



Rijksdienst voor Ondernemend
Nederland

*Opportunities for
Trade and Collaboration in the Agri Tech Sector
in France*

*>> Duurzaam, Agrarisch, Innovatief
en Internationaal ondernemen*



Vitibot

Final Report prepared by:

Marie-Cécile Damave
Head of Innovations and
International Affairs, agridées

agridées
8, rue d'Athènes 75009 Paris
France

T : +33 (0) 6 79 08 66 76
E : damave@agridees.com
W : www.agridees.com



agridées is a French independent think tank in agriculture and agribusiness that engages and shares reflections and recommendations on strategic issues to help decision-makers seize opportunities addressing the challenges of the 21st century.

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For more information please contact the Dutch
Agricultural Counsellor in Paris:
Embassy of the Kingdom of the Netherlands
7 rue Eblé
75007 Paris
France

On behalf of
The Embassy of the Kingdom of the
Netherlands & Rijksdienst voor
Ondernemend Nederland

T +33 (0)1 40 62 33 52
E PAR-LNV@minbuza.nl

1 Management Summary

France is the leading agricultural producer in the European Union and a major consumer of food. Farm production is extremely organized, knowledge and input intensive. For newcomers to penetrate this market, accessing existing ecosystems can be of great help. Partnering with an agricultural cooperative, a University, a major company in the agri-food business or a technology cluster certainly helps. These ecosystems provide networks of key stakeholders in research, development, innovation, production and distribution in specific sectors and in determined regions. Digital farming is already a reality in France, with a diversity of technology and service providers already in place. Farmers are generally open to innovative technologies under certain conditions: they need a good return on investment, these technological products and services must be reliable with interoperability, bring additional value (economic, environmental and societal) to farmers' business, and trust must be secured around data privacy and purpose of use. European and French national policies and societal demands are key drivers for a more sustainable farm production as well as food and non-food consumption. In these conditions, the most promising markets in France for applications of digital technologies are diverse. They include (1) precision agriculture (intra-plot modulation software and equipment); (2) autonomous weeding robots (mechanical and spot-spraying chemicals); (3) animal welfare monitoring (software and sensors); (4) smart insurance contracts (blockchain); (5) traceability systems (including blockchain) providing premium for carbon farming (carbon storage, greenhouse gas emission reduction) to farmers and visibility for consumers (bar codes, QR codes, labels); and (6) vertical urban farming (glasshouses, aeroponics and aquaponics equipment, energy saving systems).

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2 Agriculture: an organized industry in transition

2.1 Economic snapshot of France's agriculture and food industry

France is the leading agricultural producer in the European Union, with 20% of the European production. French primary agriculture production is diverse (due to the geographical and weather diversity of the country) and productive (farm production is extremely organized, knowledge and input intensive). A strong and diverse food and non-food industry processes and values primary farm products across the country. Supply chains generally end with distribution channels driven by large supermarket companies. France is also a leading food consumer in Europe (due to its large population base) and historically a major exporter of food.

	France	The Netherlands
GDP (billion €)	2353 (2018, Eurostat)	774 (2018, Eurostat)
Population (million)	66.9 (2018, Eurostat)	17.2 (2018, Eurostat)
Inhabitants per km2	119	507
Contribution of agriculture, forestry and fishing to GDP	1.6% (2019, World Bank)	1.66% (2019, World Bank)
Farmland (million ha)	27.8 (2016, Eurostat)	1.8 (2016, Eurostat)
Number of farms (thousand)	456.5 (2016, Eurostat)	55.6 (2016, Eurostat)
Agriculture production (million €)		
• Plant production	42.3 (2019, Eurostat)	14.1 (2019, Eurostat)
• Animal production	26.3 (2019, Eurostat)	11.0 (2019, Eurostat)
Food industry turnover (billion €)	179 (2016, Eurostat)	73 (2016, Eurostat)

2.2 Organization and main stakeholders in agriculture

The Minister of agriculture and food is an influential member of European Minister Council and also within France's Government. The [French Ministry of Agriculture and Food](#) prepares and implements the Government's policy for agriculture and forestry; education in farming and life sciences; agronomy, biotechnology and veterinary research; plant health and protection; food policy; food industry policy social policy for farmers and workers; fisheries and aquaculture policy; and animal welfare, health and protection of farm animals and pets. The Ministry of Agriculture and Food "helps farmers transitioning towards a more ecological agriculture" and takes actions for a "safer, sustainable and accessible food to all."

In France, agriculture a very organized industry. Major economic and technical organisations are well established. Economic organisations include cooperatives, private businesses supplying farmers with inputs and collecting outputs, farmer organisations and interbranch organisations (in French "interprofessions"). It is not easy for new players to penetrate this dense environment where traditional stakeholders (farmers unions, cooperatives, banks, insurance companies, chambers of agriculture, technical institutes) have no intention to give up on their influence on

farmers. Therefore, it is preferable to make alliances and build partnerships with existing stakeholders (for example cooperatives).

As farms are small, supply can be fragmented. Farmer organisations and cooperatives aim to group supply for a more balanced economic weight with their customers: the food industry and distributors. Approximately 75% of farmers in France are members of a cooperative. The latter account for 40% of the turnover of the food industry with €85.4 billion and 30% of food brands. There is a total of 2300 cooperatives including 13 large groups¹. There are 600 farm cooperatives involved in organic agriculture.

The French food industry represents 18 percent of the country's total industrial activity and 430,000 jobs. It is the second largest food industry in Europe after Germany. The current sanitary and economic crisis due to the Covid-19 pandemic has revealed that this industry is particularly resilient, despite the sharp reduction in food service activity as a result of lockdowns.

2.3 Farming is adapting to rising societal and environmental demands

In France as in most developed countries, many agricultural issues (such as GMOs, water, pesticides, animal welfare and biodiversity) have become **societal issues**. Driving forces in farming are changing from farmers and other upstream stakeholders to consumers, retailers and other downstream stakeholders. Agribusiness was techno-push, from farm to fork, and has no other choice than switching to market-pull, from fork to farm.

Societal demands and environmental imperatives for **more natural products** have translated into regulations that farmers have to adapt to, while maintaining their businesses profitable. The use of production factors that proved to be efficient for French farmers in the past decades are now under scrutiny. This includes modern plant breeding techniques (questioned since GMOs got to market three decades ago), synthetic chemical crop protection products (symbolized by glyphosate and neonicotinoids) and antibiotics in livestock breeding (antimicrobial resistance is a growing concern for human health). Overall, production factors that converge to so-called "industrial farming" are often seen as harmful to the environment and human health. However, they remain indispensable to securing food security and alternatives are not always available.

As part of the ecological transition, the Government of France has developed a **national strategy to reduce synthetic chemical pesticide** use by 50 percent by 2025. Considering French agriculture is too dependent on these pesticides, many call for a "zero pesticide agriculture". Similarly, animal production is subject to societal criticisms relative to **animal welfare** and environmental impacts (mainly manure management and methane emissions by ruminants), leading to extreme positions opposing animal breeding and favouring veganism.

Regulatory and societal pressures are impacting agriculture practices towards a more sustainable agriculture in its three dimensions (economic, environmental and societal).

¹ Rapport d'activité 2019: la coopération agricole: <https://www.lacooperationagricole.coop/fr/notre-organisation>

The Government of France promotes **agroecology**. The ministry of agriculture and food defines it as “a way of designing production systems that rely on the functionalities offered by ecosystems. It amplifies them while aiming to reduce pressures on the environment and preserve natural resources. The aim is to make maximum use of nature as a factor of production while maintaining its capacity for renewal.”²

The farming community is exploring **alternatives to conventional production factors of concern** to maintain their business profitable and contribute to the agroecological transition. It is not only a question of techniques, practices and knowledge among farmers, but also of consumers education and willingness to pay a premium for food and other biobased processed products that are derived from environment-friendly practices, when possible.

Interestingly, an environmental certification was created in 2011 to distinguish farms involved in environmentally friendly approaches. Three different levels of certification co-exist, the highest is named “High Environmental Value” (**HVE**). It is based on performance indicators relative to biodiversity, phytosanitary strategy, fertilization and irrigation management. In January 2020, there were 5400 farms certified HVE in France, most of them in viticulture.

Currently, **organic agriculture** is the agroecological farming that is the most profitable for farmers³. Retail price premium generally more than offsets additional costs of production and reduced yields. According to Agence Bio, there were 2.3 million hectares cultivated organically in 2019, i.e. 8.5 percent of France’s total farmland. A further increase is expected, encouraged by European and domestic policy at the production and consumption levels.

Adaptation and mitigation of **climate change** has become imperative for farmers in France. Their leading challenges include access to water, adapting to extreme conditions (such as drought, heat waves and hail), soil fertility, changes in cropping timeframe, biodiversity management, technology adoption towards a “climate-smart agriculture” for addressing both food security and climate change. Carbon sequestration initiatives (for example, with conservation agriculture) are increasingly popular but need to be funded to stimulate more adoption, either by public policy or via private initiatives⁴.

2.4 The food chain is adapting to economic and environmental imperatives as well as changing consumer preferences

Environmental commitments:

The French food industry organization (ANIA) published a green manifesto⁵ on October 14, 2020 that includes the commitments of food companies in line with the ecological transition. Their objectives below include opportunities for AgTech and FoodTech companies:

² <https://agriculture.gouv.fr/quest-ce-que-lagroecologie>

³ France Stratégie (August 2020) [Les performances économiques et environnementales de l'agroécologie](#)

⁴ Agridéas conference “[Farming business and climate challenges](#)”, September 29, 2020

⁵ ANIA (October 2020) L’ambition d’une transition verte : les entreprises de l’alimentation en actions ! <https://www.ania.net/developpement-durable/lambition-dune-transition-verte-les-entreprises-de-lalimentation-en-actions>

- **Reduce carbon impact of industrial sites:** the food industry commits to reduce carbon emissions by 35 percent by 2030 from their levels of 2015 (increased energy efficiency, fuel decarbonation, e.g. increased use of heat produced by biomass boilers, methanization of waste and residues, units of self-consumption of biogas);
- **Promote circularity of packaging** (decarbonation, eco-design, waste sorting, collection and recycling): the food industry commits to use 100 percent recycled packaging by 2025 (for example, the market for biobased plastics is expanding);
- Accelerate the development of **sustainable transportation and supply chain**;
- **Fight against food waste:** the objective of the pact against food waste is to reduce it by 50 percent by 2025 (for example, adding value to by-products generated by the food industry through green chemistry);
- **Environmental display:** there is no commitment in this regard but several segments of the French food industry are testing environmental labelling based on life-cycle analysis in line with the anti-waste and circular economy law (“Loi anti-gaspillage et économie circulaire”).

Social and environmental responsibility is gradually becoming as important as economic profitability in the industry, food and non-food. This is an opportunity for farming to record and show its good practices and get paid for it.

As **animal welfare** is a growing concern among the society, there are some private voluntary initiatives to label final animal products with animal welfare information. It is very likely that there will be a national and/or a European labelling in the near future to characterize and quantify animal welfare to inform and reassure consumers.

A more **biobased industry** is developing. Tracing is key to secure consumers that the biobased products on the market, which are usually at higher prices than equivalent fossil-based products, are biobased and their processing had positive environmental impacts (in terms of GES emissions or biodiversity for example). Biomass is not only used to produce food. A more inclusive biobased economy, or bioeconomy, is developing in France, including food and non-food industries. Like the European Union and several Member States, France has adopted a national strategy on the bioeconomy. Corporate Social Responsibility (CSR) reporting is currently compulsory for the largest companies, but an increasing number of smaller companies are involved in CSR. This could stimulate the bioeconomy, with a growing demand for bio-based energies, eco-designed products, waste and by-product treatment, carbon sequestration actions, etc⁶...

Food sovereignty:

One of the most visible impacts of the sanitary and economic crisis due to the Covid pandemic is that the government of France is communicating on its objective of “**food sovereignty**”, meaning food security. Although food security has been perceived as a top priority European objective since World War II and the Common Agricultural Policy was the first European policy, “food sovereignty” as it is used today is often understood at the national level, although this has little meaning under Europe’s Single Market.

⁶ Agridéés (2018) Bioéconomie : entreprises agricoles et société, une urgence partagée
<https://www.agridees.com/publication/bioeconomie-entreprises-agricoles-et-societe-une-urgence-partagee/>

Consumer preferences:

As a result of several sanitary scandals in the past decades, consumers in France show significant **mistrust** in food, questioning agriculture production practices and food industry processing methods. Consequently, a significant demand by consumers today is for more information, more transparency regarding the food they eat, its origin, methods of production, impact on the environment, climate and biodiversity. They are also increasingly eager to make sure that farm gate prices are not too low compared to retail prices, and their demand for local products is on the rise. Long food chains are often questioned by consumers who point their opacity and tend to distrust them.

Protected Geographical Indications and quality labels (mainly Label Rouge) are sources of trust but have limits, are not always understood and trusted. Tags on packaged food can only contain a limited information about the product.

Organic benefits from solid trust among consumers⁷ and this market segment is growing fast. According to Agence Bio, it amounted to €9 billion in 2018 and accounted for 4.8 percent of total food consumption. The largest segments of organic sales are grocery products (23 percent), fresh fruits and vegetables (19 percent), dairy products (17 percent), alcoholic beverages (12 percent) and meats (10 percent).

⁷ Agridées (2018) La résilience des filières bio https://www.agridees.com/download/publications/Note-la-resilience-bio_2.pdf

3 Digitalization helps successful transitions

3.1 Covid-19 pandemics is accelerating the digitalization of the agrifood industry

The **Covid-19 crisis** is accelerating the digitalization, hence the modernization, of agriculture in France⁸, as is the case for other sectors including public health and education. Despite lockdowns, farmers have been able to continue to **exchange information** among themselves and with technicians (via video conferences) and to **purchase inputs online** via dedicated websites and digital platforms.

During the lockdown in Spring 2020, farmers boosted **direct sales** of their production on the internet and social media (mainly due to the closing of open street markets in major cities), while sales of fresh traditional products tripled by **e-commerce** and total sales via e-commerce doubled.

Digital platforms have also been increasingly used to **hire seasonal workers** on farms, mainly for harvesting fruits and vegetables, mainly including <https://desbraspourtonassiette.wizi.farm/>.

Lockdowns have also represented an opportunity for developing online education services, for example using Massive Open Online Courses (**MOOCs**). For example, Agreenium is the umbrella institute of 14 different Universities in agriculture and 4 research organizations in agriculture. Numerous MOOCs are proposed on this platform: <https://www.agreenium.fr/u/moocs>

3.2 Appropriate data management implies trust, value and security

The digitalization of farming and the agro-food industry generates both hopes and fears. On the one hand, data are a lever for **progress and performance**, provided that they generate **value**. There are several ways AgTech can generate value to farming, and more specifically to farmers. As farmers are the weakest link in the food chain, taking the highest risks and getting the lowest added value, they are eager to benefit from services that adds value to their business. Digitalization can generate value for farmers and other stakeholders in the food chain in several ways. It can be **economic, social or environmental value** at the production, processing or distribution stage. To date, after several years of adoption of digital technologies by pioneer farmers, some still indicate a lack of evidence of added value. **Reliability, return on investment** and **workload reduction** are key adoption factors for farmers.

On the other hand, organizations able to process data, generate models and algorithms are feared for their power and influence. There is little room for technology providers who don't inspire **trust** among farmers and the farming industry, concerned about any "Big Brother" behaviour. Farmers don't always have a clear idea of who has access to and processes their data and for what purposes. Some

⁸ Académie d'Agriculture de France (2020) Covid-19 et agriculture : une opportunité pour la transition agricole et alimentaire ? Chapitre 14-agriculture et numérique, grand basculement entre intelligence et résilience

technologies like real-time geolocation or video recording can be concerning for livestock and plant producers, who can feel these technologies are **intrusive**.

Trust can be built in tech providers if their actions are **transparent**, if they ask **consent** prior to using farmers' data, if they inform them of the purpose of their processing and aggregating data, and most importantly if farmers get back some value from sharing their data. **Consent** can be generated by technical tools such as **blockchain** or regulatory instruments like **General Data Protection Regulation**⁹ (GDPR) for personal data and contract law.

The leading European agricultural organizations published a **Code of conduct**¹⁰ for data sharing in 2018, and its French version is **Data Agri**¹¹. It is a label initiated by leading French farmers organizations (FNSEA and Jeunes Agriculteurs) that private companies in digital agriculture can obtain if they comply with certain rules:

- There must be a **written contract** between the company and the farmer;
- **Transparency** is required about data storage, purposes of data collection and processing, and data portability;
- Farmers must be in control regarding the data processing access, withdrawal and oblivion; they must give explicit **consent** for data processing and for use by a third party; consent must be chosen and revocable; and contracts can be terminated at any time;
- **Data security** includes their confidentiality and anonymization, and their uses must be lawful.

To date, there are only 7 companies benefitting from the Data Agri label, but any company with commitments close to these rules would be welcome by farmers in France.

API AGRO¹² is a data exchange platform for agriculture. Using it secures safe dissemination of data while controlling their destination and use. API AGRO connects stakeholders in agriculture, give them access to networks of data collectors and digital solution publishers. Using this platform for newcomers would help their market penetration in France and facilitate connections with other stakeholders plugged to the platform.

In addition, there are initiatives to digitalize agriculture and food and standardize it. **Numagri**¹³ is an association which objective is to design and organize the conditions of standardization of digital data, i.e., a common language to allow farmers to consolidate information so that productions can be valued. **Num-Alim**¹⁴ is the digital platform for food in France. It is a database fed and updated by the food industry. It contains diverse data from farmers to retail outlets.

⁹ Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0679>

¹⁰ EU Code of conduct on agricultural data sharing by contractual agreement https://copa-cogeca.eu/img/user/files/EU%20CODE/EU_Code_2018_web_version.pdf

¹¹ <https://www.data-agri.fr/>

¹² <https://api-agro.eu/en/>

¹³ <https://numagri.org/>

¹⁴ <https://www.plateforme-numalim.fr/>

3.3 Digitalizing communication

Several **social media** are used by French farmers to communicate to the general public about their practices and debunk fake news. They mainly include Youtube (short videos made by farmers Youtubers) and Twitter (Tweeting farmers are grouped under the association “France Agri Twittos” - @Fragritwittos). These social media are key to reconnect farming with citizens in general, in order to build consumer trust in food and agriculture. By contrast, organisations denouncing farming practices use the same media to disseminate shocking pictures and videos to the public and make believe they are common.

Advisory services to farmers are increasingly disseminated digitally, including alerts on crop diseases by technical research institutes (e.g., the [sugarbeet institute](#) and the grains institute [Arvalis](#)) and the public research institute in agriculture INRAE ([e-phytia](#))

Farmers’ training courses and meetings via **video conferences** are key to educate them on new services and products and share feedbacks about testing new technologies. For example, the network of pilot farms “Fermes Leader” has a Youtube channel where videos are posted to share farmers feedback regarding new technologies tested: <https://www.youtube.com/watch?v=H4510U8v2TU>

Networks of connected farms are developing for farmers of the same community, e.g., who belong to the same cooperative (e.g. the dairy cooperative SODIAAL). Not only communication and training are performed in these ecosystems, but also benchmarking can be done by each farmer relative to the others, therefore identifying ways to improve her/his performance.

3.4 Digitalizing farm production

Currently, there are many different digital instruments available for French farmers either for overall farm management or precision agriculture. Instruments funding carbon farming and smart insurance contracts are being developed, and vertical farming is in its infancy.

- **Overall farm management**

Digital software able to provide a detailed technical and economic overview of plant and animal production on a farm, and identify levers of progress, are extremely useful to farmers. They can integrate data from Internet of Things (IOT), sensors, satellite imagery, and connected weather stations for example. Existing software include [MesParcelles](#) (designed by the Chambers of Agriculture), [Isagri](#), [Smag](#) and [ITK](#).

Market places to buy and sell second-hand machinery and equipment ([Agriaffaires](#), [Terre-net occasion](#)) are often used by farmers, while other market places are developing to help them purchase several types of inputs ([Agriconomie](#)) through supply chains different from the usual ones that are cooperatives and private traders.

- **Precision farming**

Precision farming is promising. It is a multiple risk (sanitary, weather and economic) management system¹⁵ that brings solutions to farmers to boost their economic and

¹⁵ OECD Environment Directorate, Joint meeting of the Chemicals committee and the working party on chemicals, pesticides and biotechnology (22 January 2020) [Report of the OECD Risk Reduction Seminar on Evolving Digital and Mechanical Technologies for Pesticides and Pest Management](#)

environmental performance. Precision farming tools converge to customized agriculture for each plant and animal and based on intra-plot analysis. Many companies market solutions available on the market in France.

- **Precision breeding** for animals and plants – phenotyping, genomics, gene editing (**plant and animal breeding companies**), modulation of seed density within plots with specific seed drills (**be Api, Precifield**)
- **Precision animal and plant health monitoring solutions** – for early-stage identification of diseases and pests via imagery, artificial intelligence, sensors monitoring animal behaviour and animal welfare (**Le Cube, Dilepix, Copeeks, Lituus**), spot spraying with adapted sprayer nozzles, mechanical and electrical weeding (**Naïo technologie**), biocontrol solutions (**Kapsera**)
- **Precision weather monitoring** (**Sencrop, Weenat, Weather Measures**)
- **Precision nutrition** for plants and animals – feed, fertilizers and biostimulants specifically adapted to each plant and animal, intra-plot modulation of fertilizer spraying (**Dairy Exp’er, be Api**)
- **Precision machinery** – robots (**Vitirover, Vitibot, Tibot, Naïo technologie**).

Some equipment is getting so high tech and expensive that farmers increasingly prefer to purchase the services of companies that own this equipment (and can use it accurately and professionally) rather than the equipment itself. These companies are called “Entrepreneurs agricoles” and are united in a Federation called “Fédération Nationale des Entrepreneurs des Territoires” ([FNEDT](#)). In addition, Ag Machinery Use Cooperatives (in French, “Coopératives d’Utilisation de Matériel Agricole”, or CUMAs) are widely spread across France and are grouped in a National Federation ([FNCUMA](#)) that includes 11 740 cooperatives where farmers share the purchase of their machinery and equipment. These federations can be interesting contact points for machinery and equipment providers.

Predictive models using Artificial Intelligence are emerging, for example to anticipate the optimal time for harvesting and expected yields and crop quality at harvest (**Cybeletech**).

- **Carbon farming**

Carbon farming is promising as farmers not only have the power to reduce Green House Gas emissions but also to store carbon in their soils and crops. Business models to reward farmers for their carbon storage actions are still in construction, whether via public payments or private initiatives. There are some initiatives but very few are rewarding for farmers. There are some **blockchain**-based solutions tracing farmers actions and allowing consumers to pay a premium for products derived from these practices, that would be transmitted back to farmers sequestering carbon (**Nataïs**).

- **Smart contracts**

Another type of digital instrument for farmers consists of **smart contracts**, generated by **blockchain** technology for insurance purposes. With smart contracts, the terms of a contract are transposed into a program that executes a transaction in the blockchain when the predefined conditions are met. For farmers, it would mean faster compensation after damage caused by adverse weather conditions like frost or hail for example. Major insurance companies including AXA and Groupama are exploring smart contracts but have not released any, to date.

- **Vertical and climate-controlled farming**

Developing farm production closer to consumers in urban areas based on high tech tools has not developed significantly in France. To date, there has been few examples of companies producing leaf vegetables and berries in vertical units like glasshouses (**Agricool, Mes Petites Feuilles, Jungle Concept, La Plucherie**) in urban areas. Other vertical and urban farming is performed in the open air on rooftops (**Agropolis, Nature Urbaine, Urban Farm**).

More specific vertical production includes insect production (**Ynsect, Innovafeed**) and spirulina production (**Algorapolis**), for example.

All the types of urban farming are likely to further develop in the near future to supply local fruits and vegetables and innovative proteins to urban consumers, as there is increasing environmental concern for farm land.

3.5 Digitalizing traceability across the food chain and e-commerce

Digital tools (such as **blockchain**) are developing to improve **traceability and transparency** across the food chain, addressing consumers distrust and demand for more information about the food they eat, its origin and production methods. To date, these initiatives have remained marginal.

Digital traceability solutions from fork to farm:

Blockchain technology is used in systems where there is no trusted third party, for example in certification initiatives. In many cases, independent certifying entities are not questioned in the farm and food industry, which is why blockchain is not often used in traceability initiatives. Experts believe this technology is more adapted to manage farmers' consent in sharing their data than in traceability systems. Here are several examples of digital traceability systems in place in food supply chains in France:

- The supermarket chain **Carrefour** uses blockchain on products marketed under its brandname "Filière Qualité Carrefour": scanning the QR code label allows access to information relative to a diversity of products including chicken, tomatoes, eggs, cheeses and salmon. For its part, Auchan retail is deploying blockchain at the international level, to develop information for consumers using a QR code on fresh carrots packaging.
- The **IBM Food Trust** offers a cloud-based blockchain solution used by Carrefour and Nestlé for Mousline ready-made dehydrated mashed potatoes.
- **Connecting Food** is a young company using blockchain to trace products in real time from the farm to the point of sale, including a digital audit of the products. Connecting Food has been implemented this technology in the dairy sector with the **Ingrédia** cooperative and the duck sector with the **Terres du Sud** Group. The objectives are to respond to consumer demands for more complete information on food products and to reassure them about their origin, quality and production methods.
- **Microsoft** proposes blockchain solutions for logistics and transportation of goods including temperature sensors for an optimal conservation of food products.
- The cooperative **Terrena** has developed traceability from bar codes tagged on products at retail outlets to find the origin of animal products, the farmer and livestock breeding conditions via the application "monagriculteur.coop" (chicken cuts, eggs, turkey cuts...)

- **Traceability of farm inputs:** in France, phytosanitary products are traced with the SC Trace solution (made by **Agro EDI Europe**) while at the European level, these products are traced by the Agro Closer platform (made by **Proagric**).

For farmers involved in a several specifications to be sold under various private labels and brand names for example, **standardizing data formats** and interoperability is essential so that farmers don't need to enter several times the same data and therefore waste time.

The development of **e-commerce** has accelerated with the Covid-19 crisis and lockdowns, both in traditional supply chains and in digital platforms for farmers direct sales (such as **La Ruche Qui Dit Oui**, **Speedle.fr**, **puyp.fr**, **pourdebon.com**, **solaal.org** and **wynd.eu/fr**). E-commerce accounted for 10 percent of food sales.

New ways of obtaining information about food products are developing, short-cutting traditional pathways. Applications like **Yuka** are very popular among French consumers (more than 12.5 million users, to date).

4 A dynamic digital innovation ecosystem

4.1 French farmers' use of digital technologies

There is an ambitious program to generalize 4G to the entire territory of France is named the "New Deal Mobile". It is estimated that currently, 96% of France is covered by 4G by at least one of the operators (a 7% increase from January 2018) and 76% by all operators (a 31% increase from January 2018)¹⁶. There is still connectivity divide in France but the gap between rural and urban areas is shrinking.

- **Total production**

In 2015, 79% farmers used internet, 90% farmers made their CAP applications online, 76% farmers checked the weather online several times a week¹⁷. Only 25% of farms in France had access to a software for technical and economic management of their businesses. Most of these farmers consisted of main crop producers (75% use technical management software)¹⁸.

In 2015, half of the farmers in France were equipped with a smartphone. They used business applications for which smartphones are measurement systems (navigation and movement sensors, camera to identify plants and diseases) that could interact with other sensors (geolocation with correction, weather stations, tractor equipment).

These data will be updated in 2021 or 2022 with the next farming census.

- **Plant production**

There were 1.1 million ha covered by remote sensing in 2016 in France, including 85% by satellite and 15% by drones and planes. Remote sensing was dedicated to 13% of France's grain acreage and 1% of grapevine acreage. Most of its purpose was nitrogen input modulation.

On average, **50% of French farmers use onboard Global Navigation Satellite Systems (GNSS)** receivers, from low to high precision uses. For example, low precision is used in viticulture and fruit production for tracing and equipment management and in crop production for guidance and modulation, while very high precision (RTK) is used in self-guidance, sowing and weeding crops and vegetables.

In France, **less than 10% of farmers use intra-plot modulation** of nitrogen fertilizer doses or seed density. This low percentage results from the low number of farms benefitting from intra-plot yield maps, usually made by cooperatives.

Almost 30% of French farmers are equipped with **yield sensors** on the combine harvester but little is made out of it. Less than 20% visualize simple maps and less than 5% analyse and interpret these maps for references in precision agriculture.

¹⁶ Authority for Regulation of Electronic Communications, Post and Press Distribution (ARCEP):

<https://www.arcep.fr/larcep.html>

¹⁷ Ministère de l'agriculture (2016) Les chiffres-clés de l'agriculture connectée <https://agriculture.gouv.fr/infographie-les-chiffres-clés-de-lagriculture-connectée>

¹⁸ Digital Agriculture Convergence Lab – DigitAg – Observatory of digital farming uses <https://www.hdigitag.fr/fr/innovation-transfert-agriculture-numerique/observatoire-usages-agriculture-numerique/>

Digital instruments used in vegetable production include mainly fixed measuring devices in greenhouses for heating and irrigation management; smartphone applications for social media, weather forecast, disease identification, irrigation and greenhouse monitoring; open-field fixed measuring devices including probes and weather stations; and software tracing farming operations (accounting and workforce management).

Very few farms use **robots** in France in plant production: most of them are weeding robots in vegetable production (approximately 100) and viticulture (10), out of the total estimated 10,000 farm robots in commercial use in France¹⁹.

- **Animal production**

Approximately two thirds of dairy farms in Brittany (France's leading milk producing region) have at least one type of digital equipment: automated feed distributor, heat or calving monitoring, milking robots, Radio Frequency Identification (RFID) tags, rumination monitoring, automated weighing.

Milking robots are estimated to be present in 9% of dairy farms in France²⁰ (i.e. approximately 8,000). Other robots used in livestock production are for manure management (around 2,000) and feeding (several hundreds). Other animal husbandry sectors include poultry production.

4.2 Several AgTech and FoodTech ecosystems

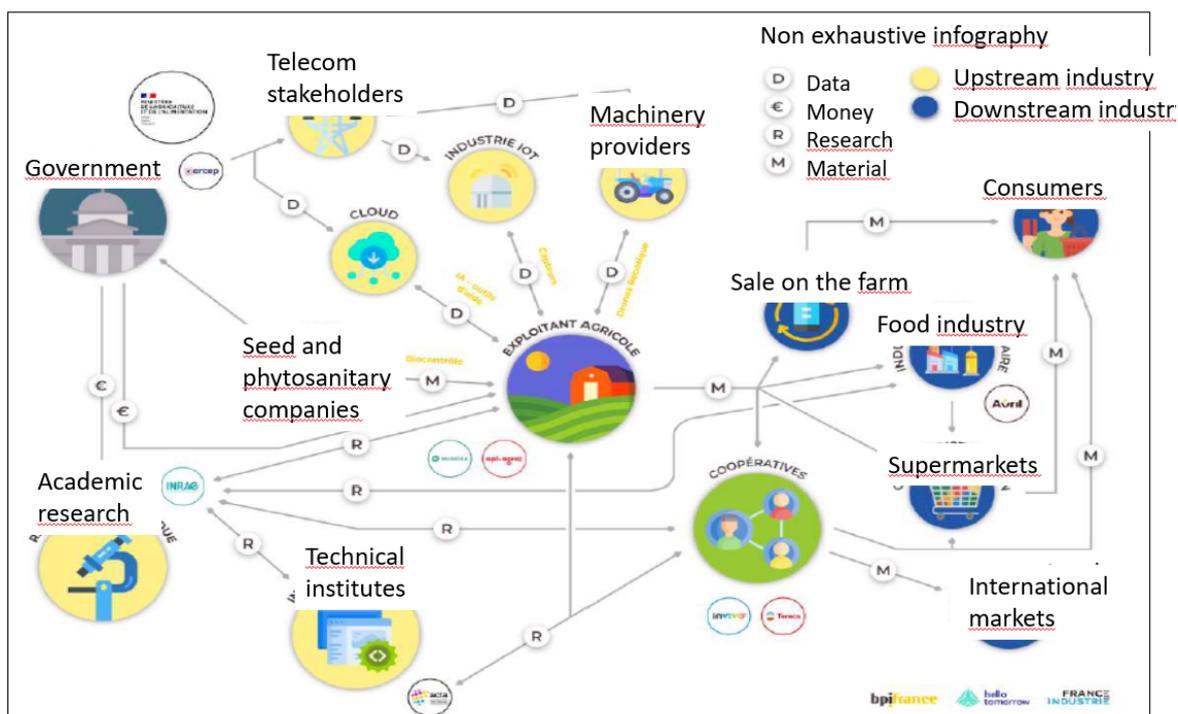
One must note that **international agribusiness companies** provide a number of digital farm management instruments. These include John Deere, Claas and New Holland in the machinery industry; Syngenta, Bayer and BASF in the seed and phytosanitary business; Yara in the fertilizing industry; and Lely in milking robots. All of them are marketed in France, but are not going to be detailed in this report, as they are not specific to France's farming business environment. These leading companies supplying inputs to farmers and can be interesting to collaborate with for innovative companies though.

Several ecosystems coexist: some include a majority of upstream stakeholders (AgTech) while other are more specialized in downstream stakeholders (FoodTech); some have a territorial basis as they belong to agricultural cooperative networks or regional technological clusters (in French, "pôles de compétitivité"), while others have a national basis. Several sources have initiated mappings to identify the most important players and fields of innovation. Below is a selection. The Public Investment Bank (BPI France) describes the AgTech/FoodTech ecosystem as follows²¹, including not only startups but also research organizations and major cooperative groups.

¹⁹ [FIRA 2020 press kit](#)

²⁰ CNIEL (2020) L'économie laitière en chiffres <http://www.filiere-laitiere.fr/fr/chiffres-cles/des-donnees-reference>

²¹ BPI France/Hello Tomorrow/France Industrie Rencontre agriculture (July 10, 2020), Startups-grands groupes : opportunités business, bonnes pratiques, recommandations <https://www.youtube.com/watch?v=SevJzRgkqWw>



To penetrate the French market, newcomers can make alliances with established and influential stakeholders to test and improve their technology, adjust it to the market and make their solutions compatible with complementary products on the market.

Examples of **successful collaborations**:

Innovafeed is a startup that collaborates with the cooperative **Tereos**. When processing agricultural products, Tereos produces by-products that used to be valued as animal feed only. They are now valued by Innovafeed, which insects are fed on these by-products. The two companies are neighbours to optimize environmental impacts. Insects raised by Innovafeed concentrate proteins that are later valued as animal feed.

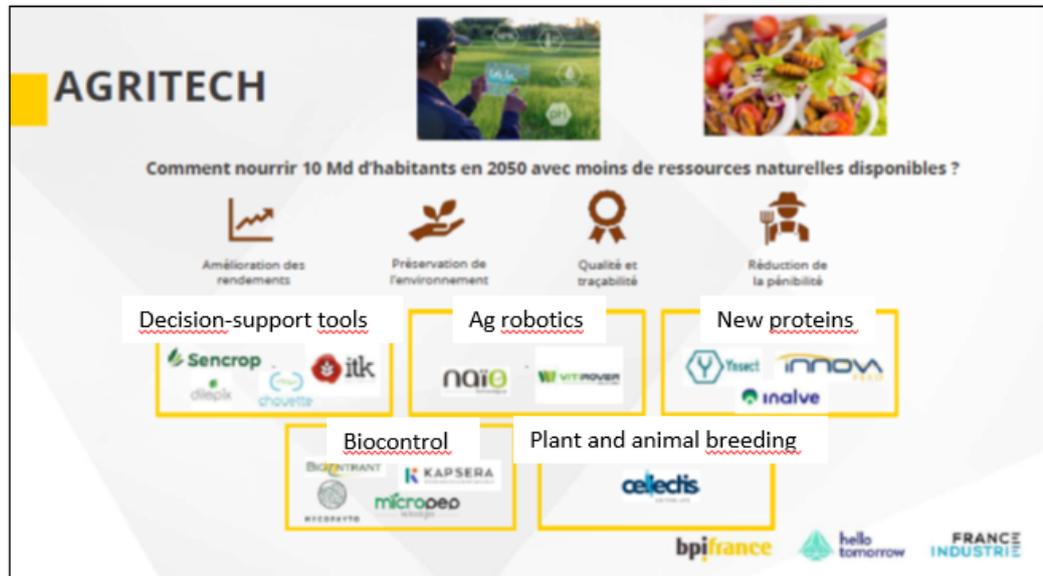
Javelot is a young company producing connected objects for the remote management of grain storage. Javelot was the winner of an innovation contest named "**InVivo Quest**" in 2018, organized by the union of cooperatives InVivo. Since then, Javelot has benefitted from contacts within the InVivo ecosystem, which has opened doors to new collaborations and business.

Startup mappings are proposed by various stakeholders including La Ferme Digitale, La FoodTech, BPIFrance/Hello Tomorrow/France Industrie, WAnge, DigitalFoodLab.

The private equity group XAnge (Siparex group) mapping is the most exhaustive one but dates back from 2019 and has not been updated since then.

More up-to-date but less exhaustive mappings propose a selection of French startups.

- o BPIFrance/Hello Tomorrow and France Industrie presented the mapping below:



- o According to [Digital FoodLab](#) (European FoodTech insight and strategy consultancy), the top 25 French AgTech and FoodTech companies in 2020 are the following:



Startups are organized in two major associations: La Ferme Digitale and CoFarming.

[La Ferme digitale](#) is an association created in 2016 by five French startups. It promotes innovation and digital technologies for a performant, sustainable and socially responsible agriculture. Its partners include Crédit Agricole (bank), Onepoint (funding technological transformation in the private sector) and Groupama (insurance company in agriculture), RéussirAgra (media in agriculture), Digital Africa and FranceAgriTweets (association for French farmers communicating on Twitter). It has 50 members including the following:

- **Education**
 - ESA (Ecole Supérieure d'Agricultures Angers Loire): Higher education and research institution in agriculture, food, territories and market
 - Icosysteme (digital platform for training in agroecology, agroforestry)
 - Ecole agriculture Les Etablières (agricultural high schools and general and technological high schools in La Roche sur Yon)
- **Funding**
 - MIIMOSA (crowdfunding platform for agriculture and food)
 - FAMM (investment and business support, startup accelerator and scaleup)
- **Connectivity**
 - Arteria (connectivity and measurement solutions for agriculture and the agrofood industry based on Internet of Things technologies)
- **Farm management**
 - Baoba (digital farm management system for livestock breeders)
 - Baqio (commercial management software for wine producers)
 - Dilepix (software solutions for automatically and remotely monitoring crops and livestock farms)
 - Ekylibre (digital farm management system for all types of productions)
 - Exotic Systems (IoT solutions to optimize and save transport costs at harvesting sites)
 - ITK (decision-support tools and connected objects for input management for farmers and ranchers)
 - MyEasyFarm (decision-support platform to optimize farm management)
 - Piloter sa ferme (personalized management instruments for farmers to help them manage economic risks)
 - Smag (software for farm management and traceability of farm outputs)
 - The Green Data (smart and collaborative decision support tools)
 - Weenat (connected and mobile weather solutions)
- **Input/output market places for farmers**
 - Agriconomie (seeds, machinery and equipment, fertilizers market place)
 - Agri market place (B2B market place for farmers and crop industry)
 - CompareurAgricole.com (market place where farmers can sell their harvested grains)
 - Linkinfarm (web platform helping farmers find, book and pay online for their farm work services)
 - Perfarmer (mobile application that helps farmers sell their grain at the right price)
 - VotreMachine.com (digital platform for renting farm equipment)
- **Vertical farming/urban farming**
 - Futura Gaia (climate-controlled vertical precision farming on living soils for vegetables)
 - NeoFarm (high-tech micro farms in urban areas for vegetable production)
- **Farm equipment**
 - Naïo Technologies (robots for agriculture and viticulture)

- Ombrea (solution for climate control on field crops, fruits and vegetables)
- Sun'Agri (solar panels positioned on crop fields for complementary production)
- **Blockchain**
 - Connecting Food (B2B traceability and audit for the food industry)
- **Short supply chains/direct sales**
 - A 2 pas d'ici (independent network for farmers inside supermarket stores)
 - Poiscaille (short supply chains for fresh, sustainable and ethical seafood)
 - Promus (logistics network and storage facilities for local food sales)
 - Socleo (software for short food supply chains)
 - Les Grappes (digital platform for direct sales of wine from 1000 wine makers)

Created in 2016, [#Cofarming](#) is an association of 18 AgTech startups involved in collaborative agriculture. #CoFarming partners are Syngenta, Banque Populaire, Bayer, Lemken, and Cerfrance Brocéliande (accounting in Brittany).

Their members include:

- **Data and collective intelligence**
 - Agrifind (sharing and exchange network for farmers)
 - AgriMind'Lab (coaching for farmers by farmers)
 - Sencrop (connected weather station accessible to all)
 - Neayi (web platform for farmers assessing and deploying new practices)
 - FarmLeap (farmers benchmarking)
 - OKP4 Smart Farmers (decentralized protocol to value knowledge from farm data)
 - Talk Ag (social platform for farmers to help each other and find answers to their problems)
- **Resources**
 - Linkinfarm (web solution allowing farmers find and secure their agricultural work services)
 - EchangeParcelle (platform for the exchange of agricultural or viticultural plots far from the farm)
 - Cuma'Go (application to improve the management and monitoring of the machinery and equipment pool shared by farmers in CUMA)
 - WiziFarm (digital services for farmers to improve their performance and simplify their daily lives)
 - AgriEchange (platform for farmers to exchange services without cash outflow)
 - Datafarm.io (data centers decarbonize data thanks to methanization)
- **Markets**
 - Piloter sa ferme (farm management to thrive in a volatile economic environment)
 - Agrivillage (platform dedicated to agritourism)
 - Boursagri (interconnected platform allowing farmers to market cereals in direct and at the best price)
 - Agrikolis (network of farmers where shipments can be picked)
 - Ferme Directe (platform connecting professionals to buy and sell any agricultural product)

[Robagri](#) is the national French association representing agricultural robotics since 2017. It has 65 members from research organizations, robotics and electronics industry, and farmers. Its missions are to (1) represent the sector upon legal institutions and bodies, produce methods and knowledge as to develop and assess robots' performance, and (3) to imagine future needs in agricultural robotics.

Main Ag robots developed in France:



[La FoodTech](#) has a regional scope: its epicenter is Dijon and it covers the Bourgogne-Franche Comté administrative region. It is an ecosystem of entrepreneurs, industries, researchers, education entities and public authorities all involved in food-related health, environment and wellbeing issues.

For a more downstream approach, LaFoodTech has put together the following up-to-date mapping:



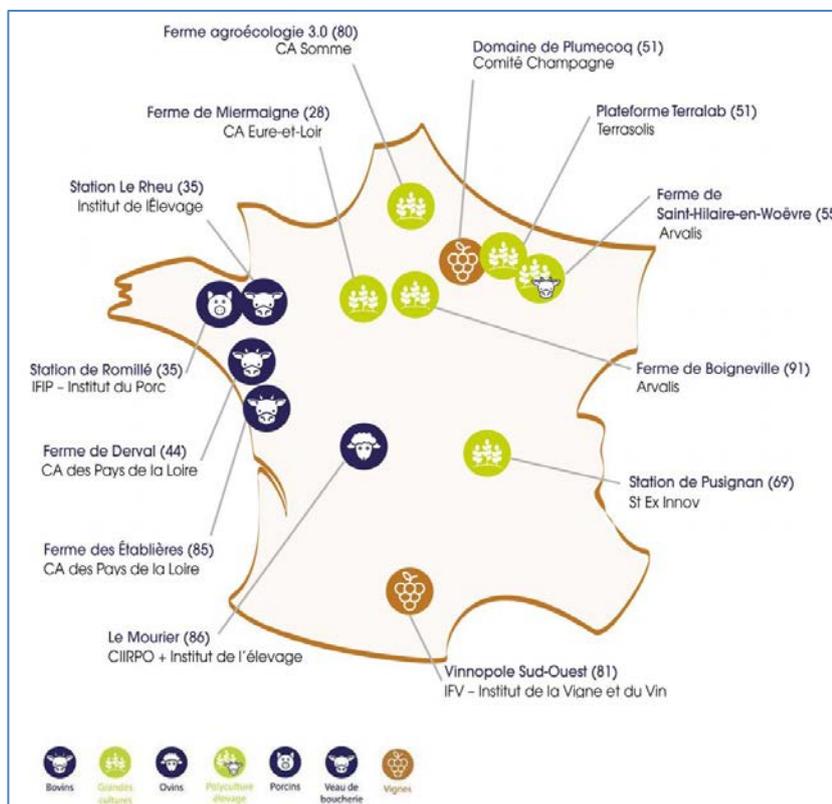
<https://lafoodtech.fr/startups/>

4.3 Applied research and pilot programs

Research in agriculture is not only conducted by public research organizations (INRAE and CIRAD) but also by the 18 “Technical Institutes in Agriculture” (in French “Instituts Techniques Agricoles”) that are funded by farmers. The latter are federated under their umbrella organization ACTA.

ACTA is active in AgTech, not only conducting research on innovative digital solutions in experimental farms, but also developing digital instruments for farmers. Technical Institutes are important in the digital agriculture landscape in France, and their purpose is not to partner or collaborate with international companies.

“[Digifermes](#)” (in other words, “digital farms”) is a network of 13 experimental farms across France where applied research institutes digital (in French, “Instituts Techniques Agricoles”) test companies, startups and farm organizations innovative digital technologies according to Research, Development and Innovation protocols. Collaborations among agricultural and digital stakeholders are encouraged and facilitated.



Map of “digifermes”.

ACTA has identified the following applications developed by technical institutes addressing climate change, reducing pesticide use, preserving biodiversity, optimizing antibiotics use, securing animal welfare, maintaining quality of life, and deploying agroecological actions.



Source : <https://numerique.acta.asso.fr/panel-dapplications-digitales-des-instituts-techniques/>

For example:

- **Taméo** was developed by Arvalis (Technical Institute for grains) and Météo France (national organization monitoring weather). It helps farmers optimize the timing of their field actions according to weather forecast.
- **Vigicultures** is a web portal monitoring pests and diseases in field crops (proposed by Terres Inovia)
- **Decitrait** helps wine producers optimize fungicide treatments to reduce residues in wine

Cooperatives also lead experimental programs of innovative digital products on farms. For example [Fermes Leader](#) is a living lab of the InVivo union of cooperatives' Bioline branch. It is a network of connected farms coordinated by the union of cooperatives InVivo to test innovative digital technologies. These are not experimental farms but private commercial farms, therefore conducting real-scale testing of innovative technologies and contributing to bottom-up innovation with young companies. International newcomers are welcome in this environment.

4.4 Regional innovation hubs and business fairs

Becoming a member of an existing innovation hub in France is helpful for newcomers to develop their activities. These include regional tech hubs named "Pôles de compétitivité" that consist of networks of stakeholders (private and public, big and small, in R&D and production) with services boosting innovation.

- **Innovation hubs : Pôles de compétitivité**

In France, 55 technology clusters are labelled as "[Pôle de compétitivité](#)" by the French Government. They are defined as "clusters that bring together large and small firms, research bodies and educational establishments, all working together in a specific region to develop synergies and collaborative innovation projects around a shared theme".

Several of these clusters are specializing in innovative technology for agriculture. They include Agri-Sud-Ouest Innovation, Axelera, Cosmetic Valley, Pôle IAR (Industrie et Agroressources), Valorial, Végépolys Vallée and Vitagora.

- [Agri Sud Ouest Innovation](#) is an innovation hub for the agri-food sector covering South Western regions of France. It provides networking services, training and education, project funding and acceleration services to their members. The cluster is part of [Plant Inter Cluster](#), a European consortium of plant clusters from Spain, The Netherlands, France, Portugal and Italy.
- [Axelera](#) is a cluster “operating at the crossroads of the chemical, environmental and energy sectors. It supports innovation and international development initiatives to enhance the competitiveness of industrial companies, and is based in Lyon, a global chemical industry hub.” Axelera’s priorities include digital, ecodesign and circularity.
- [Cosmetic Valley](#) is based in the Normandy, Ile de France and Centre regions of France. As the cluster for cosmetics and perfumery, it leads a network of businesses and research and training centres, encouraging networking, research and innovation, export support and training.
- [Pôle IAR](#) is the bioeconomy cluster. While its historical member base is located in the Northern part of France, it has expanded to include international members across Europe and in America. For newcomers in France, becoming a member of this cluster helps stimulate innovation, is a source of market intelligence and training, facilitates investments, and contributes to building international partnerships.
- [Valorial](#) is a cluster based in Brittany devoted to agri-food innovation with 5 areas of excellence: food quality and security, production/processing/conservation technologies, nutrition and health, farm and food marketing and functional ingredients.
- [Végépolys Valley](#) is based in Western France and specializes in innovation in plant production, including plant health, new technologies and practices in plant production systems, urban farming and plants in the city, biobased materials and bioprocessing, nutrition/health/wellbeing/cosmetics, plants for food and feed, as well as varietal innovation/seeds/plant performance.
- [Vitagora](#) is an agri-food innovation cluster settled in Burgundy-Franche Comté and Ile de France regions. It brings together businesses with public and private knowledge providers and developers of innovative solutions. Vitagora is one of the European Union’s Digital Innovation Hubs (DIH).

- **University Innovation Hubs**

Several Universities in agriculture include technological innovation hubs where private innovative companies are welcome:

- [UniLaSalle](#) is a center for higher private education in Earth, life and environmental sciences on four campuses in Northern and Western France (Beauvais, Rouen, Rennes, Amiens). It includes AgriLab, a collaborative innovation centre for agriculture where technology can be tested. UniLaSalle has a broad international perspective, including participation to international research projects and Erasmus program for students.
- [Yncrea](#) federates private engineering Schools on 11 campuses in Lille, Brest and Toulon. Digital agriculture belongs to Yncrea’s major focuses, with precision agriculture and urban agriculture, as well and international perspectives in research and in students’ profiles.
- [AgroParisTech](#) is a “public institute with a forward-looking approach aimed at addressing the main global challenges of the 21st century: feeding the

population in a sustainable way, protecting natural resources, fostering innovation and developing the bioeconomy". It addresses agricultural sciences and technologies, forestry, life sciences, food technology, biotechnologies, environment, nutrition, health, land and natural resources management and related public policies. AgroParisTech has several Chairs partnering with private companies and a strong focus on entrepreneurship.

- [Montpellier SupAgro](#) is a French public institution devoted to higher education and research in agriculture, food and environment. It is widely open to international issues and partnerships, with specific focus and recognized expertise on Southern and Mediterranean areas". Montpellier SupAgro, in partnership with Bordeaux Sciences Agro and INRAE, has a Chair dedicated to digital agriculture ([AgroTIC](#)).
- [ESA](#) (Ecole Supérieure d'Agricultures) is a "multidisciplinary private institute of higher education specialized in the fields of agriculture, agronomy, food science, viticulture, environment, supply chain and marketing." It is based in Western France (Angers). There are several business Chairs in ESA and other types of partnerships with private companies: <https://www.groupe-esa.com/en/entreprises/des-partenariats-pour-lavenir/>

- **Other incubators and accelerators in AgTech**

There are other incubators and accelerators for young AgTech companies in France, where newcomers could be integrated.

For example, the farm bank Crédit Agricole has created a network of more than 30 startup accelerators across France, in Italy and Luxembourg named "[Villages by CA](#)". These startups belong to a variety of sectors including agtech and foodtech.

[Euratechnologies](#) is a technological hub located in Lille. It has an AgTech innovation hub in Willems (France-Belgium border).

- **Business fairs**

Business fairs are useful to innovative companies to demonstrate their products and services to potential customers and partners. They are currently taking place in virtual digital format for social distancing purposes.

- [Innovagri](#) is an annual business fair for farmers and technicians. The 2020 edition was supposed to take place in September and postponed due to the Covid-19 pandemic.
- [FIRA](#) has been an annual international trade show for agricultural robotics since 2016. It usually takes place in Toulouse, France, but will be fully digital on December 8-10, 2020.
- [SIMA](#) is the international and professional show for agricultural machinery and equipment. It takes place every other year in Paris. Next SIMA will take place on November 6-10, 2022.
- [SIVAL](#) is the international show for crop production and takes place in Angers in the Loire Valley. The next show will be on January 12-14, 2021.
- [SPACE](#) is the leading annual international livestock show taking place in France in Rennes, Brittany. The next SPACE will take place on September 14-17, 2021.

5 Digital agriculture policy, legal framework, financial support

5.1 Public support to innovation

There are various types of public support for innovative companies in France:

- **Tax credit** for companies dedicating a large part of their spending to R&D (“crédit d’impôt recherche”): 30 percent tax credit on R&D spending up to €100 million and 5 percent beyond;
- **Tax cuts and social security exemptions** for small and medium enterprises of less than 8 years with research expenses representing at least 15 percent of their tax-deductible expenses (young innovative company status, or in French “Jeune entreprise innovante”);
- **Exceptional amortization** for digital transformation investments to help industrial SMEs embarking in new technologies.

BPIFrance is the public investment bank. It supports innovative companies through various grants and funds:

- **French Tech grant**: €30,000 to finance innovation in small businesses (< 50 employees);
- **French Tech Emergence grant**: up to €90,000 to evaluate and analyze the potential of a breakthrough project with a high technological content (deep tech) as well as its market prospects for small companies (< 50 employees);
- **Innovation feasibility assistance**: up to €50,000 to validate the feasibility of innovation projects for SMEs and companies (< 2,000 employees);
- **Support for technological partnerships**: up to 50,000 euros to finance the setting up of collaborative innovation projects by SMEs and companies (< 2,000 employees);
- **Recoverable Advance or R&D Innovation Loan** up to €3 million for SMEs and companies (< 2,000 employees);
- BPIFrance’s **Ecotechnologies fund** invests in the capital of AgTech and green chemistry startups.

A national research funding program named [Programme Investissement d’Avenir \(PIA\)](#) favours multidisciplinary projects. During the 2018-2022 period, the PIA budget dedicated to food, agriculture and forestry totals €5 billion. It includes the following:

- The **i-Nov innovation competition** selects innovation projects with a particularly strong potential for the French economy. In total, 270 projects have been funded, including 45 in agriculture, food and forestry, while 16 projects with a digital dimension received €9.6 million in funding;
- The call for **PSPC projects** (structuring projects for competitiveness, or in French “Projets Structurants pour la Compétitivité”) supports collaborative R&D projects. Since 2010, a dozen projects concerning agriculture and food have been funded;
- The **“Support and transformation of sectors” scheme** aims to strengthen the competitiveness of strategic French sectors through innovation. It is divided into several calls for projects, including “pooling of resources for the

service of sectors and digital platforms of sectors" intended in particular to support the establishment of digital platforms for the sector or initiatives to pool and share data for the development of artificial intelligence solutions;

- Demonstrators of the ecological and energy transition;
- Innovation Territories: €450 million to support 24 projects involving local authorities of all sizes, economic and industrial partners and local populations. Around 10 winning projects deal mainly or exclusively with agricultural, agri-food or forestry issues.

5.2 Other national regulations of interest for AgTech companies

The **law anti-waste for a circular economy** (in French, "Loi anti-gaspillage pour une économie circulaire") #2020-105 of February 10, 2020 aims to get out of disposable plastic, better inform consumers, fight against waste and for solidarity-based reuse, act against programmed obsolescence; and produce better.

A **low carbon certification** (in French, "**Label Bas Carbone**" or LBC) is in place in France under the lead of the Ministry of Ecological Transition. LBC offers a framework for evaluating projects that ensures their environmental quality by using tools to measure the carbon impact of projects. It also targets quality criteria (e.g., impact on biodiversity). Its particularity is that the methodological tools for project evaluation are proposed by the stakeholders themselves (industry stakeholders and local authorities) in a "bottom-up" mode. LBC is not specific to agriculture and forestry and its objective is to reward stakeholders for their actions to fight climate change. Several methods in forestry have been labelled, to date, involving afforestation or reconstitution of degraded forests. Only one agricultural method has been labelled - CARBON AGRI – since November 2019. It monitors emission reductions and carbon storage in cattle breeding and cash crops.

France's **stimulus package** (in French, "**Plan de relance**") was announced in September 2020 to support France's agriculture, food and forestry transition in the middle of the crisis caused by Covid-19. There will be 1.2 billion euros specifically dedicated to agriculture and the food industry to strengthen food sovereignty, accelerate the agroecological transition and give access to all French consumers to healthy, sustainable and local food, and adapt agriculture and forestry to climate change. This package includes a number of measures including subsidies to farmers investing in modern machinery and equipment consuming less resources, tax credits for High Environmental Value (HVE) and organic production, and a specific budget for research in drought-tolerant crop varieties.

6 V. Business/partnership opportunities for Dutch stakeholders

6.1 Conditions of technology adoption

For digital technology solutions to be adopted by French farmers, they need to be reliable, efficient, accessible, accurate, transparent, have a good return on investment, and present social benefits^{22 23}.

Accessibility includes broadband connection (digital divide is a reality in France), education and training to users (both farmers and technicians in cooperatives or chambers of agriculture for example), reasonable price for equipment or service (eg, robots as a service).

Accuracy means that technology meet farmer's needs: increasing their competitiveness maximizing profits, reducing costs); optimizing environmental performance (resource management including water and soil, adapting or mitigating climate change); managing risks (sanitary, weather, market...) to build resilience; and contributing to farmer's autonomy as entrepreneurs (farming business overview through cross-cutting dashboards). For the whole system to be operational, the various digital systems involved need to be interoperable with one another. This means technical compatibility between systems that can belong to different companies.

Transparency means farmers need to know who uses their data and for what purposes. They are willing to share their data if they know what services they will get in return. Transparency builds trust, without which farmers cannot commit to adopting new technology.

Social benefits include connecting farmers to other people inside agriculture (eg in networks of connected farms where they can benchmark and improve their performances); simplify farmers work organization (especially saving time or reducing need for seasonal workforce); making farming more attractive to younger generations (less isolated, less heavy and more modern work); and reconnecting farmers with consumers (e-commerce, shorter supply chains, local food retail).

As described earlier, **entering the French market through an ecosystem of innovation** is helpful for newcomers: it can be a technology cluster (one of the "poles de compétitivité"), a University with an international activity and bonds with the industry, or a cooperative.

6.2 Gender gap in IT: an opportunity for women leading AgTech and FoodTech businesses

Gender inequality in digital and IT in general is a reality worldwide and France is no exception. A more balanced AgTech and FoodTech ecosystem including more women

²² Agridéés (2017) [Tous acteurs de la transition numérique agricole](#)

²³ Contribution to the 2018 [OECD Global Forum on Agriculture – Digital Technologies in Food and Agriculture](#)

as project holders and entrepreneurs would bring more humanity to technologies than can be cold and rough. Women tend to be interested in tech projects that are ethical and meaningful²⁴. There is a need for projects including these dimensions and not purely technical in France.

Interestingly, [Women in Agribusiness](#) (WIA) gives a voice to women in events and builds network of women in farming and food business. This network is appropriate for women to get more visibility. The [2020 WIA Summit Europe](#) was an opportunity for young women entrepreneurs in AgTech to have a voice: Shiley Billot, CEO & Founder, Kadalys (banana-based cosmetics), Yanne Courcoux, CEO, Tibot (ag robotics for poultry farms) and Christa Hermann, Co-Founder, Terrabiom (microorganisms for regenerative agriculture). Another example is Aline Basaibes, Director General of ITK, specialist in precision agriculture²⁵.

6.3 Promising markets in AgTech

The most promising markets include the following:

- Contribute to making farm production more sustainable and more profitable
- Help farmers adapt and mitigate climate change and make it profitable
- Reduce and value waste as by-products
- Improve soil health, animal health and plant health to improve human health in a “One Health” dynamics
- Contribute to companies CSR objectives
- Inform consumers of farmers good practices and drive both producer and consumer prices higher for more transparency in the food chain

More specifically, there is a market for intra-plot modulation systems (software and equipment), animal health and welfare monitoring and registration as voluntary labelling is developing (sensors, IoT, software), weed management alternative to chemical herbicides (autonomous mechanical weeding robots, artificial intelligence), remunerative carbon sequestration (blockchain), vertical farming in controlled climate in urban areas (glasshouses, equipment for open air vertical production), e-commerce platforms for short supply chains and presenting a story about each product (blockchain, bar code, QR code).

²⁴ Susanne Hupfer, Deloitte (18 March 2020) [Closing the tech conference gender gap](#)

²⁵ See the interviews of Aline Bsaibes and Yanne Courcoux in [La Revue Agridées #242, September 2020](#)

Contact (meer info)

Voor meer informatie neem contact op met de Landbouwwraad in Frankrijk.
Ambassade van het Koninkrijk der Nederlanden
7 rue Eble
75007 Paris
Frankrijk
T +33 (0)1 40 62 33 00
E Par-Inv@minbuza.nl

Colofon

Dit is een publicatie van:
RVO.nl
Prinses Beatrixlaan 2 / 2595 AL den Haag
Postbus 93144 / 2509 AC Den Haag
T +31 (0)88 0424242
E klantcontact@rvo.nl
W www.rvo.nl

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