

A WIDE RANGE OF USES for cereals and oilseeds



Mobile phone cases, automotive parts, toothpaste, cotton buds, as well as energy: cereals and oilseeds have an increasing number of non food uses, and those markets require large amounts of them.

Based on the principle that carbon stored in plants is the only alternative to fossil fuel, the green chemistry sector has developed processes to produce bio-sourced plastics for example, made with starch from cereals and potatoes and 100% biodegradable. They have a multitude of applications, from electronic equipment to automotive parts and 3D printing, a technology that is a booming. Each year, French starch manufacturers process around 5 million tonnes of cereals (2.8Mt of wheat and 2.3Mt of maize), and have long been involved in the production of bioproducts. Half of their production is destined for applications such as paper, cardboard, but also toothpaste (it is thanks to starch that it doesn't become hard in the tube).

Vegetable oils also offer an alternative to petroleum. They can be found in a large number of consumer products. Although they are still in the minority compared to petroleum products, green oleochemicals (excluding saponification products and biodiesel) represent 7% of the vegetable oil market worldwide. In addition, the chemical industry has committed to using 15% of plant-based raw materials by 2017 and aims to double this figure by 2020 (1.24% of the utilised agricultural area in France today).

Diversification is gaining momentum

Technically, plant-based chemicals are ready to replace petrochemicals on numerous markets (plastics, surface active agents, solvents, lubricants, cosmetics... and even food products through polyphenol extraction). The development of new products is gaining momentum, for example polyamide gas pipes, to eliminate any risk of corrosion, or substitutes for substances that are deemed dangerous. Their performance and special properties

are pushing bioplastics forward in the bag, packaging, agricultural (mulching film) and hygiene product (cotton buds, nappies...) markets. In the last decade, production capacity worldwide went from 500 tonnes to 1,600,000 tonnes (2013), 250,000 of which was in Europe, with France befitting from two major assets, i.e. its agriculture and its chemical industry. A new sector known as bioeconomics is taking off.

In 2017, the chemical industry must use 15% plant-based raw materials.

Cosmetics and hygiene products are driving innovation

Plant-based chemicals also help to produce surfactants, which are molecules with various properties used for items ranging from cleaning and personal hygiene products, to adjuvants in plant protection products or even textile products. Biosolvents help to dissolve, degrease, dilute or extract other products without altering the formula.

But that's not all. The most commonly used self-tanning molecule in the world, DHA (dihydroxyacetone) is manufactured using cereals. Active ingredients derived from wheat gluten can be useful for their skin repair and nourishing properties. The cosmetics industry uses a multitude of different oils to manufacture beauty and personal care products such as creams, soaps, shampoos, etc. Smaller quantities are used as active ingredients, the virtues of

which (anti-ageing, plumping up wrinkles, etc.) are extolled by every manufacturer.

Varietal selection and the development of varieties with oleic acid contents over 90% should lead to new cosmetic applications. Oleic sunflower oil has emollient properties and makes hair easier to comb. Oleic oilseed rape oil, which is very stable with regard to oxidation, may appeal to the cosmetics industry.



Energy is coming from every direction

Energy production is the other major non food application of cereals and oilseeds. This is through direct combustion of both dedicated crops and by-products such as silo waste, straw or stalks. Pelleted cereal products (straw) or mixed products (straw-wood) also feed special boilers. The production of those biofuel pellets went from 17,000 tonnes in 2002 to over 1,000,000 tonnes in 2014.

Finally, cereal-based biofuel can help to produce electricity and heat through a process of co-generation. The combustion is used to produce steam which activates a turbine that, in turn, produces power. Such facilities can be found in Denmark and Spain, but not yet in France, while Europe would like the proportion of its electricity produced through co-generation to go from 8% to 13% by 2020.

Biomass can also be processed a first time, before being converted into energy (transport biofuel, biogas). In France, cereals (bioethanol) and oilseeds (biodiesel) are widely used to produce first generation transport biofuel.

Biodiesel is obtained from the chemical processing of oilseed rape oil. The French biodiesel production, which represented 1.85 million tonnes of petroleum equivalent in 2014, is used in combination to make up diesel fuel. Today, farmers are asked to produce oilseed rape to meet the reduction target for greenhouse gas emissions caused by fossil diesel fuel set at 35%. This threshold value will be raised to 50% by as early as 2018. Since 2007, an approach focussing on achieving progress has been embraced by some players in the French biodiesel sector, and supports farmers through cooperatives and merchants.

As for bioethanol, also part of the solution in meeting the GHG emission reduction target, it "consumed" 2.1Mt of cereals during the 2014-2015 season, i.e. 3% of our national production. Cereal and oilseed organisations also created the "2BSvs" sustainability

certification scheme in 2010 for their products destined for the transport biofuel sector.



Environmental friendliness is a priority

Although the majority of lubricants produced in Europe are derived from petrochemicals, biolubricants are slowly re-emerging because they are more environmentally friendly (biodegradability, low toxicity, suitability for contact with food products, etc.). They are primarily used for applications that do not involve any resource recycling: formwork removal oil (oilseed rape), lubricants for chainsaw chains (oilseed rape, oleic sunflower), 2-stroke engines (oleic sunflower), etc. The European Renewable Resources and Materials Association (ERRMA) expects the European production of this type of lubricant to be between 277,000 tonnes (with a moderate incentive policy) and 420,000 tonnes (with a strong incentive policy) by 2020. Printing ink is another growing sector. It is usually made of pigments, additives and a "vehicle" to carry and fix the different components onto the paper. The "vehicle" is a combination of polymers, diluting agents or solvents (vegetable oils, petroleum distillates, etc.). Vegetable oil ester-based ink made with oilseed rape, soya or sunflower oils have been increasingly favoured by printers because, in addition to being more environmentally friendly, they are more resistant to rubbing. According to the French Environment and Energy Management Agency (ADEME), the chemical and materials industries' consumption in bio-sourced ink went from 10,000 tonnes in 2005 to 22,000 tonnes in 2012 (i.e. around 23% of total consumption). It could reach 27,000 tonnes by 2020.

Paint is essentially composed of pigments (titanium dioxide), extenders (calcium carbonate), binders (linseed oil, cured polymers) and solvents (white spirit, turpentine, water). Consumers are demanding less harmful paints. According to ADEME, the 23,000 tonnes of bio-sourced paint in 2012 could almost double by 2020.

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Bio-sourced products: a very significant innovation potential

Plant-based products can also be used in healthcare, pharmaceuticals, the energy industry (biofuel and transport biofuel), the food industry, the building sector, and the paper industry.

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