Closing the cycle:

Sustainability, Innovation and differentiation on the High Oleic Palm Oil Supply chain.

A colombian business model

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High Oleic Palm Oil - An agricultural innovation

EXISTENCE OF THE BUD ROT COMPLEX
in the countries of the American continent:
date of the first cases reported.

E. guineensis plantation destroyed by Bud Rot at Monterrey (Colombia)

Longitudinal section of an oil palm with Bud Rot

#PC option: Intermediate to high resistance to the Bud Rot complex

PRODUCT DIFFERENTIATION

#HO option

#HO is an option giving a higher olein content, thanks to the hybridization of *Elaeis oleifera x Elaeis Guineensis* of La Mé origin.

Like all interspecific hybrids, **#HO** products offer the advantage of an oil with very low acidity and a better ability to prosper in environments with low sunlight.
However, assisted pollination remains essential for the entire working life of the plantation.

The **#HO** solution has an unsaturated fatty acid content of around 70% (as opposed to around 55% for a Deli x La Mé and 50% for a Deli x Yangambi) (Table 1)

Coari x La Mé has an industrial extraction rate over 25% and FFB yields that can reach 29 to 36 tonnes when mature.

The novel (**Mangenot x Manicore**) **x La Mé** is just as productive with an industrial extraction rate of around 27% (31 to 32% in the laboratory).

A major advantage of our **#HO** products is their reduced vertical growth rate, at around 20 cm per year, while other *Elaeis oleifera x Elaeis Guineensis* hybrids have growth rates of around 30 to 35 cm per year (and the best pure *Elaeis Guineensis* 46 cm per year).

This means 20-year-old palms that are 4 m tall and easier to pollinate than palms that are 6 m tall.

PalmElit No.1 for #HO:

PalmElit and its partners are pioneers in *Elaeis oleifera* surveys and in the genetic improvement of the **La Mé** origin, and are alone in exploiting such a broad and efficient genetic base of **High Oleic** *Elaeis oleifera x Elaeis guineensis* hybrids.

Advice:

Be demanding when choosing your seeds

Once the plantation has been set up, genetics is the only factor governing oil characteristics. It is strategically essential to choose the palms best adapted to the sustainable requirements of the market.

RSPO - Impact of a higher olein content on the economic and financial viability of an oil mill -
Olein fetches a higher price than stearin on some markets. A good balance between unsaturated and saturated fatty acids is recommended for the human diet.


Palm oil from #HO palms


Fruits of #HO


#HO palm

PRODUCT INNOVATION: HIGH OLEIC PALM OIL

	SATURATED					MONO UNSATURATED	POLY UNSATURATED	
Fat and Oil	Capric Acid C10:0	Lauric Acid C12:0	Myristic Acid C14:0	Palmitic Acid C16:0	Stearic Acid C18:0	Oleic Acid C18:1	Linoleic Acid C18:2	Linolenic Acid C18:3
Olive Oil				13,0	3,0	71,0	10,0	1,0
Almond Oil				7,0	2,0	69,0	17,0	
Canola Oil				4,0	2,0	62,0	22,0	10,0
High Oleic Palm Olein		0,3	0,4	28,1	2,8	55,1	11,7	0,34
High Oleic Palm Oil		0,3	0,5	29,3	3,0	53,5	11,2	0,29
Peanut Oil				11,0	2,0	48,0	32,0	
Pork Fat			2,0	26,0	14,0	44,0	10,0	
Beef Tallow			3,0	24,0	19,0	43,0	3,0	1,0
Sesame Oil				9,0	4,0	41,0	45,0	
Palm Oil		0,4	1,2	42,0	5,4	40,0	11,0	0,2
Corn Oil				11,0	2,0	28,0	58,0	1,0
Soybean Oil				11,0	4,0	24,0	54,0	7,0
Sunflower Oil				7,0	5,0	19,0	68,0	1,0
Cottonseed Oil			1,0	22,0	3,0	19,0	54,0	1,0
Palm kernel Oil	4,0	48,0	16,0	8,0	3,0	15,0	2,0	
Coconut Oil	6,0	47,0	18,0	9,0	3,0	6,0	2,0	

PRODUCT INNOVATION

RBD HIGH OLEIC PALM OIL

RBD High Oleic Palm Oil is obtained by physical refining of crude High Oleic Palm Oil to make it suitable for human consumption. After the refining process, the physical and chemical characteristics and 74% of its vitamin E (750 ppm) are conserved.

FRACTIONATION OF HIGH OLEIC PALM OIL

High Oleic Palm Oil can be fractioned with the same industrial process of regular Palm Oil. The olein yield is over 75%.

Parameter	Olein	Stearin
Yield	> 75%	< 25%
Iodine value	69 - 73	55 - 57
Cloud point	< 2°C	N.D
Melting point	8 - 10°C	44 - 46°C

HIGH OLEIC PALM OLEIN

This is the liquid fraction obtained from the first fractionation of refined High Oleic Palm Oil. It is free of impurities and suitable for human consumption.

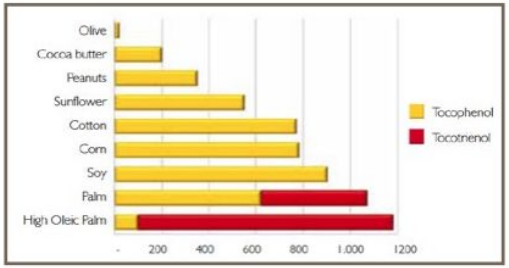
Parameter	High oleic palm olein	Super olein	Palm Olein
Iodine value	69 - 74	63-70	56 -60
Cloud point	< 2°C	3°C	< 5°C
Saturated Fat	32%	40%	49%
Unsaturated Fat	68%	60%	51%

NUTRITIONAL FACTS

High content of vitamin E - especially tocotrienols

Vitamin E is one of the most important phytonutrients of edible oils. It consists of two natural isomers, tocopherols and tocotrienols.

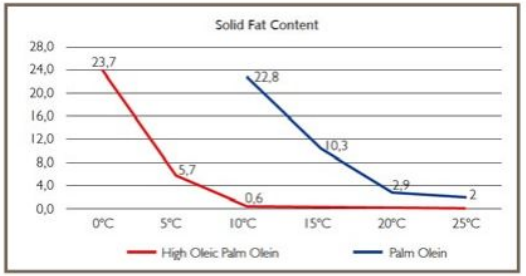
Tocotrienols are known for their high antioxidant capacity. Vitamin E reduces the risk of cardiovascular diseases, strengthens defenses and slows the aging process of the body. The High Oleic Palm Oil is the richest natural source of tocotrienols - 1180 ppm.



Rich in B-carotene (850-1250 ppm)

Beta-carotene is the most active form of carotenoids present in Palm Oil. It promotes the activity of vitamin A and is responsible for the color of the oil. Nutritionally, it is essential for eyesight, proper growth and maintenance of good epithelial tissues (skin). Crude High Oleic Palm Oil contains eight times more beta-carotene than carrots and double that of traditional Palm Oil.

It is characterized by a high iodine value (min 70), an adequate smoke point (206°C), low cloud point (max. 2°C) and low solid fat content at 15°C compared to traditional olein. The High Oleic Palm Olein is liquid clear at room temperature.



Because of its natural antioxidants content, (750 ppm of vitamin E), the High Oleic Palm Olein has high oxidation stability (116.9 hours - AOM method at 97.8°C) and a shelf life of 584 days at 25°C.

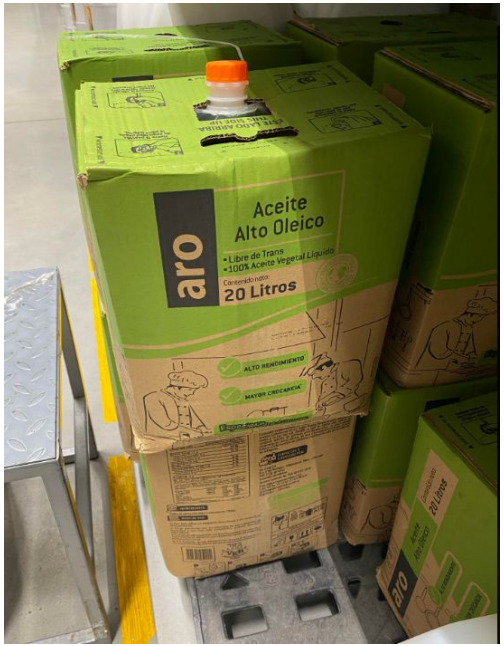
High Oleic Palm Olein performs well in food preparation, especially in fried foods, baked products and salads. Due to its characteristics, High Oleic Palm Olein can replace regular Palm Olein and Soybean Oil blends used in different regions of the world.

The High Oleic Palm Olein is ideal for use in deep frying processes, highlighting the following properties:

- An adequate nutritional fatty acid ratio: linolenic acid (<0.1%), oleic acid (> 55%) and palmitic acid (27%), providing a high oxidation resistance.
- No linolenic acid, which ensures that no unpleasant odors are produced during frying processes and that organoleptic characteristics of food remain unchanged.
- The High Oleic Palm Olein has a lower free fatty acid formation rate during frying compared with other oils.

MARKET OPPORTUNITY: PRODUCT DIFFERENTIATION

- SUSTAINABLE PACKAGING - BAG IN BOX



HIGH OLEIC PALM OIL IS NOW A SUBCATEGORY ON COLOMBIAN RETAIL WITH A SUSTAINABLE PURPOSE AND HIGHER PRICE

SHV

SUSTAINABILITY: CLOSING THE CYCLE

ON THE HIGH OLEIC SUSTAINABLE SUPPLY CHAIN, COLLECTING UCO PARTNERS ARE THE MOST IMPORTANT LINK TOWARDS SUSTAINABILITY

Alianza Team MANOS VERDES

INDICATORS TO MEASURE PROGRESS

Collectors and organizations in the sustainable value chain have different indicators but it is important to involve the government and the community in the collection as much as possible so that they understand why they need to do it and what improvements it can bring in terms of sustainability.

Alianza Team

The Alliance Team® Collection program collects the fatty waste generated from the kitchens of restaurants, hotels, casinos, industries and homes in **Colombia, Ecuador, Mexico, Chile** and **Panama**, guaranteeing that it is used in industries that do not affect human health. .

- **4,200 Tons of** UCO disposed of in Biodiesel
- **8,400 tons of CO2 not** emitted into the atmosphere.
- **4.5 billion liters of water** not contaminated.
- **12 million people have** not ingested degraded oils.

*Equivalencias de https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

The best way to measure the impact on each stage of the Sustainable Palm Oil Chain is though SDG's Indicator.

This is an example of what agricultural indicator can be measure on stage 1: Agricultural Production.

Direct Relation with RSPO principles.

IMPACT THEME	INDICATOR	
Forests and natural ecosystems	1.1	Conversion of natural ecosystems to other land uses, disaggregated by land cover type including restoration
	1.2	Proportion of agricultural area under Good Agricultural Practices or sustainable certifications.

Market Players High Oleic Palm Oil Chain in Colombia

Alianza Team MANOS VERDES

Bolfit
Una empresa comprometida con el ambiente colombiano

PALMELIT
OIL PALM SEEDS – CIRAD INSIDE

Del Llano Alto Oleico
#YApoyoDAO

ACEITE DE PALMA 100% COLOMBIANO

BioD
Above All, Everyone Must Benefit

HACIENDA LA CABAÑA S.A
Desde 1961

GUAICARAMO

cirad
AGRICULTURAL RESEARCH FOR DEVELOPMENT

fedepalma

“Recycling of used cooking oil is gaining more and more attention as its improper disposal contaminates water and causes sewage blockages.

Collection of UCO from restaurants and catering companies as well as from food producing units is beginning to developed in Colombia, however, recycling at individual household is still not very popular in most of the Country
. But every year, more and more people realize that used oil is not only a waste but also a resource and can be recycled and reused with value. Therefore, it is important to further potentiate more UCO collection programs and promote oil recycling in the community”.

- **Carlos Dominguez**