Importance of Palm Oil in India:

*Latest Developments in Processing for Food and Fuel*

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Global vegetable oils and fats production (17 O&F)

2018/19F - - 233.3 Mn T  ❯ 1992/93 - - 84.6 Mn T

~4% growth/y over last 25Y

Major vegetable oils: ~190 Mn T

~85% of VO

Global vegetable oils consumption growth of ~3.5% per year

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Mn T</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>166,8</td>
</tr>
<tr>
<td>2014</td>
<td>170,4</td>
</tr>
<tr>
<td>2015</td>
<td>177,5</td>
</tr>
<tr>
<td>2016</td>
<td>183,4</td>
</tr>
<tr>
<td>2017</td>
<td>191,0</td>
</tr>
<tr>
<td>2018</td>
<td>197,3</td>
</tr>
</tbody>
</table>

Nr.1: Palm oil 73 Mio T
Nr.2: Soybean oil 57 Mio T
Nr.3: Rape oil 26 Mio T
Indian vegetable oil industry will become more and more dependent on oil imports, especially from Indonesia & Malaysia for Palm oil and from Argentina & Brasil for Soybean oil as both oils are the most abundant available and most affordable commodity oils.

2015-17: domestic production: 8.1 Mn T
import: 15.5 Mn T
consumption: 23.9 Mn T

>50% increase in next 10Y

2027: domestic production: 10.9 Mn T
import: 25.9 Mn T
consumption: 36.8 Mn T

CPO = Main Feedstock

2017-27 growth

- 2.3%/y
- 3.9%/y
- 4.7%/y
Indian main vegetable oil market (Mn T; 2018):

<table>
<thead>
<tr>
<th></th>
<th>Import (Mn T)</th>
<th>Domestic consumption (Mn T)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm oil</td>
<td>10.50</td>
<td>10.60</td>
</tr>
<tr>
<td>Soybean oil</td>
<td>3.40</td>
<td>4.95</td>
</tr>
<tr>
<td>Rapeseed oil</td>
<td>0.35</td>
<td>2.31</td>
</tr>
<tr>
<td>Sunflower oil</td>
<td>2.20</td>
<td>2.30</td>
</tr>
<tr>
<td>Cotton oil</td>
<td>0</td>
<td>1.30</td>
</tr>
<tr>
<td>Peanut oil</td>
<td>0</td>
<td>0.96</td>
</tr>
<tr>
<td>Other oils</td>
<td>0.11</td>
<td>0.58</td>
</tr>
<tr>
<td>Total</td>
<td>16.56</td>
<td>23.00</td>
</tr>
</tbody>
</table>

72% import

India is the biggest PO importer in the world
Trend to stimulate import CPO to sustain Indian refineries

Main Palm oil consumers

<table>
<thead>
<tr>
<th>Country</th>
<th>Volumes (mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>10.80</td>
</tr>
<tr>
<td>Indonesia</td>
<td>9.45</td>
</tr>
<tr>
<td>China</td>
<td>4.85</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3.11</td>
</tr>
<tr>
<td>EU</td>
<td>6.55</td>
</tr>
</tbody>
</table>

In 2017, India consumed 10.80 million tonnes of palm oil of which 10.36 million tonnes was imported from Indonesia and Malaysia.

75% CPO 25% RBDPOL
Talking about **Indian vegetable** oil industry today means talking about **palm oil**

Palm oil today is under fire, especially in EU:
- Not enough healthy (too saturated)
- Not enough safe (3MCPD/GE)
- Not enough sustainable (bad for environment, nature)

BUT

- what about Soy then?
- what are the alternatives?

Palm oil is the most abundantly available oil:
- Highest in yield/Ha (>4 T/Ha)
- Very stable oil, rather easy to process and store
- Most versatile oil with widest applications (fractionation)
- Lowest in price as compared to other commodity oils (SBO, RSO)

Need to redefine **CPO quality** to counter negative health and safety image
Todays debate: redefining crude palm oil quality
→ new commercial standard for food oil?

Select high quality CPO for food in the PO mill
Avoid recycling of low quality PO in CPO
(eg. sludge PO, POME)

Reserve lower quality CPO for oleochemicals
Process bad quality CPO into biodiesel
(incl. PFAD, sludge PO, POME, PPF PO, …)
Palm oil

Use:
- Nr. 1 food oil
- Nr. 1 in oleochemicals
- Nr. 1 in biodiesel

- **Food:**
  Increasing demand for more palm oil to satisfy growing consumers needs (*price* is key)
  Further diversification mainly through *fractionation* (superoleins, hardstearins, HPMF)

- **Oleo:**
  Increasing demand for fatty acids & glycerin through fat splitting & fractional distillation and crystallisation: short (C6-C10), medium (C12-C14), long (C16-18), Oleic vs Stearin acid
  (Soap = main oleochemical product in India)

- **Biodiesel:** gradual ban in Europe by 2030 but massive expansion in S.E.Asia
  B30 in Indonesia, B10 in Thailand / Malaysia are main drivers for POME expansion
  (low in India, but slowly growing)
Challenges for Indian vegetable oil industry:

- Increase local oilseed production to decrease growing oil import dependency (how?)
  
  **Oilseeds**: 31 Mio T (44% soy, 28% Rape) vs **Food grains**: 283 Mio T (40% rice, 36% wheat)

- Increase overall PO food oil quality by increasing crude oil quality (eg. future CPO quality standards) & final refined oil quality (TFA, 3MCPD/GE, stability, nutritional value)

- Further improve oil refining processes while reducing environmental footprint: make use of the innovations in technology (eg. ice condensing vacuum system)

- Turn oil waste (UCO, PFAD) into value: Biodiesel (*waste to wealth*)
Focus is on **cost**-efficient and **sustainable** production of high quality commodity food oils

Both oil processors and technology providers are continuously looking for **new and better solutions** to solve current problems (3MCPD, GE) and prepare for the new challenges to come
Food safety and quality are main drivers to changing PO refining process.
ATM Dry acid pretreatment & Bleaching

Trend towards wet pretreatment & multistage bleaching

CPO refining

Trend towards dual temperature & low pressure (1-2 mbar) using ice condensing

Stripping <-> Deodorization
Palm oil Fractionation

Expansion of PO applications
Trend towards continuous fractionation in conjunction with continuous refining: Sustainability & Profitability
Palm based Oleochemicals: PO & PKO

FA cap: ~ 1.0 Mn T
FA use:  ~ 1.5 Mn T

Falcohol cap: ~ 0.2 Mn T
Falcohol use: ~ 0.2 Mn T

Biodiesel cap: ~ 0.6 Mn T
Biodiesel use: ~ 0.2 Mn T
➢ **First** generation FAME biodiesel plants were designed to convert food oils into biodiesel (Refined SBO, RSO, PO)

➢ **Second** generation FAME biodiesel plants are today capable of processing various feedstocks (non-food oils, UCO, AF, PFAD...)

➢ **Next** generation biodiesel plants produce a biofuel which doesn’t reflect anymore its origin: HVO

➢ Growing HVO market mainly in EU & US (~6Mn T)
June 2018: Indian National Policy on Biodiesel to reach B5 by 2030

Dilemma: Oil for fuel vs food to be avoided as India needs its vegetable oil for food

Situation 2018:
- Diesel consumption: 81 Mn T
- Biodiesel production: < 0.2 Mn T (~0.2%)
- Biodiesel capacity (30% occupancy): ~0.6 Mn T (~2000 tpd)

Target 2030 (5%): THE ECONOMIC TIMES
- Diesel consumption: 160 Mn T
- Biodiesel production: 8 Mn T (5 %)
- Biodiesel capacity (80% occupancy): 10 Mn T (~30,000 tpd)

Potential sources:
- UCO: 1.5-2 Mio T (collection logistics)
- PFAD & Acid oils: 1-1.5 Mio T (competition to soaps)
- Increased local production of oil crops (Jatropha fiasco)

What about HVO development in India (eg. jetfuel)
Modern FAME Biodiesel production plants are complex installations to allow processing multi-feedstocks.
Conclusions (1)

Palm oil is by far the most important oil for both food and fuel

As food oil, palm oil is under pressure because its sustainability and food safety is questioned

Today many initiatives taken to render the whole palm oil chain more sustainable (RSPO, focus on replanting iso expansion, reforestation)

Better segregation of food oil from non-food palm oil byproducts to increase food safety

Various new technological solutions developed and implemented to render palm processing more efficient and improve food quality & safety (3MCPD, GE mitigation)

There is no alternative to replace palm oil as most versatile (common sense to prevail)
Indian vegetable oil market will require even more Palm oil in future

- Challenge: how to balance import vs domestic oil?

- Overall food oil quality to be increased with more focus on harmful process contaminants: stricter standards for both crude and refined oils

- Use the best quality for food and leave the rest for biodiesel and Oleo (eg. UCO, FAD, Acid oils, AF …)

- Decide for the best technologies available as they are today economical

- Think twice and decide smart: lifetime of processing plant is 20Y!
Thank you for your attention

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