

INNOVATION R&D IN THE MAÏSADOUR COOPERATIVE GROUP



Over the years, the Group's innovation actions have undergone a constantly changing and dynamic rise, and are ever more necessary at a time when agriculture is experiencing profound technological change. The key pillars of agricultural innovation (genetics, machinery, inputs etc.), which for decades have strongly influenced changes in agriculture, now represent major turning points because of the technological advances awash in our society. These turning points are reflected by the ability to use the potentials of varieties, machines and inputs in a coordinated way.

So-called "precision" agriculture, with its ability to connect and communicate, gives rise to exciting opportunities to meet the economic, qualitative and environmental expectations of farmers and society as a whole. And animal production, which often takes a back seat in this respect, will be swept along by the tide of innovation too. Another aspect that is directly attributable to this production approach is data processing. Thanks to the measurement and communications systems that go hand in hand with the implementation of precision agriculture, huge quantities of information can be gathered and mined by modern mathematical processing tools. The subsequent models are more robust and allow us to adapt our advice and create value.

And whilst a direct result of these innovations is our ability to "produce more and better", we mustn't forget the other significant effect that they have on the attractiveness and image of the activity for new generations of farmers.

Teams at Maisadour Semences and the Plant and Animal Production segments within the Maisadour Cooperative Group are in great shape to organise these changes thanks to their work on qualifying, adapting and disseminating new technologies and Decision Support Tools. Meanwhile, Ovalie Innovation is continuing its forward-looking work by assessing the potential of future technologies: drones, connected devices, sensors, etc. Not to be outdone, "force-feeding of the future" is just one example of the major projects implemented in 2016 in the field of breeding, thanks to the close collaboration

between the Group's palmiped segment and Ovalie Innovation's Research network.

The other important aspect in the Group's innovation strategies concerns the search for value across all segments. This is where the benefits of bio-refining come in - this process aims to redirect industrial or agricultural by-products towards external value-added outlets in the fields of food processing, chemicals and cosmetics, or in a "circular economy" process to satisfy the Group's internal requirements, such as for energy or cattle feed for example. Several R&D programmes on this topic are underway, some of which in direct collaboration with the end customers.

Lastly, the Fine Food and Poultry Divisions have made significant efforts in terms of marketing and process innovation in order to ensure that the Group's products maintain optimal competitiveness. If we had to choose a word to describe the efforts put by the various stakeholders in the Maisadour Cooperative Group, "synergy" would be at the top of the list. As there is strength in unity, the stakeholders all along the chain should be acknowledged for the joint efforts they've put in to develop and expand the innovation dynamic. This 2015-2016 report gives several examples of such efforts.

To conclude, innovation is often associated with an image of creating a breakthrough activity or new products, but it shouldn't be forgotten that it's also a powerful approach and process for handling crises as complex as those overcome by Maisadour and its farmers during the avian influenza outbreak. This vision didn't go unnoticed by AGROLANDES (a brand new structure in which the Group actively participates alongside various local economic actors). In launching its actions in January 2016 under the guidance of its new director, AGROLANDES has quickly been able to engage stakeholders in the industry and Research to carry out detailed work on influenza, help resolve short-term problems and prepare for the future.



ORGANISATION

Ovalie Innovation

Under the responsibility of Thierry Véronèse, the team consists of 3 project managers (Patrice Galaup, Stéphane Ballas et Anne-Marie Busutill), a Strategic Monitoring and Communications Manager (Maryline Cotentin) and 5 PhD students in cooperation with public laboratories and private partners.

Directly serving various activities within the Maisadour and Vivadour Cooperative Groups, Ovalie Innovation's inter-disciplinary tasks in support of innovation are as follows:

- Help stimulate and structure R&D/Innovation within business segments.
- Meet their specific requirements, explore and suggest new ways forward.
- Provide financial engineering strategies as part of public support measures for innovation.
- Explore new avenues in both public and private collaborative projects with innovative companies, universities and research institutes.
- Ensure integration in innovation networks.

GOVERNANCE AND LEADERSHIP:

- **Executive Committee:** Régis Fournier (Director of Innovation at the Maisadour Cooperative Group), Franck Clavier (Managing Director at Vivadour), Thierry Véronèse.
- **Steering Committee:** Executive Committee + Michel Prugue (President of the Maisadour Cooperative Group), Jean-Marc Gassiot (Vice-President of Vivadour).
- **Multi-Disciplinary Technical Innovation Committee (C2TI):** Ovalie-Innovation team + one operational representative per business segment for each cooperative (18 people in all).

website www.ovalie-innovation.com

Agronomics and sustainable development

The Maisadour Cooperative Group's agronomics-environment-experimentation department is continuing to establish its structure and is pursuing its in-depth work on Agrosites launched in 2011 with volunteer farmers, looking at various themes: soil capital, tillage, crop rotation and permanent cover crops, crop systems,

biodiversity, connection with farmers (from advisors to online materials), etc. All these topics were raised in September 2015 during "Agronomic Encounters" on the Souprosse Agrosite which were organised in partnership with Arvalis, ADAAQ (association for the development of beekeeping in Aquitaine), Galys laboratories and Maisadour Semences.

Maïsadour Semences

R&D at Maïsadour Semences has continued to develop on its 4 strategic areas of focus: development of production areas, species, tools and collaborations. In 2015, Maïsadour Semences launched its R&D structure in Ukraine with a team of seven people.

We continue to make significant efforts on breeding, accounting for 15% of turnover. Technological and marketing innovations resolutely continue in the interaction between genetics, digital technology and additives: AgroStart, AgroPlus, NutriPlus, etc. AgroTis was created in late 2015 with the aim of developing and marketing innovative products and services (Decision Support Tools, communicating sensors, information systems, etc.). AgroTis should help farmers better reason their decisions on crop management and site organisation in their own particular context of agropedoclimatic risk and environmental constraints, and support agricultural decision makers (cooperative managers and traders, etc.) and researchers to exploit all the information generated by the agricultural activity. The solutions offered by AgroTIS will be based on the latest advances in the fields of agro-climatology, new information and communications technologies and precision agriculture as well as data analysis (cloud computing, data-mining, geostatistics).

Nutricia

Since June 2016, Fabien Skiba has been in charge of R&D at Nutricia. Activities at the experimental station in Benquet are operating at full throttle.

The programmes involve duck and chicken breeding, with major focus on feeding plans, genetics and animal health & well-being. R&D on fish formula is up and running.

Fine Food and Poultry Divisions

Development programmes on product innovation, preservation and marketing are going well.

R&D at Delpyrat is structured into 3 clusters: Delpyrat Foie Gras & Catering R&D, Delpyrat Smoked Salmon & Delmas Fish and Seafood R&D, and Delpyrat Ham R&D, alongside a renewed development process which will provide greater efficiency, innovation and profitability.

As for Fermiers du Sud-Ouest, R&D consultations on issues concerning processes and products are ongoing, as is the synergy between Delpyrat and Fermiers du Sud-Ouest, so as to pursue collaboration on challenges that affect both companies.

SNAPSHOT ON THE INCREASING NUMBER OF PHD STUDENTS IN THE GROUP

With the Bioprocesses Engineering Laboratory of the INSA in Toulouse:

- on the theme of bioplastics derived from agricultural by-products, in collaboration with the company Végéplast, Nicolas Andin,
- on the theme of organic additives for the food processing sector derived from agricultural by-products, M. Bony.

With the Laboratory for Analysis and Architecture of Systems of the CNRS:

- on the theme of sensors to assess vineyard yield, Dominique Henry.

With the Laboratory of Agro-Industrial Chemistry of the INP Toulouse:

- on the theme of industrial processing of innovative crops, Evelien Uiterrahaegen.





MAISADOUR'S INNOVATION DYNAMIC

I. At the heart of businesses to strengthen and optimise members' income

SNAPSHOT ON SEEDS INNOVATION

Maïsadour Semences

Intense R&D activity enabled us to register 34 hybrids in 2016, 21 in maize and 13 in sunflowers.

Maize registrations: 6 key varieties in the future Maïsadour Semences range:

- Mas 13.M, a silage/grain mixed hybrid, leader in earliness and yield, intended primarily for Northern Europe as well as mountainous regions of Southern Europe.
- Mas 18.L, a very early mixed hybrid which will be registered in Russia and Ukraine this year.
- Mas 23.A, a silage/grain mixed variety for France, Germany, Belgium, the Netherlands and Poland.
- Mas 24.C (DM2024), a variety that was successfully launched during the 2015-2016 campaign. Registration has been finalised in Italy, and is underway in Germany (No. 1 in grain with a yield

of 104% and No. 2 in silage with a yield of 107%) and in France (grain yield of 105.8%).

- Mas 34.B, a new semi-early, elite-grain variety which will be sold in 9 countries.
- Mas 45.M, a semi-late, elite-grain variety for all Southern production areas.
- Mas 64.P, registered in Italy, a new late variety with several usages: animal feed (cattle, pigs, sheep and poultry), industrial use and even biogas and ethanol.

Sunflower registrations: Maïsadour Semences is launching its first high oleic sunflower variety which is tolerant to herbicides. We have also registered Mas 96.P varieties, an efficient hybrid tolerant to race F broomrape. Registrations will be extended to Russia, Ukraine and Turkey.

Mas 85.SU, our first variety tolerant to TBM (tribenuron-methyl) the production of which will be expanded to include Ukraine. Mas 86.CP, a new Clearfield Plus® variety for the whole of Europe.

SNAPSHOT ON PRECISION AGRICULTURE

Maïsadour Semences / Plant Production / Ovalie Innovation

- *Development of the AgroTempo offer to ensure crop treatments at the right time on grain maize, fodder maize and sunflowers*

Developed through the joint expertise of three entities (Maïsadour Semences, the Agronomy Division of the Maïsadour Cooperative Group and Agrotis -a company specialising in agrotics), this innovative online tool was launched to enable monitoring of agro-climatic indicators on plots. It is aimed at farmers and advisors alike.

During 2015/2016, a pilot study was conducted with 20 of the Group's farmers with an eye to deploying the tool on a wider scale in 2017, i.e. across the Maïsadour and Agralia networks as well as a list of key accounts in France.

The tool works on a graphical/satellite basis and currently supports 5 modules: Plot weather and climatology, Geolocation / plot satellite imagery, Seed management, Crop stages, and Crop intervention windows (treatment and harvest).

We paid particular attention to the user-friendliness of the interface, making it as easy and intuitive as possible when choosing crop operations. It doesn't require much input of data, yet generates around 20 key indicators.

- **Connected weather stations for precision viticulture**

Monitoring of weather conditions, prevention of diseases, reductions in the use of phytosanitary products, changes to treatments mid season, monitoring of fruit maturity cycles (temperature sums)... these are just some of the advantages that these stations provide, enabling farmers to ensure a production process that brings together quality and quantity. The stations (known as PESSL stations) transfer weather data. This can then be consulted online or via smartphone by technicians or wine growers that have signed up to the service so that they can know in real time what is going on in their areas of work. The weather data feeds risk forecasting models, which are themselves accessible online or via smartphone, enabling farmers to better plan phytosanitary protection and reduce treatments when possible or to better justify them.

There may be other sensors at the station: solar radiation sensor, anemometer, weather vane, soil temperature and humidity probe, Watermark sensor, etc. PESSL iMetos stations have been designed to be easy to install and use. Since the energy is generated via a solar panel and the data are sent via a GSM link, they require no specific connections.

- **Ovalie Innovation is continuing its multi-year assessment of drone technologies as part of ongoing programmes launched in previous years.**

- Within the framework of Innoval Sud-Ouest, we are continuing to work on the Précidrones project, which began in April 2015 with

the collaboration of In Vivo, Arvalis, Terres Inovia and the INRA of Avignon, using Delair-Tech's technology (Delair-Tech is start-up SME that designs, produces and markets aerial observation solutions using long-endurance drones for the industrial and agricultural sectors). The aim of the project is still to develop a long-range drone imaging system as well as image-processing algorithms and associated agronomic models in order to provide information for decision support tools on the major crops of wheat, maize, sunflowers and rapeseed (fertilisation, weeding, irrigation, yield forecasting, etc.). This is in order to provide a comprehensive consulting service (co-financed by the French Ministry of Agriculture and the regions of Midi-Pyrénées and Aquitaine, certification by the Agri-Sud-Ouest Innovation and Aerospace Valley Competitive Clusters).

- In 2015, then in 2016: Ovalie Innovation has continued its test flights of AGRIBIRD's very first biocontrol product spreading drone. In close cooperation with the two founders of this Montauban-based start-up, Ovalie Innovation is banking on a rotary wing drone-based method of applying biocontrol products and is involved in their field trials. This next-generation quadricopter is able to take on large amounts of trichogramma capsules and then release them with precision (trichogramma are enemies of the European corn borer and as such can reduce damage on maize). This technology offers interesting solutions to the issues posed by this pest.

- Under Ovalie Innovation's guidance, Maisadour Semences and Delair-Tech have continued to work together on using drones, so as to address some of the issues relating to maize and sunflower seed research and production: studies are being carried out (and will be repeated in coming years) on emergence density on micro-plots, biomass quantification, water stress and tassel detection.



SNAPSHOT ON ANIMAL PRODUCTION**Nutricia / Animal Production / Élevage Service / Ovalie Innovation**

Nutricia's R&D efforts remain highly active on two main fronts: creating innovative feed and conducting experiments on breeding. These R&D activities mostly take place using Nutricia's facilities at the experimental station in Benquet.

- **Key events in breeding R&D:**

Chicken: significant efforts on disease prevention in Label chicken farms have led to the implementation of production itineraries that enable the phasing out of antibiotics and anticoccidials. Major work has been put in to validate the use of acidifiers, probiotics, essential oils, etc. as part of the Regional Association of "Aquitaine table poultry" (ARVOL) – a publication is expected at the Poultry Research Days in 2017.

Palmipeds: major focus has been placed on new genetic tests in interaction with food programmes.

- **Key events in feed R&D:**

In keeping with the new industrial production of feed for use in aquaculture, the development of fish food formulations, for trout primarily, has intensified this year in partnership with Aqualande. Then there is sea bass, sea bream, etc.

Insect meal: Ovalie Innovation, Nutricia and the company Ynsect are continuing their collaborative agreement to jointly assess the merits of using insects in livestock feed formulations. Since this is not an exclusive agreement, products from other suppliers will also be tested, particularly those made by EntomoFarm in Bordeaux.



The Animal Production department has worked hard on designing disinfectable smooth-walled buildings.

Here are some other examples of efforts made to deploy new technologies for "precision livestock farming":

- *Implementation of KERHIS software: this system, embedded by the technician, enables the centralisation and technical/economic management of farms, schedules, inspection reports, etc.*

- *Controlled feeding of ducks through the use of robots and programmable computer-controlled feeding chains... for more precise management.*

- *Development and deployment of automatic duck weighing systems that record changes in average weight,*

enabling better monitoring of growth.

- *"Force-feeding of the future" - through the use of new digital technologies, greater control and value generation can be envisaged for this sector. Ovalie Innovation and the Animal Production departments of Maisadour and Vivadour discussed this issue at great length. An ambitious innovation project should be launched on this subject in early 2017.*

- *Ovalie Innovation was called upon in 2014 as part of incubation activities to work on technologies that would enable the sex of ducks to be determined in ovo. Through its partnerships with the CNRS and a start-up based in Toulouse, Ovalie Innovation is poised to offer a system that's able to sort ducks by sex at 9 days of incubation: we'll see how it goes in 2017!*

**SNAPSHOT ON THE FINE FOOD AND POULTRY DIVISIONS
Delpeyrat / Fermiers du Sud-Ouest**

Here are some examples showing the dynamism of the R&D activity

• **Fermiers du Sud-Ouest**

Fermiers du Sud-Ouest and Delpeyrat have forged synergistic opportunities together and development projects are underway.

• **Delpeyrat**

Developments/innovation on Delpeyrat foie gras and catering products: The avian influenza outbreak had a significant impact on the innovation activity, which concentrated on managing the shortages, with an eye to developing new products for 2017 and carrying out testing on new processes.

- Process innovation: start of the first high-pressure sterilisation operations. Catering: development of a new process for manufacturing cod brandade for greater texture, taste and preservation.

- Product innovation: development of new taste combinations with foie gras such as Abricotine or Williamine spirits, Laphroaig whisky or Mirabelle plums & Gewürztraminer grapes and, more unexpectedly, olives, apples and Calvados brandy. Our work with the chef Guy Martin continues.

• **Production synergy between Fermiers du Sud-Ouest and Delpeyrat**

Delpeyrat has transferred France-origin supplies to Fermiers du Sud-Ouest. Fermiers du Sud-Ouest has studied the launch of products (combining highly-technical ingredients) from one entity in another (for example: the cutting of Fermiers du Sud-Ouest confit farm chicken at Delpeyrat; the combination of Fermiers du Sud-Ouest chicken cuts with Delpeyrat vegetables in the same container, etc.).





II. New business segments to create new revenue for members

1. Methanisation: following on from previous years, methanisation opportunities continue to be assessed at Group level.

- Collaborations with the Méthalandes unit in Hagetmau were ramped up during the avian influenza crisis, due in large part to the ability of methanisation technology to neutralise the influenza virus.
- Meanwhile, Ovalie Innovation is continuing to study the merits of micro-methanisation on farms. This research is being carried out in close consultation with Élevage Service and the Animal Production branch in order to soon be able to provide a viable offering for duck and chicken farms. The MCUBE project, which brings together 5 industrial and research partners, has taken full flight in 2016 with the implementation of a pilot unit close to the town of Aire-sur-l'Adour. This unit will be open for presentations and visits from 2017.



2. Green chemistry:

• Ovalie Innovation is looking to create added value... from the group's by-products:

- Feathers: there are ongoing discussions with a major chemicals group as to the merits of an industrial repurposing activity.
- Slaughter by-products: the research programme on bioplastics in collaboration with the company VégéPlast has continued, with promising results that can be published from 2017.
- Infertile eggs: there is an ongoing partnership with Symbiotec and BIO-Industrie (a regional centre for innovation and technology transfer), to split infertile eggs in hatcheries and repurpose the various components (food supplements market, cosmetics market) – Co-financed by ADEME.
- Vegetable and alfalfa by-products: Ovalie Innovation is continuing with the RUBIS programme with the INSA in Toulouse and the École des Mines in Albi. The objective is to extract an innovative molecule with textural properties for the food processing and cosmetic markets – Co-financed by the region of Occitanie.

...by implementing new crops

Ovalie Innovation is developing two key projects in this area:

- the first is about creating a coriander oil production chain. For more than two years now, Ovalie Innovation has been working on coriander seeds in collaboration with the LCA (industrial chemistry laboratory at the Toulouse school of chemistry) and its AGROMAT platform in Tarbes. The aim of this is to further exploit this crop by finding innovative outlets (cosmetics, functional foods, food supplements and ingredients). The chain will be fully integrated in the Group, from production through to processing using new processes implemented at the Aqualia fish food factory in Roquefort.

R&D efforts to develop and patent this ecological process of producing oil have come along nicely in 2015/2016 and have led to the production of pilot plots. This work was chosen by Coop de France to appear among the cooperative innovations presented at the innovation competition at the SIAL international food fair in Paris in October 2016.

The coriander oil product earned the recognition of the jury as a major innovation in the "intermediate food product" category. This is worthy recognition from a trade fair that is devoted to the food processing industry, and one that serves as a real platform for business and exchanges, bringing together over 14,000 companies and brands, food manufacturers and 333,000 buyers working in the fields of trade and distribution, catering and food processing.

- the second one concerns the recovery of by-products through strong partnerships with industrial users. Ovalie Innovation and the company Parex-Lanko, a manufacturer of plaster and mortar for the

construction industry, have committed to an approach to recover sunflower and maize stalks and develop a product to be used for the insulation of old buildings. The aim is to create a segment as part of the value chain which could give farmers close to 20% gains in net margin on their plots.



AgroLandes Technology Park

Operations relating to the creation of the technopôle AgroLandes (an agricultural technology park focussing on innovation in the agricultural and food processing industries) are being actively pursued.

Don't forget that in 2013 the authorities of the Landes Departmental Council and the Cap de Gascogne Community of Communes acquired an 84 ha site through a joint association. This site is located between Mont-de-Marsan and Haut-Mauco.

The creation in 2015 of a public interest group which is tasked with developing the site, finding potential businesses that could set up on the site and handling external relations, has been extended by the recruitment of director Marc Chazaux in January 2016.

On 22 September 2015, AgroLandes Entreprises, a non-for-profit association (in accordance with the law of 1901) was established under the presidency of Thierry Zurcher, with the aim of bringing together the founding companies of the public interest group so that they can speak with one voice on the AgroLandes steering committee. The association already represents more than 30 Landes companies of various sizes (small, medium, intermediate and even large companies), from all sectors - food processing, wood, bio-methanisation, machine tools, etc. It remains an open association in which all companies can express their views. The association holds shares in AgroLandes on behalf of its community of member companies.

The idea behind AgroLandes is simple: new jobs and the growth of tomorrow will stem from innovation, research and "cross fertilisation" between technologies (i.e. exchanges between

sectors, companies, disciplines, etc.). AgroLandes is a crossroads between supply and demand, and examples of the first themes covered include:

- Upstream: primarily the "farm of the future" and all that this implies in terms of deployment of new technologies for crops and breeding, including fish.
- Downstream: towards markets where the "factory of the future" will come into play, with modern processing and preservation technologies in our wood and food processing sectors (high pressure being an example), not forgetting the recovery of by-products through the concept of bio-refining for new outlets in the chemicals and energy sectors.

Furthermore, the AgroLandes public interest group played a significant role on the major themes implemented during the winter of 2016, in the midst of the avian influenza crisis. The public interest group has demonstrated its ability to disseminate information on scientific topics.

For the Maisadour Cooperative Group, the outlook is very positive and the Group will continue consulting with local companies and working in partnership with authorities. In parallel, the Group has engaged in an internal consulting process to assess various scenarios to develop the innovation strategy in direct relation with the opportunities that the AgroLandes offers.

