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From the Editor-in-Chief

EFFECTIVE COLLABORATION IN RESEARCH AND TRANSFER OF TECHNOLOGY FOR SUSTAINABILITY OF COCONUT SECTOR

The coconut community around the world experiences common challenges such as shortage of raw material for processing and threats of pests and diseases spurred on by changes in weather patterns that could also prolong dry weather periods that adversely affect normal production, productivity and growth of coconuts. The Lethal Yellowing disease affects most regions, especially in the Africa, Caribbean, Latin America and parts of Asia, posing serious threats to the future of coconut plantations. Other parts of the Asia and the Pacific region experience crop losses through the effects of other phytoplasma related diseases such as the Weligama Wilt in Sri Lanka, the Root Wilt in India and the Bogia Disease in Papua New Guinea. The Rhinoceros Beetle epidemic is once again in the Pacific with situation worsening in the Solomon Islands and towards the south western Pacific countries. Recent calls for collaboration amongst affected countries and interested stakeholders globally is encouraging to enable exchange of science, technology and experience that could expedite efforts in seeking relief from emerging threats.

Recent visits by APCC to large processing factories in Thailand, Malaysia, Indonesia, India, Philippines and Sri Lanka indicate a severe shortage of raw material as a key challenge with factories operating at 50% capacity. Statistics and country reports reveal alarming situation of little or no replanting of coconuts with over 50% of existing plantings in APCC member countries considered senile. This category would account for an estimated 6 million hectares of coconut plantation hence an immediate to short term replanting requirement of nearly 700 million coconut seedlings. Current seed gardens capacities available would not be able to fulfill this requirement in less than 100 years therefore the need to seek an alternative resolve.

APCC signed a Memorandum of Understanding with the Yucatan Centre for Scientific Research and Technology (CICY) in Mexico this year to provide an alternative resolve for adequate supply of coconut planting material that is high yielding and diseases resistant. CICY has developed advanced technology for micro propagation of coconut through somatic embryogenesis that could maximize multiplication rate at 1:100,000 from a single plumule extracted from the zygotic embryo of a coconut. With this new technology there is opportunity for countries that are advanced in coconut tissue culture research to consider collaborative arrangements to improve present status of coconut research in the interest of all parties.

The understanding reached with CICY would also provide an opportunity for private sector entities to consider negotiating amicable terms for the transfer of technology thus enabling set up of commercial tissue culture laboratories or biofactories to produce coconut seedlings in larger quantities for sale and distribution to farmers. Such facilities established by country or region would produce seedling of the preferred local genotypes.

A first-time International Coconut Plantation Management Certificate Course offered by the Coconut Research Institute in Sri Lanka at the request of APCC would commence in the first quarter of 2018. The exhaustive course content would range from nurseries development through to downstream processing of coconut products. APCC recognizes the dire need to increase the number of trained personnel in the coconut sector that would be of vital importance towards the success and viability of coconut farms and farmers. Information on training would be distributed to countries whilst also accessible on APCC website.

APCC Secretariat continues to urge coconut farmers to be vigilant in replanting to sustain household income. Farmers in some countries are wisely planting new seedlings between existing rows of older trees. Unproductive trees are later harvested for high value coconut timber once the new plantings are in consistent production and returning income to the farmer. This is considered a very good practice that ensures overall sustainability of coconut farms.

URON N. SALUM
Executive Director and Editor in Chief

FIJI SOE GEARS UP TO MEET GROWING GLOBAL COCONUT MARKET

Copra Millers, a State Owned Enterprise (SOE) of the Fiji Government, has a multi-pronged strategy to respond to the rapidly rising global demand for coconuts and coconut products. Among these are the setting up of a new integrated plant in Savusavu that will make an array of coconut products from the much-in-demand virgin coconut oil (VCO) to desiccated coconut and cosmetics and wellness products. Copra Millers plans to export a significant portion of its production.

"Machinery for the plant is in place and the manufacturing is expected to begin toward the end of October," said John Deo, Acting General Manager of Copra Millers Fiji, speaking to Pacific Periscope in Suva. "A coconut products specialist has been roped in from India's southern state of Kerala, one of the world's largest growers of coconuts, on a three-year contract to install and run the plant." Creating a range of value added products is part of the strategy. Desiccated coconut, coconut milk powder and other food and beverage products derived from the versatile coconut will be added to the product mix in the coming months," Deo said.

Soaps, massage oils, skincare oils and creams as well as several more wellness products all with attractive branding and the "Fiji Made" logo will begin to roll out of the integrated plant sometime next year. Some products like the coconut soap will be handmade and be marketed as premium products, Deo said. VCO will be produced using cold press technology, where no chemicals, heat or additional processing are used therefore preserving the natural nutrients, antioxidants and the important lauric acid component naturally present in the oil, which is believed to possess anti-viral and anti-microbial properties once metabolised in the human body. The manufacturing processes are designed to maintain the presence of biologically active components. The factory is Hazard Analysis Critical Control Point (HACCP) compliant and accredited. Staff are provided with a HACCP Australia Training Certificate in recognition of the level of training attended.

The Savusavu factory has been in existence for several years and its main products has been raw coconut oil, which it has been exporting to South East Asian countries and Taiwan. This market comprises 90 per cent of its export and at its peak it exported 200 tonnes a month. But like much of Fiji's agribusiness sector, Copra Millers Fiji has also been badly affected by Cyclone Winston and currently exports are down to just 120 tonnes a month and climbing slowly. It also produces coconut water. The factory celebrated World Coconut Day in September.

Ian Furlong, Pacific Trade & Invest (PT&I) Trade Development Manager in Auckland said PT&I is very happy to be of assistance to Copra Millers Fiji. "We were able to provide marketing advice for the VCO product which was about creating a story about the product, including it on the labelling and ensuring that the packaging was designed for easy access to the product as in colder climates such as New Zealand, where the VCO can easily solidify," Furlong added. In addition, PT&I has also provided Deo with several prospective customer contacts in New Zealand for VCO and also a prospective customer for coconut flour to be used in the production of dairy free vegan parmesan speciality products, Furlong revealed.

The SOE has the involvement of two Government Ministries. The Ministry of Public Enterprises oversees the manufacturing, infrastructure and investment side of the business while the Ministry of Agriculture looks after agricultural matters. The driver behind investing in the new integrated plant and starting production of VCO on the back of growing worldwide demand was primarily to revitalise the Fiji Coconut Industry and to enhance and empower the lives of ordinary coconuts farmers in Fiji, he added. Being an SOE gives the business social responsibility imperatives. "We are different from other enterprises from the private sector because we work closely with communities across the country, women's groups and other disadvantaged sections of society," Deo said.

Switching from accepting copra to the whole coconut as the raw material has been quite the game changer in encouraging replanting, according to Deo. The new machinery automatically husks coconuts, thereby taking the physical drudgery out of farmers individually husking them, which is a disincentive given the time and physical energy that is required.

Moreover, the husk is used as fuel to fire the driers. This strategy has enabled the farmers to shift away from traditional labour intensive work on copra production to simply collecting whole nuts for a higher value. "It has actually encouraged replanting," Deo said. "There has been no effective replanting since the 1960s. Systematic replanting is happening now as more and more farmers and communities see coconut farming as a viable business. One million plantings are being undertaken every year in a five-year programme. The fruiting cycle is three to five years."

One of the disincentives for coconut planting down the decades has been the unpredictability of devastating cyclones that often decimate entire groves. To address this, the Fiji Tall variety of coconut tree, which is known to be cyclone resistant, is being planted, Deo said. Planting is happening across the country including in the outer islands of Lomaiviti and other smaller and far flung maritime islands.

As the management and staff at Copra Millers Fiji and the coconut industry in Fiji look forward to the opening of the new integrated coconut plant in Savusavu, PT&I wishes them all the very best for the commencement of production in October, Furlong said. *(http://www.pina.com.fj)*

INDIA MAY SURPASS BRAZIL IN COCONUT PRODUCTIVITY

Brazil is currently holding top position in coconut productivity and India is confident it would dislodge it within next two years, according to Coconut Development Board (CDB) Chairman A. K. Singh on the occasion of the World Coconut Day celebration. He said Brazil has many old orchards while in India, thousands of orchards have come up where plantations have been done, but yields from these plants are yet to come. When flowerings in these orchards start producing fruits, the productivity in India would jump immediately, he added.

According to Dr. Singh, coconut productivity in India is 10,600 nuts per hectare as against Brazil's 11,000 nuts. Tamil Nadu had never been a traditional coconut growing State. Now, productivity of coconut farming in Tamil Nadu is higher than that of Kerala and also improving in terms of productivity as well as area.

Speaking on the occasion, Union Agriculture Minister and Farmers' Welfare Minister Radha Mohan Singh said, "India's annual production of coconut is 20,440 million nuts from 1.97 million hectare of land. Coconut provides livelihood security to more than 10 million people and supplies raw materials for many industries". The Minister said the crop contributes significantly to the national economy by sharing more than Rs1,400 crore by way of foreign exchange, Rs20,000 crore to GDP and 6 percent to oil pool. Moreover, the country itself is a huge market for coconuts as it is being used in religious occasions and marriages, among others. (UCAP Bulletin)

INDIAN COMPANY PLANS TO EXPAND MARKET FOR DESICCATED COCONUT TO THE US

The Kanhangad-based Vittal Agro Industries, a major processor and exporter of desiccated coconut powder, is planning to expand its market overseas. Speaking to Business Line, Ganesh Kamath, Partner of Vittal Agro Industries and incharge of marketing said that Vittal Agro Industries, which started exporting desiccated coconut from India in 2008-09, is now a major exporter of desiccated coconut in the country. The company exports desiccated coconut to Iran, South America, West Asia, east Africa, Algeria, Egypt and some parts of Europe.

The company is planning to venture into the US market and it is the process of upgrading its processing capacity at Kanhangad district of Kerala State. Currently, the company's Kanhangad unit processes around 1.2 lakh coconuts a day producing around 10 tons of desiccated coconut powder. It is in the process of expanding the capacity to 2 lakh coconuts a day which is expected to be completed within three months. Kamath said that the company will target the US market for desiccated coconut powder once the capacity expansion is completed. (UCAP Bulletin)

PNG GROWING COCONUT INDUSTRY GOES ON SHOW

Papua New Guinea's growing coconut industry small and medium enterprises went on show at Alotau in Milne Bay. The show – on World Coconut Day – ran alongside launching of the Coconut Industry Strategic Plan 2016-2025 in which the coconut industry will focus more on innovative products in partnership with the private sector as prices continue to drop for copra in the world market.

Kokonas Indastri Koporesen industry affairs Manager Alan Aku said leading coconut SMEs in the country were invited to take part to showcase their products. "We've started with six partners, and within two years we've gone up to 15 partners – who all produce high-value coconut products," he told The National in Alotau. "For the industry to be revived, it's downstream processing, value-adding and production of high-value coconut products. "The market is big for all the high-value coconut products.

"According to statistics from major producers – like Indonesia, the Philippines, India and Sri Lanka – 90 per cent of the market is yet to be tapped. "That is with products like virgin coconut oil, coconut soap, coconut water, coconut sugar, coconut honey and flour and feedstocks. "There are a number of products that coconut can provide and we're using coconut to bring livelihood to the people, and also wealth creation for them."

Aku said KIK was involved with SMEs that bought coconuts from the people and turned them into high-value products. "The industry is going forward in that manner," he said. *(http://www.thenational.com.pg)*

UCPB-CIIF RELEASES P114-MILLION LOANS TO COCO FARMERS

United Coconut Planters Bank's (UCPB) financing company for countryside development has approved total loans worth P114 million in the first six months of the year. UCPB-CIIF (Coconut Industry Investment Fund) Finance and Development Corp. (Cocofinance) said they released the loans to 2,367 coconut farmers for funding livelihood projects. "Coconut farmers are among the poorest in the agricultural sector; the livelihood projects we finance give them alternative sources of income to augment their earnings from the farm," Cocofinance President Edgardo Amistad said. UCPB-CIIF said it plans to release P710 million worth of loans to coconut farmers in 2016, about 16 percent higher year-on-year.

In 2015, Cocofinance had 17,981 borrowers taking out P610 million in livelihood loans. With 343 rural partners covering 20,300 barangays in 66 provinces, it is sole lending company exclusively providing credit to small coconut farmers. Amistad said Cocofinance sources funds for lending from its equity unlike commercial banks which use deposits from the public. Cocofinance is not regulated by the Bangko Sentral ng Pilipinas.

Cocofinance's equity came from contributions of P100 million from UCPB, P175 million from United Coconut Chemicals and P700 million from the CIIF Oil Mills Group or a total of P975 million. Mr. Amistad estimates about 3.5 million coconut farmers would require financing. Since 1995, Cocofinance has released P7.9 billion in livelihood loans to 408,158 households in 66 provinces. *(UCAP Bulletin)*

PHILIPPINE GENOME CENTER PROGRAM TO BOOST YIELD OF COCONUT TREES

The Philippine Genome Center at the University of the Philippines Los Baños (UPLB) aims to increase the number of nuts produced per tree per year through a program that will boost copra yield, strengthen insect resistance and enable early flowering time. This is aimed at reversing the decline in the average yield of the coconut. Currently, more than 75 million old and unproductive palms planted in one million hectares of land produce a low of 46 nuts per tree per year, way below world's top coconut producer India's average yield of 77 nuts per tree per year.

Research and development, funded by the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development (PCAARRD), target yields of 150 nuts per tree per year by tweaking the coconut genes. PCAARRD, which is part of the Department of Science and Technology, is funding a five-year program to improve coconut varieties through genomics, genetics and molecular breeding. The program is part of PCAARRD's Coconut Industry Science and Technology Program that focuses on the rapid production of quality planting materials of high yielding coconut varieties, management control strategies against insect pests and diseases, improved breeding techniques and the production of high value products.

For example, the Coconut Somatic Embryogenesis Technology is a tool for the rapid mass propagation of superior genetic stocks. Tested and evaluated by researchers from UP, the Philippine Coconut Authority, Bicol University and the Visayas State University, the technology is currently being enhanced to attain as much as 1,000 seedlings per plumule from high-yielding tall and dwarf coconut varieties. To date, however, the project is able to produce from 80 to 120 seedlings per plumule. *(UCAP Bulletin)*

VINEGAR MAY HELP FIGHT RISING CASES OF TYPE 2 DIABETES IN ASIA

A review by researchers in Singapore's Clinical Nutrition Research Center published in Molecular Nutrition and Food Research collates data from human intervention trials showing that vinegar consumption is more effective in modulating glycemic control in "normal glucose-tolerant individuals than in either type 2 diabetics or in those with impaired glucose tolerance."

A number of factors appear to support the claim that vinegar consumption can improve glycemic control in nondiabetics, including the activation of free fatty acid receptors and increased AMPK functions, thereby leading to a reduction in free fatty acids in circulation and potentially increased insulin sensitivity. It also appears to increase blood flow to peripheral tissues and increase safety, leading to lower food intake.

"Asian diets are rich in high-glycemic carbohydrates," the paper notes. Asians are also more susceptible to insulin resistance and type 2 diabetes due to increased postprandial glucose and insulin response as compared with other ethnic groups. The review states that vinegar is widely consumed across Asia and that its potential as a functional food for improving glycemic control needs to be further explored. However, the researchers were clear that there is not yet enough evidence to state that vinegar could help those who already had diabetes. *(UCAP Bulletin)*

NEW COCONUT PROJECT AIMS TO BOOST PACIFIC COCONUT INDUSTRY

A regional initiative to improve the competitiveness of small producers in the Pacific coconut industry, strengthen regional integration and intensify production has been launched by the European Union and the Pacific Community (SPC). The EURO 3.5 million (FJD$8 million) Coconut Industry Development Project (CIDP) will primarily address regional policy integration, capacity building and strengthening links in the value chain. Its steering committee meets for the first time, in Nadi, Fiji, with on-ground activities due to commence next month.

The European Union Ambassador to Fiji and the Pacific, Andrew Jacobs said: "Across the Pacific Islands, a coconut palm is considered to be the tree of life, contributing to food security, health promotion and sustainable livelihoods. New interest in coconut products, such as virgin coconut oil, is providing opportunities for growth in the coconut industry and the EU is very proud to support the development of the industry in the Pacific."The three-year initiative will implement pilot projects in selected countries with the aim to improve the livelihood of smallholder farmers locally and provide lessons learnt regionally, contributing to the development of the regional coconut industries. An amount of EURO 1.75 million is available for the pilot projects.

According to the SPC Team Leader for the project, Karen Mapusua, the pilots for Samoa and Vanuatu will result from a competitive selection process that will identify the most appropriate enterprises. "The national-level mechanism to check Expressions of Interest will ensure that activities align with the respective national development priorities for the sector. A Technical Advisory Group comprising an independent panel of experts will assess all submissions based on key eligibility and selection criteria and draw up a shortlist of prospective pilot activities," Mapusua said.

Training and awareness programmes will be also developed along with a manual on Coconut Risks Management and Mitigation for the Pacific Region for farmers, processors and other stakeholders identified in the value chain. The EU and SPC envisage assisting at least eight government representatives from Pacific Island countries in upgrading and harmonising their national strategies in line with regional policy and there will be opportunities for trade shows.

Another expected benefit of the project will be the creation of a comprehensive database of businesses, projects, farmers' groups and NGOs involved in developing activities in coconut production and processing diversification in 15 Pacific Island countries to facilitate links between value chain actors, for example, connecting growers with traders, and buyers with exporters.

This latest project will complement other work by SPC, through its Centre for Pacific Crops and Trees, and partners Bioversity International, the International Coconut Genetic Resources Network (COGENT) and governments in the region to upgrade and broaden the new South-Pacific International Coconut Genebank, to conserve Pacific coconut diversity and livelihoods. *(http://www.pina.com.fj)*

FARMERS' COMPANY IN KERALA OPEN COCONUT OIL PLANT

The Vadakara Coconut Farmers Producer Company in Kerala State opened a coconut oil plant at Muthuvana in Maniyur panchayat. The plant was inaugurated by Finance Minister T.M. Thomas Isaac on October 8. The farmers' firm recently shot to fame with a neera plant at Chemmathur earlier this year and has made a mark this time anew with the coconut oil plant. The plant has a capacity to collect 4,000 coconuts a day for convertion into coconut oil. All the 11 farmers' federation under the company will be involved in collecting the coconut required for the plant and will be paid a higher rate than prevailing in the market for the delivery.

In a related report, still from Kerala, a new proposal for taking up a project for large-scale production of coconut sugar has been put forward by the Central Plantation Crops Research Institute (CPCRI). CPCRI Director P. Chowdappa said coconut sugar made from sap has good demand in the market. Coconut sugar production can be an alternative to neera to improve farmers' income. It could save coconut farmers from distressing situation arising out of low market prices. Coconut sugar has low glycemix index of around 35, almost half that of ordinary sugar, a better option for people having problems associated with diabetes. *(UCAP Bulletin)*

INDONESIAN COMPANY PARTNERING WITH GIZ OF GERMANY

With the objective of developing a sustainable supply of coconut sugar and nectar, that complies with international quality food standards, the Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), enters a partnership with PT. HALDIN PACIFIC SEMESTA, a leading natural ingredients company located in Indonesia.

Initiated by GIZ in South East Asia, Haldin was chosen among 30 other private companies due to their high integrity and strength in innovation technology, as well as their dedication towards farmer empowerment. The partnership started in August 2016, and would involve more than 1.000 coconut farmers in Central Java.

To reach these goals, Haldin and GIZ will train the farmers, enforcing organic practices and leveraging the women empowerment on the farmers community, to improve the process conditions. The project aims to bridge the quality gap and reduce foreign matters and impurities incidence as well. The team will also create awareness of farmers on the impact for clients and consumers of these quality issues, in order to reduce market risks.

Alisjahbana Haliman, CEO of Haldin Pacific Semesta said: "We are facing a challenging situation and resources limitation to improve the current condition of coconut sugar and nectar sourcing in Indonesia. At same time our customers are also concerned about the difficulties to find a product in the market, meeting the international food quality standards. This partnership is an evidence of Haldin's commitment in working closely with farmers to address this situation, and it is a part of our Farmers Upstream Empowerment program to develop a sustainable sourcing. We appreciate Germany's support and believe it will benefit all stakeholders".

Haldin is also collaborating with the Indonesian Honey Institute, to enhance the control over the impurities sometimes present in Natural Sweeteners, such as Honey or Coconut Sugar. To show its commitment with this initiative, the company will make a significant investment this year, to acquire a CM-CRDS Testing Equipment applying the Carbon Isotope Analysis technology, allowing precise measurement of natural sweeteners adulteration. (*http://www.haldin-natural.com*)

INDONESIA AGRICULTURAL RESEARCH AND DEVELOPMENT AGENCY RELEASING NEW HIGH YEIELDING COCONUT VARIETIES

On 28 October 2016 Indonesian Agricultural Research and Development Agency officially released two high yielding coconut varieties, i.e. *Kalianda Puan* Coconut, and *Sri Gemilang* Coconut of Indragiri Hilir. *Kopyor* or *Puan* coconut is known as coconut with abnormal coconut meat which is soft, and detached from its shell. It tastes delicious, and is usually consumed directly, mixed with ice and syrup, or is used as ice cream ingredient. The number of this unique coconut is relatively low, therefore the selling price of this type of coconut is high, four or five

times higher than normal coconuts. The release of *Kalianda Puan* Coconut adds the 3 previously released varieties of quick bearing *kopyor* coconut from Pati Central Java which have 3 different fruit colors i.e. yellow, chocolate, and green. The superior features of *Kalianda Puan* Coconut are: having big fruits, higher volume of endosperm, and containing higher unsaturated fatty acids and lauric acids. Meanwhile the superior features of *Sri Gemilang* coconut are that this coconut variety can be planted in littoral zones, high yielding, and containing high proteins. The research and development of *Kalianda Puan* coconut takes more than five years, while research and development on *Sri Gemilang* coconut takes about four years.

Kalianda Puan coconut variety is the result of collaborative works among Indonesian Palm Research Institute (IPRI), South Lampung Office for Estate Crops, and Bogor Agricultural University. Likewise, *Sri Gemilang* coconut is the result of collaborative works between IPRI and Indragiri Hilir Office for Estate Crops.

Director of IPRI, Dr. Ismail Maskromo, explained that the breeding technique for *Kalianda Puan* coconut is by using negative selection which means normal coconuts grown between *Kalianda Puan* coconuts were felled. Another method used was by selecting mother palms based on a set of predetermined criteria, then compared with the previously released high yielding varieties. He further explained that although the development of *kopyor* coconuts are centered in Java and Sumatra islands, it can be developed in other areas. Meanwhile *Sri Gemilang* coconut varieties has a great potential to be developed in any other littoral zones in Indonesia. (*http://balitka.litbang.pertanian.go.id*)

GUYANA COCONUT FESTIVAL

APCC was privileged to have been invited to attend the first Coconut Festival in Guyana last October at which the Executive Director, Mr. Uron Salum, was lead speaker that provided a presentation update on the 'Global Scenario of the Coconut Sector' in the Summit held at the Arthur Chung Conference Centre in Georgetown. Mr. Salum utilised this opportunity to also speak to a student audience from secondary schools and the University of Guyana at the conference centre.

APCC was pleased to observe the enthusiasm and determination by industry stakeholders to revitalise the coconut business to improve the living standards of coconut farmers. The Government of Guyana had received and approved a new Road Map containing the strategies needed to move ahead with sustainable development of the coconut sector in the country.

In the company of a revered scientist from Mexico, Dr. Carlos Oropeza, Mr. Salum visited coconut farms on the Pomeroon River area with a visit to the Henvil Farm that produces Virgin Coconut Oil and bottles pure coconut water that is kept fresh at 3-4 degrees Celsius. Raw material for the products come from local dwarf coconut varieties planted by the family owners of over 100 acres of farm land and increasing. A trip up and down the Pomeroon River revealed many thousands of acres of coconut land being cleared and old farms in the process of redevelopment. It is a unique area where the only mode of transport to, from and within farms is by boats and other forms of river transport.

The Government of Guyana has officially received the invitation from the APCC to consider joining the coconut community as an Associate Member.

JAMAICA COCONUT INDUSTRY

Jamaica is the only Caribbean nation that is currently an Associate Member of the APCC. In October the Coconut Industry Board of Jamaica cordially accepted and welcomed the visit of the APCC Executive Director, Mr. Uron Salum, as the first attendance by the Secretariat in Jamaica since the commencement of its membership. The visit coincided with the conference trip to Guyana. Mr. Salum was given the opportunity to provide an update presentation to senior officials of the Board in the presence of the Chairman, Mr. Christopher Gentles and the General Manager, Ms. Yvonne Burns.

The high level meetings conducted included an official meeting with the Minister for Industry, Commerce, Agriculture & Fisheries, Mr. Karl Samuda and later a courtesy call with Minister William J C Hutchinson who is assisting Minister Samuda. Mr. Salum was pleased with the outcomes of the meetings with the Ministers in the company of the Board Chairman, Mr. Gentles and scientist Dr .Wayne Myrie who provided important technical information required at the meetings. The industry is going through some structural changes and reforms with the government approving a new Road Map for the coconut industry containing the relevant strategies geared for the reforms to revitalise the coconut sector in Jamaica.

Mr. Salum spent the next 3 days visiting coconut famers and industry stakeholders. The field trip included observing areas affected by the dreaded Lethal Yellowing disease with most areas showing a recovery. The visit to the Blacks Farm was important to observe a large estate area of coconuts that is not affected by Lethal Yellowing and coconuts in the best-ever yields according to the owners. Mr. Salum was able to discuss and find out why the Blacks were successful through 30 years of hard work in positioning their farms and coconuts well to avoid the threats of diseases. The family business is successfully involved in downstream processing of high value coconut products.

Mr. Salum was accompanied by Dr. Wallace of the Coconut Industry Board to the University of the West Indies in Kingston to observe the coconut tissue culture work done by Dr. Burnett at the Biotechnology Department of the University. The field trip later with the

Chairman Mr. Christopher Gentles and Dr. Wayne Myrie enabled Mr. Salum to visit the local coconut genebank that holds 47 accessions and visited the larger of the two seed gardens operated by the Board with the capacity to produce 500,000 seed nuts in one year.

APCC Executive Director assured the Government and the Coconut Industry Board of Jamaica of the support of Secretariat in moving ahead with maximising the potential benefits of the industry by utilising the wealth of experience, knowledge and technology available within the APCC network of member countries, institutions and industry stakeholders.

SAMOAN COCONUT CREAM DRAWS POSITIVE RESPONSE IN MELBOURNE

With more than 1000 exhibitors and some 25,000 plus trade only visitors to the four-day show, Samoa's coconut cream products were up against tough competition from suppliers from Malaysia and Thailand. So it was very important to have a strong point of difference. The neatly packaged cans of coconut cream, light and original stacked up with Palusami, the canned Samoan delicacy of taro leaves and coconut cream, attracted a number of visitors and enquiries to the stand. The Krissy Company is the owner of Savai'i Popo, Light and Original and canned Palusami. The company is part of Ah Liki Investments Corp.

Tricia Brunt is the Sydney based UPF Wholesaler, (a division of United Pacific Freight Pty Ltd operating from 2009). She was at Fine Food Australia with Angela Thompson and Johanna Coyle, who were behind the stand and reported great visitor and exhibitor responses. Brunt has imported the premium Savaii Popo brand into Australia since its inception in 2014. The brand is marketed to the Pacific community as a 'Taste of Home' and is already the established favourites amongst the large Pacific Island communities living in Sydney and Brisbane. It is also making progress in Melbourne and steadily making inroads into the Asian and Middle Eastern markets.

Brunt said exhibiting at PT&I Pacific Island stand was a great opportunity. To be amongst other Pacific companies who were also working hard finding markets ideal for their unique products. However, dial back to the beginning with just a handful of Sydney shops. Brunt happily reminisced about the early days in trying to break into the Australian market. Much time was spent door-knocking and introducing the product to a new audience. There were costs in marketing campaigns and successfully building demand in the Pacific islands, Asian and Middle Eastern communities.

She said "The Savaii Popo products surely adds something very different to a market already familiar with coconut creams from Thailand and Malaysia." Although there was earlier "resistance and hesitancy" from customers used to what already available, Brunt shared the manufacturers Krissy Company belief.

"The product is premium, and consumers will absolutely get value for money because they won't be buying more water in a product. They are buying pure or premium coconut cream. It is an ongoing process and one has to continue to adjust to ensure the right pricing, strategically locate the right shops in the right areas where the right target markets are."She now has over eighty retailers and strategically placed retailers and distributors throughout Sydney, Brisbane and Melbourne especially where there are good concentrations of Pacific communities in Liverpool, Blacktown and Campbelltown. They also have a few solid buyers in Tasmania and Adelaide.

Her advice to potential exporters into the Australian market is "Do your homework and know where they (customers) are" she said. "It is hard work but not impossible. Make sure you have all the necessary paperwork to be export ready, and ensure the quality of your product is there, as well as the consistency in and frequency of supplies. There is nothing worse to a retailer, than a supplier that cannot consistently supply. Price your products right for ongoing benefits, not be a one-day-millionaire".

Attitude is a big part of her success where she has worked hard to break into the male dominated markets. At the end of the day, it's about doing business. "Have a goal and be flexible with different cultures" she said. "Retain your decency, focus on the result. Everything is possible," she added.

Brunt came from Samoa to Australia as a teenager. She holds a Bachelors and Master's Degree in Business majoring in International Business and Human Resource Manager and also has over sixteen years of solid international shipping experience. Brunt is passionate about the end result and the wider impact of the business and putting money into the coconut farmers' pockets in Samoa.

Krissy Company currently has over seventy farmers, certified coconut suppliers, with more currently in the process of gaining certification. A bonus for Samoan coconut suppliers is farmers are paid for the coconuts sold to the manufacturer and the Farmers Association gets a percentage on top from sales generated from overseas wholesalers/ distributors such as UPF Wholesale. With Australia being Samoa's biggest export market, the PT&I Pacific Islands stand at Fine Food Australia initiative is a welcome boost for exporters.

Figures from the Samoa Bureau of Statistics 2016 June quarter show total exports from Samoa rose by 24.2 percent to $35.1 million compared to the March quarter. Australia continued as Samoa's largest export market with figures up to $12.9 million from $9.4 million compared to the previous quarter, 36.6 percent of total exports value. Coconut oil accounted for 3.1 percent of total export value or $1.1 million and coconut exports had also increased by half a percent to $184,000. *(http://www.growernews.co.nz)*

BANGKOK AIRWAYS LAUNCHES CAMPAIGN TO GROW COCONUT TREES TO PROMOTE TOURISM

Bangkok Airways has unveiled a new campaign that focuses on local produce to help promote tourism. According to President of Bangkok Airways Public Company Limited Puttipong Prasarttong-Osoth, Koh Samui continues to be an important tourist location of Thailand and one on the top of the list of preferred destinations among foreign visitors.

In addition to natural beauty of clear water and clean sand, coconut trees are something that has been with Koh Samui for a very long time as coconut has long been a key export item of the island, he said. But because of pest problems and the construction of more resorts, the population of coconut trees has lately fallen drastically.

Mr. Puttipong said that, accordingly, Bangkok Airways is launching a coconut-tree-growing campaign under the theme "Love Earth Save Earth: Love Samui Save Coconut Tree". Under the campaign, the airline has distributed two main species of coconut, including fragrant coconut and brown coconut which is used to make coconut milk and coconut cream. More than 2,000 coconut shoots have been given out to enable locals to grow and help promote tourism while making extra earnings as coconuts can be turned into several OTOP items. *(http://destinationthailandnews.com)*

VANUATU SHINES AT FINE FOODS SHOW

Four companies from Vanuatu shone at this year's Fine Foods show in Melbourne Australia which included high quality coconut oil from Vanuatu Coconut Oil. For some of the Pacific exporters attending Fine Food Australia held in Melbourne for the first time, the show was an eye opener. With 1000 exhibitors and 24,000 visitors across the four-day trade only showcase it would have been easy to overlook small island nations.

But the Pacific Islands stand organised by the Sydney office of Pacific Trade & Invest (PT&I) was hard to miss and shone brightly with 11 exhibitor stands and 11 companies participating. Placed in the International Foods section, it was surrounded by big hitters such as Austria on one side, the United States, Canada and Italy on another. But Pacific businesses proudly held their own as a contingent shining through in the arc lights of international attention.

PT&I Sydney Trade Commissioner Caleb Jarvis said Fine Food Australia continued to be important as the leading trade show in the southern hemisphere for exporters looking to access international markets. He also praised the Pacific Island exporters for their dedication and hard work in promoting Pacific island products. "It is a great privilege to work with such professional, committed and passionate exporters. I am always heartened by their purpose in terms of working for their countries back home. There were some companies that are new to exporting this year and we are confident they will get exports and networks established through the PT&I Pacific Island stand, "Mr. Jarvis said.

PT&I General Manager Exports Jeremy Grennell said the initiative provided a platform for exporters of premium products to engage directly with Australian and international buyers. "These products illustrate the diversity of premium food and beverage products coming out of the Pacific," he said.

Papua New Guinea was represented by Patrick Killoran of Banz Kofi and Dennis Hill and Pauline Cleaver from Niugini Organics. Samoa had distributor Tricia Brunt from United Pacific Freight (UPF) exhibiting canned coconut cream, Savai'i Popo, original and lite along with canned Palusami (taro leaves and coconut cream) and coconut oil along with Nia and Phil Belcher's Ola Pasifika koko samoa (hot chocolate), cocoa nibs and chocolates as well as Nora Plantations' cacao nibs and cubes.

KOKONUT PACIFIC 'BUSINESS OF THE YEAR WINNER' DEDICATES AWARD TO RURAL FARMERS

They are known for bringing to the world stage one of the country's most traditional beauty products still in practice – the coconut oil. After coming into the global spotlight last month when a UK magazine voted their product Virgin Coconut Oil for "Best Buy", it was no surprise the 2016 Business Excellence Awards embraced their success.

Kokonut Pacific Solomon Islands won the 2016 Business of Year Award also known as the Prime Minister's Award at the Business Excellence Awards (BEAs) hosted by Solomon Islands Chamber of Commerce & Industry's (SICCI). The coconut producers went into the race for the top award while also being recipient for the award of Exporter of the Year.

Kokonut Pacific SI (KPSI) Operation Manager, Wilson Kikolo received the award from Prime Minister Manasseh Sogavare. In humble gratitude, he dedicated their success to their local farmers. "This award goes to them, our hard working farmers," said the operations manager. He was joined on stage by his young passionate and talented team.

KPSI engages a network of some 1,179 rural farmers from across eight provinces, covering more than 5,000 hectares of organically certified coconut plantations. "KPSI manages the value chain from village based producers to final quality control, packaging and export. We also manage a NASAA Certified Organic Grower Group with hundreds of growers in remote islands and communities tending more than half a million coconut trees!"

A major factor contributing to KPSI's success is the partnership it has with Kokonut Pacific Australia (KPA) since its establishment in 2004. KPA are the distributors of their renowned Virgin Coconut Oil in Australia and around Europe and

have developed the market which KPSI supplies. KPSI acknowledges their partnership with village communities as crucial to their success and the use of appropriate technology suitable for village level, mentoring rural oil producers and the support of KPA. The KPSI headquarter is based in Honiara with a board of directors and a staff of 25. KPSI is a for-profit social enterprise. (http://www. solomonchamber.com.sb)

6TH SYMPOSIUM ON PLANTATION CROP RESEARCH HELD IN SRI LANKA

The Symposium on Plantation Crop Research jointly organized by Coconut Research Institute (CRI), Tea Research Institute (TRI), Rubber Research Institute (RRI) and Sugarcane Research Institute (SRI) was held successfully for the sixth time. This symposium is organized biannually to provide an opportunity for scientists of four Plantation Crop Research Institutes to present their research findings at a common forum.

This year, the theme of the symposium was "Plantation Agriculture towards National Prosperity". The aim of the symposium was to bring together the scientists, industrialists, investors, plantation managers, academics and policy makers to share the latest advances in plantation crop research and blend this new knowledge with their experience to make an effort in the direction of using plantation agriculture towards national prosperity. The inaugural session was held on the 2nd of November 2016 at the Waters Edge, Baththaramulla. Hon. Deputy Minister, Ministry of plantation Industries Mr Wasantha Lakshaman Perera and Mr Upali Marasinghe, Secretary, Ministry of plantation Industries addressed the meeting. Scientists who have made an outstanding contribution to the sector were rewarded at the inauguration.

The technical sessions were held on the 3rd and 4th November at BMICH, Colombo. Total of 35 research papers from four crop research institutions under six thematic areas; Crop Improvement, Crop agronomic practices and crop production, Plant protection, Nutrients and water management, Socio-economics and extension and Product, Process and Machinery Development were presented.

Full research papers were published in the symposium proceedings. At the closing ceremony, the best presenters were awarded with certificates. Major achievements, developments or outputs in each crop sector in different disciplines will be identified and summarized as a document after the symposium and submit to the policy makers for relevant implementation or scaling up processes. *(www.cri.gov.lk)*

THAILAND: THE LAUNCH OF A SPARKLING COCONUT WATER

Thai Coconut has launched a 100% sparkling not from concentrate coconut water that is filled in a glass bottle. The product contains no preservatives, artificial flavors or added sugars and is promoted as a source of electrolytes. Jum Yukinathorn of Thai Coconut explains: "the product is very beneficial for your health as it is not from concentrate and only contains 22 calories per serving. Everything that we add is all natural." The company's process overcomes a unique technical challenge.

"The microbiology of coconut water is higher than other soft drinks, so it is not easy to preserve it in sparkling form. Normally carbonation is possible in soda, but we created a new process for creating 100% sparkling coconut water," she explains. The product is available in four flavors: Original, Mango & Pineapple, Pomegranate and Lemonade. The company will be launching the product in various markets towards the end of 2016. *(www. foodingredients-first.com)*

BEN TRE COMPANY EYES INTERNATIONAL VIETNAMESE COCONUT WATER SALES

A Mekong Delta-based company is aspiring to bring Vietnamese coconut water to the world stage. In 2015, the Ben Tre Import and Export Joint Stock Company (Betrimex) decided to channel US$22 million into establishing a factory in the province's Giong Trom District, reports *Tuoi Tre*. At the moment, the company is pumping out 37 million liters of coconut products annually; the new facility could potentially amp production up to 42 million liters at maximum capacity.

The Ben Tre-based enterprise has been around for a few decades, specializing in producing coconut water and coconut milk-related creations. One of Betrimex's key product is the bottled coconut water brand Cocoxim – currently being sold locally at VND13,000 per 330-milimeter bottle. According to Chau Kim Yen, Betrimex's CEO, this price has boosted the value of coconut water 300-fold compared to street side shops. Yen also added that Vietnamese coconuts have many desirable attributes compared to regional species: local coconut species have 5% more flesh and 5% more water than the global average, making them more profitable for production.

Robert Graves, director of Tetra Pak Vietnam, Betrimex's partner, says the company has a good shot at selling Vietnamese bottled coconut water to international markets, as consumers abroad are developing a penchant for the beverage. According to *Thanh Nien*, last year the world purchased some US$1 billion worth of canned coconut water, with the US and Brazil topping the list of consumption and market growth. Production-wise, Vietnam is currently 8th in the world in terms of coconut-related products at 1.2 billion coconuts per year. However, the country's products are not highly value-added and local coconut water is not optimally utilized. *(http:// saigoneer.com)*

INDUSTRY ON THE RISE - COCONUT OIL CONFERENCE WITNESSES INCREASED STAKEHOLDER PARTICIPATION

Deepthi Nair[1]

The Coconut industry is on the rise world wide and this was clearly evident at the Second International Conference on Coconut Oil (ICCO 2017) which witnessed a participation of over 230 stakeholders from around 25 countries, including coconut producing and consuming countries. The enthusiasm was clearly evident among the participants, both from Government and private sectors, and the collaboration and networking that emerged during the Conference promises a prospectful time ahead for coconut oil and its varied products.

From Left to Right Mr. Virach Chantrasmi, Vice President, Horticultural Science Society of Thailand, Dr. Suwit Chaikittiyos, Director General, Department of Agriculture, H.E. Chutima. Bunyapraphasara, Vice Minister of Agriculture and Cooperatives of Thailand , Mr. Uron N. Salum , APCC Executive Director, Dr. Narong Chomchalow, Chairman, Conservation and Development of Coconut Oil of Thailand Forum

ICCO 2017

ICCO 2017, organised as a biannual Conference, in continuation of ICCO 2015 was jointly organised at Bangkok International Trade and Exhibition Centre (BITEC), Bangkok, Thailand on 15-18 March 2017 under the auspices of the Conservation and Development of Coconut Oil of Thailand Forum (CDCOT), Department of Agriculture of Thailand, Horticultural Science Society of Thailand(HSST), Asian and Pacific Coconut Community (APCC) and VNU Exhibitions Asia and Pacific Co., Ltd. The theme of the Conference was : "Coconut Oil and Downstream Products, Quality and Processing".

Inaugural Session

The Inaugural session was graced by the Honorable Vice Minister of Agriculture and Cooperatives, Her Excellency Chutima Bunyapraphasara. Dr. Narong Chomchalow, Chairman of the Conservation and Development of Coconut Oil of Thailand Forum (CDCOT), in his introductory address explained the background of the Conference and the objectives envisaged. He stressed on the need to address the issues related to the misinformed and distorted views on coconut oil. Promotion of coconut oil and ensuring viability and sustenance of the value added processing ventures is crucial to the sustenance of the coconut communities. Mr. Virach Chantrasmi, Vice President of the Horticultural Science Society of Thailand, in his welcome speech extended a warm welcome to all participants and hoped that the Conference would evolve as a Forum for gaining, sharing and transferring valuable information to entrepreneurs and stakeholders in the coconut industry. Mr. Uron N Salum, Executive Director, Asian and Pacific Coconut Community expressed his sincere appreciation to the Government of Thailand for hosting ICCO 2017 and

Keynote Address—From Left to Right: Mr. Keith Chapman, International Consultant for Industrial Crops, Session Chair, Australia, Dr. Fabian Dayrit, Chairman of APCC Scientific Committee (Philippines), Dr. Mary T. Newport, MD. (USA).

A View of the Audience of the 2nd International Conference on Coconut Oil (ICCO), Bangkok, 15-18 March 2017

described the event as a wealth of knowledge, information and technology to be delivered by a highly credible array of world renowned experts on the subject of coconut and its products. This was followed by a report from the Organising Committee delivered by Dr. Suwit Chaikittiyos, Director General, Department of Agriculture who explained that ICCO 2017 focussed on one of the three components of the Strategic Action Plan of ICCO 2015. He explained in detail the format of the Conference and informed the participants about the exhibition of various coconut products and the demonstration area organised in the Coconut Pavilion on the Horti Asia Floor of BITEC.

The Honorable Vice Minister of Agriculture and Cooperatives, H.E. Chutima Bunyapraphasara, in her inaugural address stressed on the health benefits of coconut oil and hoped that the Conference would enable to learn more about the goodness of coconut oil. On behalf of the Government of Thailand, she extended a warm welcome to the participants and declared the Conference open.

Session 1 – Present Status of Global Coconut Oil Production and Usage

The First Session was themed on "Present Status of Global Coconut Oil Production and Usage" which was chaired by Dr. Fabian Dayrit, Chairman of the APCC Scientific Advisory Committee on Health. Dr. Narong Chomchalow, Chairman CDCOT presented the keynote address on the "Conference Theme, Setting the Scene" in which he explained the goal and objectives of the Conference and detailed on the different sessions in ICCO 2. This was followed by the keynote address "An Update on Coconut Oil Production and Diversification in Asia and the Pacific" which was delivered byMr. Uron N. Salum, Executive Director, APCC. Mr. Salum presented an outlook on the global coconut oil scenario, coconut oil prices over the years and a comparison of coconut oil versus other edible oils. He also gave a brief description on use of coconut oil in the oleochemical industry. Mr. Salum also mentioned the market outlook of the various other value added products from coconut.

Mr. Keith Chapman, International Industrial Crops Advisor, InterAg Consultant, Australia chaired the second part of Session I. Dr. Fabian Dayrit, Chairman of the APCC Scientific Advisory Committee on Health, presented the keynote address " Providing scientific evidence for coconut oil : updates and challenges". He presented a reassessment of the Western dietary guidelines and the need for a reboot. He further presented the uniqueness of coconut oil owing to the lauric acid and ketone bodies. He described the mechanism of modulation of the gut microbiomes and the oxidative enzymes by lauric acid and how it stimulates ketone body production.

He also elaborated on the effect of ketone bodies on Alzheimers disease and presented the way forward in research comprising of basic and pre-clinical studies, epidemiological studies and clinical studies to establish the health benefits of coconut oil. He recommended for APCC to propose to WHO to change its dietary recommendations to avoid coconut oil in diet.

Dr. Mary Newport, MD, Spring Hill, FL, USA presented the keynote address "Coconut Oil and MCT Oil : Ketones as Alternative Fuel for the Brain in Alzheimers and other disorders". She described Alzheimers as a fundamental metabolic problem and called it Type 3 diabetes and further explained the changes in the human brain when affected by the disease.

She elaborated on potential of ketone as alternative fuel and presented the case study of her husband Mr. Steve Newport who was suffering from Alzheimers and showed dramatic improvement with coconut oil and MCT oil. The invited paper on "Analysis of essential oil composition and quality product standard of coconut oil and downstream products" was presented by Mr. Kunchit Judprasong, Associate Professor Institute of Nutrition, Mahidol

University, Thailand who detailed on the various analytical analysis undertaken to ensure quality of products.

Second Session - Country reports on Coconut Oil Production, Marketing and New Innovation

The Second Session " Country reports on Coconut Oil Production, Marketing and New Innovation" was chaired by Mr. Uron N. Salum, Executive Director, APCC. The Session provided the participants with an outlook on the coconut oil production and marketing scenario in the different coconut growing countries of Fiji, Jamaica, Papua New Guinea and Sri Lanka. Mr. Setareki Tale, Executive Chairman of Fiji Agricultural Marketing Authority presented a brief outlook on the coconut sector in Fiji, the revamping of coconut industry, replanting programmes undertaken and the status of VCO production in the country.

Mr. Christopher Gentles, Chairman of the Coconut Industry Board in Jamaica presented on the coconut sector in Jamaica, the impact of Lethal Yellowing disease and the modern day marketing and innovations in coconut oil in Jamaica.

Dr. James Kaiulo, Managing Director, Kokonas Indastries Koporesan, Papua New Guinea presented a brief update on the coconut sector in Papua New Guinea, the coconut industry working groups or high value coconut products groups manufacturing coconut oil, coconut soap and VCO and the challenges in the way forward. Dr. Chandi Yalegama, Head, Coconut Processing Research Division, Coconut Research Institute — Sri Lanka gave a summary of the coconut industry in Sri Lanka and the production, processing and marketing of coconut oil, ball copra and virgin coconut oil. A perspective on Coconut Oil Production In India

Country Report—From Left to Right Mr. Vinod Kumar, Vice Chairman of Consortium of Coconut Farmer Producer Companies, India, Mr. Uron N. Salum , APCC Executive Director, Session Chair, Mr. Setareki Tale, Executive Chairman, Fiji Agricultural Marketing Authority, Mr. Christoper Gentles, Chairman, Coconut Industry Board, Jamaica, Dr. James Kaiulo, Managing Director, Kokonas Indastries Koporesen, Papua New Guinea, Dr. Chandi Yalegama, Head Coconut Processing Division, Coconut Research Institute, Sri Lanka.

from the point of view of a Farmer Producer Organisation and the proposed way forward was presented by Mr. P. Vinod Kumar, Vice Chairman of the Consortium of Coconut Farmer Producer Companies Kerala, India.

Third Session — Technical Session

The Third Session "Technical Session" was chaired by Ms. Divina Bawalan, International Consultant on Coconut Processing, Philippines. The invited paper "Quality, Certification, Labeling and safety Standards for coconut Oil and Coconut Oil Products" was presented by Ms. Teeranat Limpichotikul, Food Segment Manager – Thailand, Laos Cambodia, Myanmar, Certification and Business Enhancement, SGS (Thailand) Co. Ltd, Thailand who gave an overview of GMP HACCP standards, ISO 22000, FSSC 22000 and BRC Food Safety Standards and the benefits of certification for a food processing unit. The invited paper "Potential Bioactive Compounds in Coconut Milk and Virgin Coconut Oils" was presented by Mr. Visith Chavasit, Institute of Nutrition, Mahidol University who explained the composition and MCT contents in coconut milk and virgin coconut oil and the potential for MCT for providing immediate energy.

Ms. Ungkana Poungngenmak, Assistant Direc tor, Organic Farming System and International Support, Thaipure Coconut Co. Ltd, Samut Sakorn, Thailand presented the invited paper "The International Organic Standard for Coconut Oil Production in Thailand" in which she explained the organic certification process from farm, pre processing to the manufac-turing of the product.

The next part of the Technical Session was chaired by Dr. Fabian Dayrit, Chairman of the APCC Scientific Advisory Committee on Health. The contributed paper "Enzymatic Production of High Lauric Human Milk Fat Analog from Coconut Oil and Palm Stearin" was presented by Dr. Steivie Karouw, Indonesian Palm Crops Research Institute, Manado, Indonesia. The Human Milk Fat Analogue produced by enzyma-

Technical Sessions-From Left to Right Ms. Ungkana Poungngenmak, Thai Pure Ltd. (Thailand) Mrs. Divina Bawalan, Session Chair, International Consultant based in Manila, Philippines, Ms. Teeranat Limpichoticul, Food Segment Manager, Thailand Laos Cambodia Myanmar Certification and Business Enhancement, SGS (Thailand) Co. Ltd.Mr. Visit Chavasit, Institute of Nutrition, Mahidol University (Thailand).

atic interesterification of 2-monoglyceride derived from palm stearin with fatty acid methyl ester of coconut oil was found to be rich in medium chain fatty acids and also stable to oxidative and hydrolysis deterioration. Mr. Annas Ahmad, Herba Bagoes, Indonesia presented the paper "Simple Tropical Ketogenic Diet for Modern Human Life" in which he explained a Keto Food Pyramid comprising of 70-75% calorie intake from fats, 20-25% from proteins and only 5% from carbohydrates.

The contributed paper "Formulations of Antiperspirant and Deodorant sticks con-taining Virgin Coconut Oil Dry Emulsion" was presented by Mr. Somlak Kongmuang, Department of Pharmaceutical Technology, Faculty of Pharmacy, Silpakorn University, Thailand who explained the formulation of an antiperspirant and deodorant stick using coconut oil dry emulsion. He proceeded to present the next contributed paper "The Application of Xyloglucan in Virgin Coconut Oil Dry Emulsion Formulation" where the application of xyloglucan as natural emulsifier in virgin coconut oil was found to be a possible and viable alternative in preparing dry emulsions. Ms. Nguyen Thi Ai Van, Industrial University of Ho Chi Minh City, Vietnam presented the contributed paper "Hydrolysis of Virgin Coconut Oil using Free and Immobilised Lipase from *Aspergillus oryzae* and testing their Antibacterial activity".

Dr. Ponciano Batugal, Chairman of APCC Technical Working Group and former COGENT Coordinator chaired the next part of the Technical Session which started with the invited paper "Critical Review of Existing and New Coconut Oil Processing Technologies including Major Downstream products, Waste Utilisation and disposal and Product Quality Implications" presented by Ms. Divina Bawalan, International Consultant on Coconut Processing, Philippines. She discussed the traditional dry process with new fresh dry expeller method and the fresh wet centrifuge method for production of virgin coconut oil in terms of quality of coconut oil produced, its effect on the production of downstream products and the process in relation to environment.

Ms. Yvonne Agustin, Executive Director, United Coconut Association of the Philippines presented the invited paper "An overview Update of Global Marketing of Coconut Oil and Downstream Products: Issues and Opportunities". She briefed on the current world coconut oil trade, demand for coconut oil in both edible(food) and inedible (non food) markets and the market potential for coconut oil highlighting the issues and the opportunities. Mr. Mike Foale, Honorary Research Fellow, University of Queensland, Australia presented the invited paper "The Sociological Impacts of Rapid Increase in Demand for VCO on smallholder coconut and VCO producers" and stressed the need for certified VCO production and replanting of coconuts.

The next part of the Technical Session was chaired by Mr. Mike Foale, Honorary Research Fellow, University of Queensland, Australia. Ms. Wilaisri Lymphapayom, Department of Agriculture, Thailand presented the contributed paper " Encapsulation of Curcumin in Nanoemulsion using Virgin Coconut Oil" where the research work on enhancing the use of virgin coco -nut oil and curcumin in cosmemetics by preparation of nanoemulsion was discussed. She proceeded further to present the paper "Physical Properties of Virgin Coconut Oil based Mayonnaise" in which preparation of mayonnaise using three types of virgin coconut oil and the comparative study with the traditional soyabean oil mayonnaise was discussed. Mr. Kenneth Sorenson, Alfa Laval Co. Ltd, Sweden presented the

ICCO Participants Conducting Industrial Visit to a Coconut Processing Industry in Thailand

contributed paper "High Speed Separators for Continuous and Batch Production of Virgin Coconut Oil". He explained the three stage VCO separation system and the benefits of the Alfa Laval fresh wet process.

This was followed by the presentation of the contributed paper "A Critique of VCO production in Pacific Island Countries and the Solomon Islands in particular with the Results of Research carried out and Conclusions" by Rev. Vernon Smith, International Research and Development Consultant for Coconut Processing and Product Diversification, Solomon Islands.

The contributed paper "Activated Virgin Coconut Oil and its Potential Application" was presented by Ms. Kamariah Long, Malaysian Agricultural Research and Development Institute, Malaysia explaining the production of an activated VCO enriched with Vitamin E and containing six active ingredients: caprylic acid, capric acid, lauric,monocaprin, monocaprylin and monolaurin. Mr. Harish Single, Goyum Screw Press Ltd, India presented the contributed paper "Modern Technologies and Machineries to extract copra oil" in which he gave a brief outline of the various machineries for oil extraction.

Dr. Lumduan Wongsawad of Thailand chaired the next part of the Technical Session which started with the keynote paper " Lipid Antimicrobials revisited in the age of antibiotic resistance" presented by Dr. Vermen M. Verallo-Rowell, Adjunct Research Professor and Head Skin Study Group, University of Philippines. She explained the antimicrobial activity of fatty acids found in coconut oil and the environmental factors that influence the antimicrobial activity. She elaborated on the promising features of lipid antimicrobials in wider clinical applications using nanotechnology. Dr. Ralph N. Martins, Department of Biomedical Sciences, Macquarie University, Sydney, Australia presented the invited paper "Role of coconut oil in neuroprotection and evaluation of CocoMCT for the prevention of Alzheimers". He detailed on the studies undertaken on beta amyloid anti aggregation properties and the need for further studies on effect of CocoMCT on clinical factors related to health, cognition, quality of life and Alzheimers disease related biomarkers. The contributed paper on "Kosher as a Marketing Tool for the Export of Value added Coconut Oil and Coconut Oil Products" was presented by Mr. Amos Benjamin, China And Asia pacific Head, Star K Certification Inc., USA.

The next part of the Technical Session was chaired by Mrs. Peyanoot Naka, Secretary of the Conservation and Development of Coconut Oil of Thailand Forum. Ms. Supattra Lertwattanakiat of the Horticulture Research Institute of Thailand gave a brief profile of the coconut production and marketing scenario in Thailand and the challenges faced by the industry. This was followed by presentations on the production and marketing of coconut oil and its products by Mr. Kieatisak Theppadungporn from Theppandungporn Coconut

A View of the Exhibition Areas

Company Limited, Mr. Rud Suwansareekasame from Empowerlife Co. Ltd and Mr. Nipha Dachma from P.O. care Co. Ltd.

Breakout Sessions

A review of the International Strategic Action Plan for Coconut Oil developed during ICCO 1 was presented by Mr. Keith Chapman, International Industrial Crops Advisor, InterAg consultant, Australia. This was followed by the breakout sessions for which the participants were divided to three groups to discuss on the topics – Coconut Oil: Processing Technology and Certification, Coconut Oil: Utilisation and Coconut Oil: Marketing. The International Strategic Action Plan was discussed and reviewed on the above topics and the plan suitably modified with proper vision, outcomes and action points. The modified plan was presented before the participants for further suggestions and improvements.

Field Tour

A one day professional tour to coconut growing and processing sites was organised on 18 March 2017. The visit started with the Virgin Coconut Oil and Coconut Milk Processing Plant at Theppadungporn Coconut Company Limited, Nakorn Phatum, Thailand. A presentation on the activities was done by the management to the knowledge of the participants which was followed by a live view of the ongoing activities in the plant right from assembling of nuts through the different processing steps to the final packaging and cartonising of the products. The participants also visited selected areas of the plant.

The next stop of the professional tour was to the R&D Cosmetic laboratory and the Virgin Coconut Oil Products Showroom of the Tropicana Oil Company Limited wherein the participants got to see the wide range of products possible from virgin coconut oil. The management gave a brief picture on the activities undertaken at the plant and the major products. The participants also got to taste different delicacies using coconut products. The visit to the NC Coconut Company Limited, Dumneon Saduak gave an overview of the aromatic coconut processing for export. Aromatic coconuts were sourced, semi-processed by removal of husks and then treated and packed for export. The participants also got to taste aromatic coconut and coconut jelly.

The final leg of the professional tour was to the Virgin Coconut Oil factory of Thai Pure Company Limited at Samut Sakorn. The company officials gave a brief presentation of their activities followed by a visit to the plant where VCO was produced by centrifuge methods.

ICCO 2017 recommendation

The recommendation of ICCO was for the revised Second International Strategic Action Plan for Coconut Oil to be adopted by APCC and that APCC recommends to member countries and associates to adopt the updated revised plan into their National Coconut Strategies and Programs.

[1]*Deepthi Nair is Assistant Director of Asian and Pacific Coconut Community, Jakarta, Indonesia*

ASIAN AND PACIFIC COCONUT COMMUNITY STATEMENT ON THE WORLD HEALTH ORGANIZATION HEALTHY DIET FACT SHEET NO. 394

Asian and Pacific Coconut Community (APCC) is of the opinion that World Health Organization Healthy Diet Fact Sheet No. 394 contains misleading information on the coconut oil which leads to unfavorable consequences to APCC member countries. It is, therefore, APCC wrote respectfully to WHO to rectify the Healthy Diet Fact Sheet No. 394 due to a number of scientific reasons given in the APCC statement.

APCC letter and Statement are presented in this journal as the rejoinder.

DR. MARGARET CHAN
Director General
World Health Organisation
Geneva, Switzerland

Your Excellency Dr. Margaret Chan :

Subject : Asian and Pacific Coconut Community Statement on the World Health Organisation Healthy Diet Fact Sheet No. 394

Asian and Pacific Coconut Community (APCC) is an intergovernmental organisation established in 1969 under the aegis of the United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) for the sustained development of the coconut sector. APCC has 18 member countries comprising of the Federated States of Micronesia, Fiji, India, Indonesia, Kiribati, Malaysia, Marshall Islands, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu and Vietnam as full members and Jamaica and Kenya as associate members. Nearly 25 million households depend on coconut for their livelihood, which is cultivated in an area of about 12 million hectares in over 90 countries and a total production of 12.18 million metric tonnes of copra equivalent.

We wish to bring to your kind notice the fact that coconut oil is being subjected to a negative advisory from WHO through the recommendations in the WHO Healthy Fact Sheet No. 394 which lists coconut oil as an oil not to be preferred. This negative advisory, without adequate scientific basis, drastically affects the livelihoods of millions of small holder coconut farmers. Coconut oil has been consumed in coconut growing countries and also coconut importing countries as a healthy edible oil for many centuries.

As an intergovernmental organisation working for the sustained development of the coconut sector, APCC wishes to respectfully register its strong objection to the WHO on the WHO Fact Sheet No. 394. We are enclosing the APCC Statement which details the base for our objection supported by scientific evidences, for your kind consideration.

ASIAN AND PACIFIC COCONUT COMMUNITY STATEMENT ON THE WORLD HEALTH ORGANIZATION HEALTHY DIET FACT SHEET NO. 394

We humbly request if you would kindly provide us an opportunity for a Consultation Meeting with WHO and FAO to clarify and examine the scientific evidence related to the health attributes of coconut oil.

Based on the scientific evidences explained in the APCC Statement, APCC humbly requests WHO for the following corrective measures :

Remove all warnings on coconut oil, including the one given in the WHO Healthy Diet Fact Sheet No. 394

WHO distinguish the different saturated fats : short chain, medium chain and long chain saturated fats; in all of its recommendations

WHO emphasise that both saturated fat and unsaturated fat are important in a healthy diet

WHO emphasis that consumption of too much poly unsaturated fat (especially when omega-6 to omega-3 ratio is greater than 5) is unhealthy and is associated with cardiovascular disease, inflammatory diseases, obesity and cancer.

We look forward very much to your kind consideration of our request on behalf of WHO, to the benefit of the millions of small holder coconut farmers and the millions of consumers of coconut oil world wide.

The APCC Secretariat avails of this opportunity to renew with the World Health Organisation the assurances of its highest consideration.

Sincerely,

URON N SALUM
Executive Director

Copy to : HIS EXCELLENCY DR. JOSE GRAZIANO DA SILVA, Director-General, Food and Agriculture Organisation of the United Nations, Viale delle Terme di Caracalla – 00153 Rome

ASIAN AND PACIFIC COCONUT COMMUNITY STATEMENT ON THE WORLD HEALTH ORGANIZATION HEALTHY DIET FACT SHEET NO. 394

The Asian and Pacific Coconut Community (APCC), a UN ESCAP intergovernmental organization representing 18 coconut producing countries wishes to register its objection to the WHO Healthy diet Fact sheet No. 394 which reads:

"For adults. A healthy diet contains:

- Less than 30% of total energy intake from fats. Unsaturated fats (e.g. found in fish, avocado, nuts, sunflower, canola and olive oils) are preferable to saturated fats (e.g. found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard) (3). …"
  (www.who.int/mediacentre/factsheets/fs394/en/)

Our objection is based on the following:

1. The basis of this statement is an FAO 2010 publication,*Fats and fatty acids in human nutrition Report of an expert consultation*. On page 9 of this publication, the following limitation was stated:
   - "The Expert Consultation recognises that grouping of fatty acids into these three broad groups (SFA, MUFA and PUFA) is based on chemical classifications, but it is clear that individual fatty acids within these groups have distinct biological properties. However, most of the epidemiological evidence reviewed by the experts uses broad groupings, which makes it difficult to distinguish and disentangle the effects of individual fatty acids.

   - "SFA refers to the major SFA in our diet, namely C14, C16, C18, except in the case of milk and *coconut oil where SFA range from C4 to C18*."

   This report ignored the distinction between medium-chain saturated fat (C6 to C12) and long-chain saturated fat (C14 to C18). The metabolic differences between medium-chain fat and long-chain fat have been known for many years (see for example, Bach & Babayan, 1982). This distinction is central to the understanding of the health effects of coconut oil, which is made up of about 63% medium-chain fat. The failure to recognize this difference makes this document's conclusions regarding coconut oil inadmissible.

2. Coconut oil is a component of an ancient and traditional diet which is consumed in more than 90 countries. Numerous published scientific studies have concluded that coconut oil is *not* linked to coronary heart disease. For example:

   a. Polynesian islands of Pukapuka and Tokelau (Prior*et al.* 1981): "Vascular disease is uncommon in both populations and there is no evidence of the high saturated fat intake having a harmful effect in these populations." (Note: the saturated fat referred to here is mainly coconut oil.)
   b. Philippines (Florentino & Aguinaldo, 1987): "High coconut oil intake is not consistent with high CVD mortality rate.""These observations do not seem to corroborate the contention that coconut oil as naturally ingested in the diet together with other fat sources increases the risk of CVD."
   c. India (Kumar, 1997): "The results imply no specific role for coconut or coconut oil in the causation of CHD in the present set of Indian patients from Kerala."
   d. Indonesia (Lipoeto *et al.*, 2004): "Similar intakes of saturated and unsaturated fatty acids between the cases and controls indicated that the consumption of total fat or saturated fat, including that from coconut, was not a predictor for CHD in this food culture. However, the intakes of animal foods, total protein, dietary cholesterol and less plant derived carbohydrates were predictors of CHD."
   e. Philippines (Feranil*et al.*, 2011): "Dietary coconut oil intake was positively associated with high density lipoprotein cholesterol especially among pre-menopausal women, suggesting that coconut oil intake is associated with beneficial lipid profiles. Coconut oil consumption was not significantly associated with low density lipoprotein cholesterol or triglyceride values."

3. The shift from a traditional coconut diet to a Western diet has been documented to result in higher obesity, diabetes, CVD, and other ailments.

   a. New Zealand (Prior,1973): "The high price being paid by the New Zealand Maori, in terms of morbidity and mortality from a range of cardiovascular and metabolic disorders and the contrast with the picture seen among atoll dwellers, gives a clear indication of how exposure to the ways and diet of Western society can influence health and disease patterns."

   b. American Samoa (Galanis *et al.*, 1999): "The observed energy and nutrient intake patterns are consistent with previously reported levels of obesity and risk factors for cardiovascular disease among Samoans … the food choices of certain ethnic groups may be profoundly affected by the process of modernization within a country or by migration to a more economically developed locale."

   c. In the South Pacific islands, WHO in its own publication, *Diet Food Supply and Obesity in the Pacific* (2003), noted the undesirable effects of the shift from a traditional diet, which includes coconut, to a Western diet: "people were 2.2 times more likely to be obese and 2.4 times more likely to be diabetic if they consumed fat from imported foods rather than from traditional fat sources."

4. This recommendation has its origins with the diet-lipid-heart disease hypothesis of Ancel Keys (Keys, 1957). However, re-evaluation of Keys' hypothesis has revealed several errors:

   d. Keys' early experiments on coconut oil used *hydrogenated* coconut oil (Keys *et al.*, 1957a; 1957b). This can explain his later misconception and bias that coconut oil raisesserum cholesterol. Since then, however, it has been shown that hydrogenation of vegetable oilsforms trans fats that raise serum cholesterol (Mensink & Katan, 1990; Mathan *et al.*, 2000). Therefore, his conclusions regarding coconut oil are *not valid.*

   e. Yerushalmy and Hilleboe (1957) in an early critique of Keys' 1957 papers wrote: "In the proposition considered in this paper – the suggested association between fat in the diet and heart disease mortality – the examination of all available basic data and the tests for specificity show that the association lacks validity. Consequently, the apparent association in itself cannot serve as supporting evidence for the theory that dietary fat plays a role in heart disease mortality." This criticism remains valid to this day.

   f. The countries that were included in the Seven Countries Study of Ancel Keys (Keys *et al.*, 1986) did not have coconut oil as a major component of its diet. (These countries were: Finland, Greece, Italy, Japan, Netherlands, USA, and Yugoslavia.) The fats consumed in these countries would have been mostly animal fat, which is made up of long-chain saturated fats. Therefore, this hypothesis is not applicable to coconut oil.

   g. Ramsden and co-workers (2016) recently reported on an old study, known as the Minnesota Coronary Experiment (MCE),in which Ancel Keys was a co-principal investigator. This study wasdone from 1968 to 1973 but its results were not fully published. Ramsden and co-authors noted in their paper that: "The cholesterol-fat diet paradigm has never been causally demonstrated in a randomized controlled trial. The MCE study was meant to prove this paradigm, but the results were not fully published." Ramsden and co-workers made the following conclusions from their re-evaluation of the MCE study:

      - Though the MCE intervention lowered serum cholesterol, this did not translate to improved survival.
      - Paradoxically, MCE participants who had greater reductions in serum cholesterol had a higher, rather than lower, risk of death.
      - Results of a systematic review and meta-analysis of randomized controlled trials do not provide support for the traditional diet heart hypothesis.

Conclusions

The APCC requests WHO for the following corrective measures:

- Remove all warnings on coconut oil, including the one given in the WHO Healthy diet Fact sheet No. 394.
- Given the current state of our knowledge on short-chain, medium-chain, and long-chain saturated fats, WHO should distinguish these different saturated fats in all of its recommendations.
- WHO should emphasise that both saturated fat and unsaturated fat are important in a healthy diet. However, there is *no scientific basis* for the limit of 10% of calories from saturated fat.
- WHO should also emphasise that consumption of too much polyunsaturated fat, especially if the omega-6 to omega-3 ratio is greater than 5, is unhealthy and is associated with cardiovascular disease, inflammatory diseases, obesity, and cancer (Simoupolos 2002; 2008; 2010; Deol *et al.*, 2015).

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PROGRESS ON COCONUT MICROPROPAGATION IN MEXICO

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Introduction

The coconut palm has always been a very important species for man. In recent years its commercial importance has been growing very rapidly for different high value products, as in the case of packed coconut water, since it has the potential to substitute worldwide bottled carbonated drinks with a healthier offer. Giant corporations in this field, Coca-Cola, PepsiCo and Dr. Pepper, are already selling packed coconut water products in USA and Europe. According to www.canadeanconsumer.com there will a fourfold increase (from 2.9 to 10 billion USD) in the coconut water value growth by year 2019.

This increasing growth of the coconut industry markets needs a corresponding growth in nut production worldwide. This is a task difficult to achieve considering the threat of several pests and diseases, and most importantly because most coconut plants in producing countries are old. Regarding phytosanitary threats, perhaps the most worrying are the devastating phytoplasma diseases. In the Americas the phytoplasma associated Lethal Yellowing disease (LY) has killed millions of palms in different countries in the Caribbean region (Fig. 1). Therefore, important efforts have been carried out in Jamaica and México to identify LY resistant coconut, which have successfully identified resistant ecotypes in both countries (Oropeza *et al*., 2005).

Thus in order to maintain the flourishing markets and growing demand of coconut products, replanting of most cultivation surface around the world, as well as establishing new surface, are urgently needed. It is estimated that this immense task cannot be accomplished by traditional propagation through seed. Accordingly, the biotechnological alternative of *in vitro* propagation by somatic embryogenesis, with its great propagation capacity, has been approached in different laboratories worldwide in order to develop highly efficient and commercially viable protocols. This paper reports an account of such an effort that is currently going on in México at CICY (Centro de Investigación Científica de Yucatán). For more in depth background information the reader is referred to excellent reviews that are available (Arunachalam, 2012; Nguyen *et al*., 2015; Sáenz-Carbonell *et al*., 2013).

Figure 1. Lethal Yellowing, the phytoplasma associated disease, has killed millions of coconut palms in the Americas.

Materials and Methods

All the materials and methods used for the research reported here are described in Chan *et al*., (1998), Pérez-Núñez *et al*., (2006), Sáenz *et al*., (2006), Pérez-Núñez *et al*., (2009) Sandoval-Cancino *et al*., (2016).

Results and Discussions

Development of a protocol using plumule explants

Early studies were carried out during the nineties within a collaboration of Wye College (UK) and CICY (Blake *et al*, 1994), testing different explants that initially included rachilla and whole embryos for formation of callus (that could eventually form somatic embryos with the capacity to con

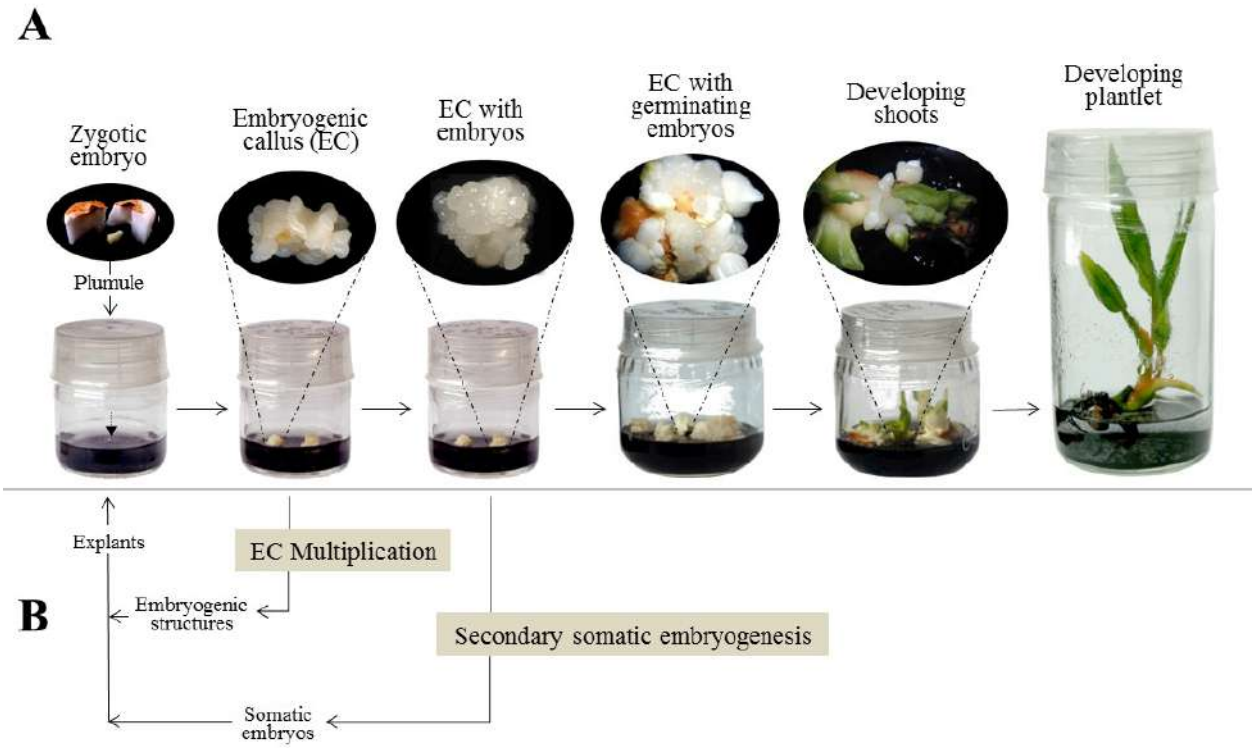

Figure 2. Diagram of the process of plant regeneration from plumule explants via somatic embryogenesis (A). Modified process including embryogenic callus multiplication and secondary somatic embryogenesis (A and B).

vert into viable plantlets). The callus formation response of these explants was not very convincing, however whole embryos showed the formation of a ring of callus-like tissue growing on the outside middle part of the embryo, although it did not develop into a proper callus. Then considering this response and the probable occurrence of inhibitors of callus formation in some embryo tissues (Kefeli *et al*., 1971), parts of the embryo were tested separately as explants, including the plumule. Preliminary results showed that plumules were very responsive for callus formation (Blake *et al*, 1994; Hornung, 1995).

Characterization of embryogenic callus development

Within the next decade basic research was carried out to study the process of somatic embryogenesis from plumule explants with different approaches (morpho-histological, physiological, biochemical and molecular) in order to gain knowledge that could be useful to further improvement of the process. In this way, it was learnt about uptake of 2,4-D by explants and the timeline of how its concentration increased (Sáenz *et al*., 2005), followed by increases of kinase activity associated with signal transduction (Islas-Flores *et al*., 2000) and relevant gene expression (Pérez-Núñez *et al*., 2009; Sáenz *et al*., 2013). At the same time studies were carried out to characterize morphologically and histologically the development of the embryogenic callus (Sáenz *et al*., 2006). It was learnt that the development of this callus is precisely well defined, with the formation of ear-shaped translucid structures that start appearing at about 30 days of culture and are fully formed by day 60. These structures have meristematic cells in the periphery tissues. From these tissues, embryogenic structures develop, first with a globular shape and then they become elongated, and that by day 90 of culture the embryogenic callus is fully developed. The embryogenic structures also have meristematic cells in the peripheral tissues, from which somatic embryos develop after transfer to medium designed to induce this response. It is interesting that when the translucid structures start forming there had been already a peak in 2,4-D concentration, on kinase activity and in the expression of *CnSERK*, an ortholog of the *SERK* gene (Pérez-Núñez *et al*., 2009). Also another peak of *CnSERK* expression happens by day 90 when the embryogenic structures are formed. A very useful finding was that it is possible to follow the proper development of an embryogenic callus just by looking at its morphology following the right pattern of development in form

and time, knowing that the correct changes in tissues, and physiological, biochemical and molecular events are taking place as learnt from the basic studies described above. Once embryogenic calli is subcultured to a medium for inducing somatic embryo formation, globular embryos appeared by day 15 and the developed into torpedo-shaped embryos by day 30. Interestingly, there is a peak of *CnSERK* activity by day 15.

In parallel studies, more practical approaches were tested including changes in the media formulation to study the effect activated charcoal and brassinosteroids (Azpeitia *et al*., 2003) on plumule explants, and gibberellins (Montero-Cortés *et al*., 2010) and BAP (Montero-Cortés *et al*., 2011) on embryogenic structures used as explants, on the formation of embryogenic callus, somatic embryos and germination, resulting in improved efficiency.

Multiplication of embryogenic callus

The characterization of embryogenic callus, described above, lead us to believe that embryogenic structures and globular somatic embryos could be useful as explants because of the presence of meristematic cells and expression of *CnSERK*. Therefore they were tried as explants and results were positive for both. These results allowed us to develop processes of callus multiplication / secondary somatic embryogenesis (Pérez-Núñez *et al*., 2006) (Fig. 2B). The first intended for massive multiplication and the second (as an intercalated step within the multiplication) to help conserve embryogenic competence during prolonged culture times (Martinelli *et al*. 2001). This combined approach

Figure 3. Scaling up of the process of coconut micropropagation in a facility outside Mérida, Yucatán, with a capacity for up to 200,000 plantlet production per year.

was tested with results showing an estimated capacity to produce about one hundred thousand somatic embryos from a single plumule explant (Pérez-Núñez *et al*., 2006). Embryos were able to germinate and convert to plantlets that after planting grew successfully to sexual maturity and fruit production. This protocol is currently being scaled up to a semi-commercial level in a facility we call "Biofábrica" or biofactory in Sierra Papacal nearby Mérida in Yucatán (Fig. 3).

Somatic embryogenesis from rachilla explants

Also within the past five years using rachilla explants, a protocol was developed for the production of embryogenic callus and its multiplication, embryos were able to germinate and con-

vert to plantlets (Sandoval-Cancino *et al*., 2016). These results are setting the basis to develop a process for massive propagation of coconut; similar to the one already developed using plumule explants, and using the knowledge gained from the plumule studies.

Conclusion and Perspectives

The transference of the technology for massive propagation based of multiplication of embryogenic callus from plumule is underway and working well, with embryogenic callus and embryo yields as expected, the full process will be working with production of plantlets during the second semester of 2017. There are plans at a later stage, to establish in México larger facilities, probably five. In parallel we are working on the establishment of embryogenic callus lines of other coconut ecotypes of interest. Keeping these will require cryopreservation, so it is planned to start working on this issue as soon as possible. Also we are already working for developing embryogenic callus lines derived from rachilla explants of very valuable genotypes, and this will be followed by testing them for massive production with a process similar to that used for plumule derived calli. However, it is clear that although results have been very satisfactory so far, for future strengthening of the coconut micropropagation efficiency capacity, it is necessary to keep on working for continuous improvement of protocols. This is something that certainly requires a multi-institutional, international, and very well organized and coordinated effort.

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THE SCARCITY OF RAW MATERIALS PROMPTED INDONESIAN COCONUT SHELL CHARCOAL BASED BUSINESSES TO UNITE

Muhartoyo[1]

The National Meeting of Coconut Shell Charcoal Based Businesses was organized by Indonesian Friends of Coconut, a non-government organization with an aim to create public awareness on the social, cultural, economic, and environmental importance of coconut, on 14-15 March 2017 in Cibogo, Bogor West Java. The purpose of the meeting was to bring together and to unite all the coconut shell charcoal based businesses and to formulate solution to the crisis and the strategy to strengthen the industry. Many people dealing with coconut shell charcoal and activated carbon businesses were very enthusiastic in discussing the crisis suffered by this business sector.

From left to right: Mr. Mawardin M. Simpala, Chairman of Indonesian Friends of Coconut, Mrs. Nurlaela Nur Muhammad, SE., Head of Strategic Issue Management-Ministry of Trade, Mr. Daniel Pesik, Chairman of Indonesian Coconut Shell Charcoal Association (PERPAKI), Mr. Mahmudi, Secretary General of PERPAKI

Coconut shell charcoal based businesses including charcoal, briquette, and activated carbon are important industry as they generate high economic returns, although coconut shell is only about 15% of the total volume of the whole nut. Based on the Indonesian Central Agency for Statistic the total export value of coconut shell charcoal, activated carbon and briquettes in 2015 was estimated around IDR 6 to 7 trillion (USD 455 million to 530 million). Around 98% of enterprises dealing with these commodities fall under the category of small medium enterprises (SMEs).

In the last two years coconut shell charcoal based businesses in Indonesia have suffered from a crisis due to multiple issues. The main issue is undesirable increased price of raw material, especially coconut shell and its charcoal which has increased 2.8 folds in the past eight years. In the last three years coconut shell charcoal price increase ranged from IDR 500 to IDR 600 (USD 0.04 to 0.05) per kilogram per year. This increase is burdening for the industry because the export price of finished products such as briquettes and activated carbon is almost stagnant. The increase is caused by many factors including the scarcity of raw materials due to whole coconut exports, decrease of tree productivity as a result of senility or aging coconut trees, poor agricultural practice or farm management, adverse weather condition affecting coconut production and reduced coconut plantation hectarage which is almost 1% per year. These factors are also worsened by the incoming individual foreign businessmen directly to coconut production centers and do business in this sector without proper procedures. As a result the business in this sector becomes tougher and unhealthy forcing around 30% of total business operators to stop their operation. The rest have to survive with narrow margin.

Considering the above mentioned problems, coconut shell charcoal based business operators gathered at the Ria Diani Cibogo, Bogor. This National meeting was the first of its kind, and was attended by 86 participants from various coconut producing provinces in Indonesia. Participants coming from North Sulawesi, Gorontalo, Central Sulawei, South Sulawesi, East Java, Central Java, West Java, Banten, West Kalimantan and some province in Sumatra like West Sumatra, Riau, Palembang, South Sumatra and Lampung. The event was also attended by Mr. Eka Sastra, member Indonesian House of Representatives Commission VI and Mr. Hariram Mahtani one of the country respected business figure.

The meeting consisted of three

activities including seminar, workshop and formation of association and the election of its chairman. Keynote speaker of the seminar was Mrs. Nurlaila Nur Muhammad, SE, Head of Strategic Issue Management of Ministry of Trade. Other speakers were Mr. Bambang Warih Koesoema, the pioneer of coconut shell charcoal briquettes business, and a representative from Haycarb, a foreign investment company that has two factories in Palu, Central Sulawesi and Bitung in North Sulawesi.

Mr. Ardi M. Simpala, Chairman of Indonesian Friends of coconut, said that he had never seen the enthusiasm of the meeting participants like the one in this meeting. Initially the organizer expected maximum of 50 people plus some businessmen from the island of Java only. It turned out to be 86 participants from various regions outside Java attended the Meeting. This increased participants made the organizing committee add more tables and chairs. In addition almost all agenda such as workshops, seminars and the establishment of the association and the election of Association Chairman overshot the predetermined time due to the enthusiasm of the participants. The first day started at 9 am and ended even until 10 pm. Mr. Ardi further said that despite the limitations and simplicity of the meeting organization, almost all participants expressed their satisfaction at being able to attend this national event.

As previously mentioned, one of the outcomes of the Meeting was the establishment of the coconut shell charcoal based business association named PERPAKI (Indonesian Coconut Shell Charcoal Entrepreneur Association). Mr. Daniel Pesik, who is charcoal business owner and one of Deputies of North Sulawesi Chamber of Commerce, was elected as Chairman and Mr. Mahmudi, who has briquette business, was elected as the Secretary General of the Association.

The Participants of Focused Group Discussion on Coconut Shell Briquette Businesses

Some ideas emerged during the Meeting and below are the ex-cerpts of the ideas:

- Bambang Warih Koesoema who started the coconut shell charcoal business in 1986 is the owner of Cococha brands. He managed to market his products to many developed countries such as Japan, some countries in Europe, North America and South America. Cococha's factory located in Pontianak, West Kalimantan. He said that it is the time all the charcoal entrepreneurs in the country sit together and unite to strive for global market. He explained that the globalization makes the business more competitive, especially with the incoming of individual foreign businessmen in Indonesia. In addition, the increase of export of whole coconuts makes domestic industry face severe shortage of raw materials. Bambang also said that his company is ready to work together with small briquettes producers to produce high quality briquettes export the product under his brand.

- Frangky E. Tegoeh who is CEO of PT. Javaindo purest Carbon-activated carbon company manufacturers based in Mojokerto-East Java, said that not only regulation of whole coconut export that should be pushed through, but also coconut shell charcoal import as a raw material of activated carbon industry. According to this young entrepreneur who graduated from a university in China and started his business there, his company has already imported coconut shell charcoal from India since the last two years as a solution to the shortage of raw material in the country. He did this because the price of charcoal from India is much cheaper than in the country. Coconut shell charcoal price from India is around USD330 per ton and in Sri Lanka USD338 compared to domestic prices which surprisingly could reach USD448 per ton. Though coconut plantations Indonesia is larger than that of India and Sri Lanka combined. He suggested that there should be a change in coconut shell charcoal import rules.

Group Photo Session Soon after the Election of PERPAKI Chairman

Formature Meeting to Select Organization Committee Members of PERPAKI

- Daniel Pesik, the newly elected Chairman of the Association of Indonesia charchoal based business (Perpaki) said that he was grateful to all participants who have chosen him to lead the Association. To succeed as the Chairman of the Association he would need the support and cooperation of all parties. He further said that urgent measures should be taken by the Government, especially the Ministry of Trade regarding the export regulation of whole coconuts which affect the availability of raw materials for coconut shell charcoal production. He further said that whole coconut export levy like the one in palm oil need to be considered so that the fund can be used for national coconut rejuvenation in a large scale.
- Mahmudi, a charcoal and briquette business owner, said charcoal briquette industry contributes greatly to the welfare of society. Almost all charcoal and briquette business operators are SMEs (Small and Medium Enterprises) who process raw materials from coconut farmers. However, in the last two years, the revenue from this business has decreased significantly compared to one or two years earlier. The fundamental and urgent solution is regulation of whole coconut export which takes away coconut shells as raw material for making charcoal and briquettes. He, therefore, urged the government to issue regulations for whole coconut export without neglecting the welfare of farmers as the majority owners of coconut. If this problems are not immediately addressed more companies dealing with briquettes will be closed down.

In conclusion coconut shell charcoal based business generates substantial revenues and employment. The decreasing availability of raw materials has been a major concern for coconut shells based business operators. As the main cause of raw material scarcity is unregistered export of whole nuts, immediate win-win solution is very much needed. The government assistance is expected to address this problem in such a way that the industry can continue its operation and the coconut farmers get remunerative price for their coconuts.

[1]Muhartoyo is Documentalist of Asian and Pacific Coconut Community, Jakarta, Indonesia

KETOGENIC RECIPES: REAL OR FAKE—LOOK OUT FOR FAKE KETOGENIC RECIPES

Dr. Bruce Fife[1]

In 2014 I published a book titled *The Coconut Ketogenic Diet*. The focus of the book was how to use a coconut oil based ketogenic diet to lose excess weight and improve overall health. Within a few weeks after my book appeared on Amazon.com, a copycat book with a very similar title and cover design was posted. Unlike my book, this other book was a cookbook devoted entirely to ketogenic recipes. The author of the book intended to make it appear like his book was a companion volume to mine.

Roasted Vegetables

It was a Kindle book and didn't cost much so, being curious, I ordered a copy. It was more of a booklet than a book. It contained only 21 recipes. Shockingly, none of the recipes were actually ketogenic and maybe only half could be considered even remotely low-carb. The recipes contained grains, potatoes, honey, and other high-carb ingredients. For someone looking for ketogenic recipes this book was a total waste, and even harmful.

A ketogenic diet is one that is very low in carbohydrate, high in fat, with moderate protein. Carbohydrate and protein intake must be limited in order for the body to produce ketones—an alternative fuel to glucose. Too much carbohydrate or protein will stop ketone production. The extra fat in the diet makes up for the missing carbohydrate calories. Much of dietary fat in a ketogenic diet is converted into ketones to be used to fuel our cells, so getting adequate fat is important.

One of the advantages of ketones is that they are a much more potent and efficient energy source than glucose. It is like putting a high performance fuel into the gas tank of your car, you get better mileage, more power, with less wear and tear on the engine. The brain, in particular, runs much better using ketones for fuel and for this reason the diet is recommended for many neurological disorders. Another health issue that is greatly improved with ketones is diabetes. The underlying problem with type 2 diabetes is insulin resistance, in which the cells of the body are unable to effectively absorb glucose. Without glucose the cells cannot produce the energy they need to function and live, therefore, they began to degenerate and die. This is what leads to many of the symptoms and complications associated with diabetes. Cells, even if they are insulin resistant, easily absorb ketones, providing them the energy they need to function properly and prevent the complications associated with diabetes.

The ketogenic diet is a therapeutic diet that has been useful in treating a wide number of health problems including diabetes, obesity, Alzheimer's, Parkinson's, epilepsy, autism, heart disease, cancer, glaucoma, infertility, and others. Strictly following a ketogenic diet can control or even reverse these conditions. For this reason, ketogenic diets have become increasingly popular. There are now numerous ketogenic cookbooks available. You can go online and find hundreds of ketogenic recipes. Coconut oil is beneficial in a ketogenic diet because it promotes the production of ketones better than any other fat and increases the efficiency of the diet.

I've written a number of books describing how to use a ketogenic diet to overcome various health problems. Although these books clearly explain what a ketogenic diet is and provide many sample recipes to get readers started, it is always helpful to have more tried and true recipes to choose from.

Most people simply turn to the Internet for recipes. This could be a big mistake! Don't get me wrong, the Internet is a very useful tool and you can find a lot of good information there, but it is

also a source of much misinformation, especially when it comes to diet and health. The Internet is the first place most people go when looking for ketogenic recipes. Unfortunately, a large number of these so-called ketogenic recipes are not really healthy or even ketogenic. They are loaded with carbohydrate, sweeteners, unhealthy fats, and other questionable ingredients. I would never recommend these recipes for people going on a ketogenic diet.

Many of the people posting these recipes assume that ketogenic is the same thing as low-carb. Not so. All ketogenic recipes are low-carb, but not all low-carb recipes are ketogenic. I have found that many of the so-called "ketogenic" recipes on the Internet are not truly ketogenic. Using these recipes will only hamper a person's efforts to achieve nutritional ketosis and slow their progress. If someone is taking up a ketogenic diet for therapeutic reasons, he or she needs to make sure the recipes are actually ketogenic, otherwise the results will be disappointing and in the case of someone with a serious disease, like diabetes or cancer, it could be very harmful.

With the growing popularity of the keto lifestyle, ketogenic recipes abound. You can easily find hundreds of recipes not only on the Internet but in books and magazines as well. Many of them sound delicious, like keto cupcakes or keto ice cream…really? Is there such a thing?

A large number of the proclaimed ketogenic recipes on the Internet are desserts, treats, and sweets—brownies, cookies, pancakes, waffles, syrups, cinnamon rolls, candy—all of the type of foods that cause obesity and metabolic disease. Even most ketogenic cookbooks are loaded with sweet treats. There are some books devoted entirely to ketogenic desserts with gorgeous pictures of decadent-looking cakes and candies on the cover! What a scam! Do you really think that changing a few of the ingredients in these types of foods makes them healthy? They may not use grains or sugar, but they are not exactly health foods either. All of them are sweetened with zero-calorie artificial sweeteners or sugar substitutes. All sweeteners, regardless of the source, promote sweet addiction, overeating, and weight gain. They also promote metabolic problems.

Keto Cookery

People looking for ketogenic recipes generally just assume that any recipe that is labeled "ketogenic" or "low-carb" is actually ketogenic. Nothing could be further from the truth. The term "low-carb" is relative. For example, a single slice of ordinary chocolate cake may supply 50 grams of carbohydrate. A low-carb version of the same size piece of cake may supply 40 grams of carbohydrate. Forty grams is a lot of carbs when you are on a ketogenic diet in which your total carbohydrate allotment for an entire day may be only 20 or 30 grams. But since 40 grams is lower than 50 grams, the cake is labeled as being low-carb. And many low-carbers wonder why they don't lose weight eating these pseudo low-carb foods.

In order to make low-carb and ketogenic foods taste as sweet and tempting as full-carb versions, low-calorie artificial sweeteners of all types are added, generally aspartame, Splenda, or stevia. Many people still fear fats, especially saturated fats, so they make their recipes low in fat or use margarine or vegetable oils in place of healthy saturated fats.

If you are wanting to follow a ketogenic diet to lose excess weight, manage diabetes, control epileptic seizures, stop or reverse Alzheimer's or Parkinson's, stop glaucoma, or achieve any of the documented benefits associated with the ketogenic diet, you MUST be eating meals that are actually ketogenic—not low-carb meals that are promoted as being ketogenic. If you are not comfortable with calculating the exact percentages of fat, protein, and carbohydrate in your meals, then you really don't know if the recipes are truly ketogenic or not.

I believe many people fail to lose weight like they should, or see the improvements in their health like they should, when they go on a ketogenic diet

because many of the foods they eat are not really ketogenic. They become discouraged and quit. Failure is not because the ketogenic diet didn't work, it is because they used the wrong recipes. Unfortunately, most ketogenic cookbooks contain a large portion of recipes that are not ketogenic, if they use any type of sugar substitute then the recipes become anti-ketogenic, and therefore potentially harmful as they will not provide the ketones the body needs to treat a serious health problem.

I was frustrated while searching for good ketogenic cookbooks because I couldn't find any where all the recipes were truly ketogenic. I realized that other people would have a difficult time as well. That is what led me to write *Dr. Fife's Keto Cookery*. I wanted to provide "real" ketogenic recipes using healthy ingredients. I wanted to compile a book of recipes that could be used to bring about all of the healing properties of ketosis that I discuss in my books.

Chicken Cacciatore

Shepperds Pie

Dr. Fife's Keto Cookery contains all of my favorite ketogenic recipes that I've accumulated and developed over the years, nearly 450 in all—far more than I have seen in any other keto cookbook. These recipes focus on fresh, whole, natural foods, without chemical additives, harmful fats, or synthetic sweeteners. No gluten or grains are used in any of the recipes. Simplicity was also a goal. Some keto recipes in other sources require hours to prepare. Not here. These recipes are generally quick and simple, yet extraordinarily delicious. The ingredients are all common and readily available. It can be frustrating when you see a fantastic dish and when you try to make it, find that it requires galangal, kaffir lime leaves, or prik kee noo (what's that?). These ingredients may be common in Thailand, but not other places. Many exotic herbs and spices can be ordered through the Internet, but who wants to pay $15 to ship a $5 spice? The ingredients in this book are all readily available at most grocery stores.

The recipes in my book, for the most part, use real food, not canned, bottled, frozen, or packed foods. The exceptions are generally condiments such as pickles and mustard. Each recipe is limited to no more than 15 grams of carbohydrate per serving, and generally is much less. Accompanying each recipe is a breakdown of the grams of fat, carbohydrate, and protein as well as total calories per serving, so you know exactly what you are eating. Unlike the typical ½ cup servings used in other recipe books, the serving sizes in this book are three to four times that much. One serving of a main dish would constitute an entire meal for one person. Regardless of how large a serving size in this book may be, each serving contains less than 15 grams of carbs.

Examples of some of the recipes in this book include: chicken pot pie, corned beef and cabbage, barbeque beef short ribs, sirloin tip roast with roasted vegetables, roasted rolled pork belly with mushroom stuffing, rosemary lemon pork chops, lamb patties with mushroom gravy, shepherd's pie, low-carb turkey dressing, crispy chicken wings, parmesan chicken strips, pecan-breaded fish filets, cheese puffs, breakfast pizza, coco fries, avocado bacon wraps, and beef stroganoff.

If you are thinking of going keto, I strongly recommend that you get a copy of this book! ♦

[1]Dr. Bruce Fire is Certified Nutritionist and Doctor of Naturopahic Medicine, Dirctor of Coconut Research Center, USA.

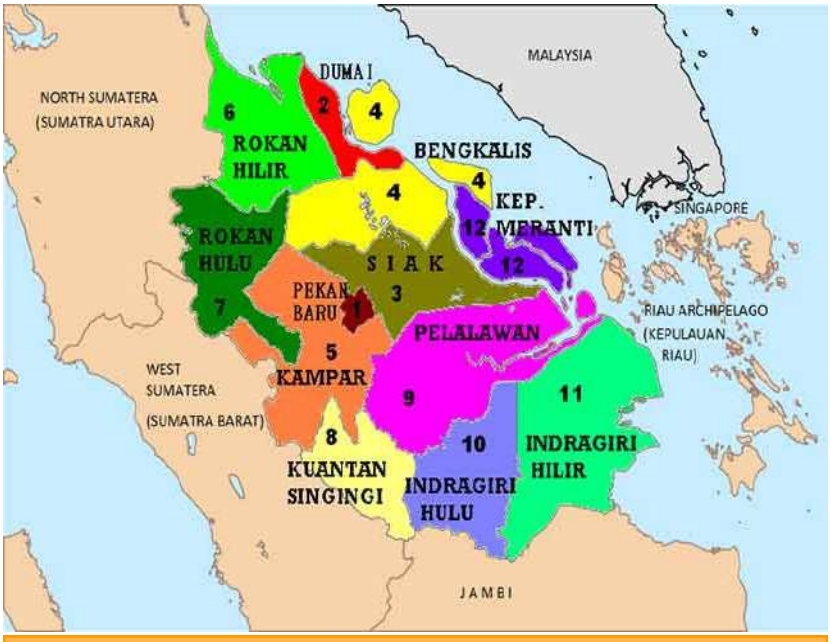
THE DILEMMA OF COCONUT SECTOR IN INDONESIA WITH SPECIAL REFERENCE TO INDRA GIRI HILIR

Mawardin Simpala[1]

Coconut is coming back…the business that used to be termed 'sunset industry' is now giving sign of its revival. Global market is now witnessing coconut craze in which demand for coconut products has increased significantly after 6 decades of sluggish market.

Coconut was a famours global commodity especially in early 20 century when coconut oil market share was approximately 20% of world vegetable oil market. During the period coconut oil which derived from copra or dried coconut meat was processed into various products such as margarine, soap, candle, and glycerin which was main inggredients for bom and ammunition used during the two world wars. No wonder copra mills were found in Europe such as in Germany, Netherlands, UK and even one in Marseille France which were far away from coconut growing areas. In this glorious past of the coconut industry, coconut producing countries that are mostly located in the tropical regions were prosperous. Two major coconut producing countries were Indonesia and the Philippines. Some coconut growing areas in Indonesia prospered during this golden coconut era.

Minahasa in North Sulawesi, for example, gained such positive impact in terms of economic development that this city was almost equal to some of big cities in Java. Cars could be easily found or spotted in the city of Minahasa. Schools were established to improve the education of the local people. No wonder many notable national scholars, politicians or high ranking military officers came from North Sulawesi. Few to mentioned was the national hero DR. Samuel Ratulangi, Kawilarang, Daan Mogot, dr. A.L. Tendean father of Pierre Tendean the famous revolutionary figure and so on. Minahasa was a major copra producer. The copra from this area was processed into coconut oil and some quantity of which was used as raw material for soap. The soap making factories were the ones that were moved from Europe which was affected by the world war I.



Indragiri Hilir Regency which is Relatively Close to Singapore and Malaysia

In the southern part of Selayar island, South Sulawesi Province, coconut farmers were wellknown for their prosperous living. During this golden time the wealth of an individual was seen or counted from the number of coconut trees owned / possesed. Farmers or peasants from Selayar could be recognized when they came to Makassar as many of whom used golden teeth as a sign or symbol of wealth. Dutch asisstant governor Van der Missen in his report during his visit to Selayar for Queens Day in 1925, wrote *"Every one attending the party wears a good cloth, with golden and diamond accessories, withouth doubt shown the prosper of Selayar. Never before I visit any place with many citizens smile with golden teeth!'*

Indragiri Hilir Regency has a different story. Tembilahan city which is the capital of Indragiri Hilir used to be a centre of copra trading in Sumatera Island. As a matter of fact, the total plantation in the Regency is 426 thousand hectares which is equal to that of the Molucca and Central Sulawes provinces combined! With the size of coconut plantation in the Regency it produces approxi-mately 9 million coconuts per day or around 3.3 3 billion nuts a year. This figure makes up about 21.2% o the national production.

During the colonial time copra from this region was directly shipped to Singapore which was

only 7 hours away by motor boat. It was also during this era the national hero Admiral John Lie transported the copra to Singapore through Dutch navy barricade to be traded for weaponry and war logistics. Mochtar Riady, one of Indonesian tycoons, traveled to Tembilahan then lived in neighboring city of Rengat, which was 1.5 hours away, for two years in 1952 until 1954. Mochtar then run his copra and rubber transportation business before moving to Jakarta. In addition, during the early days of Indonesia independence 28 kg of gold were donated by an Acehnese copra merchant, the gold was then put on the tip of the National Monument in Jakarta.

Tembilahan is known better for its coconut product brands such as Kara, Bumas or Cocomas coconut milk or Hydrococo ready to drink coconut water produced in the area. Coconut is the main income generator in this Regency which is located in the north east of the Sumatera coast. Statistical figures suggest that around 75% of the economy in the area is generated from coconut sector.

There is no official record of the establishment of coconut plantation in Indragiri Hilir. It was estimated that the coconut plantation was developed in the early 1860s and accelerated at a higher rate when Bugis and Banjar migrants came from South Sulawesi and South Kalimantan and settled in this area. The topographic condition of Indragiri Hilir is mostly below sea level in which about 93.31% of the total areas are 2 meters below sea level, and the land mostly comprises of peat soil and under tidal influence. The geographic make up of this Regency consists of land mass, rivers, canals, lakes, as well as islands. As a result the main transportation within the area is dominated by boats. No wonder Indragiri Hilir is dubbed as the

A Canal Running Through the Coconut Plantation

land of thousands of canals. When driving to Indragiri Hilir one will have to cross no less than 52 bridges which are closely located from one another before reaching the city center of Tembilahan.

Coconut plantation in Indragiri Hilir has adjusted and adapted well with the nature and geographic conditions of the area. It can be seen from the coconut plantation which is different from the ones in the rest of the country. Coconut plantations in East Java, North Sulawesi, and Molucca which are the second, third and fourth largest coconut producing provinces in Indonesia, are grown in dry and hilly land. Meanwhile coconut plantations in Indragiri Hilir are mostly grown in tidal affected wetland, crisscrossed by natural rivers or man-made canals. Harvested coconuts in Indragiri Hilir are mostly transported through these canals and rivers, within and out of the plantation areas. The coconuts are floated in the canals when the tide is up, when the tide is down the coconuts will flow from the plantation to the downstream of the canals where the wooden boats stand ready to transport the coconuts to the factories.

Besides for transportation the canal system turns out to be useful for the plantations because the high tide brings in soil nutrients or minerals badly needed by coconut trees, these soil nutrients will stay when the tide goes low. Other function of the canal is to maintain proper moisture content of the soil which is important for maximum coconut production. The canals will keep the plantation wet during dry season and dry during the rainy season. During high tide sluice-gates are open then they are closed during low tide. Embankments, canals and sluice-gates are commonly known as *Trio Tata Air* or Trio Water Management Systems of coconut plantation in Indragiri Hilir.

The sluggish period

Unfortunately the coconut golden era of coconuts during the colonial time and early days of independence was gone because of negative campaigns against coconut oil in the developed countries especially in USA during 50s to 80s. These campaigns have tarnished the reputation of coconut oil significantly hence decreased its global demand. The campaign was sponsored by American Soybean Association and Phil Sokolof through his foundation National Heart Saver Association.

Driven by the economic motive to protect domestic soybean

industry coupled with their awareness on the importance of self-sufficiency in cooking oil, ASA embarked on massive development of soybean cultivation. Cooking oil in USA used to be supplied by tropical oils, but the supply was cut off by the world wars. After the wars ASA tried to prevent the comeback of tropical oils into the USA to protect soybean oil industry by launching the negative campaigns against tropical oils. The campaign was far-reaching when Phil Sololof, a millionaire who had suffered from heart disease, jumped into the band wagon.

This campaign was successfully echoed in USA and other developed countries which resulted in the devastation of coconut sector in both upstream and down stream. Many big coconut oil factories went bankrupt and closed down including those established and operated during colonial time such as the one in Kebumen Central Java. The remaining have to struggle and manage their operational cost, diversify their products and marketing approach in order to be able to survive. Even the last few remaining companies decided to stop their operation four years ago including Arrow in Padang, West Sumatera and AEC Brothers in Indragiri Hillier. Both of these companies were established in 50s. At the farmer level many plantations were neglected and abandoned, production is only enough to sustain farmers basic need. The smallholders are no longer able to support the education of their children. Many farmers have to shift their livelihood or move to other towns. If they still live in coastal area then most of them likely become fishermen. Nevertheless, not all coconut farmers managed to shift their livelihood successfully. Farmers who are not used to be keen on the sea will be content with working or fishing in the small river

A Sluice Gate to Control the Flow Canal Water

or looking for shell locally known as *lokan*.

The migration of the coconut farmers will not surprise those who understand the history of the coconut farmers in Indragiri Hilir. Actually majority of coconut farmers in Indragiri Hilir are migrant farmers from Bugis in South Sulawesi and Banjar in South Kalimantan. Their first arrival was dated back during colonial time. The Banjar, for example, initially arrived after the surrender of Banjar Sultanate to the Dutch on 1860. As with Bugis community, they migrated to Johor and Riau after Bungaya Treaty stating the succumbing of Gowa Kingdom to Dutch at the end of 1667. The migration of the Bugis then followed during the dispute of some small kingdoms in the region and even during the chaotic era of DI/TII movement protesting central government lasted in Februari 1965. These two communities migrated and moved to Malay area of Singapore, Johor and Riau and the pioneer of coconut farming in Indragiri Hilir.

If they already migrated during the chaotic war time then it will not be new for them to move during the prolonged difficult coconut economy lasting for several decades. The migration was not favorable to coconut plantation in Indragiri Hilir. No wonder since being abandoned, the embankment system which is the most important component of coconut plantation in the area was damaged and no longer able to hold tidal water then inundated many plantations. It is estimated that 98 thousand hectarers or around 24% of the total coconut plantation in Indragiri Hilir have been damaged. Coconut trees are dying due to the immersion of salt water. The rehabilitation of this damaged plantation will need large amount of fund. According to HM. Wardan, Regent of Indragiri Hilir Regency during the two day-campaign of 'Save the Tree of Life' held in House of Representatives in Jakarta it will require at least IDR 900 billion (USD 69,230,769) to rehabilitate the damaged coconut plantation in his district. He said that there are few factors causing the damage but the main one is prolonged low price of coconut which happened for few decades.

The price of coconut which was remunerative during its golden era had drastically decreased for few decades until the last three years. According to a senior citizen in Tembilahan and confirmed by Rudiansyah, Regent Assistant, one kilogram of copra was equal to 4 kilograms of rice during that golden era. Now on the contrary or at least three years ago, one kilogram of rice was equal to 2.5 kilograms or even 4 kilograms of copra. He said that ideally coconut price is at least IDR 2,500 (19 cents

The Writer (most left) Visited an Abandoned Coconut Island due to the Damaged Embankment which makes the whole Island Submerged and the Coconut Plantation Completely Destroyed.

of USD) but was down to IDR 800 (USD 6.2 cents) or even IDR 500 (USD 4 cents) per kg. With such low price farmers even neglected their farms and letf coconuts lying on the ground. This was due to cost of harvesting and dehusking the coconut could reach IDR 600 (USD 5 cents) per nut. In fact, coconut work is not an easy work as it has to be harvested from high trees by climbing or using a hook. After that the harvested nuts are collected in the canals then floated downstream during low tide. In the sluice gate or downstream the coconuts are then brought to the collecting point for dehusking which is locally called *kopek* which is mostly done by men. Dehusked coconuts are then sorted out, the nuts with cracks or shoots are set aside for copra making while the good quality ones will be transferred to factories for industrial processing.

Indragiri Hilir has at least three coconut processing companies with total five factories in operation. One of the companies is PT. Pulau Sambu, usually called PT. Sambu, which is the largest integrated coconut factory in the country, even in the world. PT. Sambu has three factories in three different locations. Three of these factories are located in the coastal areas and can only be accessed by boats. It is estimated that the total capacity of the these factories is approximately 2,5 million coconuts per day. This is a huge capacity compared to the capacity of a big desiccated coconut factory in Manado, North Sulawesi which has the capacity of 500 thousand coconuts per day.

The Growing Demand for Coconuts and Its Dilemma

The increasing demand for coconut products around the globe brings new hope for coconut sector. However this situation also produces a dilemma whether or not whole coconut exports should be regulated. This dilemma needs immediate solution and attention from coconut stakeholders including the Government. In one side, Indonesian Coconut Processing Industry (HIPKI) claimed that the export of whole coconuts result in the scarcity of raw materials for the processing industries. On the other hand, coconut farmers said that coconut exports have increased the famer gate price.

One of coconut farmers from *Pulau Burung* named Kahar said that coconut farmers used to getting the price which was not remunerative for their livelihood. This statement was supported by Muslim, a former Commissioner of Local Election Committee who owns a coconut plantation. According to Muslim coconut farmers have suffered from low coconut price for a long time. Another local figure, Ferry Pesondra, a youth prominent figure who is a member of *Pemuda Panca Marga (PPM)*, said that low

Whole Coconuts are Loaded to a Wooden Boat for Export to Neighboring Countries from Indragiri Hilir

price rezim of coconuts was taking place for a long time in Indragiri Hilir. When coconut exporters come from neighboring countries and buy coconuts directly to famers with better prices and payment systems, the farmer gate price is now improving. If local industries buy at IDR 2,000 to 2,100 (USD 15 cents to 16 cents), the exporters will buy at IDR 2,800 to 3,500 (USD 22 cents to 27 cents) per nut. The payment by local industries may take one month after delivery to the factories, while exporters will pay immediately after the coconuts are loaded to the ships.

The phenomena of whole nut exports from Sumatra Island have drawn wider attention since the last 8 months or so. The exports take place in Lampung, Palembang, Jambi, and Indragiri Hilir where everyday tens of wooden ships carrying 200,000 to 300,000 tons of whole nuts are mostly heading for Batu Pahat, Malaysia and some others go to small ports in Thailand. This practice has been rife since the last three years.

As previously mentioned, while the whole nuts export results in the scarcity of raw materials for local processing industries, it makes the local economy in Indragiri Hilir more vibrant. Tembilahan city looks gloomy before whole coconut exports take place. According to Halim, a local contractor, when the coconut price is good like what is prevailing at the moment, the market situation in the city center is full of life, so is the night market in the city. Remunerative price has stimulated coconut farmers to maintain and rejuvenate their coconut plantations. For example, coconut farmers in Keritang, Reteh District have started to replant their unproductive coconut palms. Even those who converted their coconut palms with oil palms six or seven years ago, now they turn to coconut palms again. Therefore, it is currently common to see coconut seedlings in farmer gardens.

Considering the complexity of the problems, the dilemma of whole coconut export needs to be carefully addressed. It becomes a national problem as currently there are 5 million coconut farmers in Indonesia or over 20 million people are dependent on coconut sector. All coconut stakeholders should deliberate to seek a win-win solution for the debilitating problems faced by the coconut sector in Indonesia.

[1]Mawardin Simpala is the Chairman of Indonesian Friends of Coconut and Former APCC Market and Development Officer

SCIENTIFIC COMMUNITY WORKING TOWARDS COLLABORATION IN COCONUT TISSUE CULTURE

Deepthi Nair[1]

The Coconut sector is now described as a Sunrise Industry, the market demand for coconut and its high value products is increasing manifold every day. But in direct contrast to this, a stagnant and at times declining coconut production is also of due concern. A critical scenario of serious raw material deficit is imminent in the near future if urgent initiatives for coconut replanting is not undertaken in the major coconut growing countries across the globe.

Statistics of coconut cultivation around the world reveal that an estimated 50% of the coconut palm population could be categorised as senile, mostly beyond 60 years of age and showing trends of declining production. This implies that out of the total area of 12 million hectares under coconut cultivation in the world, an estimated 6 million hectares need to be replanted immediately. The urgent demand for quality coconut planting material is so huge that countries are desperate to find a better solution for mass production of planting material through tissue culture.

The FAO High Level Expert Consultation on Coconut Sector Development in 2013 in Bangkok, Thailand recommended to : *"Use molecular techniques to expand the genetic base for coconut breeding of hybrids with superior traits and develop a viable protocol for somatic embryo-genesis to mass produce elite planting materials for the replanting program."* A focused session on the progress in tissue culture was also highly recommended by the 47th APCC COCOTECH Conference held in 2016 in Bali, Indonesia. It was also recommended to facilitate and coordinate the formation of an International Forum on Coconut Tissue Culture to enable collaboration among scientists, research and development institutions, coconut growing countries and private sector research and development, recognizing the fact that while some countries have progressed in tissue culture, others would be in need of assistance. These recommendations paved the way to the convening of the Symposium exclusively dealing with coconut tissue culture.

From Left to Right Mr. Uron N. Salum , APCC Executive Director, Dr. Surmsuk Salakpetch, Deputy DG-Thailand Ministry of Agriculture, Dr. Ponciano A. Batugal, Chairman of APCC Technical Working Group , Dr. Chamrong Daoruang, Director of Thailand Horticultural Research Institute

The 1st International Symposium on Coconut Tissue Culture was organised by the Asian and Pacific Coconut Community in association with the Government of Thailand on 13-14 March 2017 in Bangkok, Thailand. The host facilities were extended through the Horticultural Research Institute, Department of Agriculture, Ministry of Agriculture and Cooperatives, Thailand. The objective of the Symposium was to establish record of the stage of coconut tissue culture research in various

Resource Speakers of the 1st International Symposium on Coconut Tissue Culture

coconut growing countries and explore the opportunities for collaboration between countries, institutions and individual scientific experts. This would help in expediting new technologies for micro-propagation needed to mass produce coconut seedlings in order to meet the overwhelming demand for coconut planting material globally.

Scientists and researchers working on coconut tissue culture across the globe, policy makers in Government and industry stakeholders attended the Symposium and shared ideas and discussed and deliberated on possible collaborations for developing rapid multiplication techniques in coconut. Around 75 participants from 15 countries participated apart from representatives from international organisations like CIRAD and COGENT.

Dr. Surmsuk Salakpetch, Deputy Director General, Department of Agriculture, Ministry of Agriculture and Cooperatives, Government of Thailand and the National Liaison Officer of APCC graced the inaugural session of the Symposium. She welcomed the participants to the Symposium and appreciated the efforts of APCC for addressing the issue of large scale production of planting material. She committed the active involvement and support of the Department of Agriculture of Thailand to the APCC Secretariat in organising the event. She mentioned that the organisation of the Symposium is concurrent with the policy of the Thailand Government on replanting of coconut. She expressed hope that the Symposium would pave the way for productive discussions and networking. She felt that the way forward for coconut tissue culture was indeed through multistakeholder networking.

A Full View of the 1st International Symposium on Coconut Tissue Culture 13-14 March 2017, Bangkok, Thailand

Mr. Uron N. Salum, Executive Director, APCC, in his opening statement expressed his sincere appreciation to the Government of Thailand in supporting APCC to co-host and co-organise the event. He explained the background of the Symposium and stressed on the need for the stakeholders to collaborate to address the need for good quality planting material. He urged the government sector and the private stakeholders to come together to address this most important constraint in the coconut sector world wide. He hoped that the Symposium would come up with very good recommendations for collaborative research in coconut tissue culture.

Dr. Ponciano Batugal, Chairman of the APCC Technical Working Group and former COGENT Coordinator presented the need for collaboration in coconut tissue culture. He briefed on the rationale of the Symposium and explained the objectives and format of the Symposium and the need for the formation of an APCC International Advisory Committee for Coconut Tissue Culture. He further elaborated on the work group discussions and the urgent need to address the challenges of genetic fidelity and genetic diversity in coconut.

The Symposium started with the First Session on keynote presentations on the topic "Importance of Tissue Culture for the Coconut Sector". The Session was chaired by Dr. Ponciano Batugal, Chairman of APCC Technical Working Group. The first keynote address was delivered by Dr. Alain Rival, CIRAD Resident Regional Director for South East Asian Island Countries on the topic "Coconut Biotechnologies need International Cooperation". Dr. Rival briefed on the various factors hampering fluent networking in coconut tissue culture and explained the need for collaboration. He gave a brief profile of CIRAD and its mandate on agricultural research including collaborative research in association with national and regional partners.

He further explained the initiatives of CIRAD in developing partnership platforms for research and training. CIRAD has 14 partnership platforms worldwide. He further briefed on the program Sustainable Agricultural Systems in South East Asia (SALSA). He explained the process of innovation and the micropropagation work in oilpalm was presented as a case study, the transfer of which took more than 40 years.

Keynote Speakers from left to right: Prof. Dr. Steve W. Adkins, School of Agriculture and Food Sciences, Univ. of Queensland, Australia, Dr. Ponciano A. Batugal, Session Chair, Dr. Alain Rival, CIRAD Resident Regional Director for South East Asian Islands Countries, Jakarta, Indonesia, Dr. Carlos Salin Oropeza, Researcher, CICY, Yucatan, Mexico.

He further reiterated the fact that any biotechnology - based approach, be it tissue culture, marker assisted breeding or high-throughput genomics requires huge investments and their availability on a very long term.

The keynote address on "The Potential of Tissue Culture Techniques for the Improvement of Coconut" was presented by Dr. Steve Adkins, Professor in Plant Physiology at the University of Queensland, Australia. He gave a brief description of the advances in embryo culture, cryopreservation and somatic embryogenesis. He explained the steps in coconut improvement which included collection, conservation, exchange and propagation of germplasm. He also briefed about the new embryo culture system which gave better quality seedlings with higher rates of survival, reduced the time for field planting and gave high improvement on the number of plants in the field. In cryopreservation, Dr. Adkins elaborated on the system of physical dehydration of embryoes which showed considerable efficiency. He explained the somatic embryogenesis pathway and the pitfalls identified. He stressed on the need for utilising the above techniques to solve the issues with coconut germplasm conservation and multiplication.

The keynote paper on the "Progress of Coconut Tissue Culture in Mexico" was presented by Dr. Carlos Salin Oropeza, Researcher from Centre de Investigac'ion Cienti'fica de Yucat'an(CICY), Mexico. He gave a brief introduction on the flourishing coconut industry in the world and the need to enhance production to cater to the growing market demand for coconut through replanting in large scale with disease resistant and highly productive selected palms. He further elaborated on the coconut in vitro studies undertaken in Mexico which included development of micropropagation protocols using plumule and inflorescence as explants, embryo rescue protocols and in vitro protocols for research on lethal yellowing. He explained the work on scaling up of coconut micropropagation for massive propagation through the Biofactory. He briefed on the work on maintenance of embryogenic lines and germplasm conservation embryogenic lines and germplasm conservation undertaken in CICY, Mexico including cryopreservation. He also explained the process of germplasm exchange through vitro plants exported mainly to the Caribbean countries. He reiterated the need for collaborative efforts in research and explained the system developed by CICY for massive micropropagation of coconut based on plumule or rachilla explants.

The country representatives presented the updates on tissue culture work in the respective countries during the Second Session on " Country papers on the Progress with Coconut Tissue Culture". The session was divided into two parts and the first part was chaired by Dr. Steve Adkins.

Dr. Edna A. Anit, Supervising Science Research Specialist/ Assistant Director, Department of Science and Technology – Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) started her presentation with a brief update on the activities and work undertaken by DOST-PCAARRD and explained the Coconut Road Map for Philippines. She gave an update on the Coconut Somatic Embryogenesis techno -logy (CSet) undertaken by the Philippine Coconut Authority (PCA) in association with University of the Philippines, Visayas State University and Bicol University through which they could develop 100 plantlets per plumule through primary somatic embryogenesis and further 235 plantlets per somatic embryo through secondary somatic embryogenesis. It is targeted to produce 1000 plantlets per plumule from high yielding tall, dwarf and hybrid coconut varieties in a span of three years. She

concluded her presentation stressing on the need for improvements in the technology and development of a working protocol.

Dr. Vijitha Vidhanaarachchi, Head, Tissue Culture Division, Coconut Research Institute, Sri Lanka presented the progress in coconut tissue culture in Sri Lanka. She briefed on the research on clonal propagation, embryo culture and anther culture undertaken by the Institute. She discussed in detail the explants used for clonal propagation and the factors limiting the success of the clonal propagation protocol. She also elaborated on the culture protocol for somatic embryogenesis and trials using crushed ovary and sliced ovary. She briefed on the exchange of coconut germplasm undertaken with India, Papua New Guinea and Ivory Coast using embryoculture technology. She also explained the cryopreservation work done in the institute and elaborated on the anther culture research undertaken.

The country paper from India was presented by Dr. Anitha Karun, Principal Scientist and Head, Division of Crop Improvement, Indian Council of Agricultural Research – Central Plantation Crops Research Institute (ICAR-CPCRI), Kerala, India. She explained the various types of explants tried which included zygotic embryo, embryonic meristem, plumular portion, inflorescence, ovary and anther. Studies were also undertaken on use of different callogenic chemicals, sugars, salts, culture vessels and light conditions. She briefed on the genotypic variation in tissue culture and the molecular aspects of somatic embryogenesis. The growth characteristics and reproductive behaviour of the field planted plumule cultured plantlets and the normal

Panelists of Session 1 from left to right: Ms. Meity A. Tulalo, Scientist at Palm Crops Research Institute, Indonesia, Dr. Anitha Karun, Principal Scientist and Head, Central Plantation Crop Research Institute, India, Prof. Dr. Steve W. Adkins, Session Chair, Dr. Vijitha Vidhanaarchchi, Head, Tissue Culture Division, Coconut Research Institute, Sri Lanka , Dr. Edna A. Anit, DOST-PCAARD, Philippines

seedlings were found to be comparable. She elaborated on the CPCRI protocol for regeneration of coconut plantlets from plumule explants through somatic embryogenesis. Embryonic shoot meristem was found to be better than plumule. The response of tissue cultured palms for callus and somatic embryo formation over the different months was also studied. She also presented the work on use of new chemicals like gluathione and electric current. The study on molecular and bioinformatics initiatives and transcriptome studies were discussed in detail. Dr. Karun concluded her presentation with an overview of the proposed future thrust areas.

Dr. Meity A. Tulalo, Scientist at the Indonesian Palm Crops Research Institute, Manado presented the progress on coconut tissue culture in Indonesia. She explained the scenario of coconut cultivation in Indonesia. The embyro culture techniques were predominantly used in multiplication of Kopyor coconut in Indonesia which has an abnormal endosperm like Maka -puno coconut of Philippines and hence cannot germinate normally. Embryo culture derived Kopyor plants were found to produce 80-90% kopyor fruits/palm. She also explained the technique of embryo incision done to

boration in research.

Dr. Alain Rival, CIRAD Resident Regional Director for South East Asian Island Countries chaired the second part of Session Two. Ms. Parinda Hrunheem, Agricultural Research Officer from the Chumphon Horticultural Research Centre presented the country paper on the progress of coconut tissue culture in Thailand. She explained in brief about the coconut sector in Thailand and the policy initiatives of the Government of Thailand to promote the sector. Coconut Embryo culture is predominantly undertaken in Thailand for the propagation of Makapuno. She explained the protocol used in embryo culture and the results achieved so far with different varieties using embryo culture. National Centre for Genetic Engineering and Biotechnology(BIOTEC) is one centre of the National Science and Technology Development Agency (NSTDA) who have successfully developed oil palm tissue culture via somatic embryogenesis and it is proposed to use the same model for coconut with explants from embryo, plumule and immature leaves, especially aromatic coconut in Thailand. The thrust will be to develop efficient protocols for micropropagation of coconut.

Mrs. Ngo Thi Kieu Duong, Leader Technical Advisor, Anh

Dao Science Technology Agriculture Joint Stock Company, Ho Chi Minh City presented the progress on coconut tissue culture in Vietnam. She presented a brief profile of the coconut sector in Vietnam. Work on coconut embryo culture is undertaken at Anh Dao Science Technology Agriculture Joint Stock Company, Research Institute for Oil and Oil Plants and the Tra Vinh University. Embryo culture in "dua sap" is being undertaken for mass production of plantlets. Coconut tissue culture is yet to be successfully studied in Vietnam.

Panelists of Session 2 from left to right: Dr. Sisunandar, Senior Lecturer, Coconut Research Center, The Muhammadiyah University, Purwokerto, Indonesia, Dr. Najya Muhammed, Senior Lecturer, Pwani University, Kilifi, Kenya, Dr. Alain Rival, Session Chair, Mrs. Ngo Thi Kieu Duong, Anh Dao Science Technology Agriculture Joint Stock Company, Cho Chi Minh City, Vietnam, Ms. Parinda Hrunheem, HRI, Chumpon, Thailand.

Dr. Najya Muhammed, Senior Lecturer in Pwani University, Kenya presented the country paper on the progress of coconut tissue culture in Kenya. She presented a brief profile of the coconut sector in Kenya and stressed on the urgent need for quality planting material. She explained in detail the research on invitro embryo culture protocol and the exvitro establishment of coconut plantlets in different media. Coconut embryo culture has been attempted to produce quality planting material. Challenges in acclimatisation of seedlings is to be addressed.

Dr. Sisunandar presented his paper on the research progress on Kopyor Tissue culture by the University of Purwakerto in Indonesia. He explained embryo culture, embryo incision protocol and somatic embryogenesis in Kopyor coconut. Kopyor coconut was distributed in the areas of Lampung, Banyumas, Pati and Madura and showed much genetic diversity. He proceeded to explain the constraints faced in embryo culture and discussed the new embryo culture protocol developed. He further explained the embryo incision protocol that led to development of twin Kopyor coconut. Genetic diversity testing was undertaken in Kopyor based on morphological characters and using molecular markers. The establishment of seed garden collection of Kopyor is also undertaken.

Mr. Keith Chapman, International Consultant and Industrial Crops Advisor, Inter Ag Consultant, Australia led the Third Session of the Symposium on Group Discussions on the way forward for coconut tissue culture. The participants were divided into four groups based on their interest areas. Mr. Chapman briefed the participants on the four topics on which the groups had to deliberate and discuss: Embryo Culture, Cryopreservation, Somatic Embryogenesis and Genome Analysis.

A template for the development of an International Strategic Action Plan on the four topics was provided which included development of a well defined Vision, Goals, Outcomes, Actions and Responsible Agencies for each of the topics. The groups were asked to define issues, problems and opportunities and from these define the desired Goals, Outcomes and Actions and Responsible Agencies /Groups for carrying out the Activities to complete the Actions and realize the desired Outcomes. In addition each group was asked to provide their Vision for the overall First International Strategic Action Plan for Coconut Tissue Culture, and consider a proposed recommendation from APCC.

The draft strategic action plan was presented by the group leaders and the findings were discussed and agreed in a follow-up Plenary session. Mr. Chapman finally summarised the outcomes of the Work group session. The Symposium went on to propose an International Advisory Committee for Coconut Tissue Culture Forum which will be central to coordination and implementation of the First International Strategic Action Plan for Coconut Tissue Culture.

The recommendation of the Symposium was that "APCC promotes increased scientific and technological cooperation and information sharing through networking among researchers and institutions on all aspects of coconut tissue culture for the rapid mass production of quality planting materials."

[1]Deepthi Nair is Assistant Director of Asian and Pacific Coconut Community, Jakarta, Indonesia

COCONUT BASED FARMING SYSTEM FOR LIVELIHOOD AND NUTRITIONAL SECURITY

H.P. Maheswarappa, P. Subramanian, V. Krishnakumar and Ravi Bhat
ICAR- Central Plantation Crops Research Institute

1. Introduction

Coconut is a traditional plantation crop of India and assumes the status of a high value commercial crop and Kerala ranks first in area (53.76%) followed by Tamil Nadu, Karnataka and Andhra Pradesh. In our country, 98% of the coconut holdings are less than 2.0 ha in size out of which more than 90% are less than 1.0 ha. these small holdings are mainly committed to a mono crop of coconut, which normally occupies the land for about a century. Most of these holdings neither provide gainful employment opportunities for the family labour throughout the year nor generate sufficient income to meet the family requirement. In the present condition where coconut growers are more exposed to economic risks and uncertainties owing to the high degree of price fluctuations, need of the hour is to emphasize the importance of crop diversification in coconut gardens.

Coconut gardens offer excellent opportunities to exploit the interspace potential for maximizing returns per unit area. In humid tropics, cropping/farming system aims at crop diversification and intensive cropping in the inter space available in coconut to increase the per palm productivity as well as productivity of unit holding in a system approach wherein the available farm resources like soil and water/ rainfall resource, farm labour, agricultural inputs (seeds, fertilizers, agro-chemicals) etc. are utilized to produce both nuts, food and non-food agricultural products from the farm, in a business or profitable way. Under such a cropping/farming system, all the management practices and component production

Intercropping to maximize Profitability of Coconut Farms

systems should be able to maintain high productivity, profitability and sustainability of the existing coconut palms to maximize economic yield of the farm. Sustainability is the main objective of farming system, where production process is optimized through efficient utilization of the inputs in safeguarding the environment.

2. Scope of coconut based cropping/farming system

Studies have revealed that planting method and growth habit of sole coconut palms at the recommended spacing of 7.5 m x 7.5 m make use of only 22.3% of land area effectively while the average air space utilization by the canopy is about 30% and solar radiation interception is 4550%. However, the effective root zone of the adult palm is confined laterally within a radius of 2 m around the base of the palm and over 95% of roots are found in the top 0-120 cm of which 18.9 % and, 63 % of roots are confined to top 0-30 cm and 31-90 cm depth, respectively. Making use of the underutilized soil space and solar radiation in pure stands, a variety of crops having different stature, canopy shape and size and rooting habit can be inter planted to form compatible combinations.

3. Relevance of Coconut Based Cropping/Farming Systems (CBFCS)

The practice of CBCFS can provide:

- Food security through food sufficiency
- Nutritional foods rich in vitamins and minerals (nutrients) through inclusion of vegetables, fruit crops, tuber crops, spice crops etc.
- Employment generation from farm diversification
- Ecological stability (environmental protection) by way of crop diversity and effective recycling of farm wastes).

3.1. Social benefits: Social benefits are the food and

nutritional functions of fresh nuts of coconut and coconut products, and crops produced under Coconut Based Cropping/Farming System (CBCS) which include; cereals (as source of carbohydrates, protein, fats and oils); root crops (as source of carbohydrates and minerals); legumes (as source of protein and vegetable fats and oils); fruit crops (as rich source of vitamins and minerals, and carbohydrates); leafy and fruit vegetables (as rich source of vitamins, minerals and dietary fibres); spice crops (food flavouring, and vitamins and minerals); coffee and cocoa (beverage and stimulants) and natural fibre crops (clothing materials and paper and packaging); wood and timber (housing materials, pulp and paper).

3.2. Ecological benefits

Ecological conditions of the long-term mono cropping land compared to the CBCS lands indicated the favourable and stable intensive and sustainable agricultural production under latter. Ground covering through cover cropping minimizes the direct impact of rainfall and the separation of soil aggregates under a coconut environment, which can control soil erosion by 70-90%, compared to bare soil or uncropped condition. The micro climate in coconut garden allows other crops or plants to grow favourably between spaces of palms. The presence of undergrowth vegetation in coconut plantations minimizes soil and water loss through surface runoff. An adequate ground cover can also increase rainwater infiltration and storage, eventually increasing water supply of the entire area, and reducing the runoff and soil loss.

Thus, totals of CBCS environmental value will be (Soil conservation+ Farm diversification +Nutrient recycling+ Fuel energy). Generally, the value of the coconut based agro-ecosystem is based on the direct use as food, raw materials and fuel, but the services rendered by the ecosystem should also be covered.

4. Coconut based cropping/ farming systems

In order to enhance productivity per unit land area, we have to make maximum use of limited resources without affecting the ecological balance in any manner. The ideal approach for small farmers towards this would be to increase the cropping intensity, which can be achieved through two ways, the first being the time concept where instead of taking only one crop, more crops per year are cultivated and harvested and the second being space concept, where all the available space in between the main crop is used for cultivation of various crops.

Coconut based cropping/farming systems have received priority in India in recent years and accordingly, research programmes on coconut based cropping systems were initiated during the thirties at the Coconut Research Stations at Kasaragod, Pilicode and Nileshwar and were intensified in the seventies with the establishment of Central Plantation Crops Research Institute at Kasaragod and All India Coordinated Research Project (AICRP) on Palms with centers in different coconut growing states. A number of coconut based cropping systems involving annuals, biennials, perennials and combinations of both annuals and perennials have been developed to suit the farmers' needs, availability of resources like labour, rainfall, irrigation facilities, finance etc., soil characteristics and market demand. The crops found suitable for cultivation as subsidiary crops in coconut gardens include tuber crops, rhizome spices, cereals, pulses, oilseeds, fruit crops, vegetables, and medicinal and aromatic plants among the annuals and beverage crops and spices among the perennials. The research effort of ICAR-CPCRI has resulted in the development of technologies for coconut based intercropping, multi-storied, high density multi-species cropping systems and these are being widely adopted by the farmers. The high density multi-species cropping system and coconut-based mixed farming system, involving annuals/ biennials/perennials grown in different tiers by exploiting soil and air space more efficiently and integrating with poultry and animal-husbandry, help to maximize profits and can even buffer the price crash of the main crop. The crops selected for a cropping system should be compatible with the main crop and it should have local demand.

4.1. Coconut based High Density Multispecies Cropping Systems (HDMSCS)

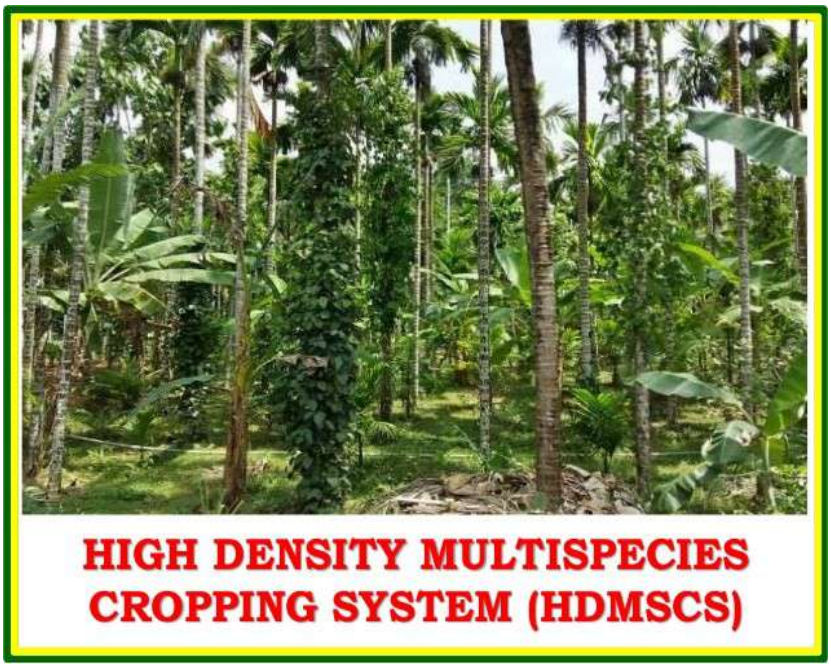
The HDMSCS is the growing of number of compatible crops in a unit area to meet the diverse needs of a farmer and this system aims at maximizing production per unit of land area and is ideally suited for smaller holdings. The sustainability of production is well addressed in this system through efficient utilization of natural resources and biomass recycling. HDMSCS models consist of a large number of crop species that include annuals, biennials and perennials with very high plant density. The crops selected will havelarge, medium and small canopy architecture and are planted in a systematic manner to exploit space both in the vertical and horizontal dimensions. The disturbance to soil is to be kept to the minimum (only slash weeding is done) and all the biomass (other than the

economic part) produced is also to be recycled within the system. Cash, food and fodder crops are generally included in the cropping system. The annual crops are removed as the canopy size of perennial crops increases.

4.2. Productivity and Economics of HDMSCS

The productivity of land increases in the high density multispecies cropping system due to crop diversification and intensification. HDMSCS at ICAR CPCRI, Kasaragod with coconut + black pepper+ nutmeg + banana+ pineapple+ annual crops like ginger, turmeric has resulted in higher system productivity and income. The coconut yield realized during 2014-15 under different nutrient management system was 177 to 188 nuts/palm/year compared to the pre-experimental yield (2005-07) of 142 to 152 nuts/palm/year. The economics of the system for the year 2014-15 indicated higher net return in applying fully organic with recycling biomass (vermincompost) + biofertiliser + greenmanuring + vermiwash + huskburial + mulching) (Rs. 3.55 lakhs/ha/year) followed by other nutrient management treatments (Rs. 3.30 lakhs/ha/year).

The results of the studies on HDMSCS conducted during 2008 to 2015 at different Centres of AICRP on Palms located in different parts of the country have indicated improvement in coconut yield and productivity of the land. The coconut based cropping systems under integrated nutrient management evaluated at different AICRP Centres also showed higher productivity and income than mono crop of coconut. At Aliyamagar (Tamil Nadu) Centre, the cropping system of coconut + cocoa + banana + pineapple with integrated nutrient management of 75% of recommended NPK coupled with



organic recycling with vermicompost recorded higher net income of Rs. 3.77 lakhs/ ha followed by fully organic treatment (Rs. 3.46 lakhs/ha), whereas, mono crop of coconut recorded the lowest net income (Rs. 1.24 lakhs/ha). At Arsikere (Karnataka) Centre, the cropping system of coconut + cocoa + lime + drumstick recorded higher net returns under fully organic nutrient management (Rs.2.95 lakhs/ha) followed by 50% of recommended NPK + organic recycling with vermicompost + vermiwash application + biofertilizer application and in situ green manuring (Rs. 2.84 lakhs/ha), whereas, mono crop recorded the lowest net income (Rs. 1.10 lakhs/ha). At Ambajipeta (Andhra Pradesh) also, the HDMSCS with cocoa+ banana+vegetables+ pineapple resulted in realizing higher income (Rs. 2.75 lakhs/ha),whereas, mono crop recorded only Rs.1.25 lakhs/ha indicating the financial advantage of HDMSCS over mono cropping coconut.

4.3. Coconut based Integrated Farming System (CBIFS)

The sustainability and profitability of coconut based integrated farming system comprising coconut, black pepper trailed on the coconut trunk, banana in the border of the plots, fodder grass(Hybrid Bajra Napier Co 3) in the interspaces of coconut, dairy unit (seven cows of Holstein Friesian and one Jersey cross breed), poultry (100 broiler birds/batch), Japanese quails (100 layers) and aquaculture (1000 finger lings) are assessed in a coconut stand of 40 years old maintained in the soil type of sandy loam of ICAR-CPCRI, Kasaragod.

The coconut palms maintained under CBIFS receiving integrated nutrient management practices i.e., organic recycling and 50% of the recommended chemical fertilizer recorded higher coconut yield (140 nuts/palm) which was comparable with other nutrient management practices and also higher than coconut mono cropping (114 nuts/palm). The integrated farming system improved the soil fertility, physical properties of soil viz., bulk density, water holding capacity and hydraulic conductivity which are required for sustainability of the system. Hybrid Bajra Napier CO 3 and Co 4 as intercrop in coconut resulted in average yield of 117 t and 114 t green fodder/

Flower Necrosis

Rotting of roots

Damaged Coconut Caused by Coconut Root Wilt Desease

ha / year, respectively. Such a coconut based farming system resulted in the net returns of Rs 5.18 lakhs /ha during the year 2014 -15, which indicates the profitability of the system.

4.4. Role of Coconut Based Cropping/Farming System in Root (wilt) affected garden

Root (wilt) of coconut is a debilitating disease and there is no effective prophylactic or curative measure for this disease as it is caused by phytoplasma. Those palms, affected by the disease, often, are seen superimposed with leaf rot disease also, and if left unattended, the disease will advance and cause drastic reduction in nut yield.

The net return from the disease affected area is comparatively low due to the poor yield of coconut and also due to the additional expenditure to be incurred on plant protection operations to combat the leaf rot disease. In such a situation, where the income from the main crop is declining, the agronomic strategy has to be oriented to evolve a suitable inter/mixed/multi-storied cropping programme, which will ensure a reasonable income to the farmer from the land. Various studies conducted on CBCS or CBFS through HDMSCS in root (wilt) disease affected areas have clearly indicated the beneficial role in improving total productivity of the land (by way of enhancing coconut yield, additional yield from inter/mixed crops, thereby ensuring nutritional security), as well as providing additional employment opportunities to the farm family. The crops included, besides coconut were banana, pineapple, black pepper, elephant foot yam and vegetables.

The contribution from various inter/mixed crops varied from 30 % to 50% in different years indicating that fall in price of main crop(coconut) could be compensated to a great extent by other crops in the system. The biomass available in the field could be effectively recycled to meet the nutritional requirement of the system, though partially, which will also improve physico-chemical and biological properties of soil paving way for improving the production efficiency of the system. Recent studies in the root(wilt)disease affected coconut gardens have proved the potential of intercropping flower crops such as Heliconiastricta Iris and sequential cropping of Tagetus (seven months) followed by Gomphrena (five months) (both being short duration crops) in improving the yield of coconut palms as well as increasing the economic returns.

4.5. Productivity and Economics of the System in Littoral Sandy Soil

The littoral sandy soil constitute a major portion in the coconut growing regions. Fodder grass (Hybrid Bajra Napier ,Co3- 92 t/ha/year), vegetable crops (cowpea-6 t/ha, ridge gourd-9 t/ha, snake gourd- 8t/ha), pumpkin-10.12 t/ha and ash gourd-(9.2 t/ha), tuber crops (elephant foot yam- 20t/ha)) and fruit crops (banana and pineapple-15t/ha)) could be successfully grown as intercrops in coconut gardens under coastal sandy soil by adopting appropriate soil moisture conservation measures viz., opening

Coconut Intercropping with Banana

of trenches/ pit depending upon the crops chosen and incorporation of one layer of coconut husk in the bottom of this trench/pit with its concave surface facing planting zone and this husk layer is covered with organic manure which is covered by soil. The yield of coconut could be increased from initial level of 40 nuts/palm to 120 nuts/palm under coconut + vegetable intercropping system followed by coconut + pineapple (107 nuts/palm), coconut + fodder grass(102 nuts/palm) and mono cropping (98 nuts/palm) during 2014-15.

The economic advantage of the system under coastal sandy soil is that all the cropping systems had realized higher net returns as compared to mono crop. The net returns ranged from Rs. 0.46 lakh/ha/year in case of coconut mono crop to Rs. 1. 13 constitute a major portion in the coconut growing regions. Fodder grass (Hybrid Bajra Napier, Co3- 92 t/ha/year), vegetable crops (cowpea-6 t/ha, ridge gourd-9 t/ha, snake gourd- 8t/ha), pumpkin-10.12 t/ha and ash gourd-(9.2 t/ha), tuber crops (elephant foot yam- 20t/ha)) and fruit crops (banana and pineapple-15t/ha)) could be successfully grown as intercrops in coconut gardens under coastal sandy soil by adopting appropriate soil moisture conservation measures viz., opening of trenches/ pit depending upon the crops chosen and incorporation of one layer of coconut husk in the bottom of this trench/pit with its concave surface facing planting zone and this husk layer is covered with organic manure which is covered by soil and planting taken.

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An Interview with Mr. Tay Enoku, Vice President Director of Sambu Group-The World Largest Integrated Coconut Industry based in Indonesia by Muhartoyo[1]

Mr. Tay Enoku is the Vice President Director of Sambu Group, the world largest integrated coconut processing industry based in Riau Province, Sumatra, Indonesia. Sambu Group is the producer of various value added coconut products such as Crude Coconut Oil, Coconut Cream, Coconut Water, Desiccated Coconut, Virgin Coconut Oil, and Coconut Shell Charcoal. These products are produced for both domestic and export markets. Exports of the coconut products go to various parts of the world such as North America, Europe, Middle East, China, Africa and Australia. More than 18,000 employees are working for Sambu Group. Mr. Muhartoyo, Managing Editor of Cocoinfo International has an opportunity to interview Mr. Tay Enoku, below is the excerpt of the interview

Cocoinfo International (CI): Mr. Tay Enoku, we would like to congratulate Sambu Group that has maintained its reputation as the world largest coconut processing industry. Could you briefly describe about Sambu Group?

Thank you. Sambu Group was established by the late founder, Mr. Tay Juhana, in 1967. This group has 3 facilities, they are ***PT. Pulau Sambu*** *in Kuala Enok,* ***PT Pulau Sambu*** *in Guntung, and in Pulau Burung.*

Collectively, the facilities process coconuts into various products from industrial products to consumer products to be marketed domestically (Indonesia) and internationally. Basically, suffice to say that Sambu Group is a collection of companies that process coconuts in an integrated manner, producing coconut-derived products. Sambu Group's chief aim is to sustainably improve the coconut farmers' standard of living by adding as much value to their plantations' coconut produce. This is so because most of the Group's raw material comes from those farmers.

(CI): What is the contributing factors that make Sambu Group become successful coconut processing industry ?

Airial View of Kuala Enok Factory

Airial View of Sambu Guntung Factory

Airial View of Riau Sakti United Plantation Factory

I would have to say that Sambu Group's success has been due to several factors.

The first one would be time. By 2017, Sambu Group is half a century old. We experienced the many ups and downs brought about by the macro factors. We have been around before coconut was the "darling of some markets" as it currently is.

Next, I would have to put focus on the community as the second contributing factor of Sambu Group's success. This is because without putting sustainability at the centre of all of our development efforts, we would not have been able to withstand the test of time. The continuous focus on our environment and communities allowed us to endure the continuous disruptions that tested our business model. In essence, at times when it was very tempting to alter our business model for a "quick profit", we had the communities' long term interests in mind such that we could fend such "temptation.'

Thirdly, as briefly mentioned, our time horizon has always been a long one. This is important considering the natural "constraint" experienced by the very crop itself - coconut trees. The time it takes for coconut trees to reach their peak productivity is comparatively longer than other alternative crops. Thus having a time horizon that is compatible with the crop's own biological cycle is pragmatically inevitable. We can "get around" this by converting the fresh coconuts into copra, which will "distort" the natural cycle of the output produce, but its economic implication is quite another story.

Last but not least, the Group has always operate and develop under a Win-Win-Win (three wins) framework. Our business model must create a win for three parties: the farmers and communities; the government and the Group. This partly explains the Group's leaning towards serving the international market.

Source of the Raw materials for Sambu Group Factories

(CI): What is the Vision and Mission of the Sambu Group?

As authored by the Group's late founder, Tay Juhana, the name Sambu means Three Duties in Chinese language. The first is, through its existence and operation, benefits the environment and communities that it is operating in. Second, is to benefit all partners and third parties who aid the Group's operation and developments. Third and lastly, is to benefit all of the Group's employees and workers as well as its shareholders.

Prioritizing the above sequence is at the core of fulfilling the duties as specified by the Group's Founder. Needless to say, the Group's business must support this configuration.

In short, the Group's Vision is to bring Indonesia's coconut to the world. Indonesia has been lagging in marketing its coconut-derived products to the international markets to the degree that some other coconut producing countries have done. In those countries, there are usually clear coherent strategies where all of the industry's stakeholders are working and aiming towards the same target. The way in which we intend to materialize that Vision, which is the Mission, is to add as much value to Indonesia's coconut farmers' output that sustainable supply can be insured for term long term. Accompanying that end, is to create value transfers from The Market to the coconut farmers in enduring ways. Again, this often means exchanging short-term economic gains for long-term sustainability.

Dampening the forces that amplify price volatility is crucial in achieving that end. This is be

cause, as in the financial markets, the moment short-term economic gain takes precedence, it is usually long-term sustainability that takes the blow. In Indonesia, the coconut industry does not have the privileges enjoyed by other "too big to fail" industries. This is especially important considering the "natural constraints" mentioned above should the farmers decide that cultivating coconut trees is economically less attractive than cultivating other crops.

(CI): Coconut products produced by Sambu Group are well accepted in both domestic and international markets, what is the recipe behind this marketing success?

Engagement with third parties who has more in-depth knowledge about the various markets contributed to achieving the various Product / Market Fits. An equally important factor in support of that has also been keeping in mind our limitations - be it business model limitation, competencies limitation or the systemic limitations that exist as a consequence of the macro environment that we are operating in.

(CI): In processing sites, is there any gap between the installed capacity and the production capacity of Sambu Group at the moment?

As "the great" hockey player Wayne Gretzky once remarked "I skate to where the puck is going to be, not to where it has been," we always try to develop with foresight. This does not necessarily mean that there is always a gap between the installed capacity and the production volume.

Having said that, it is true that currently, the recent demands forcoconut products have been than our capability to meet the demands. Consequently, armed with the market-based prognosis, our installed capacity tend to be more than our production volume in general. From our perspective, matching the raw material supply with the installed capacity is especially important in promoting Indonesian coconut products to counter to the coconut products of other coconut-producing countries that have acquired the international market mindshare.

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(CI): If so, what could be the main causes?

Other than the above mentioned reasons, there are reasons that are cyclical in nature, such as the effect of the 2014-2016 El Niño event on coconut trees worldwide and how it affected significant reduction in the availability of coconut as the industry's raw material. In turn, this significantly influenced the coconut prices to the detriment of the coconut supply continuity itself.

Then there are also reasons that are structural in nature such as the increased popularity of coconut products in the international market. Thus rendering the market/industry to become much more efficient, which further amplifies the economic implications of the demand-supply gap.

(CI): Do you deal directly with coconut farmers or through traders and/or collectors in sourcing raw materials?

Sambu Group deals with both the coconut farmers and the traders/ collectors in sourcing our raw materials. To benefit from the economies of scale from the size of our operation, we are always open to more efficient means of sourcing our raw materials. After all, the issue of efficiency is always a central consideration in developing any kind of industry.

Having said that, our long term interest is always to ensure that value transfer happens efficiently

Coconuts being Unloaded from Boats to the Factory

A Corner View of the Factory

between our customers and the coconut farmers from whom we acquire our raw materials. Again, the long-term objectives should provide context to our short-term activities.

(CI): According to media report a lot of coconuts from Indonesia are exported to neighbouring countries. Does this coconut export affect the raw material supply to Sambu Group?

Of course, as explained, the coconut product market/industry has rapidly been getting much efficient compared to a decade ago. This amplifies demand-supply gap. However, we believe that the effect is cyclical in nature because in practice, ceteris paribus condition doesn't exist. Industry participants - including our Group - always respond to such challenge with adaptive measures.

(CI): What is the possible scenario to overcome this problem?

As mentioned, the macro configuration dictates how the micro elements behave. Reportedly, the government of some coconut producing countries have put some restricting mechanism(s) to minimize the exportation of natural resources (including coconut) from their respective countries to encourage the developments of their domestic midstream and downstream processes. Additionally, some governments are even said to be subsidizing companies in order to possess competitive advantages abroad in acquiring their raw materials.

Such situation creates imbalance between industry players who are located in countries where the government do not put any restricting mechanism(s) nor any economic support(s) to the industry players. This results in the absence or lack of government-sponsored competitive advantages that players from competing countries enjoy.

Research and Development and Quality Control Departments

From the private sector perspective, increasing openness and exposure is an important ingredient in making the whole industry to be more competitive (read: on par) in sourcing their raw material. Increasing openness and exposure should lead to the realization uncompetitiveness and inefficiency sources within the current industry constellation. By itself, the realization would not be effective if not coupled with sensitivity to market demands.

Having said that, it is extremely challenging for any single industry player to compete with a collection of players who are supported by their respective government in competing in the international arena. This is analogous a boat trying to not raise against the rising tide. .

(CI) Is there any other underlying problems preventing the companies to conduct efficient and effective processing?

In answering this question, I would have to refer my understanding of the macro picture in other coconut producing countries. For example, my personal observation of Thailand is that there is a sense of coherence between all stakeholders involved in the coconut industry. The government boosts the tourism allowing ample amount of foreign visitors to enter the country.

Within the country, the private sector and/or the government accentuates Thai coconut as one of the national "must-tries," which would be responded very well by the tourists because tourists visit the country exactly for the purpose of experiencing what is proclaimed to be the idiosyncratic features of the country.

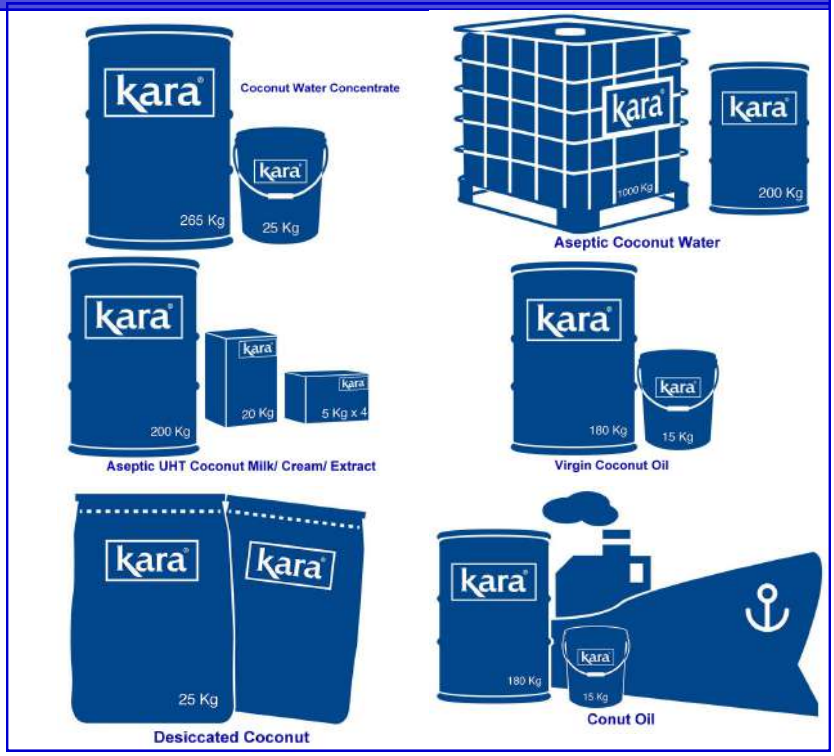
Upon returning to their respective countries of origin, the tourists then bring with them the idea of "Thai coconut" and its various application as they experienced during their visit to the country. The Idea would then spread in

Coconut Based-Consumer Products Produced by Sambu Group

those countries. In turn, this would make way for the numerous Thai cuisines served at the numerous Thai restaurants to be established in numerous countries because any coconut products - regardless of the coconuts' country of origin - can readily be accepted under the banner of "Thai coconut."

Another example would be the Philippine Coconut Authority (PCA) of the Philippines. It is an agency of the Philippine government under the Office of the President. It is responsible for developing the coconut and other palm oil industry to its full potential in line with the new vision of a united, globally competitive and efficient industry. Again, arguably there is a catalytic agent that stewards the country's coconut industry stakeholders into achieving a common goal for the industry.

In relation to the Thailand's situation and the Phillipines situation, the same cannot be said for Indonesian coconut nor for Indonesian coconut industry. This creates conditions of disincentives for industry practitioners to invest more resources to the development of the industry or even to the sustainability of the coconut plantations itself.



Coconut Based Industrial Products Produced by Sambu Group

The disincentivized condition to develop the industry derives from the uncertainty of raw material sustainability. Whereas the disincentivized condition to invest in the sustainability of the coconut plantations comes from the uncertainty about who will be the beneficiary of the coconut plantations itself should they be made sustainable. It is arguably a circular problem beyond the reach of any single industry player to resolve single-handedly.

CI): Besides using mechanical processing machineries, Sambu Group also employ a lot of people. How many people are currently employed by Sambu Group? Are they permanent or seasonal workers?

Overall, Sambu Group engages approximately 18,000 employees and workers. The number of permanent workers (employees) and contractual workers depends on the nature of the jobs inherent in the processes.

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

The concept of quality is always subjective in nature. That means that quality is whatever the market says it is. Therefore, the maintenance and assurance of product quality is inseparable to understanding what the various markets demand in terms of quality. In practice though, this can be rather a cumbersome undertaking to achieve.

Because the preparation and todos of being able to deliver what is defined as 'quality' by the various markets take substantial amount of time, it helps to always understand that definition of 'quality' with sufficient foresight. In other words, it helps to be able to see ahead of time the different features of 'quality' as defined by those markets.

(CI): What is your opinion on the future of coconut products processing and marketing?

In my opinion, as long as market awareness about the goodness of coconut, especially its health benefits, would continue, the shifting trend from 'push factor' to the 'pull factor' towards coconut products would continue. At the same time, I think the most prominent attribute that we should expect from the market is criticalness.

Coconut products producers will be faced with increasing expectations with varying emphasis, depending on the market location. By location, I do not only refer to geographical location but also of virtual locations as shaped and formed by the various technological 'filter bubbles' as well as the food activists such as, among others, Vani Hari, Marion Nestle, Marcus Guiliano and Michael Pollan.

The advancement of network-centric communication technology will inevitably requires companies, including coconut companies, to adapt to the change and to alter their hierarchical marketing framework to that of network. This is inevitable because the change has been happening at macro level.

Coconut Products in Containers Ready for Shipment Right from the Factory Port

Circulating information as facilitated by the network, somewhat lacking in authoritative figures, would create low "message-to-noise" ratio situations. Consequently, conflicting views and understandings would occur, there would be those that would even challenge the existing authoritative voices. Confusion would then ensue. This would in turn create more heterogeneous market psychography.

Coconut companies of the future would have to be able to articulate their respective messages clearly to the various markets to avoid being drowned in the confusion and false market understanding.

CI): What is your suggestion for the coconut sector development in Indonesia to make it more sustainable and viable for both processing industry and coconut farmers?

My suggestion would be that to be able to compete with other coconut producing countries, Indonesian coconut industry would have to develop coherence among all the industry stakeholders. There has to be a common goal and common structure to promote Indonesian coconut to the international market.

Most importantly, to be effective and sustainable, such goal and structure must embrace the existing diversity and heterogeneity within the national coconut industry itself. The stakeholders will have to stop trying to find a one-size-fits-all solution for such a complex problem.

For without such overarching framework, too much energy and resources will be wasted fighting the inconsistencies and incompatibilities within the domestic environment. Consequently there will be energy and resources left to compete in the international arena.

(CI): Thank you very much Mr. Tay Enoku for inspiring insights on coconut processing industries with our valued reaers. We wish you every success in your coconut processing industry and thatSambu Group becomes more productive and profitable in years to come.

[1]*Managing Editor and Documentalist of Asian and Pacific Coconut Community.*

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. Apocynaceae)
- 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.

EXPERTS' FINDINGS ON THE HEALTH BENEFITS OF COCONUT WATER

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.

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' FINDING 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).

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) .*

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

EXPERTS' FINDING ON THE HEALTH BENEFITS OF COCONUT OIL

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*

EXPERTS' FINDING ON THE HEALTH BENEFITS OF COCONUT OIL

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.

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*)

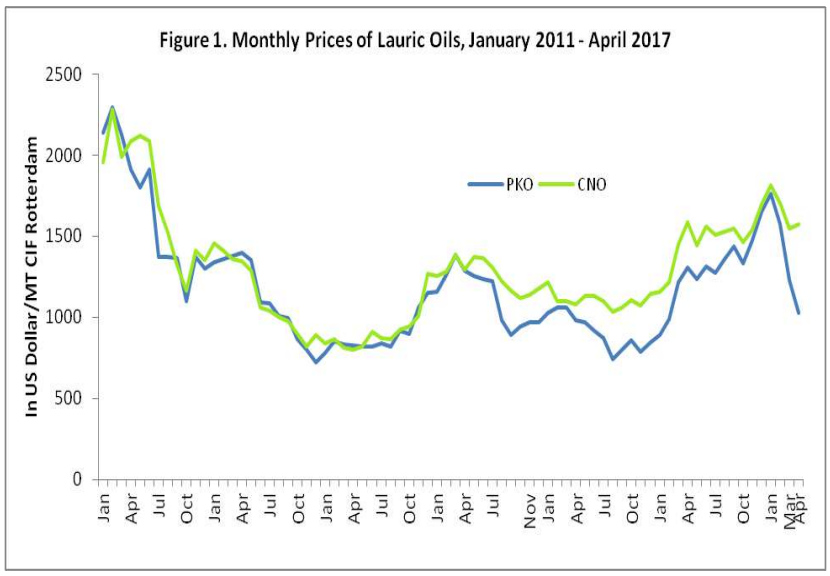
DR. S.M. Sadikot
Hon. Endocrinologist, Jaslok Hospital & Research Center, Bombay. Hon. Diabetologist, All India Institute of Diabetes, Bombay

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*

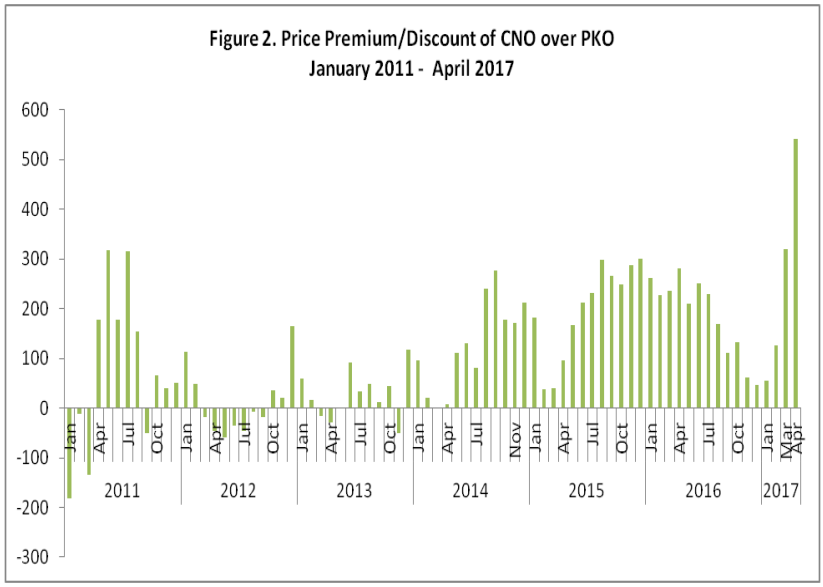
BEARISH COCONUT OIL MARKET IN THE FIRST HALF OF 2017

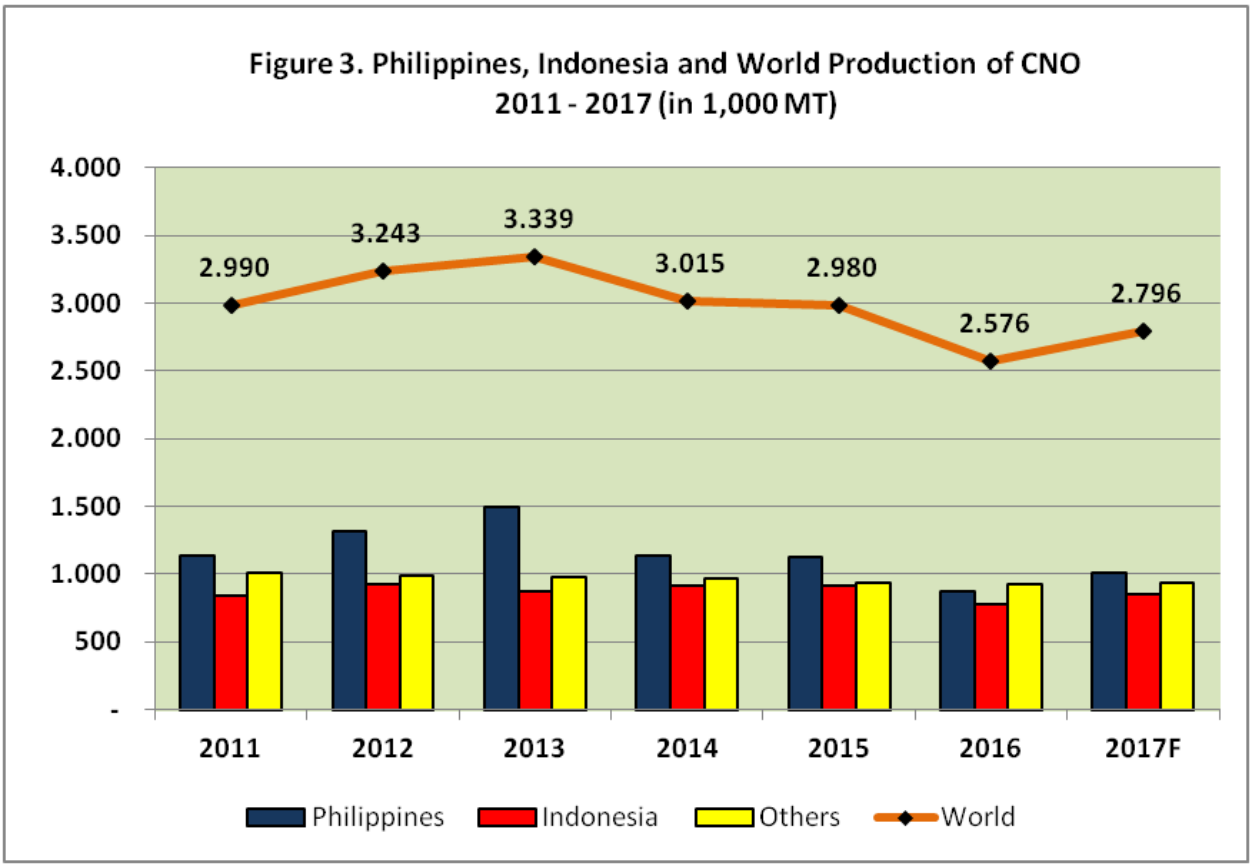
After experiencing a bullish market in 2016, coconut oil market showed an easing trend in the beginning of 2017 amid a tight global supply for the product. In January 2017, the price of coconut oil was US$1,815/MT and was reduced to US$1,571/MT in April 2017. At the same time, the price of palm kernel oil dropped from US$1,760/MT in January 2017 to US$1,029/MT in April 2017. This brought about the price premium over palm kernel oil to rocket from US$55 in January 2017 to as much as US$542 in April 2017. Since in international market coconut oil plays a complementary role with palm kernel oil, the high price premium over palm kernel oil put a pressure on the price of coconut oil. This may not only point toward a downtrend in palm kernel oil but also mirrors the prevailing shortage of coconut oil supply.



The supply of coconut oil suffered from insufficient production and competition for raw materials with other coconut products. UCAP estimated Philippine coconut production in 2016 declined by 9.1% to 2.052 million MT in copra terms, from year-earlier revised data at 2.258 million MT. The shortfall was attributed to the prolonged rainfall deficit due to El Niño episode during the last quarter of 2015 that extended up to the first half of 2016. The adverse effect of El Nino had also affected coconut production in Indonesia which led to lower copra production. In 2016, copra production in Indonesia is predicted to decline by 7.1%. In India, a Coconut Development Board survey revealed production estimate for agriculture year 2016/17 at 20,789 million nuts, 6.22% lower than the previous year. The shortfall is on account of the deficient rain fall.

At the same time, demands for other coconut products were increasing. Amid a drop in coconut oil exports, desiccated coconut exports from Philippine jumped by 35.6% in 2016. While in Indonesia exports of fresh coconut rocketed for more than 40% in 2016 at the expense of other coconut products including coconut oil. The shortfall in production and strong demand for other coconut products had inevitably led to a reduction in export supplies. Global Exports of coconut oil in 2016 plunged by 15% from 2.2 million MT in 2015 to 1.9 million





MT in 2016. The drop was following a negative trend since 2014 when the world export of coconut oil eased to the volume of 2.146 million MT or experienced a year-on-year decrease by 4.9% after experiencing a substantial increase in previous two years at an average annual growth rate of 10%. In 2015, the global exports of the commodity declined by 1% following a negative trend in the previous year.

Philippines and Indonesia as major exporting countries of coconut oil underwent strong reductions in exports of the product. In the calendar year of 2016, total export of coconut oil from the two countries fell for more than 17% compared to the same period in 2015. Philippines' exports of coconut oil from January to December 2016 were 726,827 MT or dropped by 14.8% compared to the same period of 2015. This export volume is the lowest since 1999. It is worth noting that in the last decade the lowest export volume of coconut oil from Philippines was in 2011 accounting for 781,411 MT. Meanwhile, exports of the commodity in 2015 were 853,152 MT or decreased by 0.4% compared to that of 2014. Meanwhile, exports of coconut oil from Indonesia plunged by 20.7% compared to the same period in 2015. The drop was following the declining trend in the previous year which was contracted by 1.6% from 771,419 MT in 2014 to 759,381 MT in 2015.

The shortage in the global production has, furthermore, restrained an increasing trend in the global demand. The import demand of coconut oil in the world market was dwindling from 2.1 million MT in 2015 to 1.9 million MT for the corresponding period in 2016. In the same period, the demand for the other lauric oil, palm kernel oil, also fell by 9.6% to level of 2.9 million MT as opposed to 3.2 million MT. As a result, total imports of lauric oils decreased by 9.7% to a level of 3.4 million MT as against 4.8 million MT of 2015. Apart from a shortage in copra production, a wide price premium over palm kernel oil has also been prompting a pronounced shift of demand at the expense of coconut oil at least in some countries.

The US is one of countries where the buyers of lauric oils indicate to shift their preference at the expense of coconut oil. A decline in imports of coconut oil was observed in the US during 2016. The US imports of the oil was 0.52 million MT or shrank by 6% compared to 0.55 million MT in the previous year. Meanwhile, imports of palm kernel oil in the same period were increasing. The oil import rose from 0.31 million MT in January-December 2015 to

0.35 million MT in the same period of 2016. Hence, the share of coconut oil to the US total imports of lauric oils abated to 59% from 64% in the corresponding period of 2016.

The shift in preference of lauric oils due to a high price premium of coconut oil over palm kernel oil at the expense of coconut oil was also observed in Europe. In the period of January-Drecember 2016, share of coconut oil to the European total imports of lauric oils was 47.2% which was 3% lower than its share in 2015 for the same period. Shipments of coconut oil to Europe were 0.07 million MT which shrank by 11.3% opposed to that of last year. In total, imports of lauric oils eased by 5.2% following a shortfall in supply of the oil.

Unlike in the US and Europe, the cross-price substitution effect of the two oils did not appear in China. The share of coconut oil to total imports of lauric oils in 2016 remained at 19% the same as that of last year. The demand of the oil also declined to 0.13 million MT from 0.14 million MT in 2015 or shrank by 2.6%. The decline in demand was also witnessed for palm kernel oil. The oil dropped to 0.55 million MT in 2016. Hence, the total imports of lauric oils to China shrunk by 9.8% for the said period.

The reverse trend of global coconut oil exports is expected to take place in 2017 as copra production is expected to improve though in limited pace following the recovery in coconut production. UCAP projected Philippine coconut production to recover 9.3% to 2.244 million MT. The recovery is expected to happen as rainfall pattern revealed recovery from below normal status to above normal in many coconut areas especially in the last quarter. Hence the expectation that the second semester harvest will be better than the first semester. As for Indonesia, coconut production is estimated to be stagnant in 2017 amid the recovery of rainfall pattern. Ministry of Agriculture estimated that coconut production will insignificantly decline by 0.7% compared to the last year production.

A subdued recovery in global supply is most likely preventing the price from a deep fall amid a very high price premium over palm kernel oil. In the second half of 2017, price of coconut oil is expected to be strong or at least maintain its current level.

[1]*Alit Pirmansah is Market Development Officer, Asian and Pacific Coconut Community.*

VAIGA – International Workshop on Value Addition for Income Generation in Agriculture, 1-5 December 2016, Kerala, India

An International Workshop and Exhibition on Agro Processing and Value Addition called VAIGA (Value Addition for Income Generation in Agriculture) was organised in Thiruvananthapuram, Kerala, India during December 1-5, 2016 by the Government of Kerala in India. The five day workshop on agro-processing and value addition was organised to set the pace for the setting up of agro-processing clusters in the region.

APCC Executive Director, Mr. Uron Salum participated in the Workshop and presented on the "Emerging Global Coconut Industrial Scenario". He underscored the need for diversification and value addition which had to be supported by effective government policies for tapping into the emerging global markets for coconut based products. He stressed on the need for exploring new markets and undertaking aggressive replanting of coconut trees. He elaborated on the market potential of virgin coconut oil and coconut water. Mr. Salum appreciated the concept of farmer producer organisations promoted by India which would serve as a model for replication in other countries. He explained the importance of quality, branding and labelling and also warned the coconut farmers regarding the consequences of climate change.

Resource Speakers of the 2nd International Conference on Coconut Oil

Industrialists, subject matter specialists, technologists and experts from Indonesia, Thailand, Singapore and India presented papers on the theme of agroprocessing and value addition. The workshop was attended by existing and aspiring entrepreneurs, representatives of farmer producer organisations, policy makers and officials of concerned agencies.

APCC Organizes 1st International Symposium on Coconut-Tissue Culture

The 1st International Symposium on Coconut Tissue Culture was organised on 13-14 March 2017 at Bangkok, Thailand. The Symposium was jointly organised by APCC in association with the Department of Agriculture, Thailand. Around 75 delegates, comprising of scientists and researchers, policy makers, private sector stakeholders and farmer producer organisations from 15 countries participated in the two day Symposium. The objective of the Symposium was to establish record of the stage of coconut tissue culture research in various coconut growing countries and explore the opportunities for collaboration between countries, institutions and individual scientific experts. This would help in expediting new technologies for micropropagation needed to mass produce coconut seedlings in order to meet the overwhelming demand for coconut planting material globally. The Symposium recommended for APCC to promote increased scientific and technological cooperation and information sharing through networking among researchers and institutions on all aspects of coconut tissue culture for the rapid mass production of quality planting materials.

A View of 1st International Symposium on Coconut Tissue Culture

2nd International Conference on Coconut Oil (ICCO), 15—18 March, 2017, Bangkok , Thailand

ICCO 2017, organised as a biannual Conference, in continuation

of ICCO 2015 was jointly organised at Bangkok International Trade and Exhibition Centre (BITEC), Bangkok, Thailand on 15-18 March 2017 under the auspices of the Conservation and Development of Coconut Oil of Thailand Forum (CDCOT), Department of Agriculture of Thailand, Horticultural Science Society of Thailand(HSST), Asian and Pacific Coconut Community (APCC) and VNU Exhibitions Asia and Pacific Co., Ltd . The theme of the Conference was "Coconut Oil and Downstream Products, Quality and Processing".

The Conference witnessed a participation of over 230 stakeholders from around 25 countries, including coconut producing and consuming countries, comprising of participants from Government and private sectors, processors, farmer producer organisations, equipment manufacturers and other stakeholders. APCC participated in ICCO 2017 and the Horti Asia Exhibition, organised alongside the Conference. A perspective on the global market scenario for coconut oil and other value added products of coconut was presented by Mr. Uron N. Salum, Executive Director, APCC. The collaboration and networking that emerged during the Conference promises a prospectful time ahead for coconut oil and its varied products.

Proceedings on New Coconut Variety Release, Bogor, 14 April 2017.

Indonesian Agency for Agricultural Research and Development (IAARD), Ministry of Agriculture held Proceedigns on New Superior Variety Release of Plantation crops that have passed the feasibility test on 21 April 2017 in Bogor, West Java. Head of the Indonesian Palmae Research Institute (IPRI), Ismail Maskromo, explains that 12 varieties have successfully passed as New Superior Varieties (VUB) including

Proceedings of New Superior Plantation Crops Varieties Release including Coconut in Bogor

Lampanah coconut, Aceh and Bido Coconut from Morotai Regency, North Maluku. The advantage of Lampanah coconut variety is that it has a lot of fruits averaging 20 nuts per bunch. Meanwhile Bido coconut variety from Morotai has a very short coconut stem when it begins to bear fruits with the characteristics similar that of tall coconut variety.

Bido Coconut Variety

According to him, the release of Lampanah coconut variety is the result of a collaboration between IPRI and the Office of Plantation Crops of Aceh Province. While the release of Bido coconut variety from Morotai is the result of a collaboration between IPRI and the Agriculture Office of Morotai Regency, North Maluku Province. He explained further explained that Bido coconut is a type of fast bearing coconut originated from the Bido Village, Morotai Subdistrict, Morotai Regency, North Maluku Province. It was noted that this superior coconut variety can produce 16,395 nuts per hectare or about 133 nuts per tree. The advantage of this coconut is that the stem grows slowly and it can bear fruit quickly with large fruit size. This coconut began flowering at the age two years and can be harvested at the age of three years. The shape of fruit is like a large egg, with copra oil content up to 53.34 percent, he added. Ismail said the production per hectare at the farm level is still 1.1 tons of copra per hectare per year. Actually the production potency of superior varieties reaches 3.5 tons of copra per hectare per year. The area of coconut cultivation in 2016 is 3.6 million hectares with 98 percent being the people's plantation. "Both of these superior coconut varieties will be launched during the implementation of National Farmers and Fishermen Week (PENAS) XV in May in Banda Aceh," he said.

Statistics

Table 1. WORLD Exports of Coconut Oil, 2011– 2016 (In MT)

Country	2011[r]	2012[r]	2013[r]	2014[r]	2015[r]	2016[p]
A. APCC Countries	**1,544,154**	**1,841,896**	**1,881,101**	**1,818,892**	**1,712,259**	**1,514,720**
Fiji	1,328	3,794	1,494	1,630	1,794	1,500
India	4,251	6,552	6,829	7,067	7,725	28,816
Indonesia	540,050	799,973	630,568	771,419	760,072	602,318
Kenya	600	553	38	612	161	100
Malaysia	143,611	136,783	131,068	187,665	152,091	115,969
Marshall Islands	0	3,956	3,330	124	0	0
Papua New Guinea	54,349	19,847	13,466	11,068	18,467	10,000
Philippines	781,411	852,234	1,080,836	814,206	740,279	726,827
Samoa	2,509	3,935	1,428	1,450	1,020	460
Solomon Islands	470	172	196	238	1,163	1,000
Sri Lanka	1,931	2,499	3,821	11,254	8,679	7,094
Tonga	444	0	0	0	1,020	900
Thailand	1,200	366	651	1,960	15	1,236
Vanuatu	12,000	10,011	5,535	9,208	9,000	9,000
Vietnam	0	1,221	1,841	991	10,773	9,500
B. Other Countries	**316,428**	**296,958**	**347,674**	**278,857**	**361,450**	**280,000**

p: preliminary figure ***r****: revised figure*

TOTAL	**2,551,203**	**1,860,582**	**2,138,854**	**2,228,775**	**2,097,749**	**1,794,720**

Table 2. Prices of Coconut Products And Selected Vegetable Oils, Apr 2016-Mar 2017 (US $/MT)

	2016									2017		
Products	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Copra	1,045	963	1,048	1,008	1,018	1,025	964	1,029	1,127	1,225	1,146	1,016
Coconut Oil	1,586	1,445	1,563	1,507	1,529	1,547	1,463	1,538	1,699	1,815	1,703	1,547
Copra Meal[2]	269	256	243	236	248	231	195	189	184	190	195	177
Desic. Coconut[2]	2,398	2,497	2,481	2,458	2,442	2,398	2,415	2,395	2,444	2,475	2,528	2,480
Mattress Fiber[1]	182	182	182	182	182	182	182	182	180	180	110	110
Shell Charcoal[2]	342	341	341	339	340	342	348	340	340	340	376	388
Palm Kernel Oil	1,304	1,234	1,312	1,277	1,360	1,436	1,331	1,476	1,652	1,760	1,576	1,228
Palm Oil	722	706	683	652	736	756	716	751	788	809	774	736
Soybean Oil	796	791	798	788	814	829	858	880	907	872	835	813

[1] *FOB, Sri Lanka*

[2] *FOB, Philippines*

Statistics

Table 3. World Oil Balance 2015-2017 (1,000 Tons)

Oil/Year	Jan/Dec 2015	Jan/Dec 2016	Oct 2016/ Sept 2017[F]
Palm Oil			
Opening Stocks	11,790	13,370	9,840
Production	62,560	58,310	63,800
Imports	47,770	43,540	46,850
Exports	48,240	43,680	46,820
Disappear	60,510	61,980	63,460
Ending Stocks	13,370	9,560	10,220
Soybean Oil			
Opening Stocks	4,270	5,230	5,280
Production	48,980	51,500	53,420
Imports	12,270	12,140	12,240
Exports	12,530	12,120	12,360
Disappear	47,760	51,950	53,310
Ending Stocks	5,230	4,800	5,280
Groundnut Oil			
Opening Stocks	250	260	180
Production	3,730	3,740	4,090
Imports	270	260	260
Exports	260	240	260
Disappear	3,720	3,750	4,150
Ending Stocks	260	270	320
Sunflower Oil			
Opening Stocks	2,350	2,350	1,910
Production	15,260	16,360	17,760
Imports	7,440	8,650	9,460
Exports	7,490	8,710	9,520
Disappear	15,200	16,130	17,340
Ending Stocks	2,350	2,520	2,270
Rapeseed Oil			
Opening Stocks	6,770	6,060	4,730
Production	26,140	24,940	24,270
Imports	4,140	4,390	4,300
Exports	4,210	4,300	4,280
Disappear	26,780	26,610	25,230
Ending Stocks	6,060	4,470	3,800
Cotton Oil			
Opening Stocks	450	450	300
Production	4,700	4,100	4,170
Imports	180	130	140
Exports	180	130	150
Disappear	4,700	4,160	4,150
Ending Stocks	450	400	320
Palm Kernel Oil			
Opening Stocks	970	1,080	840
Production	6,850	6,360	6,90
Imports	3,290	3,060	3,220
Exports	3,320	3,040	3,220
Disappear	6,720	6,620	6,840
Ending Stocks	1,080	830	890
Coconut Oil			
Opening Stocks	360	430	370
Production	2,980	2,650	2,850
Imports	2,100	1,660	1,820
Exports	2,070	1,680	1,830
Disappear	2,940	2,710	2,800
Ending Stocks	430	350	410

Source: Oil World

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- COIR - PITH (COCO PEAT) DRIER
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- COIR - PITH (COCO PEAT) CLEANING SYSTEM
- CUT - FIBER MACHINE
- COCONUT HUSK SUBSTRATES PROCESSING MACHINE
- COIR FIBER BALING MACHINE
- COIR GEO TEXTILE LOOMS
- COIR LOG MACHINE

TURN KEY PROJECTS

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- COCO PEAT
- GEO TEXTILES
- COCONUT HUSK SUBSTRATES

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