Vol. XV No. 4

October - December 2013

NEWS LETTER

OIL TECHNOLOGISTS' ASSOCIATION OF INDIA
WESTERN ZONE

Inside This Issue

This news letter is for free circulation only to the members of OTAI-WZ

C/o. Department of Oils, Oleochemicals & Surfactants
Institute of Chemical Technology
(Formerly UDCT)
Nathalal Parekh Marg
Matunga (East), Mumbai-400 019
INDIA.

Tel.: 91-22-32972206/91-22-24146526
Fax: +91-22-24124017
Email: info@otai-westernzone.org
Website: www.otai-westernzone.org

From the Editors's Desk

HAPPY NEW YEAR

This is the fourth and final issue of 2013. Now, an adult as I said before ! 15 years is a good score. Where do we go from here? Did the Newsletter Serve any purpose ? Any Cause? But it has collated info, from all publications, which was exciting and enthralling. Let us keep the spirit "alive" - and "kicking too". We have giants of oil technologists. They will lead the info spread. Yes, Happy New Year to all.

❖ ❖ ❖

Trade & Commerce

"GOOD PROGRESS"

India's packaged food industry could touch $30 billion by 2015

GROWING at a compound annual growth rate (CAGR) of about 15 to 20 per cent annually, the Indian packaged food industry is likely to touch $30 billion by 2015 from the current level of $15 billion including snack foods, ready-to-eat foods, healthy and functional foods. Factors that have fuelled this industry's growth are the arrival of food multinationals; rising popularity of quick-service restaurants; modern retail trade; technological advancement; changing urban lifestyles and so on, the report said.

The main categories of packaged food are bakery products; canned/dried processed foods; frozen processed foods, meal replacement products and condiments. Some emerging new categories in this segment are processed dairy-products; frozen ready-to-eat foods; diet snacks; processed meat and probiotic drinks. Some key players in this industry are Hindustan Unilever (tea; instant coffee; biscuits; pulses; instant beverages); Nestle (instant coffee; milk and milk products; ready-to-eat foods); PepsiCo (aerated drinks; fruit juices; cereals; snacks) and Haldirams (sweets; namkeens; syrups; crushes, etc.)

The growth in the economy, coupled with a strong desire among consumers to maintain a healthy lifestyle and the growing awareness of functional ingredients such as herbs; minerals; vitamins; omega-3 fatty acids and probiotics, is driving the functional foods and beverages market, highlighted the paper. D S Rawat, secretary-general, ASSOCHAM, said that the food ingredients market is also increasing at a rapid growth rate, as consumers increasingly demand bigger, bolder tastes; foods that are healthy, and ingredients that are natural or sustainable. Rawat further said that consumers are becoming more sophisticated and want more upscale flavours and ingredients. The Indian food processing market is one of the largest in terms of production, consumption, and export and import prospects. The paper also pointed out that there is a large divide between urban and rural consumers in India. Urban residents consumed 78% of all packaged food in 2011, while rural residents consumed just over 22%.

Sales of Packaged Food in India by Region in 2011: East and Northeast: 21%, North: 38%, South: 28% , West: 36%

In a recent survey by ASSOCHAM on "Craze for Ready-to-eat Foods among Young Indians" is based on responses from 2,000 representative households with children or without children, nuclear families and bachelors, mainly because many consumers in metros lead time-pressured lifestyles and have less time available for formal meals, as a result of which the demand for products which can be eaten on the go remains high. Over 82 per cent of the workforce prefers packaged food rather eating outside or roadside dhabhas in metropolitan cities like Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad, etc.

In a survey, ASSOCHAM claims that Indian food processing market will show fast-paced growth in the next five years. It is also estimated that the food processing industry will show annual growth of 40-60 per cent in the next five years. All this will be encouraged by changed trade rules and increased demand among the people. Eighty-eight percent parents said that convenience foods are preferred mainly by nuclear families where both husband and wife are working; bachelors who wish to avoid eating out, or people who do not have time, patience or the expertise to prepare in a traditional method.

According to survey, metropolitans are the largest consumers of processed food and are going to be the biggest consumers of processed foods because of their ever-increasing per capita income and lifestyle, which is also changing very rapidly. The metropolitan cities in which respondents were interviewed by the ASSOCHAM Social Development Foundation (ASDF) include Delhi; Mumbai; Ahmedabad; Cochin; Bangalore; Hyderabad; Indore; Patna; Pune; Chandigarh and Dehradun; and it was observed that there has been a surprising rise in the demand for packaged foods in the Indian market. All this is because the lifestyle of people has changed drastically and also the fact that consumer's opinions regarding their eating habits have changed in a significant manner.

The majority of the working class also mentioned that it's a boon to save time, energy and money by using these foods. Various foods helped to prevent the age-old traditional method of long preparation of grinding, cooking or fermenting for hours, and hence making the work faster. Even the manufacturers prepared the instant foods according to the tastes of the consumers.

A majority of bachelors prefer the convenience food because of less cost, time and energy-saving, convenience in preparation and consumption in the busy and hectic life. The very term 'instant foods' means simple, fast, convenient and affordable foods which are easy and fast to prepare, besides being hygienic, free from microbial contamination and also convenient to eat, the bachelors explained.

Key drivers for packaged food market in India are:

Changing demographics: Youth is driving the consumption of the packaged food such as ready meals, packaged soups, etc.

Increase in income: Rise in disposable income has increased the affordability of buying packaged food.

Urbanisation: Urbanisation has led to an increase in nuclear families and also led to more and more women moving out for work.

Growth in organised retail: The penetration of organised retail is expected to 15 per cent by 2016.

Improvement in packaging: Advancement and development of variety of packaging has led to increase in shelf life and also satisfying various needs of customers.

Increase in freezer facilities: Cold storage/ freezer space plays an important part in growth of packaged food. Freezer space in India is expected to grow at a CAGR of 16 per cent during 2008-14, which is expected to plan an important part in growth of packaged food storage.

Key players in packaged foods market:

- Hindustan Unilever Ltd: Beverages; staples; dairy; snacks
- ITC: Staples and snacks
- Nestle: Dairy; beverages and snacks
- PepsiCo: Beverages and snacks
- Dabur: Beverages and Culinary Products
- Cadbury: Confectionery
- Haldiram's: Snacks
- Britannia: Bakery Products
- Godrej: Beverages and Staples
- Parle Agro: Beverages, Bottled Water and Snacks Opportunities in packaged foods market:
- Focus on health
- Ready-to-eat segment will increase
- Private labels
- Customised products
- Demand of non-vegetarian packaged food

(Courtesy : Business Empire, January 2013)

"BE WARNED"

Edible oil sector-neglected and unattended

DESPITE being the essential commodity for food preparation in households and also in the food processing industry, the edible oil sector has remained neglected. With the development of the food processing industry in recent years and the increasing use of these oils by the household sector, the overall demand for various edible oils has increased manifold in the country.

As against the growing demand, there has been no corresponding increase in oilseeds production for last many years. The oilseeds production is somewhat stagnant at around 26 million tonnes and their productivity is hardly 950 per hectare and that is considered to be very low. With poor growth in oilseeds production, import of both oilseeds and edible oils into the country has been steadily rising for some years. India currently imports almost 50 per cent of its total requirement of oil and oilseeds from various countries as against a negligible import of 3 per cent in 1992-93. Such huge growth rate in imports of this essential commodity over the years only exposes the Central government's total neglect of this sector. Now with the Centre giving a major thrust to the food processing industry, the country will have to import almost 60 per cent of its requirement of edible oils in a couple of years. This is an embarrassing situation for an agricultural country like India and that calls for urgent remedial measures for correcting it.

As per agricultural growth projections made by the Centre for the period 2008-12, oilseeds output is targeted to go up by 4 per cent a year. Based on the current output of around 26 million tonnes, this 4 per cent growth translates into about one million tonnes of oilseeds a year, equivalent to 300,000-350,000 tonnes of oils. The targeted growth rate is after taking into account various operational constraints in the Indian agricultural sector. In fact in 2009-10, oilseeds production came down to just 24.9 million tonnes. Therefore, it is difficult to predict that even this modest growth projection of 4 per cent can be actually achieved in the current year.

One of the main factors inhibiting the oilseeds production in the country is the meagre allocation of funds by the Central and State Governments. The Union Budget of 2011-12 recognised the wide gap between domestic production and consumption of edible oils and has announced a special initiative with a budgetary allocation of Rs 300 crore to bring 60,000 hectare under oil palm plantation. If this project takes off, that could supplement earlier initiatives by the government in the oilseeds sector.

Low productivity is another key factor that is preventing desired growth in oilseed production in the country. India's current productivity of oilseeds per hectare is almost half of the world average. This is not an acceptable situation and Indian agricultural scientists have to find ways to raise the productivity to world levels. Introduction of genetically modified oilseeds is one immediate option to step up the production in this sector.

(Courtesy : Business Empire, January 2013)

"REALLY"

Palm Oil - A Healthy Edible Oil

Dr. K. Parameswaran

PALM OIL is a balanced vegetable oil and source of energy. More significantly, it is free of cholesterol and trans-fatty acids. Additionally, it is packed with carotenoids (a rich source of vitamin A) and Vitamin R. Palm oil has good acceptance as a cooking medium because of its price advantage. It is also the raw material for manufacturing oleo chemicals used in the manufacture of soaps, candles, plasticizers, etc. Palm Elaeis guineensis, originated in West Africa, is the highest edible oil yielding perennial crop. It produces two distinct oils, i.e., palm oil and palm kernel oil, which are used for culinary as well as industrial purposes. Palm oil is derived from the fleshy mesocarp of the fruit, which contains about 45-55% of oil.

Present Scenario- The production of oil palm has received greater impetus in India under the current scenario. India is one of the major producers and consumers of vegetable oils. India accounts for 12-15% of the area under oilseeds and 6-7% of the production of vegetable oil in the world. Despite annual production of about 27.00 million tonnes of oilseeds in the country, the availability of edible oil is not sufficient to meet the domestic demand. The almost stagnant domestic production of oilseeds and increased per capita consumption of edible oils has increased the dependency on imports in recent years. The country currently produces less than 50 % of its requirement of edible oils. The growth of the economy is expected to lead to increased per capita consumption of edible oils in the future resulting in greater import dependency.

Production Expansion Programme- It was

under this scenario that the Oil Palm Development Programme (OPDP) was launched during 1991- 92 under the "Technology Mission on Oilseeds and Pulses" (TMOP) with a focus on area expansion in the states of Andhra Pradesh, Karnataka, Tamil Nadu, Orissa, Gujarat and Goa. From 2004-05 onwards, the scheme is being implemented as part of the "Integrated Scheme of Oil seeds, Pulses, Oil Palm & Maize" (ISOPOM) and provides support for Oil Palm cultivation in 12 states including Tamilnadu, Andhra Pradesh, Karnataka , Kerala, Tripura, and West Bengal. In Tamilnadu, oil palm is being cultivated in Trichy, Karur, Nagapattinam, Perambalur, Thanjavur, Theni, Thiruvallur, Tiruvarur, and Tuticorin.

Oil Palm Area Expansion- A special initiative is being undertaken under the Rashtriya Krishi Vikas Yojana (RKVY) for the implementation of the Special Programme on Oil Palm Area Expansion (OPAE) in order to augment the production of palm oil by 2.5 to 3.00 lakh tonnes in the next 5 years. Under the programme, it is proposed to expand palm oil cultivation in Tamilnadu to about 700 acres more of area. The proposed financial out lay for the programme has been pegged at 4.2 crore rupees.

At the national level, it is proposed to undertake the expansion of oil palm cultivation to about 60,000 hectares more under the OPAE. It has also been decided that the expansion of area under cultivation will be concentrated on area under the purview of existing mills so as to increase the technical and economic viability of operations.

(Courtesy : Business Empire, January 2013)

"GREAT"

Seed industry in India likely to reach Rs. 10700 crore by 2015 : AASOCHEM

GROWING at a compounded annual growth rate (CAGR) of about 15 per cent, the seed industry in India is likely to reach Rs 10,700 crore mark by 2015 from the current level of about Rs 7,000 crore, according to an ASSOCHA M analysis.Besides, the production levels of seeds in India are likely to grow from the current level of about 40 million quintals to about 63 million quintals by 2015, according to a sector-specific analysis on 'The Future of Indian Seed Industry,' by The Associated Chambers of Commerce and Industry of India (ASSOCHAM).

The share of organised sector is just over half of the total seed industry at about Rs 3,250 crore while the unorganised sector accounts for the remaining as the marginal farmers comprise over 60 per cent of land owners in India and hence opt for cheaper seeds considering the cost of quality seeds is relatively higher. Andhra Pradesh, Bihar, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh and West Bengal are leading commercial seeds producing states in India.

"Limited availability of agricultural land, diverse use of agricultural crops leading to rising food crop prices, subsidies by the government to use high-yielding varieties to increase productivity and other multiple factors are driving the growth of Indian seed industry as robust seeds with vitality to increase the yield from the limited area under acreage coupled with effective crop management is need of the hour to ensure food security in India," said D S Rawat, secretary-general, ASSOCHAM, while releasing the chamber's analysis.

"The seed companies are required to convince farmers to abandon conventional seeds in favour of high-yielding hybrid seeds as the switch can help the farmers get high yields, fetch better prices for their produce and almost triple their income," said Rawat. "Besides, public private partnership (PPP) together with a strong regulatory framework and collaborative research are other key measures to ensure smooth growth of the seed industry." The global industry for seeds is likely to cross $71 billion by 2015 from the current level of about $60 billion.

The ASSOCHAM analysis revealed that farmers were gradually shedding the inhibitions about hybrids and shifting to the same as yields from varietal seeds were falling significantly but many were still reluctant as hybrids were not only expensive but also couldn't be reused. Cotton, corn, pearl millets, mustard and rapeseed, rice, sorghum, sunflower and vegetable hybrid seeds are gaining acceptance and this trend is being borne out of the variation in revenue composition of private sector seed companies.

With about 20 per cent share, cotton is the biggest component in the hybrid seed market followed by rice (15 per cent), wheat and vegetables (over 10 per cent each). While there are a handful of state seed corporations and Seed Farm Corporation of India, engaged in production, distribution and marketing of high volume low value public varieties, there are about 350 private sector producers and distributors and about 300 trading firms.

Seasonality factors and risks arising out of dependence on monsoon are certain key challenges faced by the seed companies which can surely be dealt with through strong research and development and products for both kharif and rabi seasons. Besides, there is also need to use proper technology to develop products suiting evolving disease profiles and climatic conditions.

A robust distribution network providing information on seed performance and improvements is required to gain greater acceptability. Besides, a proper inventory must be maintained to meet the future demand and crop-rotation must be done to retain the customers. Further, the growth of seed industry would depend upon the development and adoption of innovative technologies. Advanta India, Ganga Kaveri, JK, Mahyco, Monsanto India, Namdhari, Nuziveedu, Pioneer, Proagro, Rasi and Syngenta are certain leading players with major market share in the Indian seeds market.

(Courtesy : Business Empire, January 2013).

"TOO MUCH A CRIME"

Bumper cereal crop expected, but food wastage matter of concern

According to the Geneva based FAOs forecast of world cereal production, global cereal output is expected to rise to 2492 million tonnes. The forecast has been revised upwards by 14 million tonnes (or 0.5 percent) from the July forecast as a result of higher maize crops officially reported in Argentina and improved prospects in the EU and Ukraine. At the latest forecast level, global cereal production would be 179 million tonnes (7.7 percent) higher than in 2012 and a new record. The recovery is predicted to be driven by a 10.5 percent expansion in coarse grain output to 1 285 million tonnes as well as a 7.6 percent rise in wheat production to 710 million tonnes. World rice production is set to increase by 1.3 percent, reaching a new high of 497 million tonnes, in milled equivalent.

The sharp increase in global production of coarse grains in 2013 would be largely on account of a strong rebound in maize output (to 983 million tonnes), the bulk of which would originate from the United States, where maize production is forecast to reach 343 million tonnes this year, some 25 percent (69 million tonnes) higher than the 2012 drought-reduced level. Based on the current projections of overall demand, the increase in stocks would drive up the global stock-to-use ratio to 23.3 percent, the highest since 2002/03.

According to David Hallam, Director of FAO's Trade and Markets Division, the overall supply-demand situation for cereal markets is much improved over this time last year when drought-hit production and low stock-to-use ratios, especially for maize, raised serious concerns.

However, colossal loss of food is one important aspect that needs immediate attention. The waste of a staggering 1.3 billion tonnes of food every year is not only causing major economic losses but also wreaking significant harm on the natural resources that humanity relies upon to feed itself, says a new FAO report.

Food Wastage Footprint: Impacts on Natural Resources is the first study to analyze the impacts of global food wastage from an environmental perspective, looking specifically at its consequences for the climate, water and land use, and biodiversity. The key findings suggest that each year food wastage adds 3.3 billion tonnes of greenhouse gases to the planet's atmosphere. And beyond its environmental impacts, the direct economic consequences to producers of food wastage (excluding fish and seafood) run to the tune of $750 billion annually, FAO's report estimates.

FAO study says fifty-four percent of the world's food wastage occurs "upstream" during production, post-harvest handling and storage, while forty-six percent of it happens "downstream," at the processing, distribution and consumption stages. To tackle the problem, FAO's toolkit details three general levels where action is needed, namely reducing food wastage in the first place, re-use within the human food chain and third recycling and recovery.

(Courtesy : Grains Asia, September 2013).

JAI ! HO !

India Scientists develop New High-Yield Basmati Rice Variety

INDIAN scientists have developed a new basmati (fragrant) rice variety (HUBR 10-9) that has yields of up to 12% higher than the popular Pusa 1121, a variet\ that was introduced in 2003.

According to agriculture scientists of Banaras Hindu University (BHU) in India, the average yield of HUBR 10-9 is around 5.5-6 tons per hectare, which is higher than most basmati rice varieties in the country. Scientists also say that HUBR 10-9 matures in around 135 -140 days, and claim that the new fragrant rice variety is moderately resistant to neck blast and brown spot diseases. The new basmati rice variety also has a high milling rate of up to 70%. India produces about 4-5 million tons of basmati rice annually, and Pusa 1121 accounts for around 60% of the total acreage under basmati rice cultivation.

(Courtesy : Grains Asia, September 2013).

"BADLY NEEDED"

India pulses Crop update

STARTING June, the progress of southwest monsoon in India has been satisfactory so far with reasonably good spatial and temporal distribution of rains. As of August 28, the country as a whole had received rainfall 11 percent more than normal. 31 out of the 36 meteorological subdivisions have enjoyed excess to normal precipitation, according to India Meteorological Department. Agriculture Ministry's Weather Watch Group which tracks the progress of planting of various crops has reported that as of August 23, pulses were planted to 9.96 million hectares (higher than 8.53 million hectares this time last year). Normal area under kharif season pulses is about 11.0 million hectares.

While planting was completed by July, acreage reports from various regions are coming in gradually. It is expected that final kharif 2013 acreage will touch 11.0 million hectares or possibly exceed it.

Latest crop-wise acreage as of August 23 (million hectares) as compared with this time in 2012 :

Crop	2013	2012
Tur/Arhar	3.7	3.4
Urad	2.1	2.1
Moong	2.1	1.7
Others	2.0	1.3

On current reckoning, it may be sate to assume pulses crop harvest of at least 6.5 million tons with potential to go up to 7.0 million tons. Kharif 2012 harvest was 5.9 million tons.

(Courtesy : Grains Asia, September 2013).

BEWARE! BEWARE!

Edible oil may go onion way, cautions Assocham

THE Associated Chamber of Commerce and Industry of India (ASSOCHAM) has cautioned the government to take adequate precautionary measures to prevent hoarding, otherwise, edible oil may go "onion way" during the festive season. The chamber in a note on "Indian Edible Oil Scenario" has stated that in 2012, India was the largest importer ofedible oil, obtaining over 50% of its demand and emerged as the second-largest consumer after China.

D S Rawat, chamber secretary-general, said, "India's overall demand for edible oil touched 15.6 million tonne last year, as against 27 million tonne in China. Demand is growing at about 6 per cent per annum and is expected to top 23 million tonne in about five years." The edible oil consumption in the country has increased at a brisk pace over the years with growing population and increase in per capita consumption (edible oils taken into account here are soyoil, groundnut, mustard, sunflower, safflower, sesame, coconut oil, rice bran oil and cottonseed oil), according to the study.

"Due to high growth in income levels, increasing trend in spending and better living standards, India promises to continue high growth in consumption of edible oils," added Rawat.

"Due to heavy demand during the festive period, demand will increase by over 40% and the retail price of edible oil may jump by 20 to 25% if distributive mechanism was not strengthened all overthe country," cautioned Rawat.

"Edible oil usage soars during the festive season in the post-monsoon phase, as millions of people consume sweets, fried delicacies and other stuff during the September-December festive season," stated Rawat.

Also the demand for edible oil by biscuits and snacks manufacturers and restaurants may further increase at the retail level by 20-25 per cent in the festival season due to demand-supply gap. India imports about 60 per cent of its domestic demand. It imports palm oil from Indonesia and Malaysia and soyabean oil from Brazil and Argentina. Palm oil accounts for the bulk of the imports (73 per cent), with soyoil adding another 20 per cent. The edible oil imports are projected to increase to more than 15 million tonne by 2020, from 11 million tonne estimated in ongoing 2012-13 year, as perthe report.

Since the rise in supply is increasingly falling short of demand, the country's dependence on imports is only expected to shoot up, according to the paper.

The report states that the limited scope for expansion in acreage remains one of the major hindrances for increasing the production of vegetable oik in the country. Area expansion is inhibited by limited availability of cultivable land and stagnation in irrigation facilities. Despite some growth in yield of mustard, lack of increase in irrigation facilities is keeping acreage of mustard, a rabi crop, almost stagnant. Lower profits in oilseeds for the farmers due to poor yields as compared to other crops too contribute towards lack of expansion in oilseed acreage despite various promotional programmes of the government.

Unabated edible oil imports and inadequate tariff protection could result in hurting the interest of farmers and the country would never be able to achieve self-sufficiency in oilseed production unless a carefully thought action plan was initiated to ensure judicious imports during off-season and at the same time incentivise domestic oilseed production, pointed out Rawat.

Analysis of the recent growth in domestic production of soybean should serve as a good model for similar efforts in promoting other oilseeds. Coupled with this there is a pressing need to allocate more fertile and irrigated land to oilseed cultivation, as that will ensure higher returns to the farmer. However, the prerequisite for this will be development of hybrid/high yielding variety of seeds, which will assure quantum jump in yields from the present levels. Free Trade Agreements with key veg oil producing countries in Asia should provide an adequate safeguard to domestic oil industry, so that cheap palm oil imports did not trample the domestic industry, concluded the report.

(Courtesy : Grains Asia, September 2013).

"WHAT IS SWEET"

Sugar output to peak this year, glut situation to worsen

SUGAR production in India, the world's second-biggest grower, may be more than estimated as the highest monsoon rainfall in 19 years boosts yields hurt by a drought a year earlier, a growers' group said. The harvest will total 24.5 million tonnes in the 12 months starting Oct. 1, compared with 23 million tons predicted in March, said Vinay Kumar, managing director of National Federation Cooperative Sugar Factories Ltd. That compares with a crop of 25 million tons this year and more than the 23.5

million needed to meet domestic demand, he said.

Output may total 23.7 million tons in 2013-2014, the Indian Sugar Mills Association estimates. Futures are headed for a third-year of losses, the longest slump since 1992, as the world heads for a fourth year of surplus in 2013-2014. Worldwide supplies will outpace demand by 4.5 million tons in the season that starts in October, following a 10.3 million-ton surplus this season, the International Sugar Organization said Aug. 22.

(Courtesy : Grains Asia, September 2013).

"SOUND IDEA"

Malaysian palm oil producers push for biodiesel

PALM OIL has been trading at an unusually large discount to competing oils in recent months.The industry also endured the shock of record large end-201 2 stocks figure in Malaysia.

Together with concerns of large supplies in 2013 and lackadaisical demand, it is of no surprise that some Malaysian palm oil producers are again talking of burning palm oil to raise domestic use of palm oil.This would reduce stocks and it might be price supportive.

However, since the launch of Malaysia's National Biofuel Policy in 2006, the lack of will and high cost of implementing a subsidised mandate have resulted in an overhang of unused biodiesel licences, shuttered plants and shelved projects. Malaysian biodiesel players have struggled with increasingly high feedstock prices and poor export market prospects, while Indonesia gained market share on the back of a more advantageous export duty structure.

As recently as late 201 2, three biodiesel facilities were operational at sub-optimal capacities. However; palm biodiesel has offered positive margins recently. With palm oil price slumping to the floor of Brent Crude price, biodiesel makes real commercial sense.

Star Online reported on April 2, 201 3: 'According to sources, the plants of five biodiesel players, namely Carotino, Sime Darby, Kuala Lumpur Kepong, Platinum Biofuels and AM Biofuel, have already been running at full capacity over the past two months.'

Our sources reckon that Indonesian exporters may be benefiting most from the US$1 per gallon tax credit reinstated in January 2013. In the meantime, the EU is mulling retroactive implementation of antidumping duties.

(Courtesy : Global Oils &Fats Business Magazine, Vol. 10, Issue 2, 2013).

"BEWARE"

Edible oil & Fuel oil will keep India's Economic & Foreign Policy on Slippery Ground

India will spend US$ 40 billion every year on import of edible oils

VIJAY SARDANA

EDIBLE oils form an essential part of the modern diet. These oils play a vital role as an energy source, and provide the diet with many beneficial micronutrients. Like any other essential commodities, the main drivers to determine the demand of oilseeds and edible oils, are population and income.

Demand Side Analysis for Oilseeds and Edible Oils in India

Projected Population of India in 2025

According to the Report of the Technical Group on Population Projections constituted by the National Commission on Population, Government of India, the population of India is expected to increase to 1400 million by 2025 at the rate of 1.2 percent annually. As a consequence, the density of population will increase from 313 to 426 persons per square kilometer.

Projected Per-capita Income of India in 2025

According to the Chairman of Prime Minister's Economic Advisory Council (PMEAC), It has been estimated if we grow at 9 per cent per annum, India's per capita GDP will increase from the current level of $ 1,600 to $ 8,000-10,000 by 2025. It looks more on optimistic side, with this growth; India will become part of the middle income group of countries when it achieves $ 8000-$ 10,000 per capita income. In order to plan the commodities requirements, let me take a conservative estimate growth rate of 5% and per capita income will be around USD 3,000 per year.

Projected Demand of Edible Oils and Oilseeds by 2025

According to an FAO study, food energy requirements for South Asian population will be about 2700 Calories / caput / day in the year 2025. In terms of edible oil demand, it is estimated that it will be about 17 kg per capita per year. It means, India will need about 23.8 million tons of edible oils by 2025. It means with an average yield of about 30% oil from oilseeds, we will need about 80 million tons of oilseeds. If yield is less we will need more seeds.

Supply Side Analysis for Oilseeds and Edible Oils in India

With the projected demand of about 80 million tons of oilseeds to produce about 23.8 million tons of edible oils, India will need two vital natural resources i.e. water and land.

Land Availability for Cultivation

According to Minister of Agriculture, India will have about 0.12 ha. per capita land for cultivation by 2025. Net sown area is 140.02 m ha and it has remained unchanged for the last two decades. Total arable land is about 182.47 m ha, which is about 55% of India's reporting area and about 11% of world's arable land. Out of this, only one third of cultivated land is irrigated and producing 55% of food grains.

About 78.17 m ha (2010) of arable land is rainfed contributing to 45% of agricultural production, including oilseeds. At the same time we have about 120 million ha. as degraded lands.

With the current productivity levels of 1.10 tons per hectare, we will need about 73 million hectares of land to produce 80 million tons of oilseeds. This is about 52% of the total agriculture land in India. Currently about 55% of agriculture land is already used to cultivate food gains i.e. cereals. It means with the existing level of productivity and competing use of agriculture land, it is impossible to meet the demand of oilseeds and edible oils by domestic production. At present about 18 million ha. is used for production of oilseeds in India. It means we must develop an action plan to produce 4.5 tons per hectare per year to meet our demand for oil from domestic sources by 2025.

Water Requirement and Availability

According to Minister of Agriculture, India will have about 1700 m3 of water per person and 84% of this water will be used for irrigation purpose. This is at stress level.

According to ICAR, water availability for agriculture is estimated to go down by up to 12 per cent from the current level by 2025 from the current level. In other words, farmers, in fact, will require 25 per cent more water in 2025 than what they are consuming currently to produce food for feeding the domestic population. By 2025, the water requirement for irrigation will be 790 billion cubic metres.

India will Remain Net Importer of Edible Oils

With the best of efforts and resources, India will not be able to produce more than 60 million tons of oilseeds. This will be short of about 20 million tons. If we take the global average in oil seed production, we will not be able to produce more than 40 million tons of oilseeds, which is half of the requirement of oilseeds required to meet domestic demand.

In terms of edible oil, India will always need about 12 to 13 million tons of imported edible oil every year in the year 2025 onwards. It means with current rate of exchange rate India will spend about USD 18 to 20 billion every year in import of edible oils. If we take the inflation at the rate of 6% per year and exchange rate unchanged, India will need about USD 40 billion to meet the shortfall of 12 to 13 million tons of edible oils. For some reason if we are not able to improve our productivity from 1.10 tons ha to 2.00 tons per hectare, the import bill will increase.

What is the way forward to minimize import dependency for edible oils?

With growing gap between demand and domestic supplies, it is important for government of India to come^out with a time-bound action plan to minimize the dependency on imported edible oils. The growing dependency on imported oil will put pressure on current account deficit and food security of the country.

Oilseeds Vital for Nutrition Security of India

Oilseeds are not only an important source of edible oils but also very vital and important source of protein for animal nutrition as well as human nutrition. Edible oil imports, if not managed properly, will have serious adverse implications on the domestic oilseed sector. This needs a very serious and calibrated policy intervention because over dependency on imports will hurt the local oilseed production. Any adverse impact on domestic oilseed production will not only increase dependency on imported edible oils but also affect the supply of oil meal or oil cakes for livestock feed industry and protein source for human and animal nutrition.

Challenges in Achieving Productivity Targets

Based on the global experience, average yield of oilseeds in the world is about 2 tons per hectare and the best possible average is yield is 3.5 tons per ha in some countries. It means, considering the global experience, on an average, we will be able to produce about 36 million tons to at the best about 60 million tons of oil seeds per year. In order to meet the production target, we must adopt an agro-climatic condition-based production policy to include soil health policy to support proper seed technology adoption, irrigation facilities and required agri-inputs and extension services.

High yielding Oilseed Technology

India needs world class seed technology which can give a quantum jump to the oilseed production. India must establish a program to produce high yielding varieties with the help of modern technologies like nanotechnology and nutrigenomics. Success parameters of such seed technology programs must be linked to the best in class in the world. Only research program where technology is designed to deliver best in the class output should be supported by tax payers' money. In order to achieve this, even if global collaboration or partnerships are required, we should encourage this. In case new set of rules and policies are required, it should be done on priority basis, keeping national interest as paramount.

Minimize Cost of Production

Edible oils will always remain essential components of basic human diet the world over. Policies must be oriented towards minimizing the cost of production and processing of edible oils. In order to ensure this, if existing laws need to be reviewed and amended, it should be done on priority basis, so that corrective actions can start on time and the country can save time and money.

Transaction Cost and Time Needs to be Minimized

On one side we have serious issues of ensuring food security, on the other hand we have various laws which are adding unproductive cost and time lag in achieving food security in the country. It is high time we review laws like Agriculture Produce Marketing Committee Act, various acts related to seeds and agro-chemicals, agriculture research and approval processes, etc.

I am fully aware that various vested interests will object to any modifications in the existing regulatory and policy framework but in the national interest we should ignore these objections and move towards reforms which can ensure timely delivery and transparency in decision making process.

Besides improving national food security, development of the oil seeds and edible oil sector will help in generating employment in rural India, while providing animal nutrition security which is extremely vital for national food security. It will also save part of USD 40 billion valuable foreign exchange to manage the current account deficit. Simultaneously, this will help India in reducing international pressures on its economic and foreign policies.

National food security is a precondition for any sovereign economic and foreign policy.

Considering edible oil and fuel shortage in India, India's economic policy and foreign policy will remain under foreign pressure.

(Courtesy : September & October 2013, SAARC OILS & FATS TODAY).

"LOOKOUT"

Fats and Oils Processing Technology and the Way Forward

Bent Sarup

THE fats and oils industry is fundamental in its role of providing products and ingredients for the feed, food, biofuels and oleochemical sectors. The need for these products is only seen to increase in the future. This brief review will venture a view of where the industry would be going in the corning decade moving towards 2025.

Industry Drivers

As most industries the fats and oil industry is adapting to global megatrends such as rising population, scarcity of clean water, efficient use of (sustainable) energy, globalization, urbanisation, care for the environment, etc.

Additionally, since most of the output volume of the fats and oils industry can be characterized as commodities, the industry also underlies the drivers for commodity industries such as drive towards economics of size, operational excellence and industry consolidation.

On top of the megatrends above, consumers will to an increasing extent demand safer and healthier food and other products, while being more conscious about the way the products are made, such as work ethics and respect for the environment and sustainability.

Technology suppliers align with these trends in their development work to give the industry possibilities to optimize their facilities to such future demands.

Examples of technology developments

Fundamental to optimum design of production facilities is the understanding of the properties of the materials handled in the plant, of the unit operations and the overall plant performance. Recent advances in modelling from the molecular level to the plant level, and even enterprise levels, have given possibilities to increase the efficiency and precision in design and optimisation work.

Unit operations related to separation and heat transfer are key to optimum plant design. High speed centrifuges are well established for their high separation efficiency, having only a small liquid holdup, enabling faster start-up and adaption the feed compositional changes.

Compact heat exchangers, gasketed or welded, enables highest possible heat transfer efficiency, combined with minimal installation requirements. While cooling has typically been carried out with cooling water, air heat exchangers - combined with maximum heat recovery - is foreseen to gain in importance to save cooling water usage. In India the compact heat exchangers have proven their suitability for optimizing solvent recovery sections (refer photographs) and this development is expected to continue as the industry realizes the potential energy and solvent savings.

In the overall value chain from seeds or fruits to consumer products, the refining operation is often the part where the value creation (operation margins) is smallest. So besides efficiencies in separation and heat recovery, the refiner would be interested in additional income streams. Use of enzymes for degumming is now well established, both to enhance oil yields, but also to enable deep degumming. New generation of enzymes are foreseen to lead to further advances in the industry towards 2025.

Deodorizer distillates represent a source of valuable micronutrients, such as tocopherols and tocotrienols. There is increased focus on recovering these valuable micronutrients the design methods mentioned above enables optimisation of existing systems as well as being instrumental in developing new technologies, such as the new ALFA LAVAL TocoBoost® technology.

In summary it is believed that the industry will experience significant technological advances in the next decade to meet the challenges and opportunities in the market. Close collaboration between the industry, their technology suppliers and with universities will secure a bright future for all involved.

(Courtesy : September & October 2013, SAARC OILS & FATS TODAY).

"RESTORE"

Storage for vegetable and fruits required

INDIA ranks second in the world in production of fruits and vegetables and first in milk production besides being one of the largest producers of food grains among the nations. These accomplishments of the green and white revolutions have, however, not been matched by concurrent developments in supply chain management, and in new technologies for better processing, preservation, and storage of food.

Because of that, pockets of shortages and near starvation, substantial wastages due to spoilage, quality deficiencies, and inadequate returns to the farmer are very much in evidence in the country. Unprocessed food itentS"are susceptible to spoilage by biochemical processes, microbial attack and infestation. The right post-harvest practices such as good processing techniques, proper packaging, transportation and storage of food articles can play a significant role in reducing spoilage and extending shelf life. The challenges in processing lie in retaining the nutritional value, flavour, aroma, and texture of foods, and presenting them in near natural form.

The options for food preservation, distribution and processing are diverse and demanding, and need to be addressed on several fronts to derive maximum market benefits. Presently, the organisations addressing the educational and R&D requirements are too few, and there is a pressing need for supplementing their efforts.

Perhaps the most fundamental requirement to cut down wastage of easily perishable food articles like vegetables and fruits is to store them in cold storages in the farming locations. Today farmers are not getting the right prices for vegetables and fruits and are forced to sell their produce at very low prices because of inadequate cold storage facilities. Fruit and vegetable farmers have to suffer distress selling also because banks do not lend them against produce stored in cold chains. Existing cold storage owners and middlemen are aware of this situation and exploit farmers by offering sub-market price. The government's decision to bring cold chains into the Warehousing (Development and Regulation) Act, in this context, is a step in the right direction.

This move could enable the farmers to use cold storage receipts for borrowing from banks. The initiative could prevent distress sale of fresh produce and may also increase investment in supply-chain management. A panel headed by the managing director of National Horticulture Board is finalising the technical assessment procedures of horticulture products, which includes grading, sorting for ascertaining the quality.

The government had introduced a negotiable warehouse receipts system for accredited warehouses in April 201 1 to help food grain farmers to gain access to bank loans and avoid distress sale. Now, vegetables and fruits will also come under the Warehousing (Development and Regulation) Act like food grains. With the inclusion of cold storages in the Act, receipts given by cold chains would be treated as negotiable instruments, allowing farmers to avail loans at subsidised rates against their produce.

Cold chain receipts will allow transfer of ownership of the agricultural products stored ir a warehouse without actually delivering them.

(Courtesy : Businessempire, November 2013).

“DID U KNOW”

Benefits of different types of Indian rice

RICE is a staple food in most Indian homes. However, there are different varieties of Rice available in our country, Basmati Rice, Brown rice and White rice. Let us understand the health benefits of these three varieties.

WHITE RICE:

The milling and polishing processes of white rice removes most of the important vitamins and other nutrients from it. So WHO suggests and recommends that white rice be fortified with important vitamins and mineral premixes, as polished rice is nothing more than refined starch. Further research is required to build the evidence-base on the use of fortified rice and to develop global technical guidelines for rice fortification. Health benefits include:

Gastrointestinal: White rice is one of the easiest and quickest foods to digest and requires only an hour to completely digest. Since white rice is low in fibre, it is very soothing to the digestive system and easily digested. So, it is great for relieving digestive disorders like diarrhoea, dysentery, colitis and even morning sickness. It is the best food for infants, young children and old people. Overall energy: the body needs carbohydrates to function and white rice is an excellent source of energy. Protein: Every 1 50g of rice has about 5 grams of protein.

Rice powder is also used externally as a soothing powder in cases of skin inflammation such as small-pox, measles, prickly heat, burns and scalds.

BROWN RICE:

Brown rice has several health benefits. However, it is not very commonly used in Indian households mainly because people are ignorant of the health benefits of brown rice and secondly that it is costlier compared to white rice. The health benefits of brown rice includes:

Brown rice is an excellent source of soluble fibre. It helps to lower the evels of'bad' LDL cholesterol in the blood. There is also some suggestions that the oil present in brown rice or extracted rice bran oil may help lower harmful cholesterol levels and blood pressure, whilst raising the levels of ‘healthy’ HDL cholesterol.

The fibre in brown rice means that the digestion time of this carbohydrate is slower than processed grains, including white rice. This means that there is a more controlled slower release of sugar into the blood stream and it has a lower glycemic index (CD compared to other grains.

Brown rice is very rich in vitamins and minerals and hence nutritionally more beneficial.

BASMATI RICE:

Basmati rice is another unique species of rice originating from India. Basmati rice is also one of the varieties of rice used in many families. There are different variants of Basmati rice available in the market at varying costs. Just like all species of rice, basmati is available in white or brown versions, depending on the extent of the milling process.

Brown basmati rice is comparable to other types of brown rice in nutrient content (although it does contain about 20% more fibre compared to most other types of brown rice), and white basmati rice is comparable to other types of white rice. The health benefits of fibre has already been discussed earlier in the article.

Basmati rice and Jasmine rice are long-grain varieties that have been cultivated to bring out distinctive flavour profiles. Long grain of the rice gives a royal look to the rice recipe prepared, be it plain jeera rice or vegetable pulao. Basmati rice has a typical, unique aroma. In the case of basmati, this aroma is due to the presence of a chemical called 2-acetyl-1 -pyrroline, which is found in basmati rice at about 90 parts per billion. That’s about 1 2 times more than in other types of rice, giving basmati its special aroma.

(Courtesy : Businessempire, November 2013).

"USEFUL INFO"

10 Essential Health Tips For seniors

THE first wave of baby boomers are turning 65 years old this year and becoming "senior boomers" and Medicare-eligible. In fact, more than I 0,000 baby boomers a day are now turning 65-that's one every eight seconds, a pattern expected to continue for the next I 9 years.

Happily, aging is different now than it was for our parents and grandparents. Today, there are more people living longer than at any other time in history. In fact, boomers will number 78 million by 2030. "This generation, associated with social change including the civil rights and anti-war movements in the 1960s, has another important cause-staying healthy," says soon-to-be 65-year-old Arthur Hayward, MD, a geriatrician and clinical lead physician for Kaiser Permanente. "We need to become activists in promoting healthful behaviors and try our best to remain active and healthy the rest of our lives."

How to do it? Dr. Hayward recommends these 10 easy health tips for seniors to help baby boomers live longer and thrive:

Quit smoking: Take this critical step to improve your health and combat aging. Smoking kills by causing cancer, strokes and heart failure. Smoking leads to erectile dysfunction in men due to atherosclerosis and to excessive wrinkling by attacking skin elasticity. Many resources are available to help you quit.

Keep active: Do something to keep fit each day-something you enjoy that maintains strength, balance and flexibility and promotes cardiovascular health. Physical activity helps you stay at a healthy weight, prevent or control illness, sleep better, reduce stress, avoid falls and look and feel better, too.

Eat well: Combined with physical activity, eating nutritious foods in the right amounts can help keep you healthy. Many illnesses, such as heart disease, obesity, high blood pressure, type 2 diabetes, and osteoporosis, can be prevented or controlled with dietary changes and exercise. Calcium and vitamin D supplements can help women prevent osteoporosis.

Maintain a healthy weight: Extra weight increases your risk for heart disease, diabetes and high blood pressure. Use the Kaiser Permanente BMI (body mass index) calculator to find out what you should weigh for your height. Get to your healthy weight and stay there by eating right and keeping active. Replace sugary drinks with water-water is calorie free!

Prevent falls: We become vulnerable to falls as we age. Prevent falls and injury by removing loose carpet or throw rugs. Keep paths clear of electrical cords and clutter, and use night-lights in hallways and bathrooms. Did you know that people who walk barefoot fall more frequently? Wear shoes with good support to reduce the risk of falling.

Stay up-to-date on immunizations and other health screenings: By age 50, women should begin mammography screening for breast cancer. Men can be checked for prostate cancer. Many preventive screenings are available. Those who are new to Medicare are entitled to a "Welcome to Medicare" visit and all Medicare members to an annual wellness visit. Use these visits to discuss which preventative screenings and vaccinations are due.

Prevent skin cancer: As we age, our skin grows thinner; it becomes drier and less elastic. Wrinkles appear, and cuts and bruises take longer to heal. Be sure to protect your skin from the sun. Too much sun and ultraviolet rays can cause skin cancer.

Get regular dental, vision and hearing checkups: Your teeth and gums will last a lifetime if you care for them properly-that means daily brushing and flossing and getting regular dental checkups. By age 50, most people notice changes to their vision, including a gradual decline in the ability to see small print or focus on close objects. Common eye problems that can impair vision include cataracts and glaucoma. Hearing loss occurs commonly with aging, often due to exposure to loud noise.

Manage stress: Try exercise or relaxation techniques-perhaps meditation or yoga-as a means of coping. Make time for friends and social contacts and fun. Successful coping can affect our health and how we feel. Learn the role of positive thinking.

Fan the flame: When it comes to sexual intimacy and aging, age is no reason to limit your sexual enjoyment. Learn about physical changes that come with aging and get suggestions to help you adjust to them, if necessary.

(Courtesy : Businessempire, November 2013).

"GREAT HONOR"

Formation of International Organisation for Rice Bran Oil

IN the first International Conference on Rice Bran Oil held in Thailand in May, 2013, there was a common consensus for setting up of an International Council on Rice Bran Oil with an objective to promote and encourage the International technical cooperation, exports of International trade, promote the virtues of Rice Bran oil and consumption across the world.and a Ad-hoc Committee was formed to initiate the process for setting up an International Council on Rice Bran Oil.

I am happy that the first meeting of the Committee is being organized at Bangkok on 27th September to finalise the formation of International forum. Dr. A.R. Sharman, Chairman, SEA Rice Bran Oil Promotion Council, Shri Ashok Sethia, Past President, SEA and Dr. B. V. Mehta, Executive Director SEA would be participating on behalf of the Association.

The formation of the International RBO Forum will give further boost for promoting Rice Bran Oil across the globe.

(Courtesy : Sea News Circualr, Vol. XV, Issue 6, September 2013).

"TOO BAD"

Vegetable Oil Refining Industry is in Deep Crisis

EDIBLE oil refining industry is in deep crisis since last year, due to Indonesia and later Malaysia introducing inverted export duty structure on Crude Palm Oil & Refined Palm Oil / Palmolein, whereby the export tax on Refined Palm Oil/Palmolein is much lower than export tax on Crude Palm Oil and, more particularly, since end January 2013 after the Indian Government levied an import duty of 2.5% on CPO keeping refined oil duty unchanged at 7.5%, thereby reducing the duty gap between CPO and Refined Palm Oil / Palmolein to 5% from 7.5%. The Association has brought to the notice of the Central Government the plight of the industry and has requested it to raise the duty difference between CPO and Refined Palm Oil / Palmolein by 7.5% + 6.0% current duty difference in Indonesia to save the refining industry from getting ruined.

(Courtesy : Sea News Circualr, Vol. XVI, Issue 6, September 2013).

"FROM TECH POET"

FOREWORD TO VISION 2025

Nadir Godrej,
Managing Director,
M/s. Godrej Industries Ltd.

The Solvent Extraction Industry
Was very small in Sixty Three.
Meal was exported then as now.
The government would scrape and bow
To all who could bring dollars back
And Manubhai Shah kept a track.
the industry couldn't advance
If development was left to chance.
A national body he thought was best
As regional groups in the South and West
Could never speak with just one voice.
Of course he made a perfect choice.

And so back then the industry,
Coordinated nationally,
And SEA came into being
And after Fifty years on seeing
The Pomp of the Golden Jubilee,
I doubt anyone in Sixty Three,
Could have known that SEA would be
The massive giant we now see.
850 members it can boast
With plants both inland and on the coast.
Its voice is heard everywhere.
A broader scope is clearly there.
Whether the issue is oil or seed,
Chemicals or meal or feed.
The voice the government will heed
Is our own SEA indeed.
It's recognised for canalisation
As well as for registration.
And as for knowledge dissemination
Globoil's the leader in the nation.
I've always found it very pleasant
To deal with leaders past and present
But what makes SEA so much better
Is undoubtedly Dr. BV Mehta.
And for its Golden Jubilee
They've constituted a committee.
Luminaries of the industry
Will gaze in crystal balls and see
A vision for the industry.
The 'Foreword' task came to me.
And so of course I will strive
To pen my vision 2025.
Right now dark clouds are everywhere.
But above the clouds the weather's fair.
Like a plane we should soar
Above the gloom and look for more.
If we can alter our behaviour
Agriculture can be our saviour.
If our policies are bold
Our yields can rise many fold.
Oil seeds we have always had
The yields so far have been bad.
But newer seeds are at hand
And yields will rise, I understand.
More Oil Palm can be made to grow.
And lots of palm oil will then flow.
As cotton and maize both expand
Their oils will also be at hand.
And self sufficiency by '25
Is something for which we can strive.
The task is tough but with some toil
All can be grown on our soil.
An import duty would be of aid
On refined oils more should be paid.
Refining then would be done here
And that's something that we will all cheer.
Our Oleochemicals will grow
And biofuels will also flow.
Technology will be brought to bear.
With efficiency everywhere
Our future will be very bright
If this vision is kept insight.
Now some may think it is a pity
I don't explain the nitty-gritty.
So I suggest you take a look
At the rest of our excellent book!

(Courtesy : Sea News Circualr, Vol. XVI, Issue 6, September 2013).

"WELL SAID"

Focus on Oilseeds Needs to be Revived'

R.S. PARODA, former Director-General of ICAR, has called for revival of focus on oilseeds in order to reduce dependency on imports and encourage domestic production.

"We must have a clear national policy of bridging the yield gaps and increased oilseeds production to reduce vegetable oil imports as was achieved during the Technology Mission on Oilseeds in the early 1990s," he said.

Delivering the M.V. Rao Lecture on emerging concerns of Indian agriculture here, he had said that there had always been a huge gap between the domestic demand and production.

Duty Changes : Referring to the changes in duties made now and then in the Exim Policy, he said it was like fire fighting. “You can not depend on this forever. “You need to have a long term policy,” he said.

He said the demand for vegetable oils would only grow as incomes grow. The per capita consumption would grow up to 16.43 kg a year by 2020 from about 14 kg now. It would go up to 17.52 kg by 2030 and 19.16 by 2050. The demand for edible oils from industry too would grow.

Support Price : He said support price would play an important role in increasing the oilseed area. ‘The support price is evidently in clear favour of rice and wheat compared to oilseeds mainly on account of food security considerations. Similar consideration is warranted for oilseeds as well,” he felt.

Paroda said low productivity and uncertain production of oilseeds was mainly due to their cultivation under rainfed conditions.

It was also constrained by several biotec stresses such insect pests and disease that were being further aggravated by changing climatic conditions. Source : The Hindu Business Line dated 26th Ai 2013.

(Courtesy : Sea News Circualr, Vol. XV, Issue 6, September 2013).

"A REVOLUTION?"

Special Report on

Aqueous Oil Extraction

Marguerite Torrey and Joseph Doolen

OLIVE OIL extraction, carried out in the traditional manner, is the oldest green technology used to isolate edible vegetable oil. It is also the earliest instance of an oil extraction carried out with water.

Historical evidence shows that olive oil production began about 2000 BCE (Amouretti, 1996). For centuries the basic batch processes remained unchanged—harvesting, crushing, and pressing the fruits at ambient temperatures to release the oil from the plant cells, and then decanting the oil from the vegetable water that was simultaneously extracted from the fruits.

Modern virgin olive oil production qualifies as a green, sus-tainable technology because extraction is carried out at or near ambient temperatures (cold-pressed). No heating is applied during the process, so no resources have to be expended for that. No solvent other than water is used in removing the oil from the plant tissues. And since the trees are perennials, their continuing presence helps to tie down the soil and lessen erosion for periods ofyears.

MODERN AQUEOUS OLIVE OIL EXTRACTION

Olives, which have a water content of 50% (Boskou, 2006), and oil palm fruits, which have a water content of perhaps 30% when they are ripe, are the primary fruits being extracted today for their oil. In modern olive oil processing, olives are collected, cleaned to remove leaves and twigs and other extraneous materials, and then washed. If the olives are to be processed batch-wise, they will likely be moved to the crushing step almost immediately. Otherwise, the olives are susceptible to rapid oxidative degradation if they are stored

• Olive oil has been produced through an aqueous oil extraction process for millennia. However, olive oil today constitutes only about 2% of commercial edible oil production, so the question arises: What other commodity oils can be extracted via a green, hexane-free, aqueous-based process?

• Roughly a third of the world's edible oil comes from the fruits of the oil palm, which are processed using technologies based on water to produce palm oil. In the past two decades, technology based on aqueous processes has been developed to produce culinary avocado oil. But applying such technology to seeds is more difficult because the seeds on which much of the world's vegetable oil trade is based have a high protein content. This leads to emulsion formation, making separation of oil from the aqueous phase difficult.

This special report highlights advances in aqueous extraction of olive (this page), palm (559), avocado (560), soybean (593), corn (595), and camellia (599) oil, as well as in China (601) and using surfactants (604).

for more than a short time.

Larger mills are likely to run continuously. To ensure that enough cleaned olives are available to run for 12-24 hours a day without a break, the cleaned olives may be held for a period of time in stainless steel hoppers until they are fed into a continuous crushing system.

Hammer mills are commonly used in modern mills to crush the olives. They are especially well suited for reducing the heterogeneous mixture of soft fruit flesh and hard pits. The mills rupture the cellular and vacuolar membranes of the fruits, freeing the oil droplets inside. The mixture of fruit flesh and pits remains in the reduction zone until the particles in the resultant pulpy mass have been reduced to a predetermined size.

The olive pulp is then pumped to malaxers, or mixers. There, as the pulp is turned over and over for 60-90 minutes at under 30°C, the freed oil gradually agglomerates into droplets having a wide range of sizes (Petrakis, 2006). These are in contact with the water released from the cells as well as any residual water from the washing step. Industrial enzymes can be added during malaxing to increase oil yield and enhance recovery of phenolic content of the final product (Chih et al, 2012).

The equipment that defines modern aqueous oil extraction is the horizontal centrifuge decanter, first introduced by the Swedish company Alfa Laval in 1970 (Alba et al, 2011). The two-phase horizontal centrifuge "decanter consists of a cylindrical-conical rotating bowl and a helical hollow-axis screw rotating coaxially inside it and at a slightly different speed to the bowl" (Fig-1).

As malaxed olive paste is injected continuously into the two-phase horizontal centrifuge decanter through an opening in the hollow screw axis, water is added to the mix. Centrifugal force presses the heavy wet olive solids (pomace) against the wall, and they are slowly moved toward the end by the difference in rotation speed between the auger and the bowl. The lighter oil layer forms a ring nearest to the centrifuge axis, and is drained at the opposite end of the device.

(A so-called three-phase horizontal centrifuge decanter— which separates the paste into pomace, water, and oil—is also used commercially. Its greatest disadvantage compared with a two-phase system is that it generates water with a much higher contaminant level that requires greater pretreatment before it can be disposed of.)

The olive oil exiting the two-phase horizontal decanting centrifuge is actually a mixture, containing mostly oil and some water, together with fine particles of olive-flesh. The three phases can be separated by natural settling followed by decanta-tion, centrifugation, or a combination of

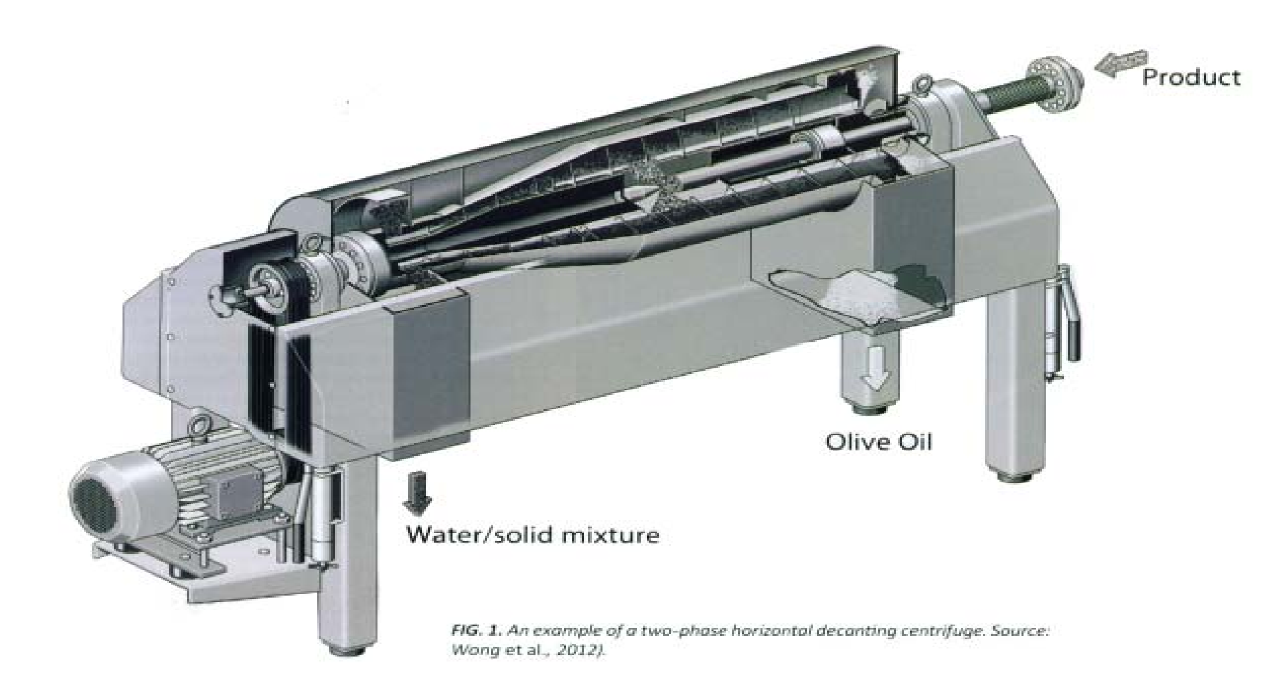


FIG. 1. An example of a two-phase horizontal decanting centrifuge. Source: Wong et al., 2012).

both process. Sieving through a vibrating screen to remove solids; passage of the oil-water mixture through a vertical centrifuge, and a final settling or decantation process to remove the air added to the oil during centrifugation are widely used processes before sending the oil to storage.

AQUEOUS PRO\CESSING OF PALM OIL PRODUCTS

The history of human use of palm oil may run as far back as Egypt 7000 years ago. European explorers and traders sailing along the coast of West Africa from 1400 A.D. onward found palm groves being harvested, and the Portuguese began to trade in palm oil around 1506 A.D.

Traditional extraction methods for palm oil were labor intensive and resulted in poor recovery and poor quality of the oil products. They included either pounding the mesocarp (the soft tissue between the skin and the kernel of the fruit) or else treading bunches that had been split, sometimes boiled, and left to soften for several days. Expelled oil was separated from the FIG. 2. Freshly processed avocado oil. Photo courtesy of A. Logon, Avocado Health Limited, New Zealand/Mexico resultant mash by skimming. The kernels were then picked out by hand, dried, and hand-cracked for subsequent production of palm kernel oil.

The first power-operated mills were constructed in Africa before 1914, but oils mills similar to those used today did not appear until the late 1960s.

Present-day oil palm milling processes recapitulate earlier processes, using both physical methods to segregate the kernels from the mesocarp and heat to hasten the processing. Harvested fresh fruit bunches (FFB) need to be processed quickly to minimize the formation of free fatty acids (FFA) that adversely affect oil quality. To this end, bunches are steamed for 60-90 minutes at 140°C and 3 kg/cm2 pressure to stop the increase of FFA and make it easier to strip the fruits from the bunches (MPBO, 2012). Steaming also pre-conditions the kernels to prevent their breaking during subsequent pressing and nut cracking.

Fig. 2 - Freshly processed avocado oil. Photo courtesy of A. Logan, Avocado Health Limited, New Zealand / Mexico.

After heating, the FFB are fed to a rotary drum thresher, where the fruits are separated from the spikelets on which they grew in the bunch. The fruits are collected (the empty fruit bunches are segregated for other uses) then reheated with live steam to loosen the mesocarp from the kernels. The fruits are mashed, and heating ruptures the oil-bearing cells of the mesocarp.

Most commonly, palm oil is obtained from the digested fruits by pressing using twin screw presses (MPOB, 2012). Hot water is added to enhance the flow of oil when necessary. The oil slurry is collected in the crude oil tank for purification, and the fiber and nuts go to the depericarper for separation. At this point, the crude palm oil from the presses contains 35-45% palm oil, 45-55% water, and varying proportions of fibrous materials.

The oil is then sent to a vibrating screen of 30-40 mesh to remove the major part of the fiber and residue. It is then pumped to a clarification tank, held at about 90°C, for oil separation. The clarified oil then passes through a high-speed centrifuge to remove impurities from the oil. The oil is dried under vacuum, cooled to about 45°C, and sent to storage.

AVOCADO

As the popularity of avocado fruits for edible purposes has increased in the past few decades, so has global production. Growers and shippers seek to market only the best fruits, so as a corollary, the amount of fruit rejected from the fresh fruit trade has also increased. Growers have looked for alternative uses for discarded fruit—and discovered a burgeoning interest in using avocado oil extracted from the fruits for culinary and cosmetic purposes.

Marie Wong of Massey University, Auckland, New Zealand, pointed out: "The oil is in the flesh of the fruit; the flesh contains a relatively high percentage of water compared to seeds and pulses. Hence, the aqueous extraction ... is more suitable for these oils," which have a water content of 65% (Woolfefd/., 2009).

Culinary properties. Avocado oil for use in cooking resembles olive oil. Since both oils are extracted by physical means with little or no heating, they both retain the green color of the fruits they come from (Fig. 2). At least 60% of the fatty acids in the oil are monounsaturated (oleic and palmitoleic), and about 10% are polyunsaturated, making for a healthful oil. According to Andrew Logan, of AvoHealth (www. avohealth.com), avocado oil has "a high lutein content [important in eye health] and very high (5-sitosterol content.".

Alpha-Tocopherol, an antioxidant, is the major form of vitamin E found in avocado oil. The levels in avocado oil are similar to those in olive oil (0.1 - 0.4 mg g'), and the presence of this antioxidant helps extend the shelf life of both oils.

The smoke point of avocado oil is high (>250°C), indicating its suitability for frying. The oil from the 'Hass' cultivar, the most popular avocado, has been described as having the flavor of avocados, with a grassy and butter/mushroom-like component, whereas the 'Fuerte' cultivar produces oil with more mushroom and less avocado flavor (Wong et al., 2010).

In comparing the cold-pressing procedures used to produce avocado oil with those for olive oil, there are several differences. For instance, seeds are not removed from olives before processing; their removal is essential for avocados. Water may need to be added to avocado flesh during malaxing to lower the viscosity. And Wolff and coworkers initially found that adding enzymes such as pectinase during malaxation improved oil yields by 5-40% in early-season fruits. Enzymes made no difference in mid-season avocados.

The top avocado producer in the world is Mexico (1.26 million metric tons in 2011). Mevi Avocados, one of Mexico's leading avocado growers, began commercial avocado oil production in a new 10,000 square meter processing and packaging plant injalisco, Mexico, in the second quarter of 2013. Mevi is operating the plant as a joint venture with AvoHealth, and according to Andrew Logan, they are using "cylindrical malaxers to eliminate dead spaces and reduce the opportunity for oxygen damage." The temperature in the malaxers is kept at about 40-50°C, which does not adversely affect oil quality. Logan commented, "Cylindrical malaxers... maximize the heat transfer area, which in turn reduces residence time."

OTHER APPLICATIONS OF AQUEOUS EXTRACTION

Keshavan Niranjan, a professor of food bioprocessing with the University of Reading (UK), points out the advantage that aqueous oil extraction has in processing fruits compared with seeds and pulses. "They don't have significant levels of proteins which would otherwise stabilize any emulsion formed, making separation of oil from the aqueous phase difficult," said Niranjan. "This is a major issue with soybean."

To counteract oil/water emulsification and the negative impacts on oil yield and quality, industrial processes for the extraction of edible oil from oilseeds generally involve a solvent extraction step, often using hexane. More importantly, this type of extraction is also often cheaper than using mechanical means. High oil yields have been reported for such processes, some in excess of 95% (Rosenthal etal, 1996). However, the organic solvents used, especially hexane, contribute to emissions of volatile organic compounds.

Marguerite Torrey is technical projects editor for Inform. She can be contacted at mtorrey@iaocs.org. Joseph Doolen is a science and political journalist who is currently pursuing his doctoral degree. He can be contacted atjosephdoolen@hotmail.com.

(Courtesy : Inform, October 2013, Vol..24 (9).

Stabilizing edible oils with supercritical extracts from herbs

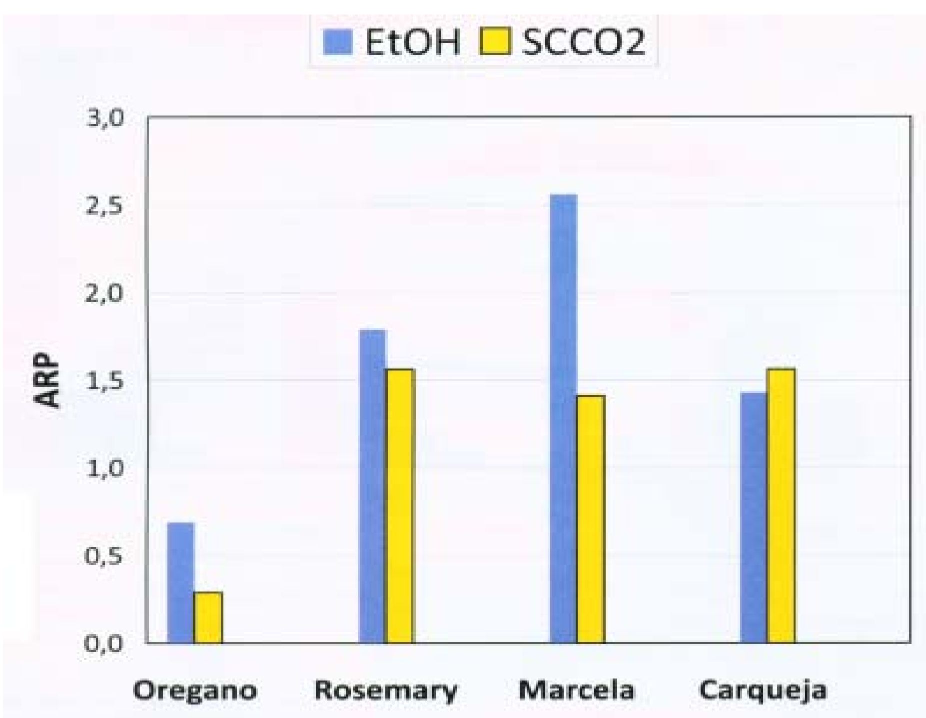
Ignacio Vieitez, Isabel Mailhe, Mathias Braun, and Ivan Jachmanian

EXTRACTS from a number of common herbs and spices are rich in natural antioxidants. Such extracts not only provide efficient protection from the harmful effects of free radicals but also offer the food industry a natural alternative to synthetic antioxidants that are often used to stabilize refined vegetable oils and other food products.

SUPERCRITICAL fluid extraction with carbon dioxide offers several advantages when compared with conventional organic solvents: Supercritical CO_2 is safe, nontoxic, noncarcinogenic, and nonflammable. It also has moderate critical points (31.1 °C, 7.38 MPa). Additionally, the selectivity of supercritical CO_2 used as extraction solvent can be conveniently adjusted by varying temperature and pressure, and supercritical CO_2 can be efficiently separated from the final extract by simple decompression.

Our research team recently investigated the efficiency of supercritical CO_2 extracts from four herbs—rosemary (Rosmari-nus ojficinalis), oregano (Origanum vulgare), marcela (Achyrocline satureioides), and carqueja (Baccharis trimera)—in the stabilization of sunflower oil (SFO) when they were added to the oil at two different concentrations.

The supercritical extractions were performed at 40°C and 300 bar (30 MPa). Extracts from the



◄ *FIG. 1.*
Antiradical power (ARP) of the extracts obtained from four herbs using ethanol (EtOH) or supercritical carbon dioxide ($SCCO_2$) as solvent. Each ARP value represents the average of two determinations. Error bar represent one standard deviation. Abbreviation: DPPH, diphenylpicrylhydrazyl radical.

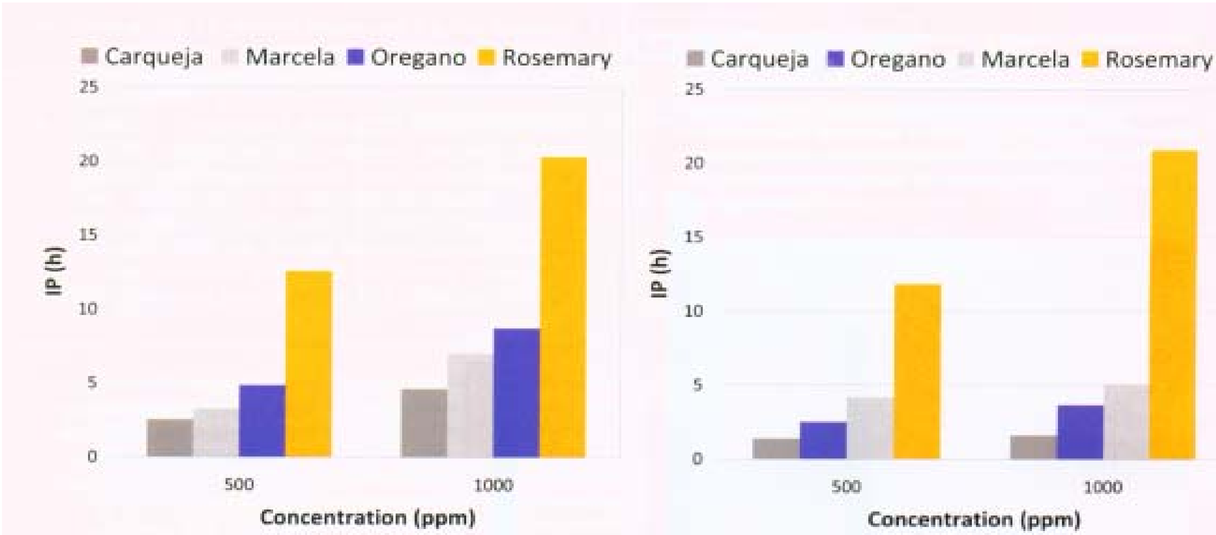


FIG. 2. *Induction period at 100°C (IP100°C) corresponding to the purified sunflower oil supplemented with 500 or 1000 ppm of (left) ethanolic extract or (right) supercritical CO_2 extract.*

same herbs were also obtained by a prolonged maceration (48 h) in ethanol at room temperature to compare the efficiency of the two methods.

Figure 1 shows that all the extracts exhibited some antiradi-cal power (ARP; obtained by the diphenylpicrylhydrazyl radical, or DPPH, method). Of the extracts obtained by maceration, the one obtained from marcela had the highest ARP, followed by rosemary, carqueja, and oregano. In most cases, the ARP values from ethanol extracts were higher than those from the supercritical CO, extracts. The latter showed no significant differences in the ARP between rosemary, marcela, and carqueja.

That the ARP values differed for extracts from each individual herb—obtained by maceration with ethanol and by supercritical CO,—was not unexpected since the extracts are a complex mixture of compounds whose proportions depend on their solubility in both solvents.

The effect of natural extracts on a vegetable oil's oxidative stability was studied. A sample of refined commercial SFO that had previously been purified by passage through a column of activated alumina to strip off all the natural and synthetic antioxidants was used. The oxidative stability of the purified oil, before and after the addition of the different extracts at 500 or 1000 ppm, was determined using Rancimat equipment at 100°C.

The induction period of the purified SFO (IP100°C = 1.4 h) was increased to different extents by the addition of ethanol extracts (Fig. 2, left, page 496) or supercritical CO2 extracts (Fig. 2, right, page 496) at 500 or 1000 ppm.

Regardless of the extraction method used, the addition of rosemary extract at 500 or 1000 ppm increased the IP100°C of SFO by 9- or 15-fold, respectively, and was the most efficient of the four herbs in providing oxidative stability to SFO.

The effect on the IP100°C of the addition of the marcela or oregano extracts to SFO was lower and depended on the extraction method. While the ethanolic extract from marcela was somewhat less potent than that from oregano, the situation was reversed for the supercritical CO, extracts. This observation suggests there were differences in composition between extracts from the same herb obtained by the different solvents.

The extracts from carqueja showed the lowest protective power, doubling or tripling the IP 100°C in the case of the ethanol extract added at 500 or 1000 ppm, respectively, and with almost no effect in the case of the supercritical CO, extract.

The efficiency displayed by each extract (determined by the Rancimat method) in stabilizing SFO was not related to the ARP (by DPPH method). Although both extracts from carqueja were useless for stabilizing SFO, they showed similar ARP values to those obtained from rosemary extracts, which were highly active in increasing the IP100°C of SFO. This confirms that the anti-oxidant actions of these two analytical methods involve different mechanisms, so that one cannot make direct extrapolation of results from one method to the other.

Table 1 shows the effect on the IP100°C of the SFO resulting from the addition of 500 ppm of three different synthetic antioxidants commonly used in the food industry: BHT, butylated hydroxytoluene; BHA, butylated hydroxyanisole; and TBHOj (erj-butylhydroquinone. The most effective was TBHQ, followed by BHA and BHT. Interestingly, adding rosemary extract at 500 ppm (Fig. 2) also caused an increase in the IP100°C higher than that produced by BHA and BHT, and very similar to that produced by TBHQ. In summary, addition of supercritical CO, extracts of rosemary, marcela, and oregano in a concentration of 500 ppm to purified SFO produced an increase in its oxidative stability of 8.7-, 3.1-, and 1.8-fold, respectively, whereas the extract from carqueja produced no significant effect. Addition to the oil of synthetic antioxidants TBHQ, BHA, and BHT at 500 ppm increased the oxidative stability 9.6-, 7.8-, and 6.4-fold, respectively. This indicates that, despite being an unpurified “crude” extract, this extract may provide high stability to SFO and appears as a very attractive alternative to synthetic antioxidants in the stabilization of edible oils.

Sample	**IP100°C (h)**
SFO	**1,4**
SFO + BHT (500 ppm)	**8,6**
SFO + BHA (500 ppm)	**10,6**
SFO + TBHQ (500 ppm)	**12,9**

Stabilizing oils with these supercritical CO, herbal extracts would increase the desirability of the product because there would be no synthetic additives. It would also be necessary to study the flavor of the oil preserved with these herbal extracts to determine what impact this may have on consumer preferences. Economic efficiency of using these alternative antioxidants will also need to be considered.

Each of the authors is affiliated with the Universidad de la Republica, Montevideo, Uruguay. Ignacio Vieitez can be cop tacted at ivieitez@fq.edu.uy.

(Courtesy : Inform, September 2013, Vol.24 (8)).

“KNOW MORE”

Edible oils with high PUFA content oxidise fast owing to unstable bond

S. Kumar Sawarkar

VERY little attention has been paid to the more important qualities of dietary fats andoil. Emphasis has mistakenly been placed on the ratio of saturated to unsaturated fatty acids, irrespective of lipid per oxidation and trans-isomerisation. Contrary to conventional wisdom, unsaturated fats are more toxic than saturated fats.

The quantity and quality of dietary fat is as important as (if not more important than) the ratio of unsaturated to saturated fatty acid of dietary fats and oils are obtained from fresh, whole, unfractionated and unprocessed food, they will be minimally oxidised and will produce healthy cell membranes with normal Cis-fatty acid configuration. They will enhance a normal balance of prostaglandin.

How much dietary fat and oil can one tolerate without risk? Evidence indicates that between 25 and 35 per cent of dietary calories as fat is safe and nutritious. Attention must be paid to the quality and source of the fat described above. The more oxidised the fats, the less they are tolerated by the human body.

In India, on an average, 35 per cent of dietary calories are consumed edible oil as fat. The quality of unsaturated fatty acid (PUFA) is mostly poor, and there is no consideration for rancidity or trans-summarisation.

When high PUFA oils are consumed, they get oxidised very fast due to unstable bond, producing freer radicals and when they are heated produces lipid peroxides.

If lipid peroxides and free radicals are present, either from dietary source or peroxidation of lipid cell membranes, the synthesis of Prostacyclin is inhibited, while Thromboxane synthesis remains unaffected.

In fact, Prostacyclin is considered as most desirable hormone by the system by virtue of their specific action considered as below:

Usefulness of Prostacyclin

- Reduces the adhesiveness of platelet resulting of free flow of blood cells and plasma;
- Reduces the tendency for fibrin deposition;
- Reduces the Thrombus formation, and
- Reduces the spasm, by relieves the encircling muscle fibre in artery walls

Thromboxane A2

- It is a potent vasoconstrictor;
- It causes the intense spasm in blood vessel walls;
- It stimulates platelet aggregation, and
- It is a potent hypertensive.

(Note: Aspirin irreversibly blocks the formation of Thromboxane A2 in platelet, resulting in inhibitory effects on platelets.)

Points to be remembered

- A recent study has shown that reducing dietary fat from 36 per cent of the total calories to 26 per cent of the total calories can significantly lower blood pressures within eight weeks;

Today, we know that n-3 fatty acids are essential for normal growth and development and may play an important role in the prevention and treatment of coronary artery disease, hypertension, diabetes, arthritis, other inflammatory and auto-immune disorders and cancer

- You must take at least 30 per cent calories from fat; • Not all saturated fatty acids have the same effect on cholesterol synthesis in the liver.

  a. Lauric acid (C-12), myristic acid (C-14) and palmitic acid (C-16) elevate choles terol levels, and
  b. Stearic acid (C-18m) carbon saturated lowers cholesterol by 21 per cent more than oleic acid.

- Saturated fatty acids are more stable and do not oxidise, hence they are safer than unsarurated fats, except elevating total choles terol;
- Mono-unsaturated oils are stable and reduces cholesterol and do not pose a threat to the hu man body;
- Poly-unsaturated fatty acids (PUFA) can be more hazardous to health as they oxidise faster. They cause arthrosclerosis;
- Poly-unsaturated oil inhibits the thyroid function;
- Poly-unsaturated oil impairs intercellular com munications;
- Poly-unsaturated oil has been associated with skin aging;
- Poly-unsaturated oil sensitises the skin to the damage caused by ultraviolet rays;
  Ultra-violet light-induced skin cancer is mediated by unsaturated fats and lipid per oxidation;
- Excessive PUFA oil interferes with learning, brain damage and behaviour;
- PUFA oil suppresses several immune function related to cancer, and
- PUFA is present at high concentration in cancer cells.

Experiment 1

Pregnant mice were fed with coconut oil. It was found that the baby mice had normal brains and normal intelligence. The babies of mice fed with PUFA were found to have smaller brains and inferior intelligence.

Experiment 2

Soya oil was given to nursing mice. The oil incorporated into their brain cells and caused visible structural changes in the cell.

In 1980, shortly after the study, the US Department of Agriculture (USDA) issued a recommendation against the use of soya oil infant formulae.

Human beings evolved consuming a diet that contained about equal amounts of n-3 and n-6 essential fatty acids.

Over the past 100-150 years, there has been an enormous increase in the consumption of n-6 fatty acids due to the increased intake of vegetable oils from corn, sunflower seeds, safflower seeds and soybean.

Today, in Western diets, the ratio of n-6 to n-3 fatty acids ranges from 20-30:1 instead of the traditional range of 1-2:1.

Studies indicate that a high intake of n-6 fatty acids shifts the physiological state to one that is prothrombotic and proaggregatory, characterised by increases in blood viscosity, vasospasm and vasoconstriction and decreases in bleeding time.

n-3 fatty acids, however, have anti-inflammatory, antithrombotic, antiarrhythmic, hypolipidemic and vasodilatory properties. These beneficial effects of n-3 fatty acids have been shown in the secondary prevention of coronary heart disease, hypertension, type-2 diabetes, and in some patients with renal disease, rheumatoid arthritis, ulcerative colitis, Crohn's disease, and chronic obstructive pulmonary disease.

Most of the studies were carried out with fish oils [eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)]. However, alpha-linolenic acid, found in green leafy vegetables, flaxseed, rapeseed and walnuts, desaturates and elongates in the human body to EPA and DHA, and by itself may have beneficial effects on health and the control of chronic diseases.

Over the past 20 years, many studies and clinical investigations have been carried out on the metabolism of polyunsaturated fatty acids (PUFAs) in general and on n-3 fatty acids in particular.

Today, we know that n-3 fatty acids are essential for normal growth and development and may play an important role in the prevention and treatment of coronary artery disease, hypertension, diabetes, arthritis, other inflammatory and auto-immune disorders and cancer.

Research has been done in animal models, tissue cultures and human beings. The original observational studies have given way to controlled clinical trials. Great progress has taken place in our knowledge of the physiological and molecular mechanisms of the various fatty acids in health and disease.

Specifically, their beneficial effects have been shown in the prevention and management of coronary heart disease, hypertension, type-2 diabetes, renal disease, rheumatoid arthritis, ulcerative colitis, Crohn's disease, and chronic obstructive pulmonary disease.

However, this review focusses on the evolutionary aspects of diet, the biological effects of n-6 and n-3 fatty acids, and the effects of dietary alpha-linolenic acid (ALA) compared with long-chain n-3 derivatives on coronary heart disease and diabetes.

On the basis of estimates from studies in Paleolithic nutrition and modern-day hunter-gatherer populations, it appears that human beings evolved consuming a diet that was much lower in saturated fatty acids than is today's diet.

Furthermore, the diet contained small and roughly equal amounts of n-6 and n-3 PUFAs (ratio of 1-2:1) and much lower amounts of trans-fatty acids than does today's diet. The current Western diet is very high in n-6 fatty acids (the ratio of n-6 to n-3 fatty acids is 20-30:1) because of the indiscriminate recommendation to substitute n-6 fatty acids for saturated fats to lower serum cholesterol concentrations.

The intake of n-3 fatty acids is much lower today because of the decrease in fish consumption and the industrial production of animal feeds rich in grains containing n-6 fatty acids, leading to the production of meat rich in n-6 and poor in n-3 fatty acids. The same is true for cultured fish and eggs.

Even cultivated vegetables contain fewer n-3 fatty acids than plants in the wild. To sum up, modern agriculture, with its emphasis on production, has decreased the n-3 fatty acid content in many foods - green leafy vegetables, animal meats, eggs and even fish.

Linoleic acid (LA;18:2n-6) and ALA (18:3n-3) and their long-chain derivatives are important components of animal and plant cell membranes. When humans ingest fish or fish oil, the ingested eicosapentaenoic acid (EPA;20:5n-3) and docosahexaenoic acid (DHA;22:6n-3) partially replace the n-6 fatty acids [especially arachidonic acid (AA;20:4n-6)] in cell membranes, especially those of platelets, erythrocytes, neutrophils, monocytes and liver cells.

As a result, ingestion of EPA and DHA from fish or fish oil leads to:

- Decreased production of prostaglandin E2 metabolits;
- Decreased concentrations of thromboxane A2, a potent platelet aggregator and vasoconstrictor;
- Decreased formation of leukotriene B4, an inducer of inflammation and a powerful inducer of leukocyte chemotaxis and adherence;
- Increased concentrations of thromboxane A3, a weak platelet aggregator and vasoconstrictor;
- Increased concentrations of prostacyclin PGI3, leading to an overall increase in total prostacyclin by increasing PGI3 without decreasing PGI2 (both PGI2 and PGI3 are active vasodilators and inhibitors of platelet aggregation); and
- Increased concentrations of leukotriene B5, a weak inducer of inflammation and chemotactic agent

Because of the increased amounts of n-6 fatty acids in the Western diet, the eicosanoid metabolic products from AA - specifically prostaglandins, thromboxanes, leukotrienes, hydroxy fatty acids and lipoxins - are formed in larger quantities than those formed from n-3 fatty acids, specifically EPA.

The eicosanoids from AA are biologically active in small quantities and if they are formed in large amounts, they contribute to the formation of thrombi and atherosmas; the development of allergic and inflammatory disorders, particularly in susceptible people and cell proliferation.

Thus, a diet rich in n-6 fatty acids shifts the physiologic state to one that is prothrombotic and proaggregatory, with increases in blood viscosity, vasospasm, and vasoconstriction and decreases in bleeding time.

The bleeding time is shorter in groups of patients with hypercholesterolemia, hyperlipoproteinemia, myocardial infarction, other forms of atherosclerotic disease, type-2 diabetes, obesity, and hypertriglyceridemia.

Atherosclerosis is a major complication in type-2 diabetes patients. The bleeding time is longer in women than in men and in younger than in older persons. There are ethnic differences in bleeding time that appear to be related to diet.

The hypolipidemic, antithrombotic, and anti-inflammatory effects of n-3 fatty acids have been studied extensively in animal models, tissue cultures, and cells. As expected earlier studies focussed on mechanisms that involve eicosanoid metabolites.

More recently, however, the effects of fatty acids on gene expression have been investigated and this focus of interest has led to studies at the molecular level.

Previous studies have shown that fatty acids, whether released from membrane phospholipids by cellular phospholipases or made available to the cell from the diet or other aspects of the extracellular environment, are important cell-signalling molecules.

They can act as second messengers or substitute for the classic second messengers of the inositide phospholipids and cyclic AMP signal transduction pathways. They can also act as modulator molecules mediating responses of the cell to extracellular signals. It has been shown that fatty acids rapidly and directly alter the transcription of specific genes.

Several clinical and epidemiologic studies have been conducted to determine the effects of long-chain n-3 PUFAs on various physiologic indexes. Whereas the earlier studies were conducted with large doses of fish or fish oil concentrates, more recent studies have used lower doses.

ALA, the precursor of n-3 fatty acids, can be converted to long-chain n-3 PUFAs, and can therefore be substituted for fish oils. The minimum intake of long-chain n-3 PUFAs needed for beneficial effects depends on the intake of other fatty acids.

Dietary amounts of LA as well as the ratio of LA to ALA appear to be important for the metabolism of ALA to long-chain n-3 PUFAs. Diet researchers showed the while keeping the amount of dietary LA constant, 3.7g ALA appears to have biological effects similar to those of 0.3g long-chain n-3 PUFA with conversion of llg ALA to Ig long-chain n-3 PUFA.

Thus, a ratio of 4 (15g LA:3.7g ALA) is appropriate for conversion. In human studies, Emken et al showed that the conversion of deuterated ALA to longer-chain metabolites was reduced by 50 per cent when dietary intake of LA was increased from 4.7 per cent to 9.3 per cent of energy as a result of the know competition between n-6 and n-3 fatty acids for desaturation.

Diet researchers further indicated that increasing dietary ALA increases EPA concentrations in plasma phospholipids after both the third and sixth week of intervention. Di-homo gamma linolenic acids (20:3n-6) concentrations were reduced, but AA concentrations were not altered.

The reduction in the ratio of long-chain n-6 PUFAs to long-chain n-3 was greater after the sixth week than after the third week Diet researchers was able to show anti-thrombotic effects by reducing the ratio of n-6 to n-3 fatty acids with ALA-rich vegetable oil.

After ALA supplementation, there was an increase in long-chain n-3 PUFA in plasma and platelet phospholipids and a decrease in platelet aggregation. ALA supplementation did not alter triacylglycerol concentrations. As shown by others, only long-chain n-3 PUFAs have triacylglycerol-lowering effects.

In Australian studies, ventricular fibrillation in rats was reduced with canola oil as much or even more efficiently than with fish oil, an effect attributable to ALA. Further studies should be able to show whether this result is a direct effect of ALA per se or occurs as result of its desaturation and elongation to EPA and DHA.

The diets of Western countries have contained increasingly larger amounts of LA, which has been promoted for its cholesterol-lowering effect. It is now recognised that dietary LA favours oxidative modification of LDL cholesterol, increases platelet response to aggregation, and suppresses the immune system.

In contrast, ALA intake is associated with inhibitory effects on the clotting activity of platelets, on their response to thrombin, and on the regulation of AA metabolism. In clinical studies, ALA contributed to the lowering of blood pressure. In a prospective study,

The diets of Western countries have contained increasingly larger amounts of LA, which has been promoted for its cholesterol-lowering effect. It is now recognised that dietary LA favours oxidative modification of LDL cholesterol, increases platelet response to aggregation, and suppresses the immune system

Ascherio et al showed that ALA is inversely related to the risk of coronary heart disease in men.

ALA is not equivalent in its biological effects to the long-chain n-3 fatty acids found in marine oils. EPA and DHA are more rapidly incorporated into plasma and membrane lipids and produce more rapid effects than does ALA.

Relatively large reserves of LA in body fat, as are found in vegans or in the diet of omnivores in Western societies, would tend to slow down the formation of long-chain n-3 fatty acids from ALA.

Therefore, the role of ALA in human nutrition becomes important in terms of long-term dietary intake. One advantage of the consumption of ALA over n-3 fatty acids from fish is that the problem of insufficient vitamin E intake does not exist with high intake of ALA from plant sources.

Most epidemiologic studies and clinical trials using n-3 fatty acids in the form fish or fish oil have been carried out in patients with coronary heart disease.

However, studies have also been carried out on the effects of ALA in normal subjects and in patients with myocardial infarction. The effects of long-chain n-3 fatty acids (EPA and DHA) on factors involved in the pathophysiology of atherosclerosis and inflammation.

The hypolipidemic effects of n-3 fatty acids are similar to those of n-6 fatty acids, provided that they replace saturated fats in the diet, n-3 Fatty acids have the added benefit of consistently lowering serum triacylglycerol concentrations, whereas the n-6 fatty acids do not and may even increase them.

Another important consideration is the finding that during chronic fish-oil feeding postprandial triacylglycerol concentrations decreases.

Furthermore, Nestel reported that comsumption of high amounts of fish oil blunted the expected rise in plasma cholesterol concentrations in humans. These rinding are consistent with the low rate of coronary artery disease found in fish-eating populations.

Studies in humans have shown that fish oil reduce the rate of hepatic secretion of VLDL triacylglycerol. In normolipidemic subjects, n-3 fatty acids prevent and rapidly reverse carbohydrate-induced hypertriglyceridemia. There is also evidence from kinetic studies that fish oil increases the fractional catabolic rate of VLDL.

The effects of different doses of fish oil on thrombosis and bleeding time were investigated by Saynor et al. A dose of 1.8g EPA/d did not result in any prolongation in bleeding time, but 4g/d increased bleeding time and decreased platelet count with no adverse effects.

In human studies, there has never been a case of clinical bleeding, even in patients undergoing angioplasty, while the patients were taking fish^oil supplements.

(The author is diet researcher and nutritional biochemist. He can be contacted at alphacardio@yahoo.com).

(Courtesy : SAARC OIL & FATS TODAY, September & October 2013).

"DYNAMISM"

The importance of renewable energy

Dr Dey is Dean

(Academic and Research), IBS Business School, Kolkata

India's energy policy planners should seriously look at the /development of natural clean energy sources such as wind and solar energy to replace fossil fuel and nuclear energy to meet the growing energy needs of the population, especially in the rural areas.

ENERGY is always a political issue, so is food. The nation states want to retain control on the daily life of its citizens by influencing the supplies and prices of these basic necessities through regulations and subsidies. This is precisely the reason why most countries maintain somewhat rigid attitude during negotiation on agriculture subsidies in WTO. To achieve this objective, historically, the nation states have developed a symbiotic relationship with corporations, both national and global, engaged in the food and energy sectors. Recent developments in India's renewable energy sector - specially its emphasis on grid-connected power generation and solar energy programme should be analysed from that perspective.

Solar energy mission

Though asearlyas 1870s,anambitiousattempt at harvestingenergy from the Sun was initiated in India by Williams Adams,' who used concentrated sunlight to run boilers imported from Britain,1 energy planners of independent India did not pay much importance to solar energy till 2007. During the 10th Five-Year Plan (2002-06), only 0.61 MW of solar power was installed.'1 Then suddenly, a thrust on solar was observed.

•In June 2008, the government announced the Solar Mission as a major thrust area in the National Action Plan on Climate Change.

• In November 2009, few weeks before the UN meeting on climate change at Copenhagen, the government approved the new policy on thedevelopment of solar energy and in January 2010, the Prime Minister formally announced the Jawaharlal Nehru National Solar Mission (INNSM) with an objective'to create an enabling policy framework for the deployment of 20,OOOMW of solar power by 2022.

This has happened at a time when wind energy had already made its presence felt in India by in-

Table 1 : Projected fuel mix (%) scenario in 2031 - 32

Fuel mix	Draft report (Dec 2005)		Final report (Aug 2006)	
	Min.	Max.	Min.	Max.
Oil	28.0	29.0	25.7	22.8
Natural gas	7.0	12.0	5.5	9.8
Coal	65.0	42.0	54.1	41.1
Hydro	0.0	4.0	0.7	2.2
Nuclear	0.0	6.0	4.0	6.4
Renewable	0.0	2.7	0.1	5.6
Non- commercial	0.0	50	9.8	12.0
Total	100.0	100.0	100.0	100.0

Source: Planning Commission (2005, 2006), Govt of India

Table 2 : India's changing structure of fuel for electricity generation (%)

Energy source	2007	2012	2017	2030	2050*
Coal, gas, oil	67	77(70+7+0)	74(69+5+0)	61(58+3+0)	34
Hydro (large)	26	14	12	11	11
Renewable energy	4	6	9	16	51
Nuclear energy	2	3	5	12	0.2

Source: 12th Five-Year Plan, vol.II, p147, Telegraph, Kolkata, 10 April 2007
*Greenpeace, 'Energy Revolution' A Sustamable Energy Outlook for India,' released in April 2007.

Table3: Capital costs and typical cost of generated electricity from the renewable options in India

SI No.		Source	Capital cost (crores of INR/MW)	Estimated cost of generation per unit (INR/kWh)	
		2005##	**2012****	**2005##**	**2012****
1	Small Hydropower	500-600	5.50-7 70	1.50-2.50	3.54-4.88
2	Wind power	4.00-5.00	5.75	2.00-3.00	3.73-5.96
3	Biomass power	4.00	4.0-445	2.50-3.50	5.12-5.83
4	Bagasse cogeneration	3.5	4.20	2.50-3.00	461-573
5	Solar photovoltaic	26.5	10.00-13.00	15.00-20.00	10.39-12.46

Ministry of Non-conventional Energy Sources, 2005, New and Renewable Energy Policy, Draft - II
** 12th Five-Year Plan Documentvol.il, p186

stalling a capacity of 5426MW during l()th Five-Year Plan against installation of only 0.61 MVV solar powers in the corresponding period. It also needs to be mentioned that per unit generation cost of solar energy is nearly three times that of wind energy.7 (Table3) German experience8 also indicates that solar is an expensive elitist energy source.

Why not wind energy mission

In 2007, India was the world's 4th largest wind energy producer and exported wind turbines worth $335.8 million. Indian firm Suzlon Energy Limited had emerged as one of the major players in the global wind industry.9 The initial high growth of wind energy vis-a-vis other renewable energy sources could be explained as a result of ‘demand pull factor’ -a reflect ion ot consumer’s eager ness for green and clean energy. The technology used in the early phase of generation of wind energy was not very complex. Industry could develop without much support of the state. ‘ “ Probably this explains why Indian manufacturers could establish themselves in the global industry without even investingmuch in research and development. However, the next phase of growth of wind energy will be influenced more by ‘supply push factors’ where the large corporations and state will play dominant roles. High-end wind technology (say, offshore, higher hub generation) will get a boost in this phase of renewable energy growth. In the 12th Five- Year Plan (20 12- 17), the target for wind has been set at 15GVV grid interactive power generation against a 10GW target for solar. More involvement and support of the state is expected in this phase.

Why expensive solar energy

Solar energy especially solar photovoltaic (PV) technology tits into the ‘state-corporate symbiotic relationship’ model.” Possible factors which have mainly contributed to this special status of solar energy are: (i) Initial high production cost: This has made In 2007, India was the world’s 4th largest wind energy producer and exported wind turbines worth $335.8 million. Indian firm Suzlon Energy Limited had emerged as one of the major players in the global wind industry. The initial high growth of wind energy... could be explained as a result of consumer’s eagerness for green and clean energy the energy utilities, especially during this nascent stage of its development, dependent on the states for subsidies and support thereby enabling the states’ to retain their control on this form of energy.

(ii) Technical complexity nnil huge expenditures associated with its research and development: The technical complexity of solar power helps the large firms retain their control on the industry. Unlike wind, the technology of solar energy experienced a fundamental reinven-tion following the development of the photovoltaic cell after World War II.i: As solar PV was a highly capital-intensive and technologically complex product, it sought investment from large established firms in related industries, especially electronics and petroleum.1' Oil majors like Exxon, Mobil, Arco, Amoco, CFP, Shell, HP, which historically enjoyed the backing of the state, were the prominent early investors in solar energy.

Emerging model of energy retailing

A new model of energy retailing is emerging. The basic difference in the emerging model with the conventional one (both primary and secondary) is that in the previous model, the distributed energy was mainly sourced from one or two major suppliers. In many cases, a single integrated firm managed the entire chain; say from exploration of crude oil to marketing of the refined products. Similarly, in many electrical utilities generation, transmission and distribution were integrated. The emerging model consists of numerous producers/generators who supply energy to one or few major distributors/retailers that control the industry by virtue of their technical and marketing superiority. The small and micro entrepreneurs are the forerunners of this revolutionary change. At present more than 1.3 million (ierman families produce electricity on their rooftops using solar PV panels.” Through ‘smart grid’ or ‘global grid,’ large utilities ensure total control on electricity transmission.l:> PV has emerged as the global leaderwith 100GW already installed (by 2012) compared to only 2.5 GW installation ot CSP (concentrated solar power) technology.

(Courtesy : Indian Engineering Exports, November 2013).

Processing POME - A Greener Solution

POMETHANE is a ne^v, reliable cost-effective solution for more eco-friendly palm oil production. It is helping leading producers reduce manufacturing impacts, thereby saving money and energy.

The technology has been implemented by several Southeast Asian companies, including Felda, Malaysia's largest crude palm oil producer. It represents a best-practice application for managing palm oil industrial waste through an anaerobic thermophilic digestion process.

Methane captured from manufacturing waste materials is converted to biogas and electricity and/or steam and hot water. In addition to increasing the diversity and security of the plant's electricity supply, the process enables:

- dramatically improved environmental performance, including reduced emission of greenhouse gases (GHG);
- lower risks of river and soil pollution; and
- improved land, forest and ecosystem conservation.

The official launch was announced at the National Seminar on Palm Oil Milling, Refining, Environment and Quality in Malaysia last November by Lars Hjorth, Wastewater Business Development Manager, Southeast Asia Design & Build Projects Group, Veolia Water Solutions & Technologies. The technology was developed by Veolia's subsidiary, Biothane.

In addition to highlighting the environmental and energy benefits, Hjorth said that value creation is a major factor why anaerobic digestion processes like Pomethane have the potential to transform palm oil manufacturing practices.

"One obstacle to adoption of cleaner solutions to treating palm oil mill effluent (POME) has been an absence of compelling economic arguments," he said.

"Pomethane enables plants to recover the energy from POME to power their mill production and staff quarters, with some plants able to produce enough gas to become energy self-reliant or even generate revenue through the sale of excess electricity back to the grid."

Additional value can be created from recycling treated POME as liquid fertiliser that can be used directly on the plantation. Solid/fibre fertilised biomass can also be recovered for use in the plantation or for sale.

Veolia has also demonstrated that Pomethane can be combined with an aerobic polishing plant to achieve a final effluent discharge of BOD < 20ppm. This opens up additional value creation potential through the reuse of water for irrigation and the application of wastewater sludge as fertiliser.

At Felda's 60-tonne Sorting Hilir palm oil mill, the 1.2MW generated per hour supplies energy to both the plant's own production facility and the grid of the local energy provider. The highly efficient treatment process yields a level of COD removal exceeding 90% and enables a significant reduction in GHG emissions.

(Courtesy : Global Oils & Fats Business Magazine, Vol 10, Issue 2, 2013).