02) and Ivory Coast (2003) (Table 03) were brought to Coconut Research Institute (CRI), Sri Lanka. The nut collection and the embryo extraction and culturing were carried out under

Sri Lankan Scientist Culturing Embryos in Madang Research Station

the personal supervision of a plant breeder and a tissue culturist who visited those countries. Cultured embryos were then hand carried by them back to CRI laboratory. These embryos were cultured in sterile water in small glass vials from the day the embryos were excised in the respective countries and were kept in the same cultures until they reached CRI. Water was used as the storage medium during transport as the risk of contamination is minimal in sterilized water.

The maximum period the embryos were in storage medium (sterilized water) until they place in standard growth medium was about 10 days and this is correct for the first batch of embryos collected from one variety. As collection proceeded, the last batch of embryos collected from another variety stay in the storage medium only about 2-3 days. After bringing them to the Tissue Culture Laboratory at CRI, they were transferred to the standard growth medium (Eeuwens Y3 medium) and maintained under *in vitro* conditions. Once they developed in to complete plants they were transferred to soil and acclimatized under appropriate conditions. Some of these plants have already been established in the field (Table 04) and they will be used for future breeding programs. However, the overall success of the germplasm exchange program including shoot tip culture was 10% which was not very pleasing. One of the main reasons for this was very poor germination and development of embryos which was accounted for 68% for Indian (Indo Atlantic origin) materials, 92.2% for Pacific origin materials from PNG gene bank and 96.2% for Southeast Asian and Pacific origin materials from Ivory Coast gene bank.

The Project aimed to optimize, validate and apply an existing standard protocol for selecting, culturing and transferring coconut embryos for wide application taking into consideration the variety effect and culture conditions. Under their objectives, optimizing the embryo culture protocol through the transfer of embryos from the Ivory Coast to the Philippines, Papua New Guinea (PNG) and Sri Lanka and assessing the feasibility of shipping embryos as compared to hand-carrying embryos had direct relevance with the limitations and constrained out lined by the report of Sri Lanka germplasm exchange programme.

The prolonged period of storage in sterilized water might have contributed to poor embryo germination, but a distinct genotypic effect was also observed as in certain varieties very few embryos were observed to be germinated in culture while some other varieties showed satisfactory rate of germination, despite the storage period in water. The Indian varieties (indo Atlantic origin) generally showed a satisfactory germination and it may be that they were storage for less time period than those from PNG and Ivory Coast. There is again another hypothesis that Sri Lanka and India coconut germplasm has the common South Asia origin and therefore Indian varieties respond well to the protocol developed for Sri Lankan materials which has the same origin. The PNG and Ivory Coast materials were of Southeast Asian/Pacific origin and DNA analysis has proved that these two groups are highly genetically different.

In order to enhance germination, Gibberellic acid (GA_3) was applied and only a few embryos could be recovered by this. Even after germination, many embryos did not grow well in culture and these did not develop in to complete plants that could be transferred to soil. Intense browning and premature senescence of embryos was observed in some cultures. Even some of the well developed plants could not be rescued as a result of quick browning of leaves. Out of the plants transferred to soil, some were

Germplasm Expedition in PNG

very weak and thus they did not survive during acclimatization.

In the case of PNG material, the non-germinated embryos were sub-cultured several times in GA_3 containing media (both solid and liquid Y3 media) to induce germination. Since most of the embryos did not respond to this treatment, the shoot tips were excised and cultured in solid Y3 medium (in the case of fairly enlarged embryos, a sizable portion of the embryo was excised that contained both shoot and root poles), as a last resort. This was the first report such an attempt was made *in vitro*-cultured embryos.

However, there were many embryos that did not show any growth (no enlargement) and with these embryos, it was not possible to excise the shoot tips and they had to be discarded. However, the growth of the shoot tip cultures was very poor. One reason for this may be that the excision of shoot tips were done at a very late stage (after several subcultures) and thus the material was not fresh. However, some shoot tips developed well and gave rise to complete plants.

Even in the case of Ivory Coast material, germination was very poor. Thus excision of shoot tips was done at an early stage and some of these cultures showed good growth. However, there were many embryos that did not enlarge and attempts were made to dissect the plumules of these embryos under a stereo microscope. However, none of these plumules showed any sign of growth in the embryo culture medium. The excised plumules were transferred to callus induction medium as an attempt to obtain callus but the attempt was not successful.

These observations were made available to the COGENT. As a result, an internationally collaborated project on "Validation of coconut embryo culture protocol for international exchange of germplasm" was formulated by COGENT with funding from Global Crop Diversity Trust and supported by Bioversity International. The project was implemented via four laboratories, Ivory Coast (CNRACI), Papua New Guinea (CCIPNG), the Philippines (PCAZRC) and Sri Lanka (CRISL).

The Project aimed to optimize, validate and apply an existing standard protocol for selecting, culturing and transferring coconut embryos for wide application taking into consideration the variety effect and culture conditions. Under their objectives, optimizing the embryo culture protocol through the transfer of embryos from the Ivory Coast to the Philippines, Papua New Guinea (PNG) and Sri Lanka and assessing the feasibility of shipping embryos as compared to hand-carrying embryos had direct relevance with the limitations and constrained out lined by the report of Sri Lanka germplasm exchange programme.

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VIRGIN COCONUT OIL (VCO) SUBSTITUTION FOR THE PRODUCTION OF ICE CREAM AND FRUIT FLAVORED VCO-EMULSION

Barlina Rindengan

Introduction

Although Virgin Coconut Oil (VCO) has been included in the list of foods that are considered safe to consume by the US Food and Drug Administration (FDA), many consumers are still reluctant to consume it. They may think that VCO cannot instantly recover their illnesses unlike chemical medicines which can give immediate relief. In addition, some people don't feel like consuming VCO directly for organoleptic reason. To overcome this problem, alternative ways of consuming VCO needs to be explored. One of the alternatives is using VCO as one of ingredients in preparing foods and pharmaceutical products.

Using VCO as one of ingredients in the preparation of both food and non-food products will help consumers to get health benefits of VCO indirectly. By using appropriate processing technolo-gies VCO can be used to replace other vegetable oils that are commonly used in food processing. It will also support the efforts of the VCO based – products diversification. Vegeta-ble oil component in some food products usually varies from 10 - 80 percent. If the oil component is substituted with VCO, the functional properties of VCO can be enjoyed by consumers. This VCO substitution will increase VCO consumption which in turn boosts VCO production.

Another reason for substituting Vegetable oils with VCO is to avoid the use of trans fat for food preparation. Vegetable oils which are often used in the processing of various products usually have undergone various processes, such as hydrogenation process. This process can result in trans fat causing various health problems. Trans fats can increase LDL cholesterols and decrease HDL cholesterol, and the increased LDL cholesterol level will lead to heart disease. Therefore, the Food and Drug Administration (FDA), requires the food industry to label trans fat on the nutrition list started in January 2006.

Considering the health benefits of VCO, it is the right time to replace unhealthy vegetable oils in food industry with a healthy vegetable oil which has not experienced various initial processes, such as hydrogenation.VCO is a healthy vegetable oil that can be used as a source of vegetable oil to replace unhealthy vegetable oil. Two products to be discussed in this article are food products (VCO - Ice Cream) and pharmaceutical products (Fruit Flavored VCO-Emulsion).

Processing VCO Ice Cream

One of popular food products

Figure 1. VCO-Ice Cream in Five Different Flavors

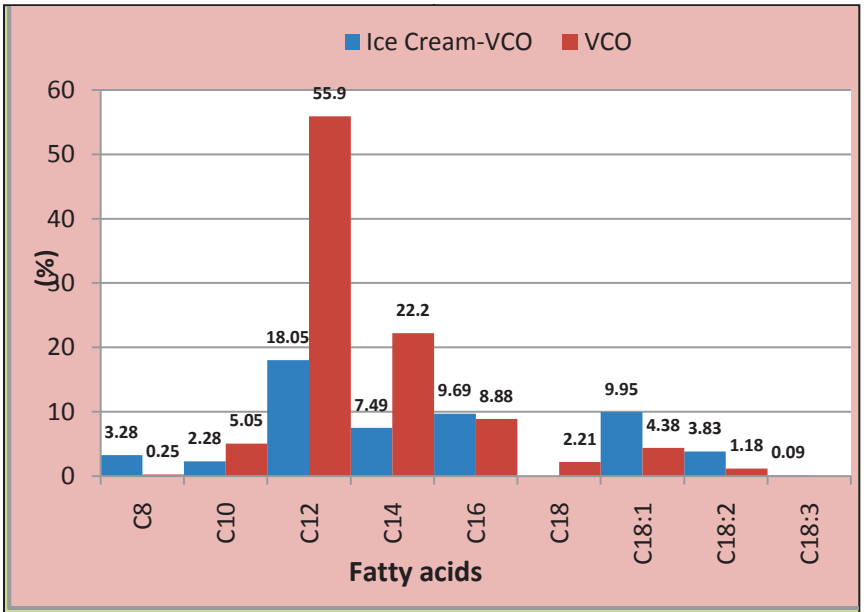


Figure 2. Fatty acid composition of Ice Cream-VCO and VCO
Source: Rindengan, et al. (2011)

which is widely consumed around the world is Ice Cream. It is basically a frozen product where the raw material is cow's milk in the form of fresh milk or skim milk. Ice cream can be processed in two ways, namely: a) using a special tool (Ice Cream Maker) and 2) manual / traditional (utilizing Mixer / blender and freezer. The stages in the processing of ice cream are as follow: Mixing, Pasteurizing, Homogenizing, Cooling, Aging, Freezing, Hardening and Storage.

Ice cream generally consists of minimum 10% of fat, 20% of non-fat milk total solids and maximum 0,5% of stabilizer. Other source describes that the composition of the ice cream is as follows: 10% of fat, 9-12 % of nonfat milk solids, 12-16% of sweetener, 0,2-0,55% of stabilizer and emulsifier, and 55-64% of water (derived from milk or other mixing materials). Ice cream fat content is the source of calories, and it also plays an important role in determining the Ice Cream characteristics, such as taste and tenderness when consumed.

Process Description

VCO can be used as a substitute for fat in ice cream processing. VCO used in this process was obtained by gradual heating technique. The VCO-Ice Cream can be processed by using Ice Cream maker (ICM). Beside VCO, other materials for VCO-Ice Cream production include egg, sugar, gelatin, milk, flavor, food colorant and water.

The step by step process is as follows: a) heat water until boilling, add milk and sugar then stir until homogeneous. b) In a separate bowl, stir egg yolks until getting fluffy then add VCO and stir until getting smooth. c) Add the dough to the first bowl and stir until homogeneous, then add the gelatin and stir. If the dough becomes homogeneous add flavor and coloring then stir until getting homogeneous. The Dough processing is then continued using Ice Cream Maker (ICM) for 15-30 minutes. Figure 1 shows VCO Ice Cream products in 5 different flavors: chocolate, vanilla ,strawberry, orange and mocca).

Characteristic of VCO - Ice Cream

a) Fatty acid of VCO - Ice Cream

The analysis results of fatty acid composition of VCO-Ice cream (with 15% of VCO) compared to the fatty acid composition of VCO raw material can be seen in Figure 2. Figure 2 shows that the lauric acid content of VCO Ice Cream is 18.05% compared with that of the original VCO which is 55.90%. When packaged with a volume of 90 ml/package, the volume of VCO/ml package is 12,50cc. Recommended dose of VCO consumption is 3.5 table spoons/day or approximately 50cc which can be consumed

Table 1. Composition and Calorie Value of Ice Cream-VCO

No.	Composition	VCO Ice Cream [1)]	Vanilla Ice Cream [2)]
1.	Water content (%)	42.94	-
2.	Fat (%)	16.19	21.86
3.	Protein (%)	3.41	4.1
4.	Ash (%)	0.9	-
5.	Carbohydrate (%)	36.56	20.7
6.	Kalori (Calorie)	305.59	295.9

Note: [1)] Rindengan, *et. al*., (2011), with 15% of VCO addition
[2)] Dali (1986)

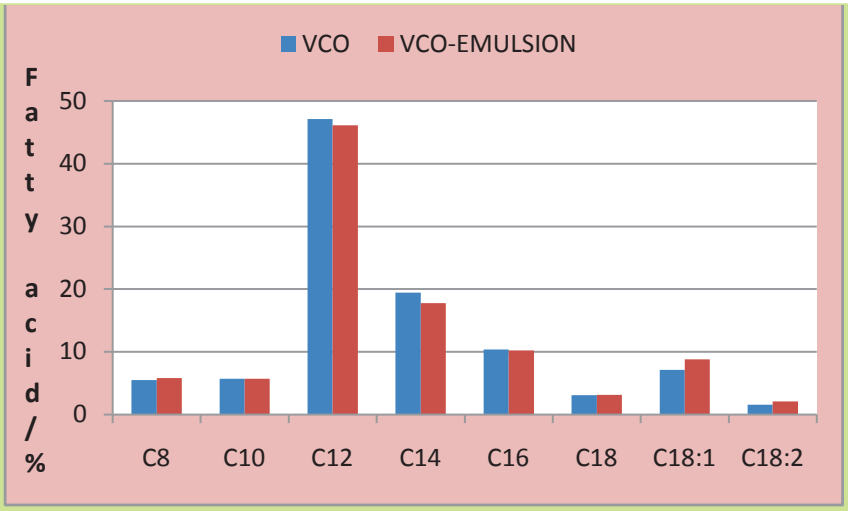


Figure 4. Fatty acid composition of Fruit Flavored VCO-Emulsion and VCO
Source: Fatimah and Rindengan (2011)

three times (with 14cc each).

To achieve the recommended dose of daily VCO consumption, consumers who are reluctant to consume VCO directly can consume 270cc of VCO-Ice Cream which is equivalent to 2.63 grams of lauric acid. As previously explained, during the ice cream processing milk is added so the VCO Ice Cream has 9.95% of omega-3 fatty acid (C18:1), 3.83% of omega-6 essential fatty acids (C18:2) which is higher than the one contained in VCO.

b). Proximate, acidity (pH) and microbiology of VCO - Ice Cream

The comparative composition of Rindengan's VCO Ice Cream and Dali's Vanila Ice cream can be seen in Table 1. This table shows that not only the protein content is similar, but total calories obtained are also not much different. Based on the previous explanation, to reach the recommended dose of daily VCO consumption one can consume 270cc of VCO Ice Cream which is equal to 825 Calorie. The recommended amount of daily calorie intake for adults is 2100 Calorie/day, and about 720 cc of it can be obtained from VCO Ice Cream.

Regarding the acidity level (pH), VCO Ice Cream (with 15% of VCO) has pH of 6. The acidity of Ice cream is normally 6.3 and the pH value varies according to the content of non-fat solids. If the solids without fat increases, the acidity of Ice cream will increase, as a result the pH decreases. The analysis also shows that the total microbe is <10 CFU. International Commission on Microbiological Specifications for Food / ICMSF has set the microbiological standard of Ice Cream as follows: total maximum microbial content is 10^4/gr for grade I and maximum of $2,5x10^5$/gr for grade II. It was found that the VCO Ice Cream has a very low total microbial content compared with the grade I ice cream. This means that the VCO contained in the ice cream can inhibit microbial development, and it also proves that VCO has properties of anti-virus, microbes, protozoa and fungi.

Processing "Fruit Flavored VCO-EMULSION"

Processing VCO into VCO-Emulsion with fruit flavor is intended to increase VCO consumption, because it is more tasty and has beneficial health effects for consumers. Currently there are at least three types of emulsion products in Indonesia, namely the Scott, Champs and Kurkuma brands. Nutrition information of the last two emulsions mention that they contain codfish oil on, while the first one does not mention it.

Process Description

VCO-Emulsion is produced by mixing the two phases which are the oil and water phases. The oil used was VCO with a concentration of 25% (higher than the oil content of the emulsion products in the

Figure 3. VCO-Emulsion with 3 different flavors i.e. grape, orange and pineappel

market), while the aqueous phase in the form of juices of pineapple, orange and grape with concentration of 25%. In the oil phase, emulsifier 'Tween 65' with concentration of 1% was dissolved. Then it is mixed with Ultra Turax Homogenizer at 10,000 rpm. Figure 3 shows VCO-Emulsion in 3 different flavors (grape, orange and pineappel) .

Characteristics of Fruit Flavored VCO-Emulsion

a). Fatty acid of VCO - Emulsion

Fatty acid profiles of VCO - Emulsion compared with pure VCO (as raw material) can be seen in Figure 4. Figure 4 shows that lauric acid content of VCO-Emulsion is 46,14%, when compared with the original VCO, the lauric acid retention of the original VCO is (46,14:47,14) x 100% = 97.80%.

It means that the lauric acid content of the VCO-Emulsion is still relatively high, compared to the original VCO. In other words during the processing of VCO-Emulsion the lauric acid content of VCO is only slightly reduced.

b). Proximate and other chemical tests

Proximate analysis of pineapple-flavoured VCO emulsion is shown in Table 1. The average values of the observed parameters are moisture content 70,60%, ash 0,47%, total protein 0,07%, fat 26,5%, crude fiber 0,22% and carbohydrate 2,3%. In Indonesian market there are 3 types of similar products, Scott, Champs and Kurkuma brand. Of the three products, two products include Codfish oil content in nutritional information (Nutrition Facts), namely the Champs and Kurkuma, while Scott does not list it. Codfish oil content on the Champs is 450mg/ 15 cc, while the Kurkuma 75 mg/15 cc. Thus the highest oil content was found on the Champs with the level of 450mg/15 cc or 3% (w/v). Compared with the results of the study, VCO-Emulsion had higher levels of oil (VCO) so when consumers take this emulsion their daily needs of VCO can be satisfied. Council on pharmacy and chemistry reported that Scott emulsion of cod liver oil prepared from Scotts Norwegian has cod-liver oil content of 29.90%.

Table 1. Proximate analysis of pineapple flavoured VCO-Emulsion

No.	Parameter	Percentage
1.	Water content	70,5939
2.	Ash	0,46675
3.	Protein	0,0728
4.	Fat	26,5035
5.	Fiber	0,2247
6.	Carbohydrate (by diff.)	2,3394

Others properties of VCO emulsion are iodine value and peroxide value. Iodine values of other VCO-flavored emulsions such as orange, pineapple and grape are 9,50; 9,75; and 10,24, respectively. Whereas their peroxide value (meq/kg oil) are 0,34; 0,39 and 0,34 respectively. According to the Asian Pacific Coconut Community (APCC) standard, iodine value in the VCO ranges from 4,10 - 11,00 and the peroxide value is 3 (meq/ kg oil). The results obtained indicate that iodine value and peroxide value in VCO-Emulsion is in compliance with the APCC standards.

Conclusion

The Processing of Ice Cream using the VCO (15 %) as the fat source results in VCO Ice Cream with fat content of 16,19%, lauric acid of 18,05 %, total microbial content of < 10 CFU, and 305,59 Calorie. The recommended dose of daily VCO consumption can be satisfied by consuming 270 cc of VCO Ice Cream which is equivalent to 2,63 grams of lauric acid. Fruit flavored VCO-Emulsion can be produced using combination of 25% VCO and Tween emulsifier of 1%. The lauric acid content of VCO emulsion is high, which is approximatetely 97.80% of the pure VCO.

Barlina Rindengan is Senior Scientist from Indonesian Palmae Research Institute.

USE OF COCONUT OILS AMONGST THE PACIFIC ISLANDS

Sairusi Bulai

Introduction

Coconut plays an important role in the socio-economic and cultural lives of Pacific island communities. In some of the countries, in particular the atolls, the only crop that can grow well under their environments are the coconuts.

Although it's economic importance, as the main export commodity in terms of copra and oil, has reduced considerably from what it was decades ago, coconut continues to be an important crop for many Pacific Island Countries, especially for the rural-based population, as the source of their livelihoods, food and drink, medicinal and for cultural uses.

Pacific Island cultures are very closely linked to the use of coconut oil, which are produced in homes for the treatment of ailments, for massaging, skin protection, for improved appearance and for the exchange of gifts in traditional gatherings. These practices have been in existence for many generations of Pacific people. Virgin coconut oil (VCO), with its production simplicity and its higher value, offers an excellent opportunity for Pacific communities, especially the rural women. But with so many countries and producers making and selling VCO, maintaining consistent quality and safety

standards is vital in ensuring the integrity of the product.

This article is a brief overview of coconut oil production and use in the Pacific. It provides a brief description of the coconut sector in the region, including the challenges faced and some suggestions on the way forward for the sector.

1.0 Current Status of Coconut in the Pacific

Coconut is part and parcel of the socio-economic and cultural lives of Pacific Island communities. In fact in some islands, especially the atolls, coconut is the only crop that can grow well under the prevailing harsh environment to provide food, drinks and other sources of livelihood to the communities that live there. It is reported that for all Pacific plants, coconut has the highest number of uses, a total of 125 reported uses, excluding its ecological role in terms of shade, coastal protection, etc. Coconut is, indeed, the 'tree of life'.

However, the importance of coconut as the main export commodity for many Pacific Island Countries has been reduced considerably over the years, mainly because of low market prices as a direct result of the strong competition from other vegetable oils. But despite this, coconut, continues to be an important agricultural export from the Pacific. In 2014, Papua New Guinea had coconut the 4th most important agricultural export behind palm oil, cocoa and coffee (PNG, 2015). This

Table 1 Coconut and copra oil production in the Pacific in 2009 *

2009		Production (t)	Production Area (ha)	Imports (t)	Exports (t)
Fiji	Coconuts	150,000 (-20%)	60,000 (0%)	9 (27%)	167 (+109%)
	Copra oil	13,000 (+36%)		1(-98%)	3,788 (-40%)
Kiribati	Coconuts	131,351 (+2%)	30,395 (+13%)	0	0
	Copra oil	6,825 (+500%)		119	0 (-100%)
Samoa	Coconuts	155,060 (+1%)	27,173 (+9%)	0	987 (-2%)
	Copra oil	5,100 (+13%)			2,500 (-4%)
Solomon Islands	Coconuts	384,000 (+7%)	51,000 (+6%)	0	0
	Copra oil	5,100 (+31%)			705
Tonga	Coconuts	59,200 (+2%)	8,379 (+14%)	0	1020 (+1720%)
	Copra oil	1,200 (-3%)		4	
Vanuatu	Coconuts	309,000 (+3%)	79,654 (+8%)	9	0
	Copra oil	12,825 (-6%)		1	5,316 (-59%)

**FAO Pacific Trade Statistics database*

trend will continue for some time given the narrow-based economies of most Pacific Island Countries and also because of the fact that coconut is already growing and producing nuts in all the islands which will be difficult to replace in the short and medium term.

Table 1 above is a summary of coconut and copra oil production and export and import statistics in a number of Pacific Island Countries in 2009, showing production trend between 2005-2009. This showed a number of things:

- Areas under coconut remain in general the same although some small increases are shown. Most of these coconuts comprise of smallholders which are not actively managed. At the same time this data did not indicate the high incidence of senility of the coconut palms which in some countries is at 60 – 70%.
- Overall, copra oil production increased over the five years but with exports declining. At the same time, whole nut exports are increasing, which was probably targeting the Pacific islands diaspora in Australia, New Zealand and the United States of America.

2.0 Social and Cultural Uses of Coconut Oil

Coconut is an important component of Pacific islanders' diets. This is mainly in the form of coconut milk, both raw and cooked, and in some islands, especially in Kiribati, coconut sap is important and is consumed as toddy or syrup. From the statistics shown in Table 1 above, the increasing exports of whole nuts may be indicating that Pacific islanders overseas have continued to maintain coconut, most probably coconut milk, as an important part of their diets.

Currently, the Pacific Island Countries have one of the highest rates of non-communicable diseases (NCDs) in terms of obesity and diabetes, and a main strategy that is in place to combat these is to support the increasing consumption by Pacific islanders of their traditional local foods. It is expected that coconut will play an important role in this regard.

Coconut oil, produced in the households, although, is not used for cooking and other food preparation performs important functions in Pacific traditional ceremonies and dances, and for skin protection and appearance and traditional medicines.

Pacific people taking part in traditional ceremonies and dances look beautiful, their bodies glistening with coconut oil, and because these ceremonies and dances are normally performed outside in the sun and in the rain, the coconut oil acts a skin protection.

3.0 Industrial Processed Coconut Oil

Most of the Pacific Island Countries have industrial processing facility for the production of copra crude oil. For some countries, there also exists refinery facility for producing refined, bleached and deodorized (RBD) copra oils. But as seen in Table 1, although, copra oil production increased for the period 2005 – 2009, oil exports had actually been declining. This meant that domestic use of industrially processed coconut oil had been increasing. Most

of the domestically used oil would be for cosmetics and for industrial food processing.
It would be assumed that a portion of this oil is also being used for social and cultural uses, especially in traditional ceremonies and traditional dances, and for massaging, replacing the coconut oil that is normally produced in households for these purposes. None of the industrial copra oil, however, is destined for domestic cooking and food preparation.

4.0 Virgin Coconut Oil (VCO)

The first VCO from the Pacific which was exported to the United States of America was produced in Fiji with the advent of the DME technology. Unfortunately, the Fiji producer was unable to maintain the quality standard required and lost the market. Since then, many in the Pacific islands Countries are now producing and selling VCO, both for domestic use and for exports. For example, the Samoan NGO, Women in Business (WIBDI), has managed to negotiate a deal with, and is supplying the internationally renowned The Body Shop organic and fairtrade certified VCO for a number of years now. VCO has therefore provided an excellent opportunity for Pacific Island communities to enhance their livelihoods, especially the rural women.
A major challenge, however, is the need to maintain the quality and safety standards that will ensure that VCO maintains and enhances its position in the market. In Fiji, for example, a survey undertaken in 2009-2010 (see Table 2) showed that there were close to 20 producers and suppliers of VCO, especially in the rural and outer island areas but without a mechanism to ensure the consistency of the quality and safety of the products that were produced and sold. This situation continues today, posing a great risk to the continuing acceptance of the product in the export markets.

The Secretariat of the Pacific Community (SPC), through its Land Resources Division (LRD), provides support to its member countries in a number of areas in agriculture, land and forestry. In all these, coconut is one of a number of important crops in the Pacific that SPC LRD actively promotes. In doing this, it uses a value chain approach, covering farm production right to the point of sale.

Currently, work is continuing to find the most economically suitable products that can be made from the senile stems. This will provide incentive to coconut smallholders to actively manage their coconut plantations by removing the senile unproductive palms and replacing them with younger and more productive ones. Clearing of senile palms will also provide opportunity to farmers to include other crops in their coconut plantations resulting in systems with increased diversity and resilience to cope with climate change.

A number of enterprises are being supported to ensure that their VCO processes comply with GMP and HACCP requirements, and their products branded and marketed appropriately.

Other areas of work include the inventory of coconut plantations in a number of island countries. The difficulty in obtaining up to date and reliable statistics on coconut in the Pacific island is a major challenge. This work will contribute to the improvement in the status of statistics of coconut in the Pacific islands in terms of areas, location, ownership and senility, etc.

SPC is in the process of signing a new coconut project with the EU, and this will further strengthen its work on coconut, pursuing a value chain approach from the field in terms of plantation management and establishment of smallholder farmer groups to the processing of coconut products like VCO, and to packaging and promotion and marketing.

5.0 Conclusion

Coconut continues to be an important crop for Pacific Island countries despite the reduction in its export earning capacity over the years. It has the most recorded use out of the many plants and trees in the Pacific. Coconut oil, in particular, is very important in the socio-economic and cultural lives of Pacific communities.

Coconut is expected to play an important role in the current push for more consumption of local nutritious food to stem the growing incidences of NCDs in the Pacific.

Table 2 VCO Producers in Fiji Between 2009-2010*

Company and Location	2009 Prod Metric tonnes (% export)	Expected 2010 Metric tonnes	Current capacity Metric Tonnes	process
Mr Peni Drodrolagi (Origins Pacific Ltd) – Taveuni and Moala	12 tonnes	24 tonnes	48 tonnes	DME
Mr Jagdish Prasad (Fijika Natural Products) – Labasa, Vanua Levu ph: 9213147			Est 100 tonnes	TinyTech
Mr Ian Chute - Vanua Levu			Est 100 tonnes	tinytech
Mr Adrian Tarte (Wainiyaku Estate) – Taveuni ph: 8280971	170 tonnes (organic exported)	125 tonnes	200 tonnes	Press
Mr Tony Philp – Nabavatu, Vanuabalavu, Lau ph 9997720			6 tonnes	DME
Womens groups - Cicia, Vanua balavu, Lakeba in Lau	1.2 tonnes		1.2 tonnes	Ferm.
Mr John Bennett (Mamfiri Oils) – Rotuma	80 kg (cosmetics)	Nil	9 tonnes	DME
Mrs Virginia Foy, Suva & Taveuni ph 9053806	800 kg (local clients)	800 kg	1 tonne	Ferm.
Mr Bhoo Prasad, Lautoka			Est 5 tonnes	DME
Mrs Lua Radrodro, Waila				
Mr Harish Chand, Macuata Natural Products, Labasa, Vanua Levu ph 9470980				
Ms Adi, Naidi Village, Savusavu				Ferm.
IHRDP, Tailevu				Ferm.
Bobby, Indian boy, Tailveu ph (OPL contact)			48 tonnes	Similar to tinytech
Womens group – RakiRaki , Viti Levu (IHRDP)			5 tonnes	Ferm.
Womens group – Nataiwa, Vanua Levu (IHRDP)			5 tonnes	Ferm.
			Est total capacity 650 Tonnes	

The introduction of virgin coconut oil (VCO) has given a new dimension to coconut in many Pacific island communities, especially in the enhancement of the livelihoods of many rural women. But there is an urgent need to put in place regulatory frameworks to ensure that all VCO produced and traded in the Pacific meet a certain standard of quality and safety. This especially critical given the fact that quite a number of producers are located in remote islands which may not be meeting certain standards like GMP and HACCP. In this regard, financial investments will be required to support the changes required including the development and marketing of new products made from VCO.

Furthermore, there is a need to encourage new planting of coconuts by economically removing the senile palms. This will also provide the opportunity for coconut smallholders to diversify into other crops and trees that would result in more resilient systems that would cope better with climate change.

In all these, the Secretariat of the Pacific Community will continue to play an active role in supporting communities, farmers, enterprises and countries towards the achievement of their goals for coconut.

Sairusi Bulai is from Land and Reseources Division of the Secretariat of the Pacific Community based in Suva, Fiji.

An Interview with Mr. Rajiv Singh, Chief Executive Officer, Coco Veda Natural Product Inc., Philippines by Uron N. Salum

Coco Veda Natural Product Inc. is specializing on producing coconut based products in Philippines with five chains located in Malaysia and Singapore, Sri Lanka, UEA, and Ghana. Both edible and non-edible coconut products are produced by the company. The edible coconut products include Cold-pressed Virgin Coconut Oil (VCO), Coco Sap Nectar Syrup, and Coco Sap Sugar. Mr.Uron N. Salum, the Editor-in-Chief of COCOINFO INTERNATIONAL, has had an opportunity to interview Mr. Rajiv.Singh. Below is the excerpt of the interview.

Cocoinfo International (CI): Mr. Rajiv Singh, when did you set up your company and why did you choose coconut as the business line for your company?

We are a team of small Professionals who have previously worked in various Corporates across Asia . Our objective was to build a Socially Sustainable Enterprise and after one year of detailed study / research which entailed a fair amount of traveling across Coconut Producing Countries of Asia & West Africa , we decided to invest in the Coconut Industry and put forth this proposal to our investors who continue to support us in the start-up period .

Coco Veda was incorporated in Q4 of 2013 initially as Coco Viviendo along with an experienced lady from The Philippines (whose late husband was amongst the pioneers of Virgin Coconut Oil development and amongst the first few exporters of VCO from under the brand name of Viviendo Philippines) and another lady friend from Ghana , also with hands on enterprise experience in the Coconut Industry especially Cold Processed Virgin Coconut Oil .

By mid 2014 , the Company was stalling and facing internal difficulties due to the way business was being conducted which was not well aligned with the Socially Sustainable Quality Conscious Roadmap approved by our investors , and a tough decision had to be taken in September 2014 to accept the facts , restructure the Company to run it professionally albeit with our limited knowledge of the Industry .

They say "Adversity is the Mother of Innovation" , so we embraced the challenge , Ms EO whole heartedly assumed full responsibility of the Operations & Product Development whilst my focus is primarily Strategy , Risk Management , Market & Business Development " .

It's worth mentioning here that at this point in time , we were supported by a lot of valuable information and given moral encouragement by several senior people from the Philippine Coconut Industry including PCA Officials without which we may not have been able to make this leap of Faith .

Hence our new name Coco Veda was born , the word Veda in

Sanskrit means "(Sacred) Knowledge" which we chose in line with "Ayur Veda " which implies " The Science of Life". In our brief and limited exposure to the Coconut Industry , we soon realized the pressing need to build a "Knowledge Rich Company" and focus on Health & Wellness in order to be able to build something sustainable that can trace back to the Coconut Farmers we support and outlive our generation - it's likely to be a long journey that's only just begun.

(CI): What are the Vission, Mission and Core Values of your Company?

Our Business Model is a B2C focus across Asia, Middle East & Africa for which we need an experienced and committed leadership team as a critical component to our "Engine Of Success". This is fuelled by a relationship based network of Farmer to Client Partnerships to drive us forward in realizing our Vision – "From Farm to E-Commerce". In order to achieve this , we hope to commence production of Cold Processed Without Heat VCO at our plant in Ghana by the end of this year to service the West African market locally.

In South Asia, we are in early stage discussions with some potential partners to set up a facility in Sri Lanka for the Indian Sub Continent as a market.

We recognize the challenges that we have embraced, we'd like to try and keep this journey simple & enjoyable with emphasis on a sound & ethical value system

- Our products should speak for themselves
- Human Ethics and Social Responsibility should always take priority
- Share knowledge as well as opportunities
- Let continuous improvement be a part of our DNA

.

(CI): Is raw material readily available? If you have experienced any difficulties in sourcing raw material, what would be the main causes?

We deal directly with Farmer Co-operatives in Coconut Farming

Communities that have set up small processing facilities. We also deal with some consolidators who bring Raw VCO from the farms to their facilities for onward distribution. In order to have better control of the Supply Chain Logistics & Quality we aspire to have a co-operative under our own umbrella some day, driven also by the parallel objective of developing Sustainable livelihood programs that actually Change Lives.

(CI): Do you use any specific coconut variety for the raw material of your product lines? What would other specifications or standards used to decide type of coconut to be used to process your products?

For VCO , the tall variety is preferred and for Coco Syrup / Sugar , the hybrid dwarf is better esp for tappers to follow the tapping regime with discipline and care. We are not dealing with the Aromatic Variety since we aren't in the Coco Water business.

(CI): What is your opinion on the market prospects of edible coconut products?

The answer to this question lies probably more with APCC than us . In my opinion, a lot depends on how successfully the Scientific Research that has already been done is taken forward to translate into Clinical Trials and documented in Medical Journals at least from an Asian Perspective to begin with even if not from a USA FDA Perspective. As a new entrant to the industry, I see this clearly as an area that needs thrust and look forward to industry players coming together under the leadership of an Organization like APCC.

For example , with VCO which has emerged as the Lead Product of the Industry , we certainly need to see more evidence of Clinical Trials in the areas of Cardiovascular Health, Brain Function, ASD & ADHD, Dementia & Alzheimers, Thyroid Response, Cancer, Diabetes, Metabolism Issues, Breastfeeding, Skin Disorders, Scalp Problems etc.

Similarly, with Coco Syrup and Coco Sugar , more convincing evidence needs to be established with regards to the Glycemic Index values, it's long term effect of consumption on Diabetics and related benefits especially with the new 2015 Dietary Guidelines being released in USA which categorically restricts refined sugar intake .

Another potentially powerful Functional Food is High Fibre Coconut Flour which we believe will gain market as a result of the spotlight on Balanced Nutrition, the increasing cost of Healthcare as global population is both increasing and ageing simultaneously.

The world population is adding 100 million babies every year whilst the global (nominal) GDP continues to grow by approximately USD 3 trillion per annum, most of this growth is taking place in the emerging economies of Asia & Africa and is expected to continue till 2050 before demographics may start to change. I believe it's in the interest of the Coconut Industry Officials and Players to come together with a time bound agenda on establishing evidence based results ; there is no shortage of Knowledge, Skills and Passion.

(CI): Your company also processes and markets a Number of Personal Care Products, could you provide details of these and their performance on the market?

The lead ingredient in our Personal Care Range is our "Cold Processed Without Heat Virgin Coconut Oil" for the simple reason that we truly believe that the Skin is our body's largest organ which needs nourishing and looking after - this is the simple premise of our formulations , our entire range is Cold Processed and the products are manually made. What we have so far developed is a range of Hair Care , Facial Care , Lip Care , Body Care & Baby Care , you can view these on our website at www.cocoveda.net.

We've also just launched our Therapeutic Care which includes a Pain Relief Oil and a Repellent Oil to begin with along with a full range of concentrated Essential Oils which we wish to market alongside at affordable prices. Honestly, it's early days for us to pass judgement on the performance of all these products on the market, we know that are products are good & effective, it's now a marketing job we need to embark on to find the right partners to promote these wellness products along with our brand.

We look forward to sharing the nutraceutical & dermatological benefits of our products with people around the world who are willing to give us an opportunity and believe in what we are doing

(CI) Could you explain about the packaging strategy for your products? They look very attractive.

As you know Sir, there are limitations in the Philippines for availability of a variety of

affordable packaging in small quantities and we are several steps behind countries like Korea and this area is very much Work in Progress for us. Since our market focus is primarily Health & Wellness, we have to do everything possible with our limited resources to make the products are as presentable and possible and I thank you for acknowledging our efforts

(CI): Why do you prefer using Absolutely No Heat (ANH) processing method for your VCO?

What we have done with our VCO is not an invention, it's merely an innovation to the ANH (Absolutely No Heat) Process which we felt needed to be improved upon based on our internal Value System of Continuous Improvement being a part of our DNA. We adopted a simple approach to this by meeting seniors in the VCO industry including Sensory Experts at PCA and studied various Research Publications carefully especially those written by scientists like Dr Conrado Dayrit . It was soon quite clear to us that there are various grades of VCO which fall within the acceptable criterion of the APCC specifications. We developed our own method of bringing down the Moisture Content of our VCO naturally to below 0.1% with a sharp focus on the Clarity, Aroma , Texture & Taste. This is done by a seven stage manual process of different types of Filtration, Curing, Settlement and Micro Filtration to the Raw VCO we receive.

(CI): What is your current production capacity? Are your equipment / machinery for VCO processing locally pro-duced or imported?

We have no machinery equipment and can process up to 5000 liters VCO per month from our small processing facility at the moment. This may be increased as demand grows.

(CI): Do you apply Good Manufacturing Process (GMP) in your company? Is there any difficulty in applying GMP?

We are already Certified Organic & Halal Approved, our GMP, ISO and HACCP Certifications are still work in progress although it's high priority for us.

(CI): Quality control is very important for product sustainability. How do you maintain the quality of your products?

Sir, Quality is our middle name and a matter of pride for us. If we adhere to all the systems we are putting in place, there is no reason why we cannot maintain quality as long as we are mindful that as we grow the pressure and commitments will increase. At the end of the day, this is teamwork and everyone has to perform together.

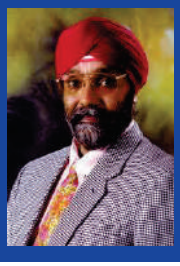
(CI): What is your opinion about developing the coconut sector in the Phillippines to make it more sustainable and viable?

In my humble opinion there is room for PCA to drive a domestic initiative to increase consumption of Coconuts in daily nutrition diet which is lagging on a per capita basis in comparison to other Coconut Producing Asian Countries like Indonesia, India, Sri Lanka and Thailand who use a lot more coconuts in the recipes of their local cuisine . This will also help to combat obesity in the country which has sounded alarm bells recently and brings along with it high healthcare costs. It may be worthwhile for PCA to look at the possibility of a Consumer Co-operative to spur demand of products like Virgin Coconut Oil that will more than offset Healthcare Costs. Such approaches have worked well in Western Countries.

(CI): Thank you very much Mr. Rajiv Singh & Ms. EO for sharing about your coconut business venture with your valued readers. We wish you well in your coconut business venture and that you become more productive and profitable in years to come.

We gratefully thank APCC and its Executive Director in particular for giving us this opportunity to emerge from the shadows and give recognition to our efforts and initiatives

EXPERTS' FINDINGS ON THE HEALTH BENEFITS OF COCONUT WATER



Prof. Rabindarjeet Singh
Director, Sport Science Unit, University Science Malaysia

A study on the effectiveness of fresh young coconut water (Malayan Tall Coconut Variety) for whole body rehydration, following exercise-induced dehydration shows that although plasma glucose was high when coconut water was ingested, it was significantly higher with CEB (Carbohydrate-Electrolyte Beverage) due to its higher glucose content. With coconut water having similar rehydration index with same trend for per cent rehydration and restoration of plasma volume with the CEB, it can be concluded that coconut water could be used for whole body rehydration after exercise-induced dehydration. In addition, consumption of coconut water caused less nausea, fullness and no stomach upset and it is also easier to consume larger amount of coconut water when compared with carbohydrate-electrolyte beverage or a sports drink.

(Source: Prof. Rabindarjeet Singh, 2009. Coconut Water: A Rehydrating Drink after Exercise *Cocoinfo International*, 16 (1): 19-20, and in Proceedings, Malaysia National Coconut Conference 2009, Perak, Malaysia)

DR. D.P. Athukorale

Cardiologist, Pharmacologist, Academician, Colombo, Sri Lanka

Green Coconut has much water and is rich in proteins, minerals, vitamins, calcium, phosphores, iron, iodine, chlorine, sulphur, potassium, carbohydrates and vitamins, B1, B2, B5 and magnesium. The water also helps the hydration of the body. The green coconut has a ratio of amino acids arginine, alanine, cisteína (essential) and serina, greater than those found in cow's milk. It is perfect and natural isotonic to restitute energies in the human body.

Tender coconut water has been used in other areas of the world where intravenous solutions cannot be obtained. Japanese have used tender coconut water (T.C.W.) intravenously in Sumatra, Indonesia in World War I. Pradera et. al. have used intravenous T.C.W. for pediatric patients in Havana, Cuba without any serious reactions

(Source: Dr. D.P. Athukorale 2008. Tender Coconut Water – Its Health Benefits *Cocoinfo International*, 15 July: 14-16)

Dr. Bruce Fife

Certified Nutritionist and Doctor of Naturopathic Medicine, USA

One of the secrets to coconut water's success as a rehydration fluid is its mineral or electrolyte content. Coconut water contains the same major electrolytes as those in human body fluids. It has proven to be a superior rehydration fluid when taken both intravenously and orally.

Today coconut water is used worldwide as a home treatment for dehydration-related diseases such as cholera and influenza. Death rates from cholera are high. Death, however, is not caused by the infection itself, but by dehydration resulting from the loss of body fluids. Giving cholera patients adequate amounts of coconut water results in a remarkable 97 percent recovery rate.

(Source: Fife, Bruce *Healthy Ways Newsletter, Vol. 4 No.4)*

Dr. (Mrs.) E.R.H.S.S. Ediriweera

Senior Lecturer, Department of Nidana Chikithsa, Institute of Indegenous Medicine, University of Colombo, Rajagiriya, Sri Lanka

- Young coconut water could be drunk to alleviate the burning sensation during micturition
- Young coconut water, breast milk, treacle of *Saccharum officinarum* (F.Graminae) and sugar are mixed together and given for hiccough
- Leaves of *Dregia volubilis* (F. Asclepiadaceae) are to be pounded and mixed with tender nut water. The juice is extracted and given in treatment of poisoning of *Nerium indicum* (F. Apocyanaceae)
- Water of young king coconut (before flesh is formed inside) is given for fever and it can be consumed as a diuretic in dysuria.
- A King coconut is to be opened by slicing off the top.30 gms of powdered fruits (without seeds), of *Terminalia chebula* (F.Combretaceae) are added to the King coconut water inside and stirred. Sliced top is then replaced (as a cover) and kept outdoors in the dew overnight. Following morning, the mixture inside is to be filtered and drunk as a purgative. This is called El Vireka by Sri Lankan traditional physicians. The number of bowel motions will increase as the person continues to drink cold water from time to time during the morning. He should not consume hot or warm food and liquids. This is good for purifying blood and cooling the body.

Vermen M. Verallo-Rowel, M.D.
Award-winning, American Fellow Dermatologist and Medical Researcher based at the Makati Medical Center, Metro Manila, Philippines

- Coconut water contains growth factors that function much like a culture broth and that get used up in the process of growth of the meat.
- Whether in human beings or in plants, growth factors are produced to regulate growth. These chemicals are very potent. Even tiny amounts produce major growth effects. These plant growth factors have bewitching, Merlin-the-Magician-like names: *gibberelin, auxin*, and *cytokinin*. Each promote growth.
- One of most studied of the *cytokinins* is *kinetin* which is also found especially abundant in coconut water.
- Because of its size, the growth factors in the coconut are abundant compared to other nuts in plant kingdom. They are kept in a stable environment (the coconut itself), continue to be active, and withstand the rigors of heat and storage – perhaps because throughout its life the coconut is exposed to the sun and the elements at 30 meters or more above the ground.
- Kinetin, one of the coconut's growth factors, has been shown to retard the aging of fruit flies and of human cells in culture, and finally, of people using a cream containing kinetin.

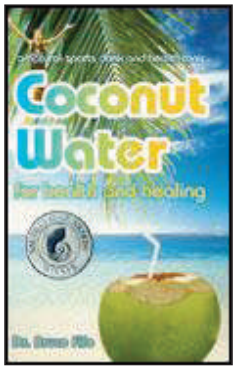
(Source: Verallo-Rowell, V.M. 2005. *RX: Coconuts! (The Perfect Health Nut). Bookman, Inc, Manila, Philippines)*

Dr. Eufemio Macalalag
Director of Urology, the Chinese General Hospital, Metro Manila, Philippines

- Dr. Macalalag has proven the effectivity of administering coconut water in treating renal disorders and in reducing or dissolving all kinds of kidney stones. The process involved the endoscopic procedure of multiple urethral stenting (MUS) or tubatuin (MUS-T), inserting two to twelve urethral catheters into the kidney ureter and irrigating it with coconut water from seven to nine-month old coconuts or buko nectar concentrate powder (BNCP) for a period of 3-19 days. Daily "bukolysis" and renoclysis with BNCP efffects approximately 10 percent reduction in the size of all types of stones treated.
- Dr. Macalalag said that the water from one mature coconut consumed daily, which is equivalent to about two full glasses per nut, could almost guarantee that the formation of stones in the urinary tract would be prevented. Dr. Macalalag asserted that the biggest plus factor in "bukolysis" is its capacity to dissolve kidney stones and arrest their growth.

(Source: *http://www.pinoybisnes.com/food-business/coconut-water-an-economical-health-drink/*)

Coconut Water for Health and Healing



This book describes the many health benefits of this remarkable beverage. It includes a fascinating account of how coconut water has been used as an emergency IV fluid around the world and why it is becoming one of the most popular sports rehydration drinks today.

Coconut water isn't just for rehydration, however. Studies show it provides numerous health benefits, some of which are the following: dissolving kidney stones, protecting against cancer, balancing blood sugar, providing ionic trace minerals, improving digestion, feeding friendly gut bacteria, relieving constipation, reducing risk of heat disease, improving blood circulation, lowering high blood pressure, helping prevent atherosclerosis, possessing anti-aging properties, and enhancing immune function.

Coconut water tastes delicious straight from the coconut, but can also serve as the base for a variety of foods and beverages. Included are 36 tantalizing coconut water recipes. With 80 percent less sugar than fruit juice or soda, coconut water makes a healthy, refreshing drink for you and your kids.

EXPERTS' FINDINGS ON THE HEALTH BENEFITS OF COCONUT OIL

Marry G. Enig, Ph.D.
Director, Nutritional Sciences Division, Enig Associates, Inc.12501 Prosperity Drive, Suite 340, Silver Spring, MD, 20904-1689 USA

The lauric acid in coconut oil is used by the body to make the same disease-fighting fatty acid derivative monolaurin that babies make from the lauric acid they get from their mothers' milk. The monoglyceride monolaurin is the substance that keeps infants from getting viral or bacterial or protozoal infections. Until just recently, this important benefit has been largely overlooked by the medical and nutritional community.

(Source: Enig, G.M. 2001. *Health and Nutritional Benefits from Coconut Oil: an Important Functional Food for the 21st Century*. Coconuts Today, Special Edition for the 13th Asian Pacific Congress of Cardiology, October 2-3, 2001, EDSA Shangrila Hotel, Manila, Philippines).

Vermen M. Verallo-Rowel, M.D.
Award-winning, American Fellow Dermatologist and Medical Researcher based in Manila, Philippines

The Coconut is the Perfect Health Nut. The coconut can help you avoid obesity, boost your immunity, protect you from bacteria, fungus, and viruses – all while keeping you heart-healthy and moisturizing your skin to a natural glow and beauty, even treating acne, and providing beneficial antiseptic, tumor-protecting, and antioxidant effects.

Source: Verallo-Rowell, V.M. 2005. *RX: Coconuts! (The Perfect Health Nut). Bookman, Inc, Manila, Philippines..*

Dr. Jon J. Kabara
Emeritus Professor, Michigan State University, and Technology Exchange Inc. Galena, Illinois 61036, U.S.A

Never before in the history of man it is so important to emphasize the value of lauric oils. The medium-chain fats in coconut oil are similar to fats in mother's milk and have similar nutriceutical effects. In the past four decades misinformation and disinformation provided by certain politically biased agricultural groups and repeated in professional and lay press have led people to believe that all saturated fats are unhealthy. Little attention is focused on the fact that saturated fatty acids are not single family of fats but comprise three subgroups: short (C2-C6), medium (C8-C12) and long (C14-C24) chain fatty acids. The medium chain fats are found exclusively in lauric oils.

(Source: Kabara, J.J. 2000. *Nutritional and Health Aspect of Coconut Oil* In: *Proceedings of the XXXVII COCOTECH Meeting/ ICC 200, 24-28 July 2000,* Chennai, India, pp. 101-109) .

Dr. Conrado Dayrit

Emeritus Professor, University of the Philippines, College of Medicine, Former President, National Academy of Science & Technology, Metro Manila, Philippines

With all the opprobrium cast against it, it bears repeating again and again that no evidence has ever been presented to prove that coconut oil causes coronary heart disease in humans. The human epidemiologic evidence proves that coconut oil is safe. Coconut eating peoples like the Polynesians and Filipinos have low cholesterol, on the average, and very low incidence of heart disease. All evidences now point to inflammation and low HDL as the principal instigators of plaque formation. The chemical properties of coconut oil (CNO) and its biologic actions as a medium chain fatty acid make CNO superior to other oils for cooking and health use. Its anti-inflamatory and immune-regulatory actions as shown by its remarkable control of diabetes, hypertension, heart disease, auto-immune diseases and cancer, make coconut oil unique.

Source: Dayrit, Conrado S. 2006. Coconut Products and Virgin Coconut Oil (VCO) for Health and Nutrition – A strategy for Making Coconut Globally Competitive. In *Proceedings of the XLII Cocotech Meeting, 21-25 August 2006, Manila, Philippines*.

Dayrit, Conrado S. 2005. The Truth About Coconut Oil: The Drugstore in a Bottle. Anvil Publishing, Inc. Manila, Philippines.

Dr. Bruce Fife

Certified Nutritionist and Doctor of Naturopathic Medicine, USA

If there was an oil you could use for your daily cooking needs that helped protect you from heart disease, cancer, and other degenerative conditions, improved your digestion, strengthened your immune system, and helped you lose excess weight, would you be interested? This is what coconut oil can do for you. The oil from the coconut is unique in nature and provides many health benefits obtainable from no other source. Coconut oil has been called the healthiest dietary oil on earth. If you are not using coconut oil for your daily cooking and body care needs, you are missing out on one of nature's most amazing health products.

(Source: Fife, B. 2004. *The Coconut Oil Miracle.* Penguin Books (USA.) Inc. New York, USA.)

Walujo Soerjodibroto, MD, Ph.D.

Nutrition Department, Faculty of Medicine, University of Indonesia, Jakarta, Indonesia

The clinical study on the effects of virgin coconut oil (VCO) on immune responses among HIV positive patients in Dhamais Hospital, Jakarta concludes that the macronutrient intake, mostly in terms of energy, fats and protein were significantly improved among the VCO supplemented group. In addition, the weight and nutritional status of the subjects, especially among the VCO supplemented group, were maintained well throughout the study. By maintaining body weight and nutritional status, it is expected to have significant increases in CD 4 concentration because nutritional status is frequently associated with immune status, both humoral and and cell-mediated.

(Source: *Research Report on the Effects of Virgin Coconut Oil on Immune Responses among HIV Positive Patients in Dharmais Hospital, Jakarta, 2006:21*)

DR. D.P. Athukorale
Cardiologist, Pharmacologist, Academician, Colombo, Sri Lanka

Coconut milk and coconut oil are consumed by the majority of Sri Lankans and rural people which comprise 70% of our population. They get a significant portion of their calories from coconut. It has been found that the majority of people in the rural areas get about 35 gram of fat per day from coconut and they consume very little food containing fats such as milk, butter, cheese, beef, pork, and corn oil as they cannot afford these expensive dietary items. From our clinical experience, we know that serum cholesterol level of people in rural areas is very low. When we investigate patients with ischaemic heart disease (IHD) from rural areas, we find that their serum cholesterol is normal or low. The commonest risk factor for heart attack in rural areas is smoking.

Coconut has been used in Sri Lanka for over 1000 years but the epidemic of IHD is of recent origin. Before 1950, heart attacks were not common in Sri Lanka.

(Source: D.P. Athukorale 1996. The Truth About Coconut Oil. In *Facts About Coconut Oil*, Jakarta: APCC, pp. 52-54) .

Raymond Peat Ph.D.

A lecturer at some universities such as the University of Oregon, Urbana College, Montana State University, National College of Naturopathic Medicine, etc.

Most of the images and metaphors relating to coconut oil and cholesterol that circulate in our culture are false and misleading. I offer a counter-image, which is metaphorical, but it is true in that it relates to lipid peroxidation, which is profoundly important in our bodies. After a bottle of safflower oil has been opened a few times, a few drops that get smeared onto the outside of the bottle begin to get very sticky, and hard to wash off. This property is why it is a valued base for paints and varnishes, but this varnish is chemically closely related to the age pigment that forms "liver spots" on the skin, and similar lesions in the brain, heart, blood vessels, lenses of the eyes, etc. The image of "hard, white saturated coconut oil" isn't relevant to the oil's biological action, but the image of "sticky varnish-like easily oxidized unsaturated seed oils" is highly relevant to their toxicity.

(Source: *Coconut Oil by Dr. Raymond Peat, http://www.efn.org/%Eraypeat/coconut.rtf*)

Dr. Mehmet Cengiz Oz
Director of the Cardiovascular Division
New York Presbyterian Hospital

If you're going to choose just one product to add to your health arsenal, coconut oil may be your best bet. Coconut's chemical compounds make this natural ingredient a powerful tool to solve a whole handful of health issues, including aging, weight balance and infection. Full of antioxidants, this healthy fat is an Oz-approved essential for a healthier you.

(Source: www.coconutresearchcenter.org)

Prof. B.M. Hedge
M.D. FRCP (London) FRCP (Edinburg), FRCP (Glasgow), FRCPI (Dublin) FACC, FAMS

Little over 50 per cent of coconut oil is medium chain fatty acid, Lauric acid and another 7-10 per cent is medium chain Capric acid. Lauric acid gets converted inside the human system into Monolaurins, the best fat that mother's milk has. Other than mother's milk monolaurins are found only in coconut oil. New born babies and infants depend on the monolaurins for their immune system development and their capacity to withstand any infection. In addition, coconut oil can be digested by the salivary lipase, getting obsorbed very fast to give energy like carbohydrates. All other fats need the pancreatic lipase for digestion that the infants do not have. The coconut oil is the best alternative food fat for the infant when mother's milk is not available.

Coconut oil is low calorie fat and as such helps control body weight. Changing the food fat to coconut oil could help reduce weight in obese individuals. It also helps to control blood fat levels in diabetics. Coconut oil's regular use in diet would regularize blood fats and is known to increase the HDL cholesterol fraction while decreasing the LDL and triglycerides significantly; disproving the myth that coconut oil increases cholesterol and triglycerides.

(Source: "Coconut Oil-Ideal Fat Next Only to Mother's Milk" in www.bmhegde.com)

Naiphinich Kotchabhakdi, Ph.D.
Neuroscience, Research Center, Institute of Molecurlar Bioscience, Mahidol University, Salaya, Nakornpathom 73170, Thailand

Coconut oil is a rich natural source of Medium-Chain Fatty Acids (MCFAs) which contain highest percentage (up to 92%) of saturated fatty acids with 6-12 carbons, such as Caproic or Hexanoic acid (C6:0), Caprylic or Octanoic acid (C8:0), Capric or Decanoic acid (C10:0) and Lauric or Dodecanoic acid (C12:0). These MCFAs usually form esters of glycerol to become Medium-Chain Tryglycerides (MCTs). Like all triglycerides (fats and oils), MCTs are composed of a glycerol backbone and three fatty acids. In the case of MCTs, 2 or 3 of the fatty acid chains attached to glycerol are medium-chain in length. Many recent studies have demonstrated that MCTs can potentially help in the process of burning excess calorie, and thus reducing weight gain and promoting loss. MCTs also promote fat β-oxidation and reduced the need for more food intake. Compared with long-chain fatty acids (LCFAs), MCFAs are substantially different in their chemical and physical properties on metabolism. MCFAs do not seem to require binding to proteins such as fatty-acid binding protein, fatty acid transport protein, and/or fatty acid translocase (FAT, homolog to human CD36). MCFAs are a more preferred source of healthy energy (β-oxidation). Recent studies have shown that MCFAs are usually incorporated into adipose tissue triglycerides, and can influence adipose tissue and other systemic functions more substantially than previously known.

(*Source: The International Conference on Coconut Oil 17-20 March 2015, Bitec Conference and Exhibition Center, Samut Prakan, Thailand*)

DR. S.M. Sadikot
Hon. Endocrinologist, Jaslok Hospital & Research Center, Bombay. Hon. Diabetologist, All India Institute of Diabetes, Bombay

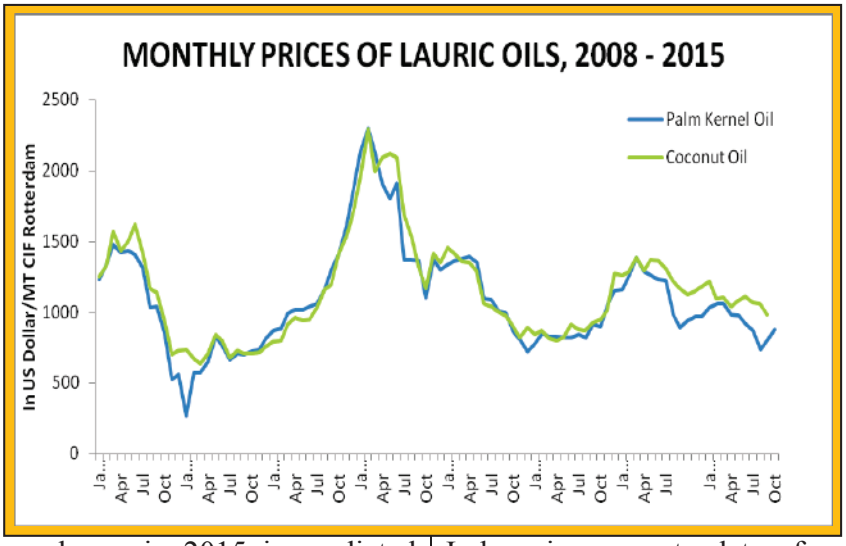
Ghee, coconut oil and mustard oil are traditional cooking media which have been used in India and other developing countries for thousands of years. Although they are saturated fats, they do not show a wide Omega-6 to Omega-3 fatty acid ratio which is quite high in polyunsaturated oils. The desirable ratio is less than 10:1. Increasing prevalence of diabetes and other related diseases are found correlated with increasing Omega-6 to Omega-3 ratio. On the other hand, consumption of coconut oil which is deficient in polyunsaturated fatty acids has been found to enhance secretion of insulin and utilization of blood glucose. It is beneficial to consume the traditional edible fats such as coconut oil along with polyunsaturated fats to reduce the Omega-6 intake and maintain optimum Omega-6 to Omega-3 ratio in the diet.

(*Source: Coconut Oil for Health and Nutrition, APCC 2004)*

BEARISH CNO MARKET IN THE SECOND HALF OF 2015

Alit Pirmansah

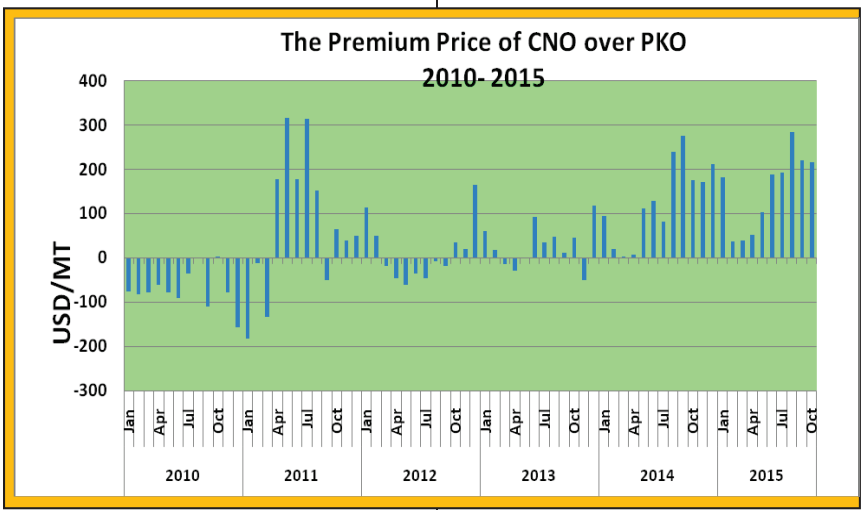
The coconut oil market in the second half of 2015 is expected to dwindle following a bearish market since the second half of 2014. An uncertainty in the global economy driven by a sluggish economic growth of China has disrupted price trend of commodities including lauric oils in international market. The high premium of coconut oil over palm kernel oil has been prompting a pronounced shift of demand at the expense of coconut oil at least in some countries. The large premiums have also triggered a substantial shift of consumption from coconut oil to other vegetable oils, at least in the key producing countries such as Philippines.

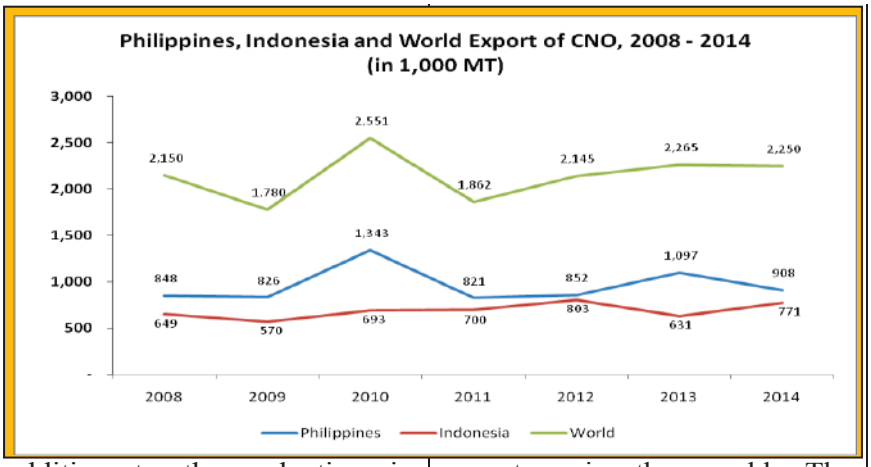


The price premium of coconut oil over palm kernel oil has reached US$ 285/MT on average in August 2015, versus the 10-year average of US$ 36/MT. The premium remained stable in the following two months at average monthly level of US$/MT 219. Since the two lauric oils have a complementary role in the global market, the downtrend in price of palm kernel oil has inevitably brought the price of coconut oil to move down despite a shortfall in the production of coconut oil. Price of coconut oil in October 2015 was US$1,096/MT or has been reduced by 9.67% compared to the price in January 2015.

The production of coconut oil would be expected to be lower following a shortage of copra supply and coconut production. Copra production in the Philippines, the top coconut oil producer, in 2015 is predicted to decline by 1.7% compared to the previous year following the decrease of coconut production. The shortfall of coconut production in the Philippines is mainly due to a persistent impact of typhoons coupled with pest attack and worsened by the current unfavorable weather. Though the government has been promoting and implementing replanting programs, it has been progressing in slower pace than expected due to a lack of seedlings. Hence, it seems that coconut production in the Philippines would take a longer period to recover. As for Indonesia, recent data from Ministry of Agriculture shows that the coconut production in copra terms in 2015 is expected to decline by 0.5 %. This means that coconut production in Indonesia has been decreasing for three consecutive years at the average of 1.4% per annum.

The main reason for the shortfall in coconut production in Indonesia is the reduction of coconut area due to the change in land use. According to Ministry of Agriculture, coconut area in Indonesia in 2015 has been reduced by 6,299 ha or dwindled by 0.22% compared to that of 2014. In





addition to the reduction in area, the senility of coconut palms has also contributed to the drop in coconut production. The government stated that 12% of the palms are categorized as unproductive and need for replanting. While in India, Coconut Development Board reported that there could be a 20% decrease in production of coconut in the country due to changing weather patterns. While in Sri Lanka, another key producing country, the production of coconut seems to be stagnant for years.

The shortage in the global production has, furthermore, restrained an increasing trend in the global demand. The effect was perceived in 2014 when the world export of coconut oil eased to the volume of 2.250 million MT or experienced a year-on-year decrease by 0.3% after experiencing a substantial increase in previous two years at an average annual growth rate of 10%. The world exports of coconut oil are expected to raise its level to at least the level of 2013 amid a weak growth in global economy and a wide price premium over palm kernel oil as a positive signal coming from official data from two major producing countries, Philippines and Indonesia.

The Philippines and Indonesia remained two major coconut oil exporters in the world. The countries contributed 75.4% of global supply in 2014. Exports of coconut oil from the Philippines, as expected, declined in 2014 following the decrease in coconut and copra production. Exports of coconut oil from the Philippines were recorded at 0.908 million tons in 2014 which were 17.23% lower than the previous year. The export, however, seems to shortly regain as latest data show a noticeable increase in the first half of 2015. Data from Statistics Philippines Authority shows that from January to June 2015, the export of coconut oil was 416,007 MT or increased by 19.78% compared the volume of 347,302 MT of January-June 2014. The increase in shipments of coconut oil from the Philippines in 2015 has been predicted as the Philippines' industry is adapting the situation by importing raw material and crude coconut oil from other origins and shifting its domestic consumption to palm oil. On the other hand, Indonesia, as the second largest exporting country, has benefited from the shortage of coconut oil supply in the Philippines to widen its global market.

The weakening Rupiah against the USD was also an incentive for exporters of commodities. Exports of coconut oil from Indonesia in 2014 were recorded 0.771 million tones which was 22% higher compared to the previous year and recorded as the highest level ever. In the period of January-August 2015, the official data from BPS-Statistics Indonesia show that exports of coconut oil from Indonesia has reached 538,408 MT which is higher by 1.38% compared to the same period of last year volume.

It is expected that though the market witnesses a bearish trend in the first half of 2015 and is likely to continue to the second half of 2015, the price would gradually increase as it finds new lowest level. It is worth noting as reference that the lowest ever recorded price of coconut oil, CIF Rotterdam within the last four year was seen in April 2013 at US$ 800/MT. The price of coconut oil is expected to recover as the price difference between coconut oil and palm kernel oil is narrowing. It is also expected that global demand for coconut oil would increase or at least remain stable as the global economy recovers. The other cause that will probably induce coconut oil price is the government plan of some coconut oil producing countries especially the Philippines to double the biodiesel blend from the current 2.5% to 5%. Such increase is the result of the countries' decision to reduce dependency and import volume of fossil fuel. In the Philippines, in 2012 about 140-150 thousand tons of coconut oil were used for the production of biodiesel and it will increase to approximately 350 thousand tons, when the mandate comes to full implementation. Such change will reduce the Philippines export of coconut oil that will bring a shortfall in global supply.

Alit Pirmansah is Market Development Officer, Asian and Pacific Coconut Community.

International Conference on Coconut Oil 2015, Bangkok, 17-20 March 2015

The International Conference on Coconut Oil (ICCO) was successfully held at BITEC Conference and Exhibition Center, Bang Na, Samut Prakan, Thailand on 17-20 March 2015. The Conference was jointly organized by Thailand Department of Agriculture (DOA), Conservation and Development of Coconut Oil of Thailand Forum (CDCOT), FAO Regional Office for Asia and the Pacific (FAO/RAP), Asian and Pacific Coconut Community (APCC), and VNU Exhibition Asia and Pacific. The conference with the theme "Increasing the Awareness of the Health and Nutraceutical Benefits of the Coconut: From Past to Present" was well attended by 250 local and international participants. Various presentations extolling the health benefits of coconut oil (CCO) and virgin coconut oil (VCO) were presented by experts from different countries such as Australia, the Philippines, Indonesia and Thailand. Likewise, country reports on coconut production and trade were presented by representatives from Fiji, India, Indonesia Papua New Guinea, Solomon Islands, Sri Lanka and Thailand. Exhibition of VCO and VCO-based products was also organized along with Horti Asia 2015 at the BITEC Exhibition Center. Various products including VCO and VCO-based products, APCC publications and posters were showcased in this exhibition.

Stakeholders' meetings on coconut and cocoa, Andhra Pradesh, India, 3 March 2015

Stakeholders' interface programmes on coconut and cocoa farming were organized by Central Plantation Crops Research Institute (ICAR-CPCRI) in Andhra Pradesh to understand the farmer's problems and to address them. The first stakeholder meeting was conducted at Mukkamala near Horticultural Research Station, Ambajipet on 3 March 2015. About 250 stakeholders including farmers, entrepreneurs, extension personnel from State Department of Horticulture, Scientists from CPCRI and HRS Ambajipet attended the interface meeting. Dr P Chowdappa, Director CPCRI inaugurated the meeting and Dr. B.M.C. Reddy, Vice Chancellor, Dr. YSR Horticultural University presided over the inaugural function. Farmers shared their experiences and field problems in coconut and cocoa cultivation in the meeting. On 04.03.15 the stakeholder interface meeting was conducted at ICAR-IIOPR, Pedavegi. Dr. S Aruraj, Director IIOPR inaugurated the meeting. Dr. P. Chowdappa guided the discussions. Dr. Venkatesh Hubballi, Director, Directorate of Cashew and Cocoa Development (DCCD), Kochi also spoke. About 200 farmers and other stakeholders attended the meeting. During the interaction with farmers and to resolve their problems, it was informed by Dr. P. Chowdappa, Director CPCRI that 50 demonstration plots will be set up on various aspects of cocoa cultivation including improved varieties, canopy architecture, nutrient management and processing with financial support of Directorate of Cashew and Cocoa Development, Kochi and in collaboration with State Department of Horticulture, Dr. YSR Horticultural University and Mondelez India Foods Limited. As part of the interface programme the team of scientists from CPCRI led by Dr. Chowdappa visited farmers' gardens and diagnosed field problems including pest and disease incidence and nutritional disorders for which remedial measures were suggested. *(CPCRI Website)*

Visit of officials from CABI to APCC, 8 June 2015

Centre for Agriculture Bioscience International (CABI) is an international not-for-profit organization that improves people's lives by providing information and applying scientific expertise to solve problems in agriculture and the environment. Through knowledge sharing and science, CABI helps address issues of global concern such as improving global food security and safeguarding the environment. This is achieved mainly by helping

CABI Officials Having Discussion with APCC Team

farmers grow more and lose less of what they produce, combating threats to agriculture and the environment from pests and diseases, protecting biodiversity from invasive species and improving access to agricultural and environmental scientific knowledge.

A team of officials from CABI comprising of Dr. Wai-Hong Loke, Regional Director, South East Asia, Dr. Sivapragasam A., Deputy Regional Director and Dr. Soetikno S. Sastroutomo, Senior Scientist visited APCC Secretariat, Jakarta on 8th June 2015 and had discussions with Executive Director, APCC and other officers. CABI put forward the proposal for a collaborative program for biosecurity planning for the coconut industry aimed at the protection of the economy, environment and public health from the negative impacts associated with pests, diseases and weeds. CABI offered to serve as a technical provider in biosecurity planning which provides a mechanism for the coconut industry, Government and other relevant stakeholders to actively identify potential pests of highest priority, analyse the risks they pose, put in place procedures to reduce the chance of pests becoming established and minimise the impact if a pest incidence occurs. APCC appreciated the interest shown by CABI in collaborative work with APCC for the development of the global coconut sector and invited CABI for the forthcoming Conference on Integrated Pest Management proposed in Philippines.

Philippines Celebrated the 29TH National Coconut Week, Manila, 27-30 August 2015.

The Philippine Coconut Authority (PCA) celebrated its 29th National Coconut Week and the 2nd International Coconut Festival on August 27-30, 2015, with the theme "NIYOGOSYO: SAGOT SA MABILIS NA PAG-ASENSO". Highlight of the celebration was the 2nd International Coconut Festival, Trade Fair and Exhibits held at Mega Trade Hall 2, 5th Level, Building B SM Megamall, Mandaluyong City, Philippines. The activity line up included Opening Ceremony and Appreciation Day graced by the Guest of Honor Honorable Cynthia Vilar, Senator Secretary Francis "Kiko" Pangilinan, Office of the

Some Value Added Coconut Products Showcased during the National Coco Week

Presidential Assistant for Food Security and Agricultural Modernization. Other activities in this annual event included Launching of the KAANI8 Coconut Agro-Industrial Project, Coco Junior Chef on the Go, Coco on the Go, Fashion Accessories Show, Investment/ Market Opportunities of Coir Based Industries, VCO and Allied Product, and Coconut-Cocoa Intercropping and Processing of Quality Cocoa Products.

International Symposium on Quality Coconut Oil for Nutrition and Health, Delhi, 28-29 September 2015.

Asian and Pacific Coconut Community (APCC) in collaboration with Coconut Development Board (CBD) India organized International Symposium on Quality Coconut Oil for Nutrition and Health on 28-29 September 2015 at Sangrila – La Eros' Hotel, New Delhi. The objective of the symposium was to review past works carried out globally on coconut oil and virgin coconut oil and to present the current studies going on in different countries and to explore the future scope on international collaboration / networking with various APCC member countries / institutes. This will lead to formulation of research projects which could be submitted for funding from international donor agencies like WHO, FAO, etc.

The symposium was arranged in four technical Sessions. First and second sessions were set on keynote addresses on the review and status of research work and the clinical studies on coconut oil and virgin coconut oil respectively. The importance and uses of coconut oil in major coconut growing and consuming countries was presented in the third session and the fourth session was set apart for working group discussion.

A display of coconut oil based nutriceuticals, cosmoceutical and toiletery items were displayed to showcase the wide usage of coconut oil and virgin coconut oil in the sectors. This was an eye opener to the participants on the potential of coconut products in the health care segment. The two day-symposium was concluded with positive notes and listing down a few research studies to be taken up on priority through international collaboration.

Table 1. WORLD Exports of Coconut Oil, 2009– 2014 (In MT)

Country	2009	2010	2011	2012	2013r	2014p
A. APCC Countries	1,591,934	2,236,400	1,544,776	1,847,598	1,908,977	1,905,065
Fiji	4,423	9,700	10,200	3,794	1,494	1,630
India	9,855	3,000	4,251	7,830	6,829	7,067
Indonesia	570,311	692,500	540,050	802,947	630,568	771,419
Malaysia	128,855	131,600	141,963	136,783	131,068	177,225
Marshall Islands	3,200	0	0	3,956	3,330	3,000
Papua New Guinea	35,648	45,300	54,349	19,847	13,466	11,068
Philippines	826,237	1,342,500	781,411	852,234	1,096,861	907,606
Samoa	1,834	0	0	3,961	5,364	5,500
Solomon Islands	634	0	0	172	2,384	2,000
Sri Lanka	1,937	2,300	1,931	2,499	3,821	3,976
Tonga	900	1,000	1,000	0	0	0
Thailand	700	800	1,200	366	651	1,274
Vanuatu	5,800	6,900	7,200	11,368	11,300	11,300
Vietnam	1,600	800	1,221	1,841	1,841	2,000
B. Other Countries	188,429	314,803	317,028	297,510	347,712	345,000
TOTAL	1,780,363	2,551,203	1,861,804	2,145,108	2,256,689	2,250,065

p: preliminary figure *r: revised figure*

Table 2. Prices of Coconut Products And Selected Vegetable Oils, 2014-2015

(US $/MT CIF, Europe)

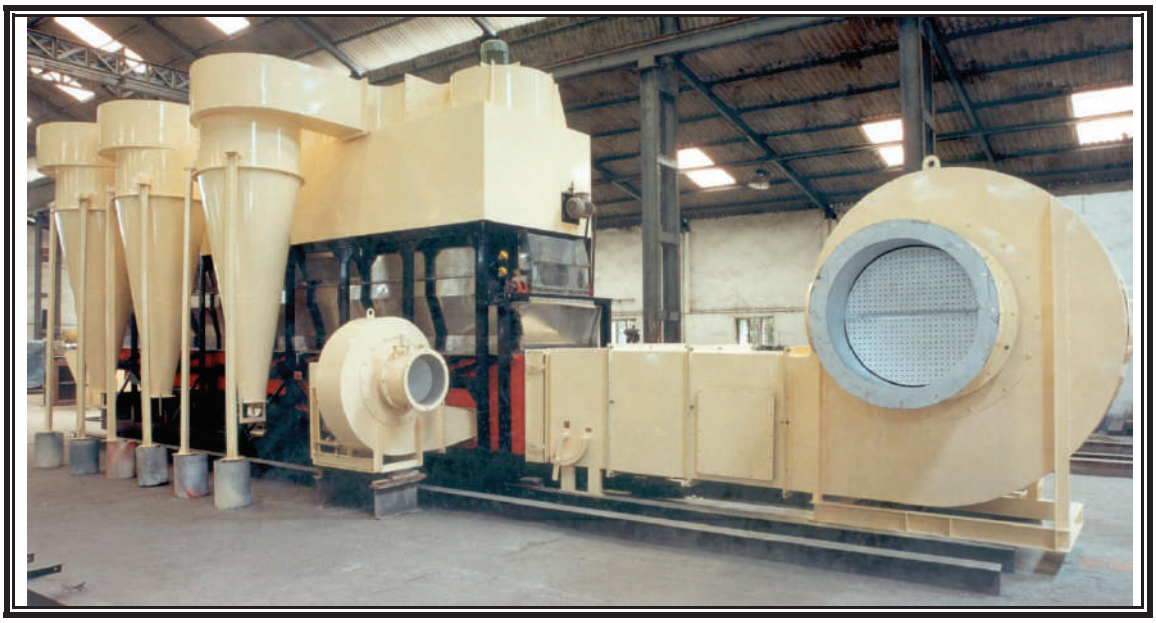
	2014		2015									
Products	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct
Copra	795	813	764	794	721	714	745	740	735	689	685	712
Coconut Oil	1,141	1,179	1,213	1,097	1,102	1,039	1,081	1,110	1,068	1,056	984	1,096
Copra Meal[2]	215	210	214	236	254	257	249	246	242	217	206	203
Desic. Coconut	2,537	2,570	2,650	2,641	2,818	2,747	2,680	2,155	2,079	2,031	1,957	1,968
Mattress Fiber[1]	214	213	213	203	204	204	163	154	153	154	138	142
Shell Charcoal[2]	353	366	373	380	362	362	361	356	356	353	346	353
Palm Kernel Oil	970	967	1,030	1,060	1,062	986	978	922	875	771	763	878
Palm Oil	726	690	694	670	667	661	649	666	647	571	506	575
Soybean Oil	645	670	715	689	690	743	711	711	767	738	725	733

[1] *FOB, Sri Lanka*
[2] *FOB, Philippines*

Table 3. World Oil Balance 2012-2015 (1,000 Tons)

Oil/Year	Jan/Dec 2012	Jan/Dec 2013	Jan/Dec 2014	Jan/Dec 2015F
Palm Oil				
Opening Stocks	9,430	11,534	10,660	10,900
Production	53,446	56,570	59,570	62,580
Imports	41,130	43,150	44,500	46,700
Exports	40,735	43,780	44,580	47,190
Disappear	51,738	56,814	59,250	61,600
Ending Stocks	11,534	10,660	10,900	11,380
Soybean Oil				
Opening Stocks	4,558	4,362	4,290	4,150
Production	41,758	43,010	45,130	48,430
Imports	9,115	9,580	9,830	11,730
Exports	9,385	9,600	9,730	12,070
Disappear	41,684	43,062	45,370	47,510
Ending Stocks	4,362	4,290	4,150	4,730
Groundnut Oil				
Opening Stocks	379	322	380	240
Production	3,937	3,800	3,920	3,670
Imports	173	190	220	250
Exports	191	190	240	240
Disappear	3,975	3,742	4,030	3,690
Ending Stocks	322	380	240	230
Sunflower Oil				
Opening Stocks	1,854	2,155	2,140	2,460
Production	14,831	16,638	16,190	15,190
Imports	7,230	6,184	8,260	7,480
Exports	7,239	6,160	8,160	7,510
Disappear	14,522	16,677	15,970	15,350
Ending Stocks	2,155	2,140	2,460	2,280
Rapeseed Oil				
Opening Stocks	2,079	2,390	5,010	5,440
Production	24,444	24,400	27,120	25,990
Imports	4,139	4,050	3,990	4,050
Exports	4,139	4,060	3,990	4,010
Disappear	24,133	21,770	26,700	26,840
Ending Stocks	2,390	5,010	5,440	4,630
Corn Oil				
Opening Stocks	243	221	290	320
Production	2,721	2,920	3,160	3,260
Imports	883	920	730	700
Exports	903	893	680	730
Disappear	2,723	2,878	3,170	3,280
Ending Stocks	221	290	320	280
Palm Kernel Oil				
Opening Stocks	730	942	870	960
Production	5,991	6,200	6,540	6,840
Imports	3,050	3,420	3,150	3,310
Exports	3,062	3,470	3,160	3,310
Disappear	5,766	6,222	6,450	6,780
Ending Stocks	942	870	960	1,010
Coconut Oil				
Opening Stocks	362	424	350	380
Production	3,288	3,390	3,020	2,980
Imports	1,972	2,020	1,880	1,880
Exports	1,947	2,060	1,870	1,960
Disappear	3,251	3,424	3,010	2,930
Ending Stocks	424	350	380	350

Vibratory Fluid Bed Dryer for Desiccated Coconut



We are India's leading manufacturer and exporter of Vibratory Fluid Bed Driers for Desiccated Coconut. We have executed turnkey projects for D/C mills & factories in India, Indonesia, Philippines, Sri Lanka, Thailand, Vietnam, Cote d'Iviore (West Africa), Mozambique (East Africa).

Output Capacity: From 175 Kgs per hour to 1000 Kgs per hour of desiccated coconut.

Other Products:

- Deshelling Machine
- Nut Counter
- Blancher
- D/C Cooler
- Grader
- D/C Cutter
- Dehusking Machine
- Oil Expeller
- Filter press
- Band Dryer / Tray Dryer
- Combination Dryer
- Copra Dryer
- Rotary Dryer
- Spray Dryer
- Charcoal Briquetting Plant

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