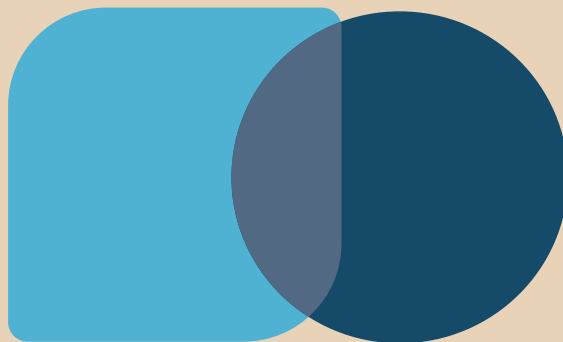


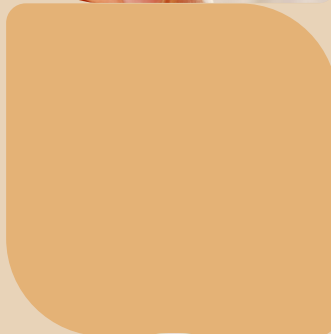
Activity report 2023



COMMITTED

to a healthier and
more eco-friendly
world

using vegetable oils and
proteins



ITERG

 **IMPROVE**



COMMITTED



**Industrial Sovereignty
and Resilience**



**Ecological and Environmental
Transition**



**Digital Transition
Factories of the Future**



**To a more competitive industry
from upstream to downstream**



Serving Industry

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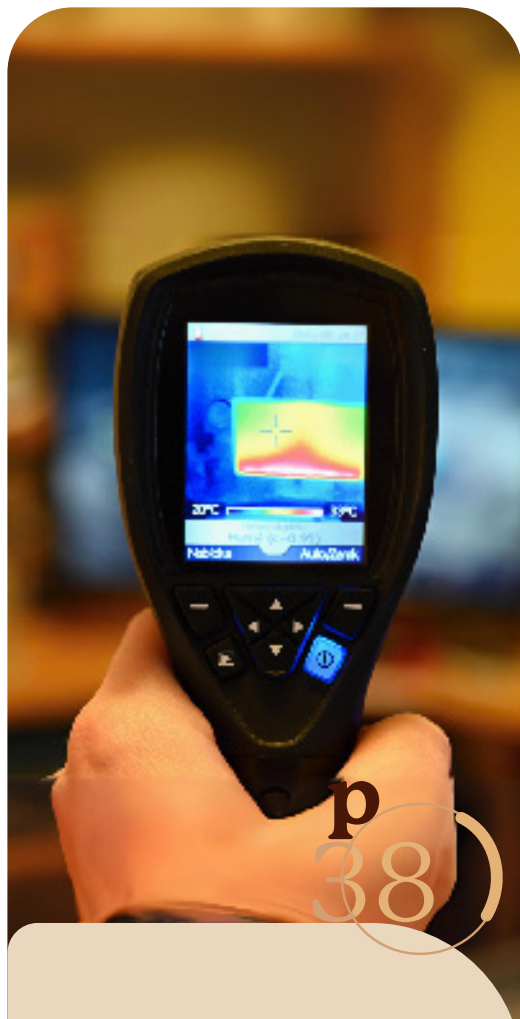
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Editorial

For ITERG, 2023 was marked by some important challenges but also by many successes that reflect the vitality and resilience of our Industrial Technical Center. As you will read, this 2023 activity report spotlights the advances and commitments that marked this year, which was structured around four key issues.

ECONOMIC AND GEOPOLITICAL VOLATILITY HAVE IMPACTED THE SECTOR ADAPTIVE AND INNOVATIVE STRATEGIES

“[...] securing access to resources, [...] optimizing and guaranteeing production processes”

Once again, the economic and geopolitical context heavily influenced our sector. The volatility of prices for raw materials and energy, exacerbated by tensions around the world and the conflict between Russia and Ukraine, required constant vigilance and quick strategic adaptation from stakeholders in our sector. This situation emphasized the importance of our work in research and innovation to secure access to resources and also optimize and guarantee production processes.

CUTTING EDGE EQUIPMENT AND BOLSTERED EXPERTISE AN INNOVATIVE RESPONSE TO GLOBAL CHALLENGES

“[Offer]...innovative and effective solutions to the numerous mutations generated by energetic, environmental, and food transitions.”

ITERG group's strength comes from its human and technical capabilities. This year, we've reinforced our team to continue expanding and deepening our expertise, and we've also acquired new, cutting-edge equipment (see pages 23-24). These expanded capabilities allows us to stay at the vanguard of technology and research in our sectors of oils and proteins, thus offering our clients and partners innovative and effective solutions to the numerous mutations generated by the energetic, environmental, and food transitions that are in the works.

2023: A YEAR OF ROBUST GROWTH

“We owe this success to our commitment to excellence and the work of our teams in collaboration with our partners.”

In the area of financial and operational results, 2023 showed a significant progression in our turnover, accompanied by a firm control of costs and a continual improvement in our economic performance. We owe this success to our commitment to excellence and the work of our teams in collaboration with our partners in the Alliance (a synergy of means and skills between ITERG-IMPROVE and PIVERT), our neighbors at Terres Inovia, and other public research centers with whom we've shared ambitious and innovative projects.

The year 2023 also offered the chance to consolidate public funding, TFA, CVO, and grants from the Ministry of Research, to benefit collective research and general interest missions. This 2-million-euro budget is essential because it allows us to fulfill our statutory missions that include standardization, technological and scientific monitoring, regulatory monitoring, and conducting research projects that will lead to tomorrow's innovations.

TOWARD THE FUTURE ITERG'S STRATEGIES AND INNOVATIONS FOR 2024-2027 IN THE FRAMEWORK OF A NEW PERFORMANCE CONTRACT

"The three key vectors in the new PA will allow us to help companies in their ecological and energy transition, their digital transformation, and also to reinforce our country's sovereignty and resilience."

Finally, if we project into the future, 2023 will be seen as a year of consolidation and preparation for the challenges of the future. The new Performance Agreement (PA), that will cover the period 2024/2027, aims to anticipate the market's needs, develop new skills, and extend our network of collaboration. "The three key vectors for the new PA will allow us to help companies in their ECOLOGICAL and ENERGY transition, their digital transformation, and also to reinforce our country's sovereignty and resilience." Our goal is to remain pioneers in the field of fats and proteins through continuous innovation in our various sectors of activity (crushing and pressing grains, oleochemistry, innovative processes for the production of protein concentrates or isolates...) and by developing our intellectual property portfolio by filing patents.

In conclusion, I'd like to remind you that ITERG celebrated its 80th anniversary in December 2023 (see pages 54-55), a significant milestone that reiterates our long history of innovation and service. This annual report is evidence of our continuing commitment to excellence, collaboration, and innovation. Together with our personnel, partners, clients, and public institutions, we will continue to meet tomorrow's challenges while contributing to the progress and sustainability of our industry.

“ Through their commitment, ITERG's personnel serve the sector by creating the sustainable world our societies demand and expect! ”



Yves DELAINE

ITERG President
IMPROVE President



Denis CHÉREAU

ITERG CEO
IMPROVE CEO

01

Presentation of the ITERG Group



01



For a healthy, sustainable world

The ITERG Group, that brings together the ITERG Industrial Technical Center and its subsidiary IMPROVE, has proven itself to be a major actor in innovation in the fields of vegetable oils and alternative proteins since 2020.

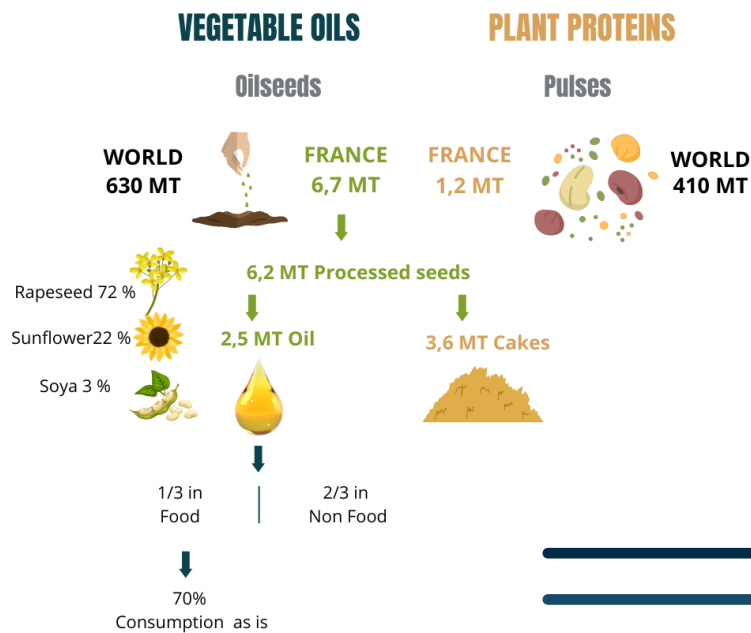
Its strategy integrates a multidisciplinary approach from idea to industrialization, which favors the transition to healthier models that are more respectful of the environment.

This integrated approach allows us to address very diverse markets where vegetable oils and proteins play a pivotal role in opening the way to innovative, sustainable, and competitive solutions.

Feeding innovation, shaping the future

Whether in relation to food, health, agriculture, or industry, vegetable oils and proteins offer many opportunities to shape the future. By exploiting the unique properties of these natural resources, researchers and companies innovate to create sustainable solutions that reduce our dependence on fossil resources and minimize environmental impact. This transition toward renewable and less-polluting raw materials is essential to build industries that respect the environment and contribute to the health and well-being of current and future generations.

A few production figures



On 19 December 2023, ITERG marked its 80th anniversary with the motto “Feeding innovation, shaping the future” (see page 55).

Feeding innovation with vegetable oils and proteins means exploiting their potential in order to imagine new products and technologies that meet the changing needs of our society. It means encouraging creativity and collaboration between researchers, entrepreneurs, and industry to find ingenious and sustainable solutions.

Shaping the future means adopting a responsible approach in our use of these resources. It means investing in practices that respect the environment and integrating vegetable oils and proteins into our production processes in a sustainable way. It also means creating a future where innovation and sustainability go together, offering optimistic perspectives for future generations.

The ITERG Group is actively committed to a healthier and more sustainable future by shaping a world where vegetable oils and proteins play a determining role, thus offering optimistic perspectives to industry by contributing to its competitiveness and long-term sustainability.



The ITERG Group, which, since December 2020, is made up of the ITERG Industrial Technical Center and its subsidiary IMPROVE, occupies a central role in innovation in the sector of vegetable oils and alternative proteins, thus favoring the transition toward more environmentally-friendly models and reinforcing the sector's competitiveness.

The group covers the entire value chain, from conception to market, and strives toward high standards in terms of functionality, taste, nutritional value, and sustainability. It can thus offer a variety of services including research, analysis, production, environmental or nutritional studies, and industrial transfer along with consulting and training.

Thanks to the diversity of its expertise, the ITERG Group can undertake innovative multidisciplinary projects, favoring the resourcing and exchange of experiences with its industrial and academic partners to effectively respond to constantly-evolving complex challenges and societal expectations.

The ITERG Group works with producers and users of fats, vegetable proteins, and their derivatives in extremely diverse food and non-food markets (see the markets on page 59).

Our 6 platforms



Functional/sensory analysis and performance
Specialties: Oils and fats at Canéjan, proteins at Dury



Plant-Based Chemistry



Applied formulation
Cosmetics, food, feed, crop protection at Canéjan
Dairy/meat alternatives at Dury



**Dry/wet extraction and
Functionalization of proteins:**



Nutrition - Life Sciences

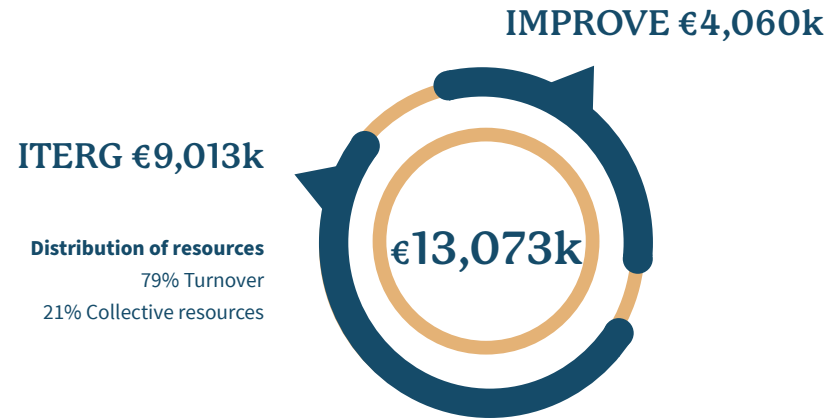


Oil extraction and refining

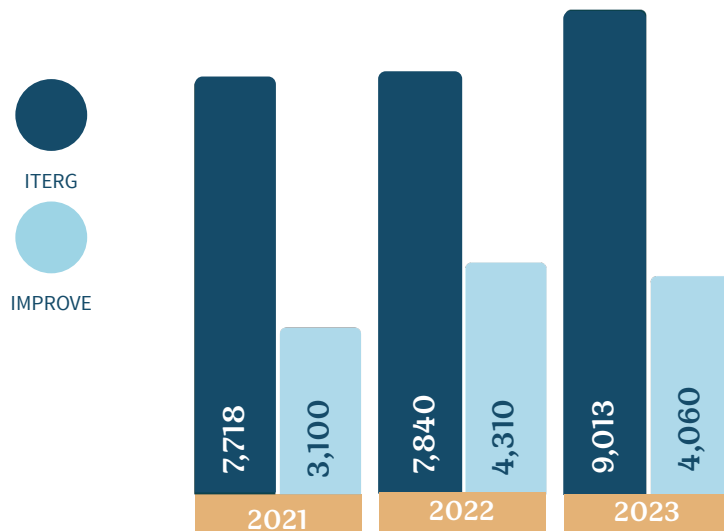
Key figures for 2023



ITERG Group Resources



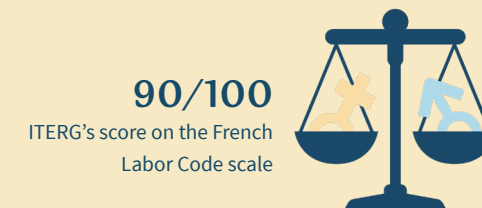
Evolution of resources over 3 years in €k



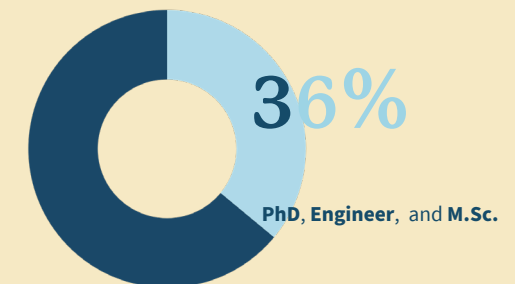
The men and women of ITERG Group



Equal pay FOR women and men



Staff with scientific expertise



Board of Directors 2022-2025 on 12.19.2023

Government commissioners

Ms. **Laura GRISAT**, Deputy director of chemistry, materials and eco-industries, Ministry of Economy and Finance - DGE
 Ms. **Maud IACOMELLI**, Ministry of Agriculture and Food – DGPE/SDFE/SDFA/BGC
 Ms. **Constance MARECHAL-DEREU**, Head of the Industry Department, Ministry of Economy and Finance - DGE
 Mr. **François-Xavier TURQUET**, Head of the bio-sourced chemistry and industrial biotechnology project, Ministry of Economy and Finance – DGE
 Ms. **Marie-Laure WOLF**, Director of the chemistry project, Ministry of Economy and Finance - DG

General economic and financial auditor

Mr. **Hubert GICQUELET**, “Applied Research and Quality Promotion” Mission, Ministry of Economy, Finance, and Industrial and Digital Sovereignty, CGEFI

Representing company executives

Mr. **Jean-Christophe SIBILEAU**, President and CEO of SAINT-HUBERT
 * MR. **Yves DELAINE**, President of FNCG
 Mr. **Olivier NASLES**, Treasurer of FRANCE OLIVE
 Ms. **Hacina MOSA**, Head of QSE, Grandes Huileries du Midi, PROVENCE HUILES
 Ms. **Marie SAGLIO**, CEO, LESIEUR
 Mr. **Hervé LIMOUZIN**, BU Director at ADM SIO

Representing technical staff

Mr. **Gérald COUPE**, (FCE - CFDT)

Representing higher academic or technical education or expertise, in the oils and fats industry or as users:

* MR. **Paul-Joël DERIAN**, Director of Innovation & Sustainable Development AVRIL, President of SAS PIVERT
 Mr. **Laurent ROSSO**, Director of Terres Univia
 Ms. **Monique AXELOS**, Scientific Director of Food and Bioeconomics, INRAE
 Ms. **Sophie LECLERE**, Director of Innovation and Development, Natural Ingredients and Actives EXPANSCIENCE
 Mr. **Fabrice MOULARD**, Oilseeds Federation

Auditor

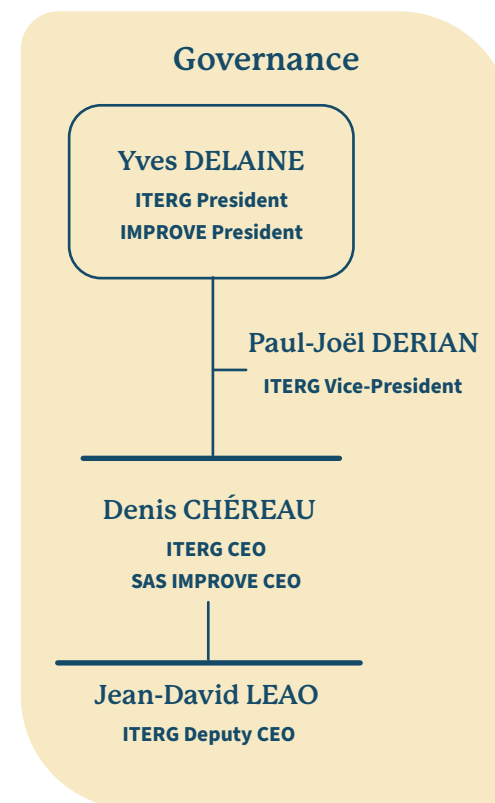
MR. **Mathias TAN** (GTAC)

Observers

Mr. **Hubert BOCQUELET**, FNCG Managing Director
 * MR. **Gabriel KRAPP**, Chairperson of the Quality Commission
 FEDIOL
 Mr. **Patrick GUILLEMOTEAU**, NOUVELLE AQUITAINE REGION
 Mr. **Michel DAVID**, (FNIC-CGT)

Staff observers

Mr. **Alexandre CAVACO-SOARES**, ITERG
 Mr. **Christophe VINGHES**, ITERG



* Mr. **Gil FORTEGUERRE**, PICARDIE INVESTISSEMENT
 * Mr. **Christophe GRIFFART**, CRÉDIT AGRICOLE

* *Members of the IMPROVE Board of Directors*

Update and projections

ITERG's 2020-2023 Performance Agreement

The majority of the indicators for the 2020-2023 PA were met, which demonstrates ITERG's success in accomplishing its key missions. A notable growth in its commercial services, in particular collaborative R&D services, compensated for reduced funding for collaborative activities. Our organization also maintained the essential collective actions associated with its general interest missions.

The Performance Agreement (PA) is a four-year commitment signed by ITERG, its professional federation, the FNCG, and the Ministry of Economy and Finance that sets out strategic orientations aligned with the goals of industrial policy.

This PA is characterized by an attentive evaluation of the institute's performance, which ensures the respect and realization of the stated goals.

Qualitative Advances by Key Vector



Industry of the Future: The integration of OLEAD teams and materials marked an important technical turning point (see the 2021 activity report). Over €400k were invested in equipment from 2021 to 2023, enriching R&D on mechanical extraction procedures to preserve the naturalness and functionality of oils, proteins and minor compounds, in a collective framework or directly with industry.



Ecological Transition and Bioeconomy: ITERG's Environment & Eco-industries Unit and Plant-Based Chemistry Unit have respectively made significant progress in environmental evaluation and developing innovative bio-sourced biopolymers. In collaboration with IMPROVE and PIVERT, ITERG stimulated innovation and accelerated commercialization through synergies, benefiting from over 2 million euros in industrial activity.



Food Transition: ITERG has developed advanced methods of analysis and clean-label solutions that meet the quality and safety requirements for food. By valorizing lipid nutrients, these innovations contribute to a healthier diet. These research projects benefited from major investments in the expansion and modernization of our laboratories (1.7 million euros).

Conclusion and perspectives



This positive assessment of the 2020-2023 PA perfectly illustrates ITERG's ability to anticipate and effectively respond to market challenges. Advances in key areas such as the industry of vegetable oils and proteins, the ecological transition, and functional plant-based food products show the impact of its research and development efforts. The acquisition of IMPROVE in late 2020 and investments in its laboratories bear witness to its continued commitment to innovation and supporting industry, laying a solid foundation for future challenges and opportunities.

Jean-David LEAO - ITERG Deputy CEO

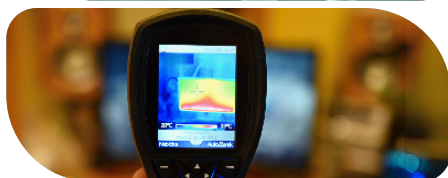
Roadmap 2024-2027

The oil protein crops sector is currently at a crossroads of crucial challenges that require innovative and collaborative responses to ensure its evolution in a context of mutation. These key challenges center around three fundamental vectors that are: the ecological and energy transition, the digital transformation, and food sovereignty and resilience.

Within this perspective, ITERG's roadmap is deeply entrenched in these three key themes, defining specific objectives and concrete actions to meet the challenges and seize the opportunities offered by this strategic sector.



Within the framework of the **ecological and energy transition**, we have to rethink the practices of mechanical oil extraction to reduce our carbon footprint, while at the same time meeting the growing expectations as far as environmental and societal sustainability through the development of bio-sourced products.



In parallel, **the digital transformation** offers considerable opportunities to improve efficiency in industrial processes through the introduction of artificial intelligence and the use of simulations to optimize the crushing and refining steps, thus contributing to better productivity and a more efficient use of resources.



Finally, the question of **food sovereignty and resilience** must be addressed urgently to account for the increased demand for vegetable proteins to nourish humans and animals. In this context, innovation plays an essential role through the development of new food and non-food products from vegetable oils and proteins, while guaranteeing the safety of food production by controlling contaminants and anti-nutritional factors.

To accompany manufacturers in the oilseed and plant protein crop sector in these transitions, the PA integrates the need to define new vectors for collective R&D. In fact, beyond studies to incrementally improve the technical and environmental performance of current manufacturing capabilities, we need to look toward innovative ruptures, for example, the creation of new, non-food markets, a more radical transformation of processes in the mid-term, or creating more value for food oils and vegetable proteins. In addition the 50 or so manufacturers in the sector, ITERG leverages its expertise and its platforms to serve a much larger number of industrial sectors that use vegetable fats and proteins. Annually, ITERG consults on scientific and technical questions for more than 500 manufacturers from sectors such as: the food industry, animal feed, dietary supplements, pharmaceuticals, cosmetics, chemicals and materials.

"ITERG innovates for a sustainable oilseed and plant protein sector: reducing the carbon footprint, optimizing through AI, and developing quality bio-sourced products, while staying fully committed to improving competitiveness."

Cultivating our values

Background images generated by AI - contacts at the end of the report.



People at the heart of our performance

Promoting safe and harmonious working conditions for all our employees

Innovation

Creativity, audacity and synergy for ethical and responsible innovation

Technical and scientific expertise

Maintain our role as a scientific reference for the oilseed and plant protein sector

Support and transfer

Supporting development, innovation, and industrial transfer

Sustainability

Developing sustainable industrial solutions for a greener and more eco-responsible economy

Boosting safety, well-being, and eco-responsible engagement

Within the ITERG Group, corporate social responsibility (CSR) penetrates into the heart of our values, encompassing Occupational Health and Safety (OHS), Quality of Life and Working Conditions (QLWC), as well as the development of sustainable industrial solutions for a greener and more eco-responsible economy. Our corporate culture is based on the well-being and safety of our personnel, which is essential to creating a work environment that favors professional development and the harmonious integration of every employee.

“Sustaining a QLWC working group”

In 2023, our commitment to these principles was amplified by the creation of a **QLWC working group**. This group’s mission is to imagine and undertake strategies for continual improvement, evaluating their effectiveness as far as workplace well-being while simultaneously integrating the principles of sustainability and eco-responsibility into our day-to-day practices. This approach reaffirms our desire to promote an ethical workplace environment that respects the planet.

“Reinforcing our safety culture”

We also reinforced our **safety culture** by involving our personnel in behavioral audits (nearly 100% participation in 2023), enhanced by innovative learning activities such as an escape game created by the occupational health services to raise awareness about the risks of chemical products, and in-depth studies about exposure to noise and solvents. These initiatives demonstrate our commitment to preventing professional risks and fit in to a global CSR approach that aims to ensure a working environment that respects our employees’ health and safety.

“Showcasing our values and our employer brand”

In the context of our efforts to attract and retain talent, we showcase our **employer brand** to reflect our ethical values and a diverse workplace environment that offers professional development opportunities and the possibility to contribute to sustainable industrial solutions. This positioning is crucial from the start of the recruitment process and guarantees an enriching experience for new employees, encouraging them to get involved in our eco-responsible strategies.

“Invigorating our internal communication”

Our internal communication was boosted in 2023 by the introduction of new publications that improve transparency on our values and key performance indicators, thus reinforcing cohesion and motivation inside our teams. This sharing of information contributes to aligning all of our employees behind our shared objectives, including our sustainable development goals, underlining our collective commitment to a greener and more eco-responsible economy.

Striving for excellence

Quality is at the heart of all our activities, demonstrating our unwavering commitment to excellence.

The goal of our quality approach is to simultaneously guarantee our clients satisfaction by providing products and services that meet or exceed their expectations, and continuously improving our organizational efficiency. By optimizing our processes and making the best use of our resources, we aim to boost our efficiency and cement our reputation as an organization resolutely dedicated to quality and excellence.

Renewal



ACCREDITATION
NO. 1-0171
SCOPE
AVAILABLE ON
WWW.COFRAF.FR

New methods added to our scope of accreditation in 2023:

- Determination of mineral oil content (saturated and/or aromatic hydrocarbons) by LC-GC-FID
- Determination of trace metal and mineral content by ICP OES

New in 2023

COFRAC accreditation of ITERG according to the ISO/IEC 17025 standard was renewed until 12/31/28

Renewal



ITERG is certified ISO 9001 2015.

Renewal



ITERG is certified for "Good Manufacturing Practices for Cosmetics. Workshops in the Non-Food Development Department."

Renewal



ITERG est certified by Fosfa

CONSEIL OLÉICOLE INTERNATIONAL

ITERG is accredited by COI for sensory analysis, physico-chemical analyses and olive oil contaminant analysis from December 1, 2023 until November 30, 2024.



IMPROVE is verified by Ecocert for its cutting, separating, grinding, and shaping services cereals and grains.



ITERG is certified by Ecocert Greenlife SAS, according to the COSMOS standards, for these services: pressing organic seeds, refining and deodorizing organic vegetable oils, hydrogenating organic vegetable oils, and grinding organic materials.



ITERG is accredited by Qualiopi for its training activities.

2023, the year in review



ITERG again qualified ITAI Launch of the
PROFEEL UMT 12 January 2023 Adebiotech Day -
Presentation of the Alliance

January



27 February 2023 Presentation at the Agriculture Fair - Fabrice
BOSQUE 28 February 2023 Training for new arrivals at ITERG
Panorama of vegetable oils

February



23 March 2023 Tech Day - Lipids Guillaume CHOLLET
28 - 30 March 2023 Barcelona In cosmetics fair
29 - 30 March 2023 PPIC - Denis CHÉREAU

March



Nomination of Lionel LAGARDERE as Chairman of the AFNOR 60C
Commission 30 April - 3 May 2023 AOCS Congress - Frédéric BAUDOUIN

April

3 May 2023 ACD Day- Marie REULIER "ITERG at the heart of the strategy to valorize vegetable oils"
31 May 2023 Seminar Cap Proteins - main results

May



24 - 25 May 2023 ISO meeting on the AVRIL Campus
7 - 8 June 2023 Bridge 2 Food - Jean Charles MOTTE

June

July

Renewal of ISO certification 9001

End of the IMAGO project, financed by the Nouvelle-Aquitaine Region and European Union with FEDER

2 - 5 July 2023 ISSFAL Congress - Lina TOUTIRAIS



August

September

27 - 28 September 2023 ALINA
FAIR - Franck DEJEAN



October

17 October 2023 Technical Environment Day ECO-DESIGN Launch of the IFOODEA Collective

18 - 19 October 2023 Cosmetic 360 - Marie REULIER, Fabrice FARRUGIA 2 - 4 October 2023 5th

International Exhibition for Cosmetics TAKSIM-ISTANBUL-TURKEY Jérôme VILA, Franck DEJEAN

November

6 - 7 November PPIC, MINNEAPOLIS - Denis CHEREAU

21 - 22 November 2023 Bridge 2 Food Asia - Laura DEVOT,

Amadou SIDIBE 27 November 2023, GLN Day - Leslie COUDELO



December

9 December 2023, Celebration of ITERG's 80th

anniversary Nomination of Lionel LAGARDÈRE CEN from 2024 to 2029 12 December 2023, INNO SWEET - Sophie GELIN



02

Industrial sovereignty and Resilience



02



Creating more value for oils and developing the use of vegetable proteins in our diet

The transition toward biorefinery models in the oilseeds sector reinforces food sovereignty and resilience. It allows for optimal use of all the parts of the grain in food for humans and animals as well as in non-food applications while at the same time guaranteeing food safety against contaminants. ITERG Group's implication in this area is reflected by its investment in research and innovation, notably through the development of methods of analysis, its expertise in nutrition, the introduction of innovative technologies, and the realization of environmental studies.

Expertise and monitoring: the quality and safety of lipids under the microscope

The essential role of the Oilseed and Plant Protein Monitoring Plan

In 2023, ITERG reaffirmed its leading role in monitoring quality and contaminants in vegetable oils through its constant and active participation in the steering committee for the Oilseed and Plant Protein Monitoring Plan, initiated by Terres Inovia twenty years ago.

This work encompasses the collection and in-depth analysis of self-inspection data on contaminants in raw and refined oils from various sources such as sunflower, canola, soy, and palm.

During its last campaign, the project benefited from a significant participation from 40 manufacturers who contributed to collecting 769 oil samples and recording 189,206 pieces of data covering a large range of contaminants (pesticide residues, heavy metals, PAHs, mineral oils, etc.)

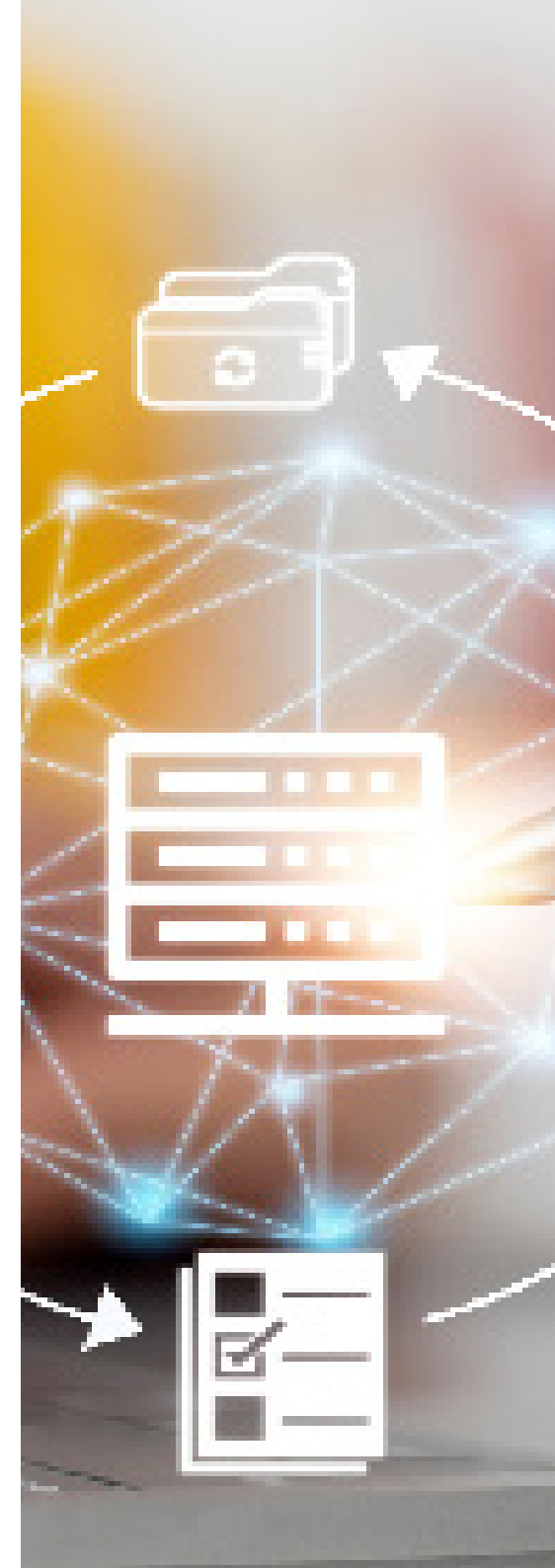
— Laura KRIEGER —

**Business Manager, Analysis and Expertise Department,
ITERG**

The continual increase in the amount of samples and data shows manufacturer's desire to always be improving the quality and safety of vegetable oils and proteins, demonstrating their proactive response to the challenges of public health and sustainability.

The development of a new web portal, in partnership with Intercéréales, is in progress. It will contain all the data from the Oilseed and Protein Monitoring Plan (that is, the data on oils managed by ITERG as well as the data on grains and oil cakes managed by Terres Inovia) and the Cereal Sector Monitoring Plan.

This approach demonstrates ITERG's continuing commitment to reinforce the reliability and transparency of processes in the oilseeds sector, underlining its pivotal role in protecting the quality of oilseed and protein products.



Precise measurement of trace elements in vegetable fats with ICP-OES

In 2023, our laboratory enriched its analytical equipment with the acquisition of an inductively coupled plasma optical emission spectrometer (ICP-OES).

This cutting-edge equipment expands our analytical capabilities, allowing us to detect and quantify trace elements in lipid samples with increased precision, sensitivity, and speed.

Among the trace elements analyzed are: iron, copper, phosphorus, lead, arsenic, cadmium, tin, nickel, mercury, calcium, sodium, potassium, and magnesium.

Some of these metals are strictly regulated by Codex standards or stringent Manufacturing Best Practices, or are recognized as potentially pro-oxidant or toxic at specific dosage levels.

The integration of this advanced technology reinforces not only our capacity to identify contaminants at trace levels, but also positions us as a first-tier actor in the field of food-safety analyses.

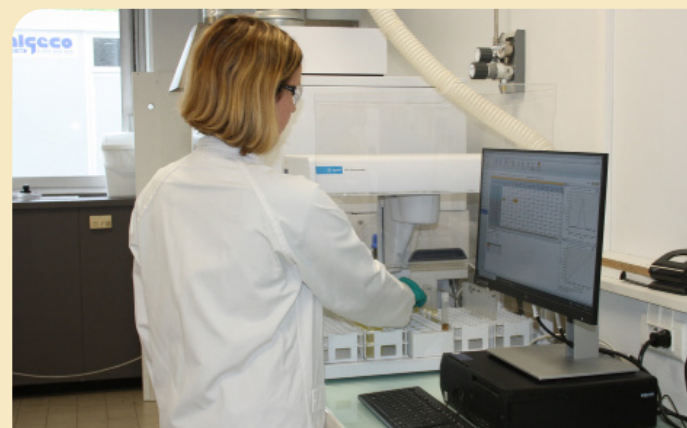
Recognition of our expertise is attested to by our COFRAC accreditation, which guarantees that our analysis procedures and results adhere to rigorous quality standards.

By regularly investing in new equipment, ITERG maintains its expertise in lipid analysis.

This approach reflects our commitment to providing reliable and precise analytical services, thus bolstering the efforts by manufacturers to guarantee the safety and quality of food products.

— Franck DEJEAN —

Head of the Analysis and Expertise Department,
ITERG



Determination of the content of 12 phthalates in vegetable oils by GC-MS/MS



At the beginning of 2023, our laboratory acquired a new gas chromatograph coupled with tandem mass spectrometry (GC-MS/MS).

This cutting edge analysis is generally used for contaminants (pesticides, etc.) and in this case, allows us to improve on our older phthalate analysis method in less time, with a better sensitivity, increased selectivity, and more reliable quantification.

The phthalates analyzed are: Dimethyl phthalate (DMP), Diethyl phthalate (DEP), Dipropyl phthalate (DPrP), Diisobutyl phthalate (DiBP), Dibutyl phthalate (DBP), Benzylbutyl phthalate (BBP), Dicyclohexyl phthalate (DCHP), Diethylhexyl phthalate (DEHP), Dinooctyl phthalate (DnOP), Diethylhexyl terephthalate (DEHT), Diisononyl phthalate (DiNP), and Diisodecyl phthalate (DiDP).



Phthalates, used as plasticizers to increase the flexibility, transparency, and durability of plastics, can originate from the extraction and processing of vegetable oils. They can migrate from materials in contact with oil, like tubing, storage tanks, or packaging.

So, this method aligns with food safety concerns as phthalates are known endocrine disruptors.

This method was externally audited by Cofrac in March 2024, which will give ITERG COFRAC accreditation, again underlining our technical competence, reliability, and striving for continual advancement.

Last minute

On 4/22/2024, our laboratories received notification from COFRAC to add phthalate analysis by GC-MS/MS to the scope of our accreditation.

Congratulations to all the teams, and especially to the "Gas Chromatography" team!

— Julien ESCOBESSA —

Head of GC Quality Control - Analysis & Expertise Department, Quality Analyses Correspondent, ITERG

From science to plate: working toward a sustainable and healthy diet

The benefits of glycerolipids: impacts and potential of plant lechitins for human health

Glycerolipids (PL) are minor components of our diet and represent less than 2% of the lipids we consume. Even if their participation in our diet is minor, they are nonetheless far from being neutral and without nutritional interest. In fact, they play a structural role as important building blocks of biological membranes and a functional role in the nervous system and lipid digestion.

The consumption of PLs thus provides a two-fold nutritional interest, as a supplier of amino acids and of fatty acids for the construction of cellular membranes.

As excellent emulsifying agents, PLs have a direct impact on the stages of digestion and absorption and favor the bioavailability of beneficial fatty acids such as omega-3s.

This nutritional benefit of PLs as structuring agents for food matrices was presented by Leslie Couëdelo (ITERG Life Sciences team) at the event by the Lipids and Nutrition Group (GLN) on 27 November 2023. Additionally, within the ELIPRO Project (Profeel UMT), we examine questions related to the impact of dietary uses of lechitins on the digestibility of lipids and proteins to favor their bioavailability while preserving the qualities of the intestinal barrier.

In fact, synthetic emulsifiers are currently pointed to as detrimental to intestinal health and data related to lechitins is very limited.

Within the framework of her thesis work, (ITERG / INRAE-Carmen Lyon), Chloé Robert published new data on the benefits of plant lechitins that simultaneously contributed to improving the population's status in omega-3s and favoring biodiversity in the intestinal microbiota: *"Natural emulsifier lechitins preserve gut microbiota diversity in relation with specific fecal lipids in high-fat-fed mice."*

Thus, despite the fact that glycerolipids (PL) make up only a small fraction of the lipids in our diet, their impact on human health is fundamental. Their role in structuring cell membranes, digesting lipids, and preserving intestinal health underlines the importance of these compounds. The study and judicious use of PLs, in particular plant lechitins, could play a key role in improving the nutrition and dietary development strategies that aim to optimize our health.



— Leslie Couedelo —
Nutrition Life Sciences Project Manager,
ITERG

Focus on the Actia PROT&IN RMT and its work



Co-directed by ITERG, the Actia PROT&IN RMT (Joint Technological Network) initiated, in 2023, development of a tool to aid in the formulation of products that integrate diverse sources of plant proteins. Its goal: to allow us to evaluate and compose plant-protein-based mixtures in order to compare the FAO reference protein values to the protein needs of target populations (the elderly, athletes, people who are overweight, etc.)

Protein requirements are different and specific according to the targeted population. The tool must be precise in terms of quantity, digestibility, and amino acid profile, as well as the speed of digestion, which influences the effectiveness of assimilation. Finally, it must also take into account the available data on possible interactions between the various foods ingested together during a single meal.

This tool was discussed within the framework of a working group made up of RMT partners (CTCPA, UNH-INRAE and ITERG), as well as members of the Actia Nutriprevius Network and the Actia PROFEEL UMT.

Together, the different stakeholders agreed on the interest of this tool and the need to further develop our knowledge of plant proteins in terms of amino acid content in the plant sources currently available, protein content (flour, concentrate, isolate), digestibility and bioavailability, as well as the composition of the non-protein fraction of these sources (for example, antinutritional factors).

Did you know?



On 23 November, Benjamin Buaud participated in the webinar "Innovating with plant proteins" organized by the Technological Resources Center CRT AGIR to present the RMT's work.

In the current context of increasingly plant-based food products and the democratization of the use of plant-protein materials, several technical and scientific challenges still need to be met, especially where the taste and functionality of these ingredients are concerned. This webinar presented examples of innovation and collaboration that aimed to facilitate and diversify their use in finished products.

● Benjamin BUAUD ●
Nutrition Life Sciences Project Manager,
ITERG Coordinator for the Actia PROT&IN RMT

Partners in the Actia PROT&IN Joint Technological Network (RMT):
ITERG, ADIV, CTCPA, ADRIANOR, ACTALIA, TERRES INOVIA, EXTRACTIS, Human Nutrition Unit (UNH-INRAE-UCA), AgroParisTech / Paris-Saclay University, CBMN Laboratory / University of Bordeaux / CNRS / Bordeaux INP, Agro Campus Dijon / Lycée Agricole Félix Kir Plombières

For more information on the Actia PROT&IN RMT
visit - <https://www.actia-asso.eu/projets/protin-2020/>

Dietary innovation: working toward a sustainable future with plant alternatives to meat

Eating a meat has a high environmental impact, and plant-based alternatives to steaks, sausages, and chicken are gaining popularity among consumers.

The most common technology for producing these vegan alternatives is extrusion. This technology uses a combination of shearing and high temperatures to align the proteins into fibers and recreate the texture of chicken, fish, or ground meat.

In 2023, IMPROVE acquired a twin-screw extruder capable of producing meat analogs with both high and low moisture content using a minimal amount of only a few kilograms of proteins, with a capacity of up to 10 kg/h - this is the perfect tool for developers of ingredients to test their new proteins and produce their first dietary prototypes as well as for dietary-product developers to test new recipes.

This equipment is polyvalent and can be used for meat analogs, snacks, breakfast cereals, pasta, and candy.

With the augmentation of technologies such as extrusion, the transition to plant-based alternatives to meat products is accelerating, providing a concrete response to environmental challenges and simultaneously expanding the selection of sustainable food choices for consumers.

— Frédéric BAUDOUIN —

Head of the Protein Characterization and Applications Division,
IMPROVE



Did you know?

Since 2022, ITERG has been developing a specific sensory-analysis method for plant proteins intended to provide precise evaluation of their sensory characteristics (*see the 2022 ITERG activity report*). This methodical approach allows us to identify and quantify taste perceptions such as bitterness, tartness, or cut-grass flavors that can inhibit their acceptance by the general public.

By combining ITERG's sensory expertise and IMPROVE's extrusion technology, manufacturers benefit from an integrated offer to create meat substitutes, or any other dietary product, that meets the taste requirements of consumers and remains feasible to produce on an industrial scale.

Food and environment: progress and perspectives in eco-design and sustainability

Improving the AGRIBALYSE® database



AGRIBALYSE® is the French government's database of environmental-impact indicators for agricultural and food products based on Life Cycle Assessments, and managed jointly by ADEME and INRAE. As a member of the REVALIM Scientific Interest Group, ITERG contributes to the work of improving this database.

In 2023, that constituted two projects co-financed by ADEME: PACK-AGB and InCyVie.

The goal of **PACK-AGB** is to improve considerations on packaging in the AGRIBALYSE® database. Thus, the partners in this project (ACTALIA, CTCPA, IFIP, IFV, ITERG, IPC and Bleu Safran) set up a methodical reference framework for packaging in the AGRIBALYSE database, allowing for a more exhaustive consideration of materials, shaping procedures, and the end of life for each element in a sales-packaging solution. This framework was applied to the creation of sets of Life Cycle Inventory (LCI) data on packaging, allowing us to cover 50% of food products in the AGRIBALYSE® database. ITERG contributed to creating 48 new Life Cycle Inventories representing the packaging for oils and margarines.

The **InCyVie** project brings together the various Agricultural and Food Industry Technical Institutes. It began in 2023 for a duration of 4 years and aims to enrich and consolidate the Life Cycle Inventories (LCIs) for agricultural and food products in the AGRIBALYSE® database. In 2023, we were able to create or update the first batch of LCIs for the project, in which ITERG contributed to updating the inventories for margarines and creating the inventories for virgin coconut oil and refined copra oil.

Work on these two projects integrated version 3.2 of the AGRIBALYSE® database, that is set for publication in summer 2024.

— Fabrice BOSQUE —
Head of Environment & Eco-Industries,
ITERG



Environmental labeling

Following on the experiments engendered by the AGECL law (Anti-Waste Law for a Circular Economy), Article 2 of the Climate and Resilience Law introduces into the Environmental Code “an environmental impact labeling system for goods and services intended to inform consumers about the relative environmental impacts of goods released to the national market.” The environmental labeling system is steered by the Ministry of Ecological Transition and Territorial Cohesion (MTECT), with support from ADEME, and primarily concerns the food and textile sectors.

ITERG has been working with public authorities throughout 2023 via a monitoring group that follows the structuring of the environmental labeling system. This group includes the CGDD (General Commission for Sustainable Development of the Ministry of Ecological Transition and Territorial Cohesion), ADEME, ACTA, ACTIA, and Agricultural and Food Industry Technical Institutes. In this way, ITERG was able to:

- provide technical expertise to the federation through its contribution to the discussion on the environmental-labeling format,
- raise awareness among food manufacturers and professional organizations on the issues related to this labeling system,
- identify critical watchpoints on the future labeling system,
- provide initial data for the ECOBALYSE tool developed by the CGDD.

The latest political debates on the name, format, and method for calculating the environmental score are pending, so that a standardized, voluntary labeling system can be deployed in the second quarter of 2024. In this way, ITERG plans to test the proposed method.

— **Cynthia VIALATTE** —
Environment & Eco-Industries Project Manager,
ITERG

Did you know?

On 20 April 2023, the partners in the Actia Écoval Joint Technological Network (RMT) presented a complete status report on the environmental labeling project for dietary products, its upcoming deployment, and its implications for companies in the food industry.

Topics discussed:

- The principles, regulatory framework, and calendar
- The proposed system (method, data, and format)
- The system’s operability and perspectives

Speakers: Emilie ADOIR (IFV), Fabrice BOSQUE (ITERG), Laura FARRANT (CTCPA), Anthony ROUAULT (ACTALIA)

For more information on the ECOVAL RMT and to see the replay, visit <https://www.actia-asso.eu/projets/ecoval-2020>

Webinar

‘The status of environmental labeling for food products.’





Ecological and environmental transition



03

The background of the slide is a close-up photograph of green leaves, likely from a plant in a field. The leaves are vibrant green and have a slightly glossy texture. The lighting is soft, creating a natural and fresh atmosphere. The text is overlaid on a white, rounded rectangular box in the center-left of the image.

Modernization of transformation processes and promotion of bio-sourced products

The ecological and energy transition in the oilseeds and proteins sector is essential to meeting current environmental challenges. By revising extraction methods for vegetable oils and favoring the development of bio-sourced products, we can significantly reduce our carbon footprint and foster a more sustainable use of resources.

The ITERG Group is mindful of these stakes, and within this dynamic, is fully committed to developing innovative solutions that contribute to the environmental and economic sustainability of our sector.

Innovation and Functionality: the keys to positioning new ingredients

Whether in the food or cosmetics sector, the emergence of new sourcing and processing (extraction, biotechnology, etc.), leads to the development of new ingredients. These ingredients are positioned as alternatives to petroleum-sourced, animal-derived, or exotic products, or showcased for a particular activity.

Whether the ingredient manufacturer is looking to imitate a molecular structure, a stabilizing, thickening, or gelling property, or simply to demonstrate the formulability of their active ingredient, the evaluation of applicative performance is essential to convince formulators.

If each formulator and field of activity retains their know-how and practices, it's still necessary to understand the functional performances in order to:

- optimize production processes accordingly
- compare them with commonly used ingredients (animal proteins, petroleum-sourced waxes, stabilizers that are controversial or originate from palm/coconut)
- recommend optimal conditions for use

ITERG's Formulation team offers a service that allows them to simultaneously, with a minimal number of tests:

- position the ingredient in comparison with a reference
- identify formulation levers to optimize performance
- implement in simple model-formulas that nonetheless speak to formulators

To do that, the formulation frameworks combine manufacturing processes and common ingredients that have been validated and characterized: notably for physical stability and rheological properties. Each ingredient category can thus be substituted (one by one if multi-functionality is desired) by ingredient to evaluate and the properties to compare, with all other factors being equal (central conditions). The parameters of composition and/or processes are then varied to optimize and or demonstrate the added value of the new ingredient (discriminative conditions). According to the objectives and desired degree of evaluation, two approaches are used: decision trees and mapping.

— Cécile JOSEPH —
Formulations Project Manager,
ITERG

The integration of new ingredients in the food and cosmetic sectors represents significant progress toward more sustainable and effective products. The evaluation of applicative performances, the optimization of processes, and the laying out of guidelines for usage are key steps for successful integration. The methodical approach used by ITERG's Formulations team perfectly illustrates how science and innovation can converge to respond to the challenges of modern formulation.

New semi-industrial processes for developing local-scale oil mills

To meet the current environmental and societal demands for better consumption while also limiting environmental impact, the idea of relocating the production of flavorful oils closer to major population centers is gaining traction.

To meet this demand, ITERG is striving to support the emergence of small, artisan or semi-industrial grain transformation units that valorize local production and adhere to high environmental standards.

The impediments to developing small production units are in part linked to the characteristics of the grains to be processed through mechanical pressing. In fact, the use of chemical solvents is prohibited for these applications, and consequently, ITERG is working to perfect custom mechanical processes for the matrice to be processed.

Currently, the grains that are difficult to press mechanically, notably those that contain only a small amount of oil (less than 15%) and contain a significant fraction of cellulose, go through a solvent extraction process (hexane) to extract the oil.

Grapes are among the grains considered complex to extract mechanically. GIVEN their geographical situation in the Bordeaux wine region, ITERG undertook the first mechanical pressing tests on this matrice.

The project has a two-fold objective

- attaining oil yields that are sufficient for the economic feasibility of small structures
- developing a process for preparing the seeds that limits abrasion to the mechanical pieces during pressing



— Jean-Philippe LOISON —

Assistant R&D Engineer, Industrialization and R&D,
ITERG

By developing appropriate mechanical extraction techniques that respect the environment, ITERG not only meets societal expectations for better means of consumption but also paves the way to self-sufficiency and resilience for small production units. This allows for the valorization of local resources as well as a reduction in global ecological impact, in phase with informed and responsible consumption.



From Petrochemicals to Biorefineries: enhancing environmental performance through bio-based chemistry.

Promoting French rapeseed as a substitute for petroleum derivatives

Sustainable development has become a structural concept for our modern economy. Changes in climate caused by greenhouse gases, the accumulation of waste, demographic growth, and the loss of biodiversity have triggered a massive awakening within the population and in industrial sectors.

Prompted by the need to respond to environmental challenges and by regulatory pressure (REACH), the chemical sector has initiated a transition from petroleum-derived chemistry to bio-based chemistry. In this perspective, the concept of “biorefineries” has emerged, allowing industrial stakeholders in this field to create and produce bio-sourced molecules and materials to replace the current petroleum derivatives.

In this context, the ERMONES project aims to promote non-food rapeseed oil with a high erucic acid content to develop a new family of polyesters. This oil is produced in France, and more specifically, in Normandy.

Erucic acid (IUPAC nomenclature: (Z)-13-docosenoic acid) consists of 22 carbon atoms and one double bond between carbons 13 and 14 in a cis (Z) configuration (Figure 1). Erucic acid is naturally present at a concentration of 45% in the oil, but it is possible to achieve a purity greater than 95% through a distillation process. The first step in the project is to develop strategies to introduce a hydroxyl function onto the C22 skeleton, either at position 13 and/or 14 (M1 and M1'), or – in a more innovative manner – at position 22 (M2) (Figure 1). The influence the position of the hydroxyl function has on the synthesis and properties of C22-based polyesters will be studied in a second phase.

ERMONES Project, ANR CFP in collaboration with PROTEUS and the LCPO

— Guillaume CHOLLET —

Head of the Industrialization and R&D Department,
ITERG

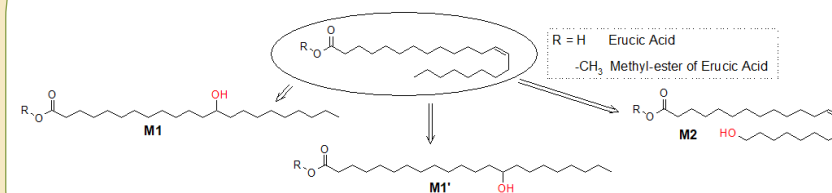


Eco-design strategy

Environmental performance is an essential element for these innovative bio-sourced materials. To guarantee this added benefit for the environment, the ERMONES project will follow an eco-design strategy to orient the technical work at various milestones. Raw materials, monomer synthesis, and polymerization conditions will thus be evaluated by Life Cycle Assessments (ISO standard 14040-44) to quantify their impacts on the different air, water, and soil ecosystems.

— Lou BERNARD — Environment Project Manager, ITERG

Figure 1: Monohydroxylated monomers derived from oil with high erucic acid content



New functional bio-sourced polymers

The PRiCEPOX project aims to develop new, functional bio-sourced polymers from castor oil – non-edible resource – more specifically, derived ricinoleic acid.

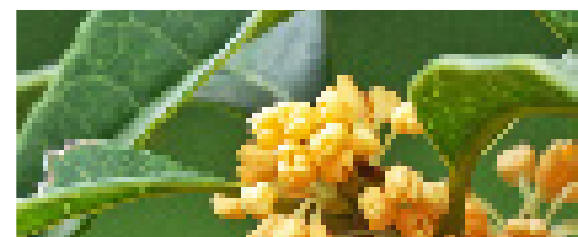
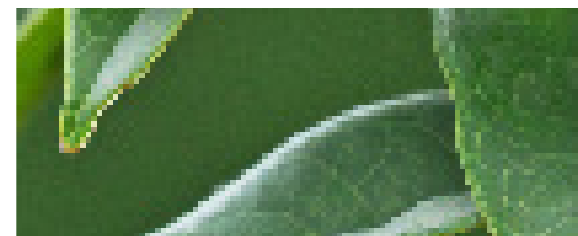
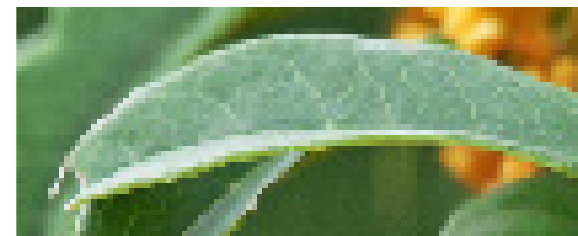
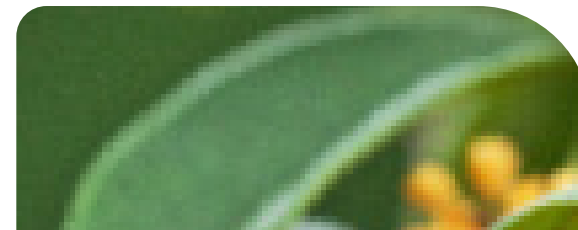
The project will initially focus on obtaining an enriched fraction of ricinoleic acid, enabling the expansion of ITERG's range of 'PRIC' estolides towards higher molar-mass polyesters. The project's main strategy will then consist of leveraging the enriched ricinoleic acid synthon to form an epoxidized precursor of ricinoleic acid, which will serve as a platform molecule for obtaining numerous tailor-made estolide synthons and polymers that have applications in various markets.

While PRIC estolides are already utilized in the cosmetic industry, the PRiCEPOX project aims to reach new markets by introducing new functionalities such as oxirane, urethane, (meth)acrylate, and even network formation, leveraging the chemical versatility of the newly created epoxy function.

Model formulations will be used to investigate and exemplify the benefits of using ricinoleic acid oligomers in various applications, including but not limited to surface coatings, adhesives, additives, and self-repairing materials.

The PRiCEPOX project reflects significant advancements in the field of bio-sourced materials, leveraging castor oil to develop a new generation of functional polymers. This project opens the way for new industrial applications, from cosmetics to self-repairing materials. It is thus showing how green chemistry can contribute to the ecological transition through sustainable innovations.

● Boris BIZET ●
Plant-Based Chemistry Project
Manager, ITERG



At the heart of plant-based chemistry

Future challenges of the PRIC range, a pioneer in the estolide sector

Following its success in cosmetic applications, ITERG finds itself at the heart of innovation in the field of estolides. This progress not only consolidated its reputation as an excellence hub on the subject of bio-sourced polymers based on vegetable oils, but also amplified the demand for increasingly sophisticated innovations.

In response, ITERG has intensified its efforts on several fronts:

- on the one hand, the institute is dedicated to studying new raw materials and means of synthesis to diversify and enrich its range of estolides.
- on the other, it continues to study functionality, seeking new applicable markets.

In this framework, ITERG must increase its scale-up capacities to facilitate the industrial transfer of innovations. We aim to guarantee a quick and effective implementation of technological advances to best meet the market's expectations. To do this, ITERG began transferring a part of its production to PIVERT and will formalize their subcontractor status in 2024. Through this approach, ITERG underlines the importance of continual adaptation and innovation in responding to the challenges and opportunities of the market.

ITERG is at the forefront of research on bio-sourced polymers and continues to push the boundaries of innovation with its range of estolides.

By consolidating its collaboration with PIVERT for industrial upscaling and transfer, ITERG is not simply responding to market expectations; it is anticipating them, demonstrating a perfect synergy between adaptation, innovation, and commitment to an ecological transformation.

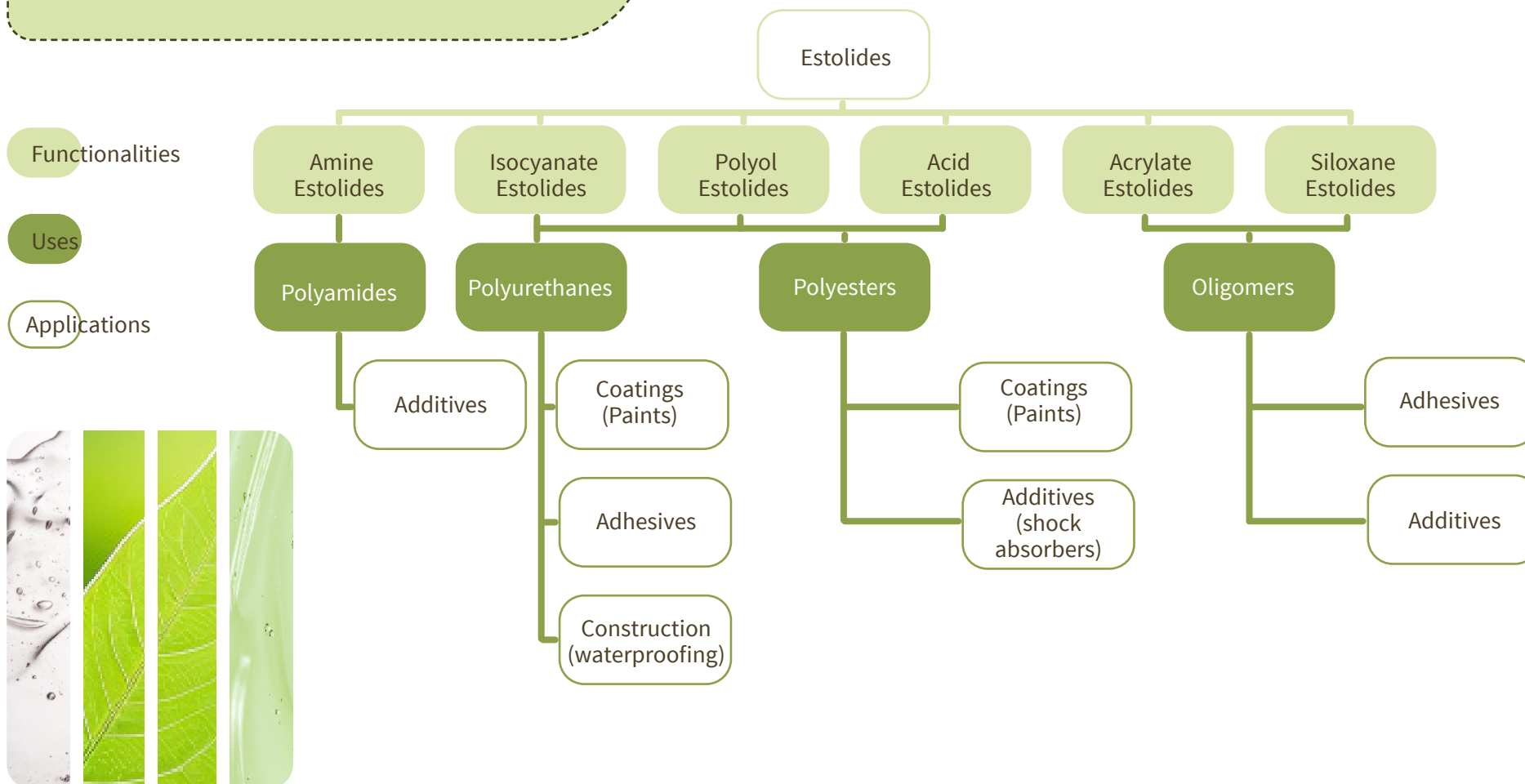
■ Guillaume CHOLLET ■

**Head of the Industrialization and R&D Department,
ITERG**



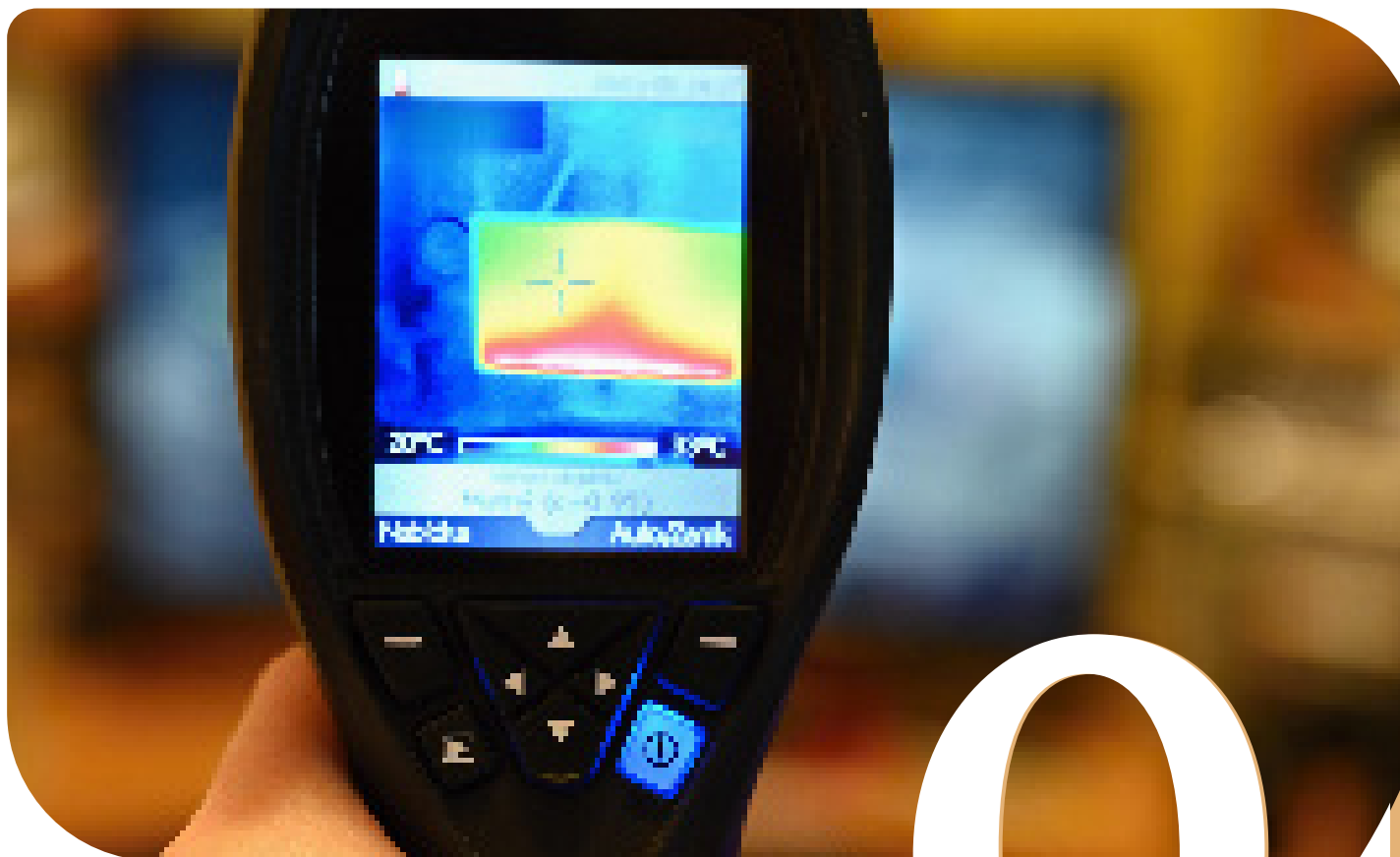
Did you know?

These polymers made from plant resources are used in a large spectrum of applications, especially for paint, adhesives, and surfactants. ITERG is innovating with new chemical derivatives from biomass whose functionalities offer a strong added value.





Industry of the future



04



Optimizing the oilseed and plant protein sector through appropriate technological platforms

An orientation toward the industry of the future is essential to the oilseed and plant protein sector because it allows for the development of technological platforms adapted to upscaling and the study of processes in industrial conditions, favoring optimization of the value chain. By integrating Life Cycle Assessments in these platforms, we can measure and improve the sector's environmental impact to anticipate the ecological and economic challenges of the future.

The ITERG Group is actively engaged in improving the efficiency of industrial processes, aiming to optimize both the quality of the final products and significantly reduce their carbon footprint.

Advanced technologies for a sustainable industrial future

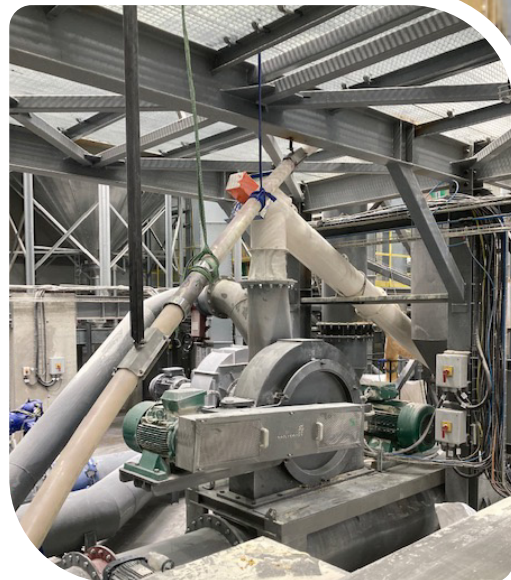
Commissioning of an industrial line for debittering powders

IMPROVE recently commissioned an industrial line for the debittering of powders according to one of its patents. This project is part of the ongoing development of a pilot industrial line for producing pea concentrates, also according to an IMPROVE patent.

The main goals of this line are to improve the mass yields of the fractions obtained and the purity rates of the concentrates produced, while optimizing energy consumption.

Joan Enric OLIVA RAVENTOS

Dry Fractionation Project Manager, IMPROVE



Acquisition of a steam-injection thermal processing skid (OMVE) and a ring dryer.

Scientific and technical monitoring is one of the activities that IMPROVE carries out all year long in order to meet new client demands while following the market's evolution. The goal of this monitoring is to identify new or existing technologies used in other sectors in order to transfer and apply them to the world of alternative proteins. In this context, IMPROVE regularly leases and invests in cutting edge equipment, thereby favoring quick adaptation to new trends and the specific needs of its projects.

At the heart of the alternative protein production process, IMPROVE attaches great importance to controlling food quality and safety, in particular during protein stabilization. Controlling the microbial load of products without altering their protein structure is a major challenge. To meet this challenge, IMPROVE acquired, in 2023, a new thermal processing unit with a capacity of 10 to 30 liters per hour and equipped with a steam-injection system. This technology, well-established in the dairy industry for its ability to implement UHT thermal treatments, has so far seen little use in the alternative proteins sector. It's adoption marks a significant step forward, allowing us to reduce the presence of thermoresistant microorganisms while preserving the integrity of proteins.

In parallel, the protein purification process generates diverse co-products, mainly composed of fibers and starches. In the spirit of sustainable development and resource optimization, IMPROVE developed an innovative approach to valorize these by-products. In 2023, the company acquired a ring dryer, an industrial dryer generally used to process gluten. This technology has proven to be particularly well-adapted to drying co-products issued from alternative protein production, with a remarkable evaporation capacity of 5 kg of water per hour. The integration of this dryer illustrates IMPROVE's commitment to energy efficiency and reducing waste, underlining its pioneering role in the search for sustainable and innovative solutions in the field of alternative proteins.

— Amadou SIDIBE —

Head of the Wet Fractionation Division, IMPROVE

Thermal processing skid



Ring Dryer

Precision fermentation and purification processes

Precision fermentation aims to produce food ingredients, proteins, enzymes, flavors, vitamins, and pigments from abundant and inexpensive substrates by using precise genetic modifications to reorganize the metabolic pathways of microorganisms (bacteria, yeasts, filamentous microorganisms, or microalgae) and thus program them for the synthesis of beneficial molecules.

Production of the beneficial ingredients through fermentation is followed by a step that purifies and isolates the ingredient, called DSP (Downstream Processing). The general schema of DSP in fermentation is shown opposite.

DSP represents a significant part of the challenges in precision fermentation (in addition to regulation and effluent management) based on the following elements:

- fermentation products form in a diluted solution. A number of other components are also present in the culture mixture, which is why purification from diluted solutions involves more successive unit operations, which are sometimes costly;
- the products that result from fermentation are sensitive to shear and temperature, and can be degraded by exposure to solvents, acids, bases, and concentrated salts;
- harvested fermentation broths are susceptible to contamination. Once the broth is removed from the fermenter, aseptic conditions are no longer maintained and the fermentation product is subject to degradation by the activity of contaminating microorganisms. Rigorous control of DSP is essential to avoid deterioration of the product quality.

In response to these challenges, the Alliance (see page 63) serves as a strategic support mechanism for industries, assisting them in the various phases of product development from fermentation, through purification, to physico-chemical and sensory characterization.

The Alliance's expertise in this field is a valuable resource for overcoming the technical challenges of DSP and optimizing the production and quality of fermented ingredients, thus contributing to the advancement of precision fermentation as one of the food production methods of the future.

Amadou SIDIBE
Head of the Wet Fractionation Division, IMPROVE

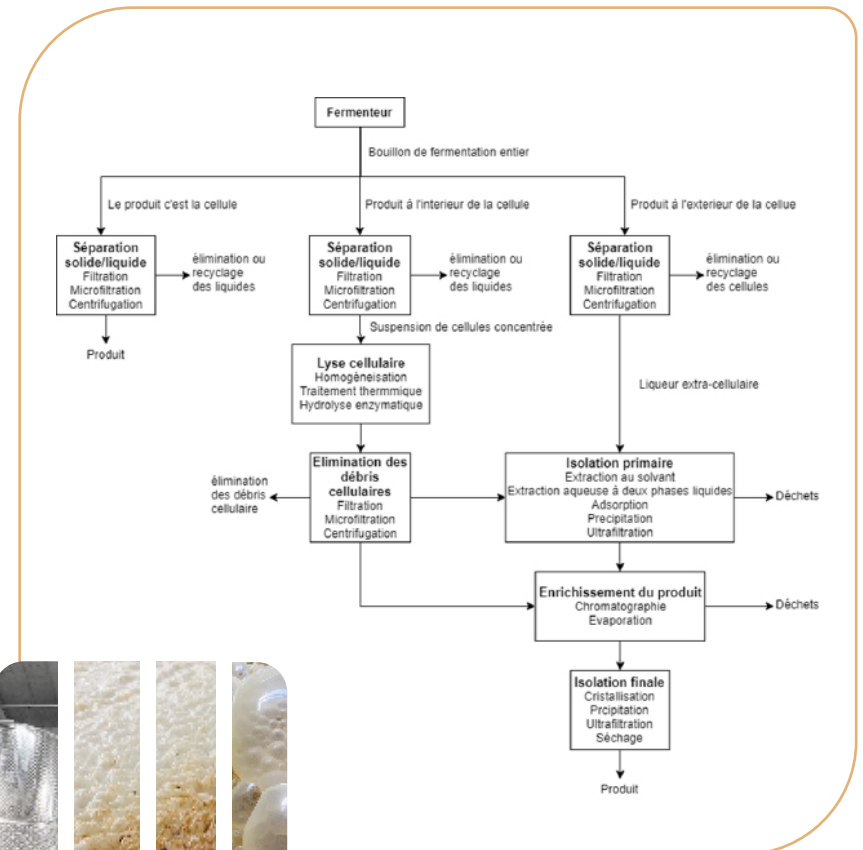


Figure 1: General schema of DSP in fermentation

Pauline M. Doran, Chapter 11 - Unit Operations, Editor(s): Pauline M. Doran, *Bioprocess Engineering Principles (Second Edition)*, Academic Press, 2013, Pages 445-595, ISBN 9780122208515, <https://doi.org/10.1016/B978-0-12-220851-5.00011-3>

Continuous protein isolate production demonstrator

Following the disruption of biological raw materials and during the aqueous fractioning of proteins, several molecules are brought into contact in the presence of water. This mixture can cause various reactions that can alter the product's characteristics and quality, such as oxidation, microbial growth, and enzymatic reactions. These reactions occur naturally in a wide variety of biomasses, from traditional sources like seeds and oilseed cakes to new protein sources like yeasts, insects, and algae. However, batch processing, generally used for developing a process, results in longer processing times compared to continuous processing, which is used on the industrial scale. These extended times allow undesirable reactions to occur, which can alter the product quality.

IMPROVE is developing a continuous micro-pilot-scale line of unit operations (5 to 20 kg/h of raw material), initially focusing on the fractioning of legume and oilseed proteins, to address the issue of undesirable reactions. The significant increase in productivity compared to batch processing allows for a substantial reduction in raw material processing times, thereby limiting oxidation, microbial growth, and enzymatic reactions. Continuous processing also allows for closer approximation to industrial conditions, which can be beneficial for certain developments, such as incorporating effluent recycling (counter-current).

— Amadou SIDIBE —
Head of the Wet Fractionation Division, IMPROVE



Developing a continual approach in the processing of legume and oilseed proteins represents significant progress toward improving both the quality and efficiency of biomass transformation.

Thanks to this innovation, we can reduce undesirable reactions by accelerating processing times, while simultaneously approaching industrial-production standards and improving effluent recycling.

Patents for isolate production

Throughout its decade of activity in the plant biorefinery sector, IMPROVE has built up know-how and knowledge that enables it to respond effectively to the specific needs of the market. Thanks to this expertise, IMPROVE has developed and patented two innovative processes, Ultimate and pH+, that mark significant advances in the production of isolates and proteins. These innovations meet market expectations in terms of functional and sensory properties, highlighting the energetic and environmental aspects.

The Ultimate process represents a technological breakthrough in the fabrication of isolates from leguminous plants. It produces isolates that are soluble in water and characterized by a remarkable neutrality both in taste and color. This method allows food industry manufacturers to easily integrate these isolates into a large range of products, improving quality without altering the original flavors or colors.

The pH+ process offers an innovative solution for obtaining isolates from extremely pure proteins (over 95% protein) while maintaining organoleptic neutrality. The process works for both leguminous and oleaginous plants and sets itself apart by eliminating the need for spray drying, a more energy-intensive step generally necessary in drying isolates. This characteristic underlines IMPROVE's commitment to greener production by reducing energy use and environmental impact.

These technological innovations, Ultimate et pH+, highlight IMPROVE's proactive approach to offering processes that not only meet functional and sensory demands for market products, but do so in a way satisfies the energetic and environmental concerns of our era.

— Amadou SIDIBE —
Head of the Wet Fractionation Division, IMPROVE



The keys to creating an eco-responsible industry through LCIs

Life Cycle Analyses aim to quantify the environmental impact of a product or service. They're based on the creation and use of Life Cycle Inventories (LCIs), meaning compilations of the flow of materials and energy representing an agricultural production activity: transport, food processing, chemical product synthesis, the production of electricity or heat, waste emissions, etc.

The existing databases offer a large choice of LCI's, but they are often multi-sector, and thus nonspecific.

To limit approximations, ITERG has an internal database containing more than 200 LCI's that are more precise and representative of the food transformation and bioeconomy activities in the vegetable oil and plant protein sector.

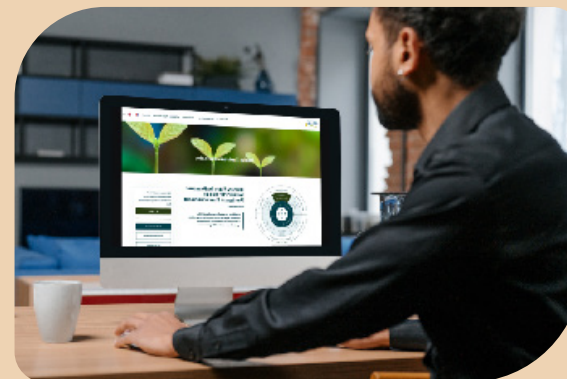
For example, this database differentiates the LCIs of oilseed and protein plants according to their technical itineraries, including the sustainability labels for exotic rapeseed and palm oil cultures. Numerous contributions from industrial actors in the sector, along with ITERG's expertise, enabled us to create biomass transformation LCIs that are particularly qualitative and robust, thus providing reference data on the environmental impact of oils, and soon, on plant proteins.

The close collaboration of the Environment and Eco-Industries Unit with the activities of Technology and Plant-Based Chemistry in the framework of innovative research requires the almost continual creation of LCIs for bio-sourced products utilized in various industries.

The use of specific and detailed Life Cycle Inventories represents a major step towards a more responsible and sustainable bioeconomy, offering a precise understanding of the environmental impacts of processing vegetable oils and proteins and thus paving the way to more ecological practices in the food and chemical industry.

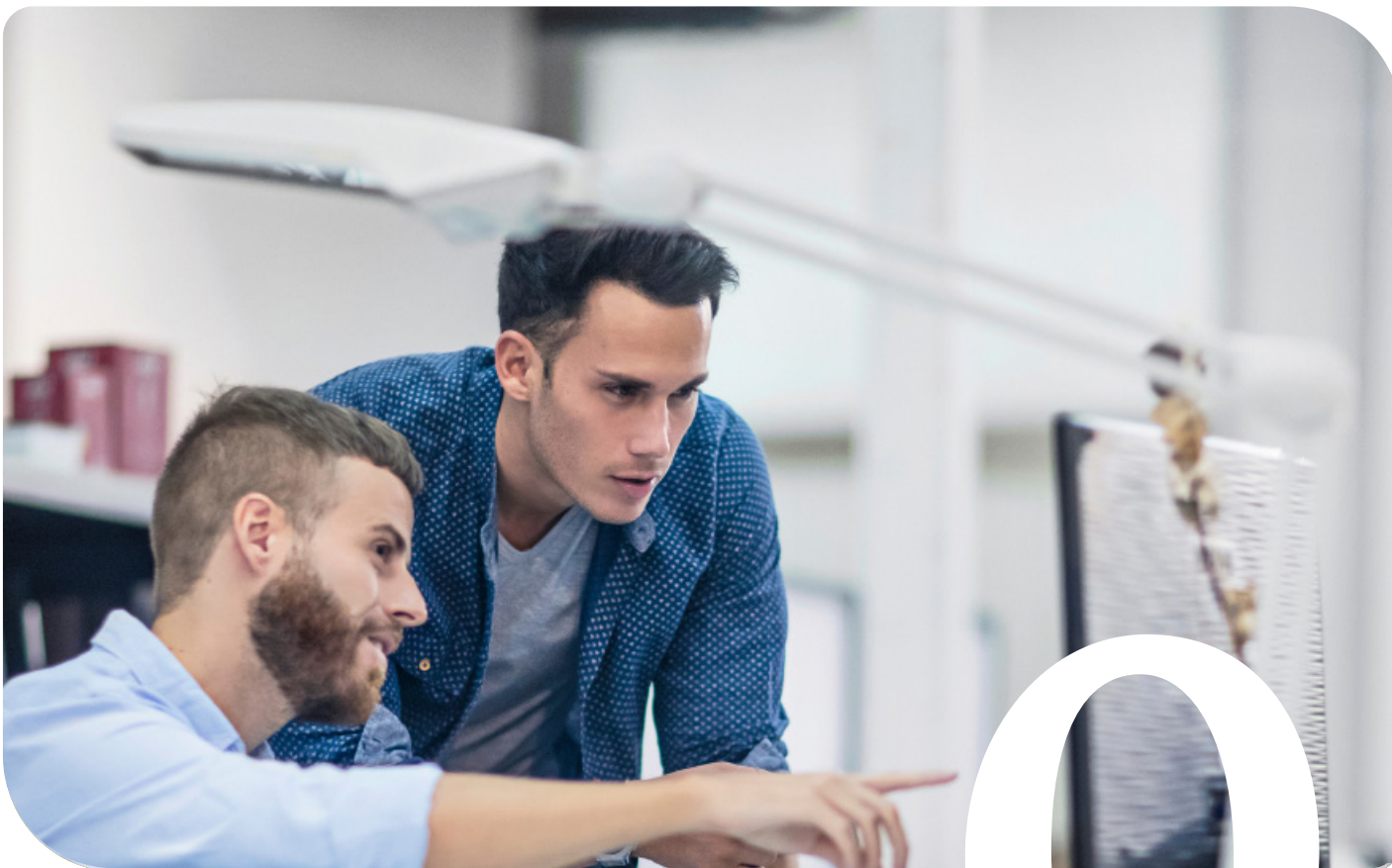
—Cynthia VIALATTE —

**Environment & Eco-Industries Project Manager,
ITERG**



05

For a more competitive sector



05



Through research and industry support

ITERG contributes to boosting the sector's competitiveness by providing companies with the knowledge, innovations, and services needed to remain at the forefront of progress.

By supporting collective research, promoting innovation, and providing technological standardization and monitoring services, ITERG helps companies meet current and future challenges while contributing to the sector's sustainable economic growth.

The Research & Innovation dynamic

Targeted and innovative research to meet industrial challenges

ITERG's RDI initiatives are deployed according to two main orientations: **collective projects**, that aim to federate the industry's stakeholders around shared issues and develop solutions that benefit the entire sector, and **specific, B2B projects**, designed to meet individual needs for business partners. The latter are an opportunity for a personalized and targeted approach that promotes innovation and competitiveness in specific areas.

ITERG reinforces the competitiveness of companies in the sector by deploying an **ambitious program of collective research** that covers all of its areas of expertise. Its research program is in line with public policy to support the dietary and environmental transitions and the evolution toward factories of the future. This approach promotes the valorization and innovative use of vegetable oils and proteins in downstream markets.

At the heart of its approach, ITERG prioritizes **interaction with manufacturers** and professional bodies to ensure adequacy between research projects and the demands of the sector. The FNCG (French National Federation of Oilseeds and Fats) technical committees and topical steering committees for collective research offer a platform for meaningful discussions on the direction and results of research conducted by ITERG. Additionally, the Scientific Committee, made up of manufacturers and independent scientific experts, helps to establish and evaluate non-economic research and innovation projects, and *in fine* the quality of ITERG's scientific production resulting from these projects.

A Regional Technical Committee was created in 2023, in response to a request by the Nouvelle-Aquitaine region. The goal of this technical committee is to bring independent scientific expertise to ITERG's Resourcing Program by taking into account the needs of the regional socio-economic stakeholders.

The orientation of R&D projects reflects ITERG's alignment with contemporary societal and environmental priorities, while meeting the demands of competitiveness and innovation in the sector.

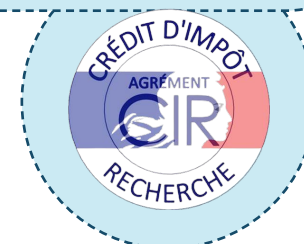
ITERG's active participation in major collaborative projects supported by national and European funding, attests to its central position in the industrial innovation ecosystem, encouraging meaningful implication in resolving present and future challenges in the sector.



Did you know?

ITERG is approved as an Industrial Technical Center (CTI) for the Research Tax Credit (CIR), conducting research and development (R&D) work on behalf of companies. This allows companies to include subcontracting costs incurred by ITERG on their behalf, in their CIR declaration.

To learn more: <https://entreprendre.service-public.fr/vosdroits/F23533>



Our ecosystem

Spinneret



Networks



Competitiveness clusters



Biomass Valorization



Regions

Nouvelle-Aquitaine



Hauts de France



Resources-Partnerships

ITERG's research and innovation approach is based on a dynamic exchange between the academic world and the industrial sector. This two-way process is characterized by academic research upstream, through multidisciplinary doctorates and research projects, and industrial resourcing downstream.

The goal is to nurture new knowledge, technologies, and innovations to anticipate and respond to the industry's future needs.

Our partnership with the Carnot 3BCAR network and integration in the ACTIA UMT/RMT are the pillars of this approach, that's further enriched by participation in national and European collaborative projects such as those funded by the ANR, ADEME, regional collectives and the European Union.

This collaboration also extends to technical centers that share common goals, like Terres Inovia, thus encouraging the sharing of resources and expertise.

This connection with the industrial community allows ITERG to remain pertinent and in touch with the real, tangible needs of businesses and society's expectations. This cross-resourcing with manufacturers that have complimentary expertise, both in France and abroad, accentuates the synergy, facilitating the acquisition of practical know-how and quick adaptation to process innovations.

Inter-CTI cooperation

ITERG and Terres Inovia (The Agricultural Technical Institute for the Vegetable Oils, Proteins and Hemp Sector) set up a joint laboratory (LabCom) at the Canéjan site (33) at the end of 2021 to meet the needs of the vegetable oils and proteins sector. This LabCom allows the two institutes to pool teams, knowledge and technological platforms to undertake collaborative research projects that the economic operators in the oilseeds and plant protein industry in the territory can benefit from directly.

This strategy, reinforced in 2023 by the allocation of supplementary human and material resources, positions ITERG as a driver of innovation, closely linking academic research and industrial applications for a sustainable and competitive future.



Theses in progress

- **SACHOIL** - Bio-sourced amphiphiles combining oligosaccharides and fatty acid derivatives -Manon CARRÉ

Project Manager: Guillaume Chollet, ITERG

Academic Partner: Henry Cramail, UMR 5629 LCPO CNRS, Bx INP and UBx

- **FOLIDE** - Functionalization of depolymerized lignin - Maëva PELOILLE

Project Manager: Marie Reulier, ITERG

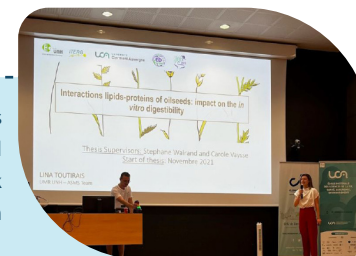
Academic Partner: Henry Cramail, UMR 5629 LCPO CNRS, Bx INP and UBx

- **PROLIDIA** - Lipid-protein interactions from oilseeds: Impact on their digestibility and benefits in the prevention of sarcopenia associated with aging - Lina TOUTIRAIS

Project Manager: Carole VAYSSE, ITERG Academic partner: Stéphane Walrand, Human Nutrition Unit UMR 1019 INRAE UCA

Congratulations!

Lina Toutirais won the Poster prize awarded by Théa Laboratories at the 26th Doctoral Life Sciences, Health, Agronomy, and Environment Days at the University Clermont Auvergne that took place on 5 & 6 June 2023 in Clermont Ferrand, for her research on the digestibility of oilseed fats and proteins.



The IMAGO project, financed by the Nouvelle-Aquitaine region and the European Union with FEDER, was completed in 2023.

Its aim was to create a top-level Research, Innovation, and Transfer Hub on the Pessac-Canéjan site, focusing on production and transformation technology for vegetable oils and proteins to adapt to the new societal demands in the bio-sourced sectors (ecological, energy, and digital transitions).

This equipment supplements the ITERG-Terres Inovia technical platform to meet the needs of the vegetable oils and proteins sector and its users, and embark on new research themes. *See the new equipment on p. 68-69 of the ITERG Group's 2022 activity report.*



ACTIA Network

The Joint Technological Units (UMT) and Joint Technological Networks (RMT) are tools set up and supported by the ministry in charge of agriculture and the food industry, and coordinated by Actia for the food sector. Set up to stimulate innovation and technological sharing, they function through a close collaboration between technical institutes, public research facilities/teaching institutions, and industrial stakeholders. Together, these units aim to accelerate technological progress and reinforce competitiveness in the French food industry, while simultaneously meeting the challenges of sustainable food production

Current Actia UMTs and RMTs

Since January 2023, ITERG has coordinated the Actia PROFEEL UMT (Joint Technical Unit) in the field of plant-based nutritional, functional, and sustainable formulation.

Positioned to respond to the challenges of the oilseeds and vegetable proteins sector with a multidisciplinary vision, the Actia PROFEEL UMT aims to develop new formulation strategies in line with the principles of “functional, sustainable plant-based food,” meeting societal and regulatory expectations and creating specific applications. Launched in Bordeaux for a 5-year project, this unit collaborates notably with the DO-IT team from the Carmen unit (Inrae, Inserm, University of Lyon), which specializes in lipid metabolism and intestinal physiology. **The Actia PROFEEL UMT is an excellent example progress and engagement in the sector of functional dietary supplements and clinical nutrition solutions.**

In addition, ITERG coordinates the Actia AL-CHIMIE, PROT&IN and ECOVAL RMTs (Joint Technical Networks), and participates in the PROPACK FOOD RMT coordinated by CTCPA (French Technical Center for the Conservation of Agricultural Products).

The topics covered are very diverse (formulation, proteins, packaging, chemical contamination, eco-design, nutrition).



Carnot 3BCAR

Carnot 3BCAR, led by INRAE, is a R&D network dedicated to innovation in the sectors of bioenergy, biomolecules, and bio-sourced materials. By exploiting the advances in biotechnologies and green chemistry, this network of 18 research institutions is working to favor technological transfer and contractual research to stimulate the emergence of a sustainable bioeconomy. Carnot 3BCAR ensures efficient collaboration with companies, covering the entire value chain from biomass production to the final applications of biomaterials and bioenergies.

Current Carnot 3BCAR projects

- **FOLIBRASS (2023 - 2028)**

In response to the challenges of encapsulation and the Clean Label requirements, as well as improvements to Nutri-Score, which became more complex with the enrichment of formulas with unstable and less-refined natural compounds, the FOLIBRASS project aims to utilize plant powders derived from brewery spent-grains for the encapsulation of bioactive lipid compounds. These encapsulated biomolecules will then be integrated into various formulated food products.

Participants: ITERG, UMR 1208 IATE

- **SOLEXOL (2021- 2024)**

The goal of the SOLEXOL project is to provide green solvents (or mixtures) to extract natural compounds like fats and secondary metabolites from seeds and oil cakes.

Participants: ITERG, UMR 1010 LCA, UMR 5503 LGC

- **HYPE (2022 - 2024)**

The HYPE project aims to create 100% bio-sourced hyperbranched polymers by first developing multifunctional monomers from erucic rapeseed oil, paving the way for sustainable alternatives to petrochemical-derived polymers.

Participants: ITERG, UMR 5629 LCPO

- **ICVG (2023)**

The ICVG project aims to address the identified limitations of current Life Cycle Inventories (LCIs) to strengthen ITERG's internal LCI database of bio-sourced raw materials and to consolidate how bio-sourced products are taken into account in Life Cycle Assessments (LCAs).

Participant: ITERG

General interest missions

Standardization

ITERG, in its quality as an Industrial Technical Center, plays a major role in harmonizing regulatory and normative standards at the national and international levels. ITERG actively contributes to the work of expert groups on standardization, notably **AFNOR**, the **CEN**, and **ISO**.

ITERG also participates in the working groups on chemistry and sensory-analysis expertise organized by the International Olive Council. This participation gives manufacturers in the sector access to information on the evolution of analysis methods and future regulatory constraints.

Participation in these bodies demonstrates ITERG's influence in establishing norms in its field of expertise. Its influential participation in official bodies favors constant evolution toward advancements and innovation within the fats industry, which helps to raise quality and safety standards for stakeholders in the sector, as well as consumers.

Participation in national and international work groups

AFNOR T60C & ISO/TC34/SC11 Fats– Chaired by Lionel LAGARDERE, this group focuses on the standards concerning fats.

CEN/TC19/JWG1 Biodiesel – This group works on the standards specific to biodiesel, an important co-product of the fats industry.

CEN/TC275/WG13 Contaminants & Neoformed Compounds – This group focuses on the detection and analysis of contaminants and neoformed compounds in products.

Congratulations!

Passing the flame between experts plays a major role in the continuity and development of quality and safety standards. Following the retirement of Florence LACOSTE, Lionel LAGARDÈRE was chosen to take over as Chairman of the AFNOR Commission /60C “Animal and Vegetable Fats and Oils”, for a mandate lasting from January 2023 until December 2025.

Additionally, at the end of 2023, Lionel was unanimously elected to chair CEN/TC 307 “Oilseeds, Animal and Vegetable Fats and Oils, and their Co-products - Sampling and Analysis Methods” for the period 2024 to 2029, thus succeeding Florence LACOSTE.

In taking over these new responsibilities, Lionel LAGARDÈRE committed to continuing the work of developing and perfecting the standards that regulate the fats sector, ensuring an effective and promising transition for the future of the industries concerned.



Role in dispute resolution and crisis management

As a Benchmark Laboratory, ITERG provides industry professionals with efficient analytical methods that have been validated and recognized by standards of normalization, that are particularly useful in commercial disputes and international health crises.

This role is essential to guarantee the integrity and real liability of commercial exchanges, protect public health, and ensure consumer safety.



*The ISO meeting on the Avril Campus
24-25 May 2023*

Participation in public or professional expert committees

In 2023, ITERG was represented in the following groups of experts:

BIPEA (Inter-professional Analytical Studies Bureau): Technical Committee for the “21 - Lipids” circuit

TERRES UNIVIA: Human Food Committee

FOSFA (Federation of Oils, Seeds, and Fats Associations): Technical Committee

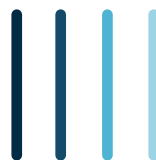
FNCG (National Federation of Fatty-Substance Industries): Technical Committee.

Science Watch, a major asset for companies

ITERG monitors information for the vegetable oil and protein sector: news, regulations, standardization, patents, scientific and technical publications.

ITERG's management of this monitoring system allows industry stakeholders to save precious time while guaranteeing access to pertinent and reliable information. The documentary products simplify access to essential news that is rigorously selected from a vast flow of information, thus allowing companies to focus on the elements that are truly important to their activity.

This monitoring serves as a strategic insurance that helps companies seize opportunities and respond to market challenges in an effective way, ensuring optimal reactivity to the constant evolutions in the sector. As part of their subscription, company's receive a question and answer service as well as regular documentary updates.



Focus on

In 2023, the Information and Communication Monitoring Unit diffused to its subscribers:

- 366 requests for information articles
- 52 press overviews
- 25 patent watches
- 126 regulatory alerts
- 11 newsletters
- 4 economic overviews

To discover our subscription offer, visit:
<https://iterg.com/adhesion/>

Did you know?



Receive all our news by
subscribing to our free newsletter:
<https://iterg.com/newsletter/>

80th anniversary celebration on 19 December 2023

ITERG 80ans

Historic timeline

80 years of commitment to serving the lipids industry



14 May 1943: creation of a Technical Institute for Lipid Studies and Research by the Lipids, General Organizational Committee:

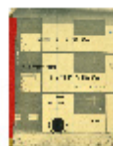
RESEARCH - DOCUMENT - TEACH

1945: creation of a research laboratory at the Bellevue CNRS named after Chevreul, the creator of lipochimistry

1943

1945

1957: inauguration of the Experimental Workshop at Poudrerie du Bouchet in the Paris region



1957

18 August 1950: ITERG becomes an Industrial Technical Center (CIT) according to the law of 22 July 1948, thus acquiring its definitive legal basis. Its name became "The Lipids Institute".

1950



1980: creation of a joint pilot workshop ITERG-CETIOM at Pessac. The institute's Parisian laboratory is transferred to Pessac.

1980

1986: development of private contracts toward sectors that utilize lipids.

1986



1989: all of ITERG's activities are transferred to Bordeaux as of June 1989.

1989

1992: creation of a new logo.

1992

1999

1999: attribution of the CRT label

2002

2002: creation of a steering unit for refining lipids at the Pessac site.



2006

2006: creation of the Carnot LISA institute by ANR.

2008

2008: labeled as an Agriculture and Food Industry Technical Institute by the Ministry of Agriculture and Food Sovereignty.



2009

2009: creation of CEDOP and inauguration in 2010.



2018

2018: new logo - expansion of our CIT boundaries to include, in particular, plant proteins.



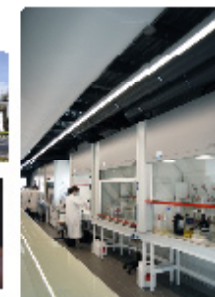
2019

2019: acquisition of the crushing and refining platform OLEAD - Integration of 9 people into ITERG in January of 2020.

2021

2021: acquisition of SAS IMPROVE and creation of the ITERG Group.

2021: extension of our laboratories.



On 19 December 2023, ITERG marked its 80th anniversary with the motto “Feeding innovation, shaping the future.”

This event brought together 200 participants including employees and a close circle of industrial and institutional stakeholders who have played an essential role in our journey and our success.

The lectures and round tables underlined ITERG’s pioneering role in research on vegetable oils and proteins to anticipate future challenges, stressing the importance of innovation for the dietary, energy, and environmental transition.

The dialogues were particularly rich and constructive, reflecting the shared passion and drive for innovation in the oilseed and plant protein sector. Moments of friendly interaction between manufacturers, officials, and ITERG researchers allowed us to build stronger bonds and open new pathways for future collaboration.

These discussions were also a chance to highlight recent successes and current projects, while at the same time exploring the opportunities and challenges to come. The participants discussed technological advances, market trends, and the emerging needs of society in the areas of sustainability and food safety.

The manufacturers expressed their gratitude toward ITERG for its role as a catalyst for innovation in the sector and it’s continued support, notably through research and development projects. They underlined the importance of ITERG’s collaborative approach, which facilitates the implementation of innovative and sustainable solutions at the industrial level.

The public authorities and professional and inter-professional federations, for their part, reasserted their commitment to supporting ITERG’s initiatives to promote a favorable context for research and innovation in the vegetable oils and proteins sector.

The event closed with a renewed commitment from all stakeholders to continue their close collaboration, in the same spirit of cooperation and innovation that has characterized ITERG’s history. The friendly ambiance left everyone with a feeling of shared optimism and determination, and the conviction that, together, we can meet the challenges of the future and contribute to a more sustainable world.

This anniversary not only celebrated 80 years of excellence and innovation at ITERG, but also marked the starting point for new scientific and industrial adventures in a world where science and technology will play a key role in building a better future for everyone.



Welcome Denis
CHEREAU

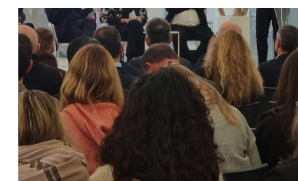


Screening of a film on the history of
ITERG



Testimonial
Guillaume CHANTRE

ROUND TABLES



ITERG in its ecosystem



ITERG, a transitional actor serving
industry for the 2030 horizon



Benjamin LAMMERT
President of Terres
UNIVIA and FOP



Bernard GARRIGOU
Mayor of Canéjan



Yves DELAINE Chair
of the ITERG BOD





Serving Industry



06

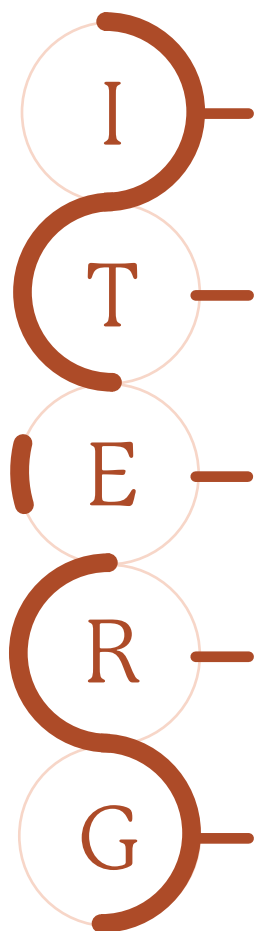


Stimulating industrial development through knowledge transfer and the adaptation of services

The ITERG group mobilizes a vast array of multidisciplinary skills, from ideas to marketing, in diverse food and non-food fields.

By transmitting its expertise through training, consultancies, and industrial transfers, the group ensures the continuous development of companies who rely on it. It is constantly adapting its service offers to respond precisely to market demands, which is clearly reflected in client satisfaction.

5 great reasons to work with the ITERG Group



INNOVATION

Our group is at the cutting edge of innovation in the vegetable oils and proteins sector. We are constantly investing in research and development to provide our partners with the most advanced solutions and help them remain competitive.

TECHNOLOGY

We have at our disposal a full range of cutting-edge technological platforms. This allows us to optimize the production and experimentation processes, guaranteeing maximum quality and efficiency.

EXPERTISE

Our teams are made up of highly-qualified specialists in diverse fields of expertise. This expertise allows us to support our partners throughout their projects, from conception to process optimization, to industrialization.

RESPONSIVENESS

We understand the importance of responsiveness within an industrial environment in constant evolution. Our organization is structured to guarantee quick responses that are adapted to our partner's needs, giving them the agility to seize market opportunities.

A GLOBAL PERSPECTIVE

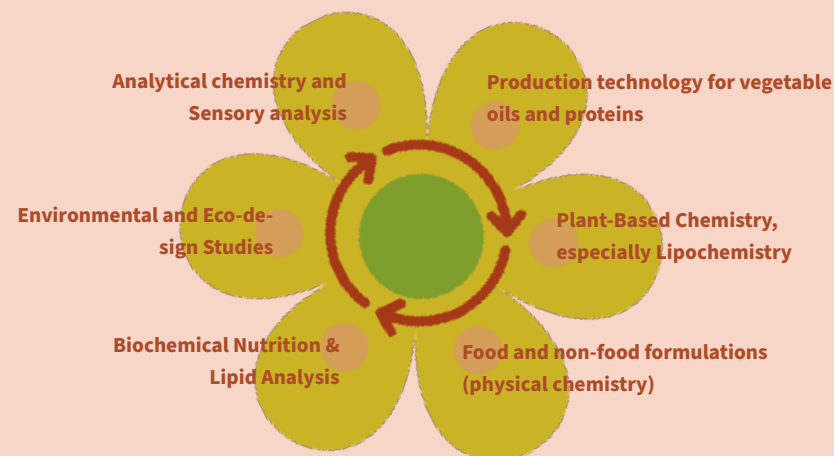
Our approach combines a global perspective and multidisciplinary expertise. Over and above specific solutions, we provide comprehensive support that integrates diverse skills to ensure sustainable and responsible development.



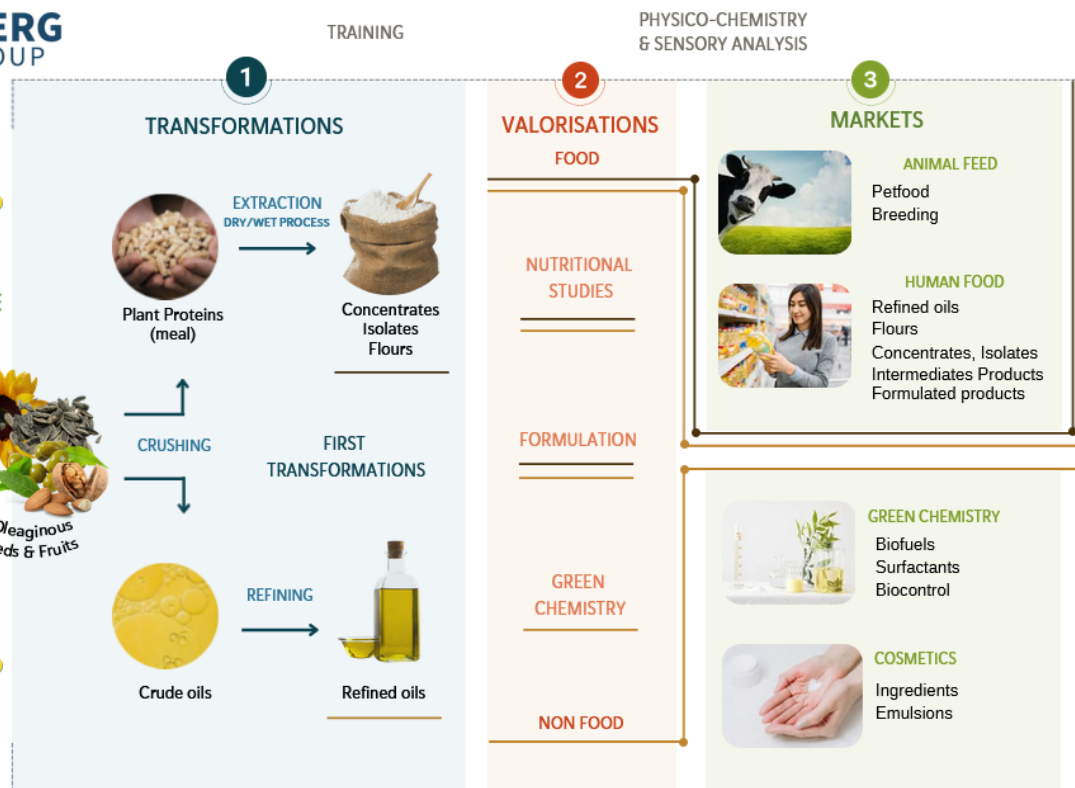
The ITERG group puts essential platforms and skills in synergy to ensure the success of complex projects, from concept to market, from kilogram to ton. This collaborative and multidisciplinary approach allows us to meet the most complex challenges and explore innovative solutions.

Manufacturers thus benefit not only from the individual expertise of each team, but also from the combined power of several skill sets.

Our fields of expertise



Targeted markets:



Focus on our clients



In 2023, the ITERG Group served

771
ACTIVE CLIENTS

with

580 **191**

at ITERG

at IMPROVE

Percentage of international clients



Transmitting knowledge and know-how to guarantee the future of businesses

Our training programs and audit and consultancy services are key elements in the effective transfer of knowledge and continuous improvement in manufacturing practices. The ITERG Group offers comprehensive support for all operational activities in companies that use or produce fats and proteins.

Training

The professional training sessions provided by the ITERG Group are adapted to the specific needs of companies and available in a collective format, with various companies, or customized for internal sessions. In addition, in partnership with ENSMAC, ITERG offers specialized trainings in the field of fats and their industrial applications for engineering students at the end of their course of study.

In 2023, 16 training programs were delivered by ITERG to nearly 150 participants. These training sessions covered themes from the composition and characteristics of fats to the uses of vegetable oils in various sectors.



In December 2023, IMPROVE brought together 60 professionals from six different countries to participate in a training day on different aspects of valorizing alternative proteins. This event associated seed producers, manufacturers of ingredients and vegetarian food products, and equipment suppliers around the theme of proteins. They closed the day with a visit to the IMPROVE platform.

Audit-Consulting

ITERG's audits and consulting rely on a group of experts ready to intervene on a multitude of issues, from optimizing processes to getting more value out of raw materials and improving quality. These services are tailor-made to establish a precise diagnostic, provide recommendations, and assist with everything from implementing solutions to transferring technology.

Examples:



In order to improve the quality of a copra oil to be used to produce Monoï, an organization in the sector asked ITERG to carry out a refining audit on their process for refining raw copra oil. ITERG's expertise was solicited in order to identify ways to improve the quality of the refined oil and make the process more sustainable by improving the by-products. Several months later, ITERG was called upon again to realize an audit on the crushing stage in the oil mill, which led to recommendations for technical but also operational improvements that will install a continuous-improvement approach.



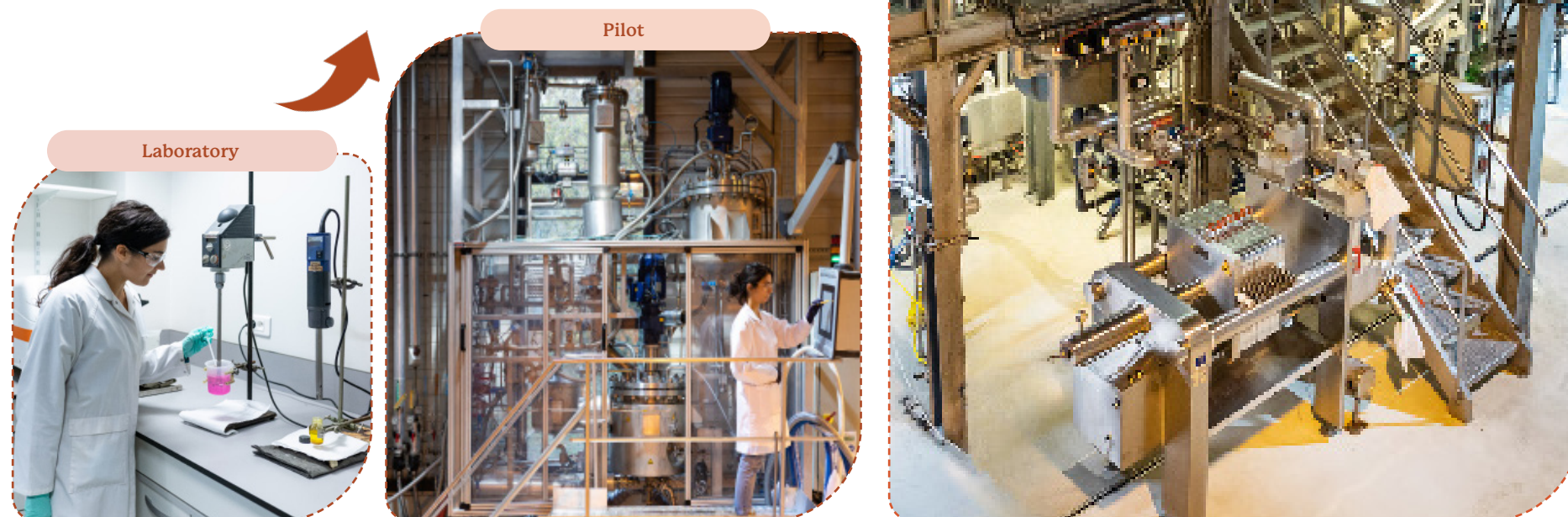
Within the framework growth and increasing crushing volumes, a Canadian oil mill producing "high-end" first-press oils tasked ITERG with conducting an audit. This audit focused both on the equipment currently in place in the mill's various workshops and also on the practices used throughout the oil-production process. ITERG's expertise allowed for identification of all the levers for increasing crushing volumes while optimizing the quality of first cold pressed oils, known as "flavor oils." This audit covered every stage of the process: receiving the grains, storage, pressing preparation and realization, processing the oil, and final bottling. A complete technical report was provided to the client, giving them a photographic image of their current processes, offering suggestions for improvement, and finally fixing a goal to be attained.

Industrial Transfer

The ITERG group assists manufacturers all the way through their journey of innovation, from the genesis of the idea to the industrialization phase.

Transitioning an innovation from its conceptual stage to commercial production requires a precise and rigorous scaling of processes from the pilot stages to the semi-industrial level. This process is essential for ensuring optimal production. It allows for confirmation of project feasibility not only on the technical level, with the precise adjustment of production of parameters, but also on the economic level.

The ITERG Group's expertise in the rigorous evaluation of processes and provision of customized technical solutions guarantees project success before large-scale deployment. This critical phase offers the opportunity to validate every aspect of the project, correct any discrepancies with the initial projections, and ensure that the final project meets market requirements in terms of quality, performance, and sustainability.



Capitalizing on internal research to offer new services

In an industrial landscape marked by rapid and continuous change, the ITERG Group isn't content to just adapt to trends. By dynamically converting research results into innovative services, it guarantees that its offer perfectly matches the evolving demands of the industrial sector. This proactive approach not only positions ITERG as a leader in the realm of innovation, but also ensures that its clients benefit from the most advanced technologies and methodologies to tackle contemporary challenges and anticipate future needs.

Transforming knowledge into value

At the heart of ITERG's approach is its capacity to convert knowledge gained from research into industrial applications. This pragmatic approach guarantees that its investments in research and development lead to innovations that can be implemented directly in industry.

Agility as a founding principle

ITERG's capacity to reinvent itself and innovate is not based on chance, but on results from a corporate culture deeply rooted in anticipation and adaptation.

Aligning offers to market needs

By focusing our efforts on developing research projects generated and guided by the needs directly expressed by industrial stakeholders, we're sure that the offers we develop are not only at the height of technology, but also perfectly aligned with our partners' specific expectations and needs.

Customer Satisfaction



ISO 9001 certification for ITERG's activities demonstrates our commitment to quality and client satisfaction. Through questionnaires and prioritizing direct exchange with clients, ITERG actively listens to their needs, preoccupations, and suggestions. In 2023, two activities underwent a specific client satisfaction inquiry:

- Training: satisfaction rating of **9.1 /10** from 134 trainees questioned.
- Laboratory analyses, with a focus on companies in the cosmetics sector (61 companies): **17/20**.

Examples of ITERG's ability to offer the industry new services resulting directly from internal research

- New analytical services that have been added to the catalog following the work of the Analytical Research & Development Unit:
 - Mineral Oils: Accreditation in April 2023 for the detection of MOSH-MOAH, with a very low quantification threshold (1 ppm)
 - Glucosinolate derivatives
 - Metal analysis by ICP (see page 23)
- Entrust us with the sensory analysis of your plant-based protein products. Thanks to our 12 meticulously-developed descriptors, our expert panel will be able to precisely characterize them.
- Our expertise in formulation will also allow you to hide any "disagreeable" tastes detected during the sensory analysis, with a confirmation of the positive impact of these proteins in generic formulations (models).
- We've also added a new service in the field of formulation: "Functional ingredient positioning" This approach applies both to food products (biotech-derived proteins, palm substitutes, etc.) and cosmetics (vegetable waxes, powders, new sources of oils/butters, or those derived from biotechnology).



Finally, for 2024, a new training course is being introduced, led jointly by Sophie GELIN (ITERG) and Frédéric BAUDOUIN (IMPROVE) on the "STATE OF THE ART AND ORGANOLEPTIC PROPERTIES OF PLANT PROTEINS."

Getting the most out of biomass through a unique Alliance



ITERG, IMPROVE, and PIVERT joined forces to form an Alliance with an ambitious vision: using sustainable processes to valorize biomass. This dynamic collaboration aims to produce natural, wholesome, and healthy ingredients while optimizing the time-to-market.

The common goal is to guide companies toward the ecological transition and the adoption of biorefining practices, thus embodying the factory of the future.

By covering the entire value chain up to the formulated product, the Alliance is aiming for excellence - functional, organoleptic, nutritional and environmental.

Targeted biomass



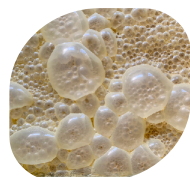
Oilseeds



Protein crops



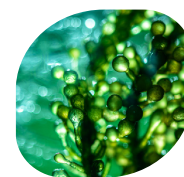
Cereals



Yeasts, molds



Worms, insects



Algae, microalgae

Targeted markets:

- Cosmetics
- Human and animal food
- Formulation
- Green chemistry and many others

Key figures

The Alliance brings together **180** scientists and technicians and **€100 million** worth of technological equipment. The resulting synergy of skills and expertise allows it to optimize usage of all the fractions, products, and co-products.

Last minute

On October 15, 2024, the Alliance invites you to discover its full range of expertise and platforms and to meet its experts.

This will be a unique occasion to seize numerous opportunities to valorize your biomass.

To discover the program and register visit:
<https://iterg.com/alliance-day-on-biomass-valorization/>



Focus on



In 2023, the Alliance, ShakeUp Factory, Foodinnov and Nutrikéo created a collective, **Innovative Food Evolution Actors: IFOODEA**, or the fusion of IDEA + FOOD.

The goal is to be at the forefront of trends, technologies, and innovations in order to lead the transformation from farm to plate.

Find all the information about our collective in our white books: <https://ifooddea.com/>



Testimonial

WE CRACKED THE CODE

AND **UNLOCKED** THE POTENTIAL OF PLANT PROTEINS



PIP International, located in Lethbridge, AB. Canada and IMPROVE SAS have been working together since 2020 commercializing IMPROVE's lab scale protein extraction technology for pulses. Since then, the team has successfully developed the technology to a commercial scale of approximately 2MT / day.

Countless obstacles have been overcome with the support of IMPROVE as PIP moves to fully automated and continuous operations by the summer of 2024. IMPROVE's advanced lab protocols have been of critical importance to PIP.

As we work to integrate a fully functioning lab at our facility, IMPROVE has saved us time and money while elevating us to a world class lab in months versus years.

In addition, IMPROVE has used their expertise to answer and solve questions to further support PIP's product development activities with our customers and help ensure PIP's success. As a team, PIP believes that our protein will make it into products that will reach every plate in the world.

Christine LEWINGTON
CEO
PIP INTERNATIONAL



**Lesieur,
Végétal ensemble
depuis 1908**



Since summer 2022, I've had the chance to collaborate on several projects through R&D services or expert interventions at Lesieur internal events (innodays).

The various teams at ITERG have always been open and available to discuss perspectives and preliminary ideas before entering into a contract. This is a significant advantage for an industrial R&D/Innovation unit as it gives us the chance to make a decision to commit resources to a service after setting a clear framework on the issues, the context, and the objectives to attain. This availability and transparency are particularly valuable during the brainstorming and planning phases of R&D projects.

As far as experiments and the monitoring of R&D services, I consider the work carried out to be of high quality, with a critical eye for the results and their interpretation. Regular status updates allowed us to steer and redirect the focus based on the results obtained, which is a key efficiency factor for R&D services.



**Mathieu ALLARD,
Head of Innovation at
LESIEUR**



Testimonial

A BRIGHTER FUTURE STARTS WITH A BETTER SOURCE OF OIL



Frédéric DESTAILLATS,
Vice-President of
CHECKERSPOT

As the Vice-President of Strategic Development at Checkerspot, I want to express my gratitude to the exceptional ITERG Life Sciences team that we had the privilege to collaborate with on several crucial studies regarding the bioavailability of lipid nutrients.

Our company, Checkerspot, is on the cutting edge of biotechnology, specializing in the development of microalgae oils for various applications such as nutrition, cosmetics, and technical uses. In our quest to ensure the quality and pertinence of our products, collaboration with trustworthy partners is essential.

Our work experience with the ITERG Life Sciences team was extremely positive on several levels. First, the team's professionalism was remarkable. Their exceptional expertise in the field of lipids and their commitment to scientific excellence greatly contributed to the success of our collaborative projects.

Their scientific rigor and the quality of the methodology deployed by ITERG Life Sciences were noteworthy. Their methodical approach in conducting physico-chemical characterizations and in vitro modeling brought crucial precision to our work. Also, the bioavailability study was conducted with meticulous attention to detail, which enhanced the reliability of the results obtained.

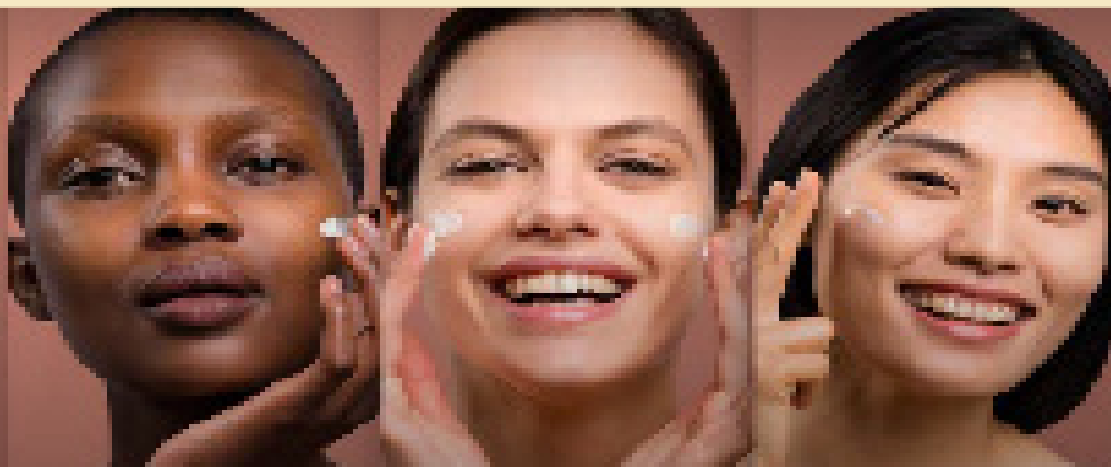
What particularly stands out about the ITERG Life Sciences team goes beyond the technical aspect. The human contact and availability shown by the team members to discuss and explore opportunities were key elements in the success of the projects we conducted together. The collaboration was based not only on an exchange of scientific knowledge, but also on a relationship of openness and trust that greatly enriched our partnership.

In conclusion, I strongly recommend to other companies in the sector, analytical platforms, technical centers, and biological research laboratories to follow the exemplary collaboration model established by the ITERG Life Sciences team. Their commitment to dialogue and quality and their human approach are undeniable keys to success in conducting complex scientific projects.



L'ORÉAL
PARIS

Testimonial



Cosima DUFOUR SCHROIF Scientific and Technical Manager of the Green Sciences Incubator, Future & Green Sciences Department, L'Oréal



The L'Oréal for the Future program is an expression of L'Oréal's commitment to a more responsible and sustainable economic model. The group's Research & Innovation contributes to this work by undertaking a profound transformation in its approach to science and inventing the beauty of tomorrow using nature as its inspiration and its foundation.

The objective is to ensure that L'Oréal's activities are always respectful of the planet in regards to climate, water, biodiversity, and resources. For R&I, the goal set for 2030 is that 95% of ingredients in our formulas are bio-sourced, issued from abundant minerals or circular processes.

This scientific transformation revolves around four pillars of green sciences: sustainable cultivation, biotechnology, green chemistry, and green extraction. It's a paradigm shift that presents new technical challenges for the teams that design and bring to market innovative, high-performance products that are adapted to consumer needs. It is not a simple substitution, it requires rethinking our formulation, and that begins with an excellent knowledge of ingredients.

This is the context of our collaboration with ITERG/IMPROVE. This work is based on the physico-chemical characterization of the ingredients' intrinsic properties and continues to the characterization of their functional properties. This global approach allows us to then orient ingredients toward the most pertinent areas of application.

With ITERG/IMPROVE, we found a partner that is attentive, responsive, and competent. The teams have a multidisciplinary approach, and our interactions are consistent, tracked, and productive.

ITERG Scientific Committee

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Mr. Olivier GALET, Head of R&I Proteins, AVRIL Group

Representative of the public authorities

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Mr. François-Xavier TURQUET, Project Manager biosourced chemistry and industrial biotechnologies, Ministry of Economy and Finance – DGE

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Mr. Michel LAGARDE, Emeritus Professor, INSA Lyon

Mr. Michel LINDER, Professor, ENSAIA

Mr. Didier MAJOU, Director, ACTIA

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Mr. Stéphane WALRAND, University Professor - PH Université Clermont Auvergne and CHU Gabriel Montpied-UNH

Mr. Frédéric CARRIERE, Research Director, CNRS

Mr. Frédéric BAUDOUIN, Laboratory Manager, IMPROVE

PERMANENT GUESTS

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MR. TOFIKE CHRIFI, REGULATORY AND SCIENTIFIC AFFAIRS OFFICER - CONTAMINANTS/ENVIRONMENT, FNCG

MS MARJORIE DASNE, REGULATORY AND SCIENTIFIC AFFAIRS OFFICER, FNCG

MR. YVES DELAINE, PRESIDENT, FNCG, IMPROVE, ITERG

MS. ANNE LE GUILLOU, LIPIDS SENIOR TEAM LEADER, R&I ADVANCED TECHNO INGREDIENTS TEAM, DANONE – PRESIDENT OF SFEL

MR. PATRICK CARRE - OILS, OILSEED AND PULSES PROCESSING , TERRES INOVIA

Professional bodies

Mr. Hubert BOCQUELET, General Delegate, FEDALIM, FNCG, SYFAB

Ms Elodie TORMO, Head of Innovation and Monitoring, TERRES UNIVIA

07

Annexes

Publications

- **Investigation of the effect of refining on the presence of targeted mineral oil aromatic hydrocarbons in coconut oil.**

Bauwens G, Cavaco Soares A, Lacoste F, Ribera D, Blomsma C, Berg I, Campos F, Coenradie A, Creanga A, Zwagerman R, Purcaro G.

Food Addit Contam Part A Chem Anal Control Expo Risk Assess. 2023 Mar;40(3):392-403.

- **Experimental determination of pesticide processing factor during extraction of maize germ oil**

P. Carré, F. Lacoste, J.N. Arnaud, L. Leitner, J. Roiz

OCL, vol.30, 2023.

- **Natural emulsifiers lecithins preserve gut microbiota diversity in relation with specific faecal lipids in high fat-fed mice**

C. Robert, A. Penhoat, L. Couëdelo, M. Monnoye, D. Rainteau, E. Meugnier, S. Bary, H. Abrous, E. Loizon, P. Krasniqi, S. Chanon, A. Vieille-Marchiset, F. Caillet, S. Danthine, H. Vidal, N. Guillot, P. Gérard, C. Vaysse, MC Michalski

Journal of functional foods, vol. 105, 2023.

- **Method for the analysis of volatile compounds in virgin olive oil by SPME-GC-MS or SPME-GC-FID**

R. Aparicio-Ruiz, E. Casadei, F. Lacoste, C. Ortiz-Romero, DL Garcia-Gonzalez, M. Servili, R. Selvaggini, J. Escobessa, S. Vichi, B. Quintanilla-Casas, A. Tres, PA Golay, P. Lucci, E. Moret, E. Valli, A. Bendini, T. Gallina Toschi

MethodsX, 2023.

Conference «Environmental assessment of agricultural and food products: methods to support the sectors in their eco-design approaches» 27 February 2023, International Agricultural Exhibition, Paris - Intervention by Fabrice Bosque «Interest of the agricultural and food environmental assessment: example of the Pruneau d'Agen sector».

Tech Day - Lipids, Bioeconomy for Change Day, 23 March 2023, Paris - Intervention by Guillaume Chollet "Limitations related to the use of metropolitan vegetable oils"

The New Food paradigm talk, April 13, 2023 - Intervention by Denis Chéreau, "What protein will we eat & grow by 2030?"

RMT Actia Ecoval webinar, April 20, 2023 - Intervention by Fabrice Bosque on «Environmental labelling of food products: where are we?»

Plant based foods & Proteins Summit Americas, April 26-27, 2023 - Speech by Frédéric Baudouin (Improve) "Toward the next generation of alternative protein ingredients"

Technical day «Speciality chemistry - the importance of a biosourced approach», 3 May 2023 - Intervention by Marie Reulier «"ITERG at the heart of the vegetable oil recovery strategy»

AOCS Annual Meeting, 3 May 2023 - Speech by Frédéric Baudouin (Improve) "Toward the next generation of alternative protein ingredients - perspective from a R&D service provider"

Webinar «Oilseeds: potential of processing processes to improve protein autonomy», 16 May 2023 - Intervention by Loïc Leitner "Effect of technological routes on glucosinolates and protein solubility: analysis of glucosinolates derivatives"

4th international congress on mineral oil contaminants in food DGF, 5-6 June 2023 - Intervention by Florence Lacoste "International standardization work on mineral oil hydrocarbons - vegetable oils and proteins a vast field of possibilities"

Webinar "Legumes: From Seed Quality to Consumer", June 6, 2023 - Introduction and conclusion by Jean-David Leao, Frédéric Beaudouin (Improve) and Lucile Sarrazy "Functional, nutritional and application properties of plant protein materials: comparison of several sources and production processes", and Sophie Gelin "Sensory analysis of plant protein materials: descriptors, profiles and volatile compounds"

Adebitech Symposium on «Alternatives to animal experimentation», 6-7 June 2023 - Intervention by Leslie Couëdelo "Alternative to in vivo model"

Plant-based foods and proteins summit Europe, 7-8 June 2023 - Intervention by Jean-Charles Motte (Improve) "Newest processes aiming to create a new generation of protein concentrates"

Environment technical day: "From production to consumption: how to integrate eco-design in IAA?", 22 June 2023 - 3 interventions by Fabrice Bosque

15th International Congress of the ISSFAL (International Society for the Study of Fatty Acids and Lipids), 2-5 July 2023 - intervention by Lina Toutirais (PhD student) "Interactions lipids-proteins of oilseeds: impact on vitro digestibility"

CAP PROTEINE Day – Terres INOVIA – ITERG – AVRIL – ARVALIS – IFIP – ITAVI, July 4, 2024 - Interventopn by Alexandre Cavaco-Soares "Study of the digestibility of these meal on poultry"

Alina Exhibition, 27-28 September 2023 - Intervention by Franck Dejean **"the risk of mineral oils (MOSH/ MOAH) in oils and foods"**.

Workshop Plant Protein Innovation Center, 6-7 November 2023 - Denis Chéreau intervention "Process efficiency in second generation of pulse protein concentrates".

Grain Industries Technical Days (JTIC) - Intervention by J. Eudes Hermant «Milling technology: how to adapt a «classical» soft wheat milling diagram to the milling of other agricultural raw materials, including pulses»

Bridge2Food Summit Asia, 21-22 November 2023 - Presentation by Amadou Sidibé (Improve) "How new protein purification processes redefine the market"

GLN Day, November 27, 2023 - Intervention by Leslie Couëdelo «The nutritional value of glycephospholipids as structuring agents of food matrices»

Inno'sweet scientific symposium, 12 December 2023 - Intervention by Sophie Gelin «Development of a sensory analysis method applied to vegetable proteins»

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