

# Coco chemicals - potential value added products from Coconut Oil

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Coconut oil (CNO) is an important cooking medium in the southern part of India. But its relative importance as an edible oil has been declining due to availability of cheaper substitutes like palm oil and other soft oils. World production of coconut oil (CNO) in 2018-19 was 2.88 million tons which is only 1.4% of the total edible oil (199.82 million tons) produced by nine major edible oils in the world. According to the United States Department of Agriculture (USDA) estimates 2017-18, industrial usage of CNO accounts for about 49 percent of global production and remaining 51% only is consumed as edible oil. In India 40% CNO is consumed as edible oil and industrial use accounts for 60%, which is mainly in soap industry. If we compare the trend of production of CNO with other edible oils during the last ten years (2009-10 to 2018-19) we can see that growth rate was very weak, and that it has decreased from 3.26 million MT to 2.88 million MT registered 12% decrease. As against this, production of other vegetable oils show a tremendous increase during the same period. Palm oil production has increased from 45.27 million MT to 75.59 million MT registering 67% increase, while the production of soya bean oil increased from 36.1million MT to 56.5 million MT, rape seed oil

increased from 21.72 million MT to 25.31 million MT and sunflower oil increased from 13.04 million MT to 20.01 million MT. To sum up, while the world production of major vegetable oils increased to 46%, the corresponding growth of CNO during the 10 year period was negative. Even though CNO contribution is very low in the global market compared to other major edible oils it still maintained its demand in the domestic and international market both in the edible and non edible sector because of its uniqueness. CNO has captured an increased segment of non-food uses like oleo chemicals, personal care products and various other industrial uses in the international market. But it faces stiff competition from various vegetable oils, mainly Palm Oil (PO) and Palm Kernel Oil (PKO). CNO has niche market under natural lauric fatty acid and medium chain triglycerides

Oleo chemicals produced from CNO is called Coco chemicals. Fatty acids, one of the basic natural oleo chemical, present in CNO is used as starting material for wide variety of higher value added oleo chemical products. Many types of fatty acids are now being produced by fractionation of CNO. Most common and useful among them is lauric acid. Though world demand for coconut fatty acids is slowly increasing, Palm Kernel Oil

(PKO) is still the major source of lauric acid which is mostly manufactured in Malaysia. Both the oils also called lauric oils have high levels of lauric acid but the two oils differ from each other. Lauric acid, capric acid, caprylic acid, myristic acid and palmitic acid are the major industrially useful fatty acids derived from CNO. Fatty alcohol (lauryl alcohol and myristyl alcohol) and glycerol are other high value industrially useful coco chemicals which can be derived from CNO. These are key ingredients for common oleo chemical products such as pharmaceuticals, detergents, soaps, cosmetics etc. On the other hand, oleo chemical derivatives are produced from a multitude of reactions often using the basic oleo chemicals as building blocks. These oleo chemicals and their derivatives find their way into a long list of applications and market. Consumer trend is also increasing towards the application of oleo chemicals in the detergent, soap and personal care products. In India there are few industrial units for producing coco chemicals by fractionation of CNO. India has to consider a lot of other things in this area for improving its product development and industrial base and for making a significant contribution to the global market.

The lauric oils (CNO&PKO) are mainly used in the oleo chemical industry, due to their high lauric acid content. Lauric acid is a medium-chain saturated fatty acid, a basic coco-chemical, which makes up 45 to 50% of CNO. Lauric acid is converted into monolaurin, a metabolite that is naturally produced by the body's own enzymes upon intake of CNO. It is also available in pure form in the oleo-chemical industry as a supplement. The lauric acid is used extensively for both food and non-food purposes and the range of its uses is extended by further hydrogenation, fractionation and by inter-esterification. In food industry lauric acid is mostly used in preparation of high quality spreads, shallow frying oils, filling creams for biscuits and cakes, ice cream, non-dairy whipping creams, coffee whiteners etc. Lauric acid and its derivatives are used in soaps, bath products with excellent lathering and conditioning quality, and also in household and industrial cleaning products as a surfactant, cleansing agent and emulsifier. Coconut fatty acids and its esters are used in the manufacture of intermediates for the textile industry, lubricants and metal working fluids. Other group of fatty acids extracted from coconut oil is caprylic acid and capric acid which are further processed to produce medium chain triglycerides. Sodium lauryl sulfate (SLS), a common surfactant that is made from lauric acid.

CNO has largest percentage of glycerol (13.84%) which is an important by product which is used in various industries especially in pharmaceuticals and food industries. CNO with highest percentage of lauric acid is a potential source for producing monolaurin, and SLS are also used in a wide range of products for their antiviral properties. Hierholzer and Kabara (1982) reported that these fatty acids and its derivatives kill viruses (HIV, cytomegalo viruses, Herpes virus, and Influenza virus). It can cause disintegration of the virus envelope, inhibit late maturation stage in the virus replicative cycle and prevent the binding of viral proteins to the host cell membrane. Capric acid is another medium chain fatty acid which accounts for about 6-7% of coconut oil. Capric acid and monocaprin have also shown promising activity against other viruses, such as HIV-1 (Kristmundsdóttir et al., 1999). Considering its antiviral activity, pilot clinical trials have been initiated in Indonesia using Virgin Coconut Oil (VCO) as an adjuvant therapy for Covid-19 patients. It is expected that VCO can prevent disease from worsening (Ref. ICC website). However, more detailed clinical studies need to be conducted in this area.

### **Extent of Value addition converting CNO to Coco chemicals**

CNO is one of the most important raw materials for oleo chemical industry in the Philippines. There is huge demand for oleo chemical products in the domestic and international market. The market for coco chemicals have recorded substantial growth since 1980s particularly in industrialized nations as well as in some developing countries. The price of key oleo chemicals such as fatty acids and fatty alcohols is twice the price of inputs such as crude coconut oil and palm kernel oil. One unit of coconut oil gives out 0.93 units of various coco chemicals and resultant products sell at a much higher price. Estimates have shown that an addition of 800 to 1000 US dollars per ton of CNO can be earned with this value addition. This additional income by value addition is presently generated by the CNO importing countries by re-exporting it as coco chemical products. About 70-85% of the production cost of basic oleo chemicals is feedstock or raw material cost. Changes in the supply and demand and prices of coconut oil have significant impact on the coco chemicals competitiveness. The main constraint now faced by the coco chemical industry is instability in supply of raw material (CNO) and its availability at competitively affordable price.

Share of CNO in Global Vegetable Oil Production (2020/21)					
Sl. No	Product	Quantity (in Million MT2010/11)	Quantity (in Million MT 2020/21)	% share	Change over 10 years
1	Palm Oil	49.18	72.91	35.2	+48%
2	Soybean Oil	41.47	59.73	29.0	+44%
3	Rape Seed Oil	23.42	29.11	14.0	+25%
4	Sunflower Oil	12.09	19.27	9.3	+59%
5	Palm Kernel Oil	5.67	8.77	4.2	+54%
6	Cotton Seed Oil	4.81	4.68	2.3	+1%
7	Groundnut oil	6.41	6.12	3.0	-4%
8	Olive Oil	2.92	3.20	1.4	+9%
9	Coconut oil	3.50	3.44	1.6	-2%
	World Total	199.82	207.23	100.00	+26%

(Source: Foreign Agricultural Service/USDA Global Market Analysis-2021)



### Way forward

Global demand for coconut has been increased exponentially in the past few years, inlines with the increasing demand for coconut products such as coconut water, coconut milk powder, coconut sugar, desiccated coconut and virgin coconut oil. This leaves the oleo chemical industry fewer coconuts to be processed for their oil. The combination of increasing coconut product demand and decline in production due to aging of coconut tree population in major producing countries has resulted in increased prices over the past few years. According to United States Department of Agriculture, a stable lauric oil demand is anticipated from the oleo chemical industry. It is estimated that world demand of lauric fatty acid is 4.5 million MT annually of which one third is consumed in US alone. World import of CNO averages between 1.9 million MT and PKO 1.7 million MT for a total of 3.6 million MT. Assuming a recovery rate of lauric acid of 40%, available supply from both sources combined would be 1.4 million MT. The huge demand supply gap is being filled up by similar products derived from petro based products. During the last decade there has

been considerable development in coconut sector based natural coco chemical industry in the world and increasing quantities of different fatty acids are finding wider use in various sector. In view of major threats being posed by other vegetable oils it would be appropriate to seriously consider dependence on CNO as edible oil. Major CNO producing countries are less dependent on it as edible oil and are using it more in industrial sectors. CNO has substantial use in oleo chemical industry apart from its use as edible oil. However, changes in the supply and demand and prices of coconut oil have significant impact to the coco chemicals competitiveness. The impact of the supply and cost of CNO to its viability as an oleo chemical feedstock is complicated by the fact that there are other natural and synthetic raw materials that can viably used for this purpose. The increasing price of crude oil and narrowing premium now being set to CNO relative to PKO has made CNO more competitive in oleo chemical industry. However price instability and availability of CNO are the major concerns for establishing large coco chemical plants in India. Therefore the coconut oil producing sector in India may adopt programs that will ensure continued production growth and price competitiveness of coconut oil against substitutes. Besides, CNO industry in India need to be modernized in making value added oleo chemical products. Possibility of importing crude CNO for production of value added coco chemical products also need to be ascertained. This value addition avenue needs to be considered to make a healthier and vigorous coconut industry in India in the coming years. ■