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INSIGHT

Overcoming the edible oil crisis: what industries need to consider next

Replacing fats in food formulations has been a technical and scientific challenge for decades. Whether driven by commodity prices, sustainability, functionality, health or clean labelling, understanding the science underpinning the formulation and the impact of reformulation on both processing and consumer perception is key.

Currently, due to the Ukraine-Russia conflict, the world is facing a major supply chain shortage of different products, including petroleum and gas. One of the biggest shortages is in sunflower oil as Ukraine and Russia are the two top suppliers to Europe. The conflict has brought some unique challenges for the food industry to the fore that require immediate solutions.

Whilst palm oil is disliked due to consumer concerns about deforestation and its sustainable impact[1], it's the worldwide major oil product and it's also facing disruption, with the Indonesian government intending to ban the exports of palm oil in order to assure the supply of food supplies at home[2].

In the UK, consumers have been made aware that some food products labelled as "containing sunflower oil" may really contain refined rapeseed oil, according to the Food Standards Agency and Food Standards Scotland[3].

Sunflower oil, derived from the seeds of sunflowers, is widely used in cooking, emulsions and sauces, and in the manufacture of fat-based spreads. It is mainly composed of polyunsaturated linoleic acid and monounsaturated oleic acid, the proportion of which can be controlled through careful cultivation and post-harvest processing. Sunflower oil is favoured over other edible oils due to its neutral taste profile and its high content of vitamin E, which has a role as an important antioxidant and protector of cells from age-related damage, bloodstream, and body tissues[4].

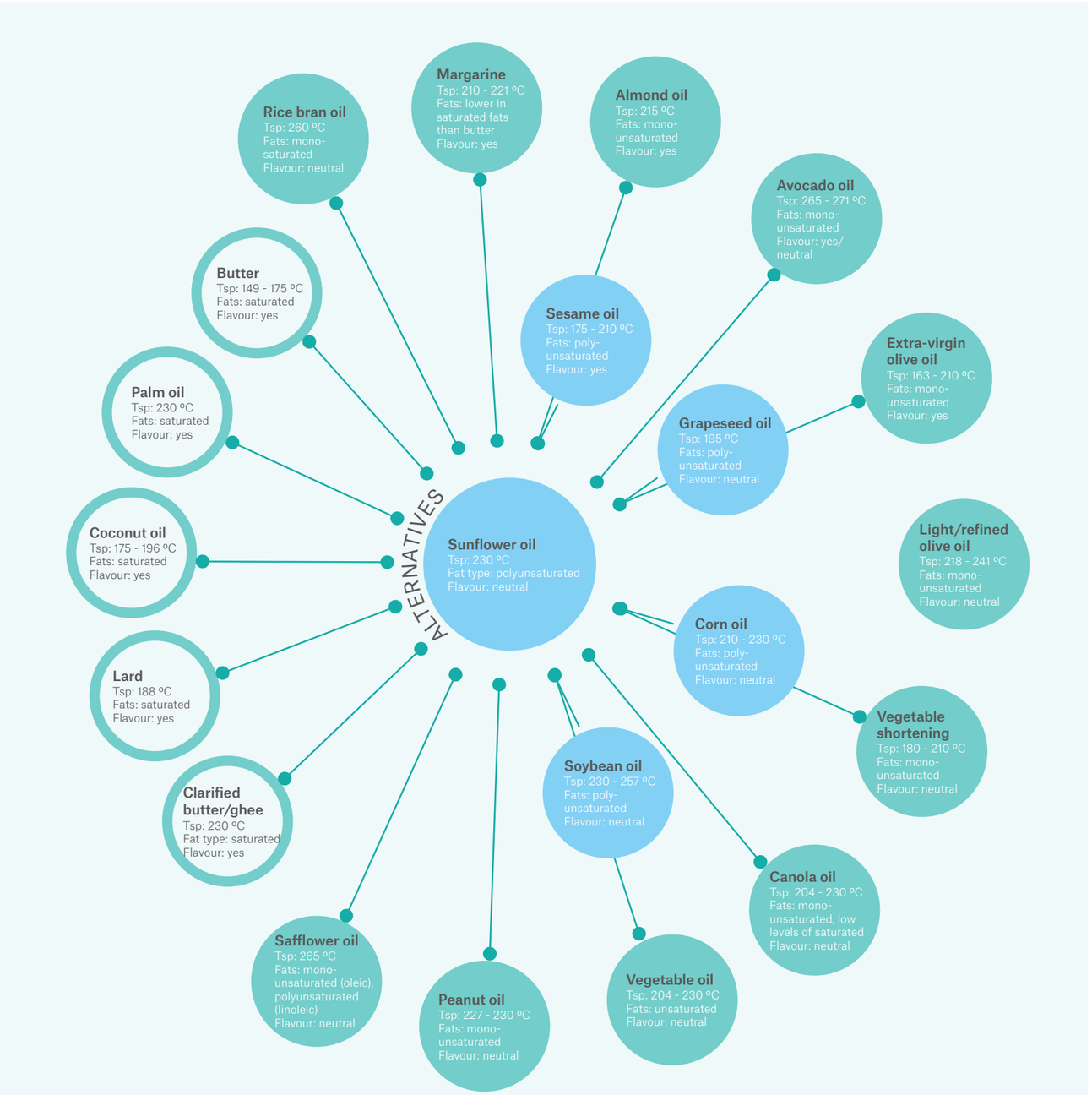
Snack manufacturers opt for sunflower oil due to its ability support shelf life and to impart suitable properties to food products due to its low content of saturated fat, high smoke point and neutral flavour, at a comparatively lower cost compared to other edible oils, such as olive oil and rapeseed.

An immediate challenge is therefore to develop safe alternatives to sunflower oil that can be used as like-for-like replacements in food products. Understanding the deep science associated with its functional and nutritional properties, will be key to enabling food manufacturers to quickly respond and future proof their organisations against further market disruptions.

There are a myriad of options that could be considered, and Sagentia Innovation is helping companies select the most appropriate option for their specific application. We know that each formulation is unique; however we believe there are three main characteristics that need to be assessed when choosing a replacement; flavour, saturation[5] and smoke point. The smoke point is particularly important because it is an indicator of the breakdown and deterioration of the lipid.

Rapeseed oil – Canola - is of particular interest since it is unsaturated and high in monounsaturated fat. It's also high in Vitamin E and omega 3, 6, and 9 fats, which are beneficial to brain, heart, and joint health, and it's been recommended by the British Heart Foundation for cooking use.[6]

Sagentia Innovation's view of potential alternatives to sunflower oil



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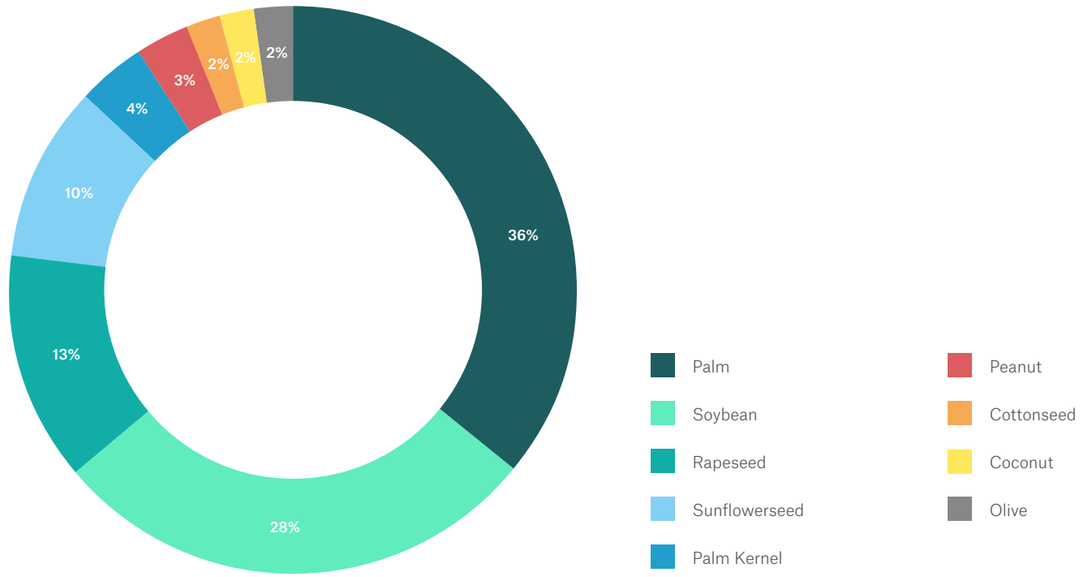
Production of major vegetable oils worldwide



Ref: Cooking Oil Market Size, Forecast and Growth Trends [2028] (fortunebusinessinsights.com)

"Understanding the deep science associated with sunflower oil's functional and nutritional properties, will be key to enabling food manufacturers to quickly respond and future proof their organisations against further market disruptions."

Best alternative solutions, based on smoke point, saturation, flavour and lack of allergenicity, for key applications

Edible Oil	Bakery and Confectionery	Snacks	Petfood
Oil function	Flavour and moisture to baked goods- Presence of oils improve texture/ mouthfeel by conferring elasticity.	High oleic oils (monounsaturated) offer high stability, clean flavour, longer shelf life, and superior performance.	Vegetable oils in peanut and corn products, should be avoided due to allergenicity. Lards of animal origin are unhealthy and contain high sodium, therefore should also be avoided.
Oil use restrictions	The smoke point of the oil should be > 200 °C Fat quality is crucial as it can result in rancidity and loss nutritional value.	The smoke point of the oil should be > 200 °C	The smoke point of the oil should be > 130 °C
Safflower oil	✓	✓	✓
Rice bran oil	✓	✓	✓
Corn oil	✓	✗ Should be used in lower amounts due to its saturation	✓
Olive oil	Should be refined or light to not be flavoured	✓	
Grapeseed oil	✓	✗ Its smoking point is lower than 200 °C	✓
Canola oil	✓	✓	✓

For those formulations in which an additional flavour can be included in or easily disguised, companies can also explore other alternatives, such as avocado oil.

For those products where allergens are built in within the formulation, then soy, sesame and almond oil can be considered.

A last consideration is non-lipid solutions. Exploration of oil replacements from an ingredient point of view could lead to hydrocolloids, gels and even protein / fibre systems, and from a technology stand point, frying could be replaced with baking or other novel technologies such as n-Bread[7].

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Reformulation considerations

Once the right oil alternative has been identified, a number of additional key considerations need to be taken into account, as follows:

Label check and regulations i.e.
- How can this ingredient be used?
- Where can the ingredient be used?
- Is there a claim to be added?

Processing
- Will the product' physicochemical parameters be modified?
- How might this impact dosage level and processing?

Sustainability
- How much more/less sustainable is this new formulation, ingredient, process and how does it impact on waste streams?

Supply chain
- What are the unit economics?
- Is there a sustained supply and how susceptible is it to future disruptions?

Nutrition
- How will the nutritional profile change?

Sensory
- How will the replacement impact mouthfeel and consumer perception?

How Sagentia Innovation can help

As mentioned in our R&D Acceleration white paper, it's usually tempting to rush right into the lab and start prototyping when beginning a new product development (NPD) initiative. There may be some benefits in doing so, such as familiarising the R&D team with some of the issues connected with specific components and processing methods before establishing a more concentrated experimental strategy. However, this tactic typically falls short of making tangible progress outside of fortuitous findings. Rather than developing breakthrough solutions, teams are more likely to swiftly prototype processes, ingredients, and recipes that are similar to what is already known.

"We can help you with our thorough structured approach to R&D."

We can help you with our thorough structured approach to R&D: we begin by understanding your product innovation objectives, we tailor a streamlined experimental program based on our understanding of the key challenges and then we leverage our deep science and technology expertise, in order to identify the right solution to deliver a successful outcom.e

Success case study

Our client, a global manufacturing company, was interested in growing its ingredient supply chain network, focusing on alternative texture enhancing ingredients, which would improve its strategic position in the market.

Using a phased approach, Sagentia Innovation developed an understanding of the functionality of the ingredient within the specific matrix. We conducted a thorough review of the academic literature, identified and interviewed suppliers and sourced samples. We then applied a set of criteria to select ingredients to take forward for further evaluation and experimentally validate the functionality of the ingredients against the product specification.

“This enabled our client to grow their supply network and reduce their costs with solutions ranging between 20% and 30% cheaper.”

By developing an understanding of the science underpinning the ingredient functionality and combining our advisory skillsets and lab testing development capabilities, we were able to recommend a set of high performing alternative ingredients with a very high functionality and matching specification to meet the product criteria. This enabled our client to grow their supply network and reduce their costs with solutions ranging between 20% and 30% cheaper.

References

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5. Which cooking oil is the healthiest? - BBC Future
6. What’s the best oil to use for cooking? - BBC Food

For over thirty years, Sagentia Innovation has been bringing breakthrough technologies, ingredients, materials, processes, and products to market for our clients, across multiple industries

We accelerate innovation for clients by leveraging our knowledge to develop new solutions grounded on scientific principles. Our teams can help you expedite your own R&D processes by evaluating your R&D platforms and key performance metrics against industry leaders, developing a predictive modelling tool that links ingredients to sensory outputs, or designing a digital manufacturing tool.

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About Sagentia Innovation

Sagentia Innovation provides independent advisory and leading-edge product development services focused on science and technology initiatives. Working across the medical, industrial, chemicals and energy, food and beverage, and consumer sectors, Sagentia Innovation works with a broad range of companies from some of the world's leading and best-known brands, to start-up disruptors, new to the market. It is part of Science Group (AIM:SAG), which has more than ten offices globally, two UK-based dedicated R&D innovation centres and more than 400 employees. Other Science Group companies include Leatherhead Food Research, TSG Consulting and Frontier Smart Technologies.

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