The gold rush to alternative proteins

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If you have ever tried to evaluate your personal carbon footprint, you were probably struck by the weight of your meat consumption. It is no longer a secret that animal husbandry has a heavy environmental impact: according to the FAO, **livestock contribute to 15% of total greenhouse gas emissions**. Most of the emissions are linked to deforestation: 26% of the planet's ice-free land is used for livestock grazing and 33% of croplands are used for livestock feed production. Meanwhile, the need for protein and the demand for animal products are increasing. Meat production went from 70 million tons in 1961 to 330 million tons in 2018 and could reach 524 million tons in 2080. Meeting this demand is a major challenge of our current and future generations. Intensification of breeding methods is not only bad news in terms of environmental impact. It also affects animal health and welfare, with more frequent disease outbreaks, and the quality of the meat for consumers.

The awareness is growing and there are many levers to activate, such as protein self-sufficiency in Europe and extensive breeding. Looking at the issue from a VC perspective, we believe that **technology** will be one of the key drivers of success in the protein transition. According to GFI, $11,1 billion has been invested in alternative protein companies since 2010, 73% of which was raised since 2020. So which technologies are we talking about, which kind of products can we expect in our plates in the coming years, and why did we decide to bet on the sector?

We deep dived into five different technologies that act as a substitute to animal protein and lipids (= fat):

Insects

Plant-based

Fermentation

Cellular agriculture

Plant molecular farming

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What do all these products and technologies really represent in the market?

Alternative proteins represent a quite confidential market today, weighing 1% - $ 36Bn - of the total protein market. However, the room for growth is huge as studies predict that this share will represent up to 60% by 2040 (FAIRR). According to BCG, the market for alternative meat, eggs, dairy, and seafood products will reach $290 billion in 2035 already.

What will drive this growth?

Obviously, it is hard to imagine a population with 60% of vegans in 20 years. As a matter of fact, according to Nielsen, 98% of plant-based meat buyers in America also purchase meat products. Meat eaters will actually be the largest market segment for alternatives. These flexitarians will be foodies, millennials, females and GenZ looking for healthy nutrition - 56% of consumers state that one of the major reasons they eat plant-based proteins is “to be healthier” according to Mintel - as well as environmental impact and animal welfare. It’s good to keep in mind that 73% of consumers agree that plant-based meat should mimic the taste of meat (GFI). Which, by the way, makes us believe that most alternative proteins firms will be working closely with specialty ingredients companies.

Who will drive this growth? The alternative food sector is getting more active than ever, with startups raising a lot of money. A few famous ones are presented below.

Insects

Insects show a certain potential as an environmentally friendly choice for future feed & food systems - may it be via mealworms, black fly soldiers, crickets, and so on. However, this sector is still facing significant hurdles and has not yet found a significant market: regulation challenges, consumer acceptance, niche markets and production costs are making it extremely difficult to scale and reduce unit cost. Hence, at Capagro, we made the choice not to invest yet in this field.

Ynsect

The (French🇫🇷!) startup **Ynsect** is our best example for this sector: leader of vertical farming to produce proteins and fertilizers from molitors, they raised a Series C of 320m€ in October 2020, of which $233 million of equity funding was led by Astanor Ventures.

Plant-based

Plant-based alternatives contain a mix of various plants, vegetables, grains, and pulses to recreate the texture of meat, dairy, seafood, or egg products. Some startups have created a true technological innovation regarding the raw materials or the process, whereas others focus on marketing while relying on standard grains and extrusion technologies. What we are looking for as investors are start-ups who bring new technologies and solutions to the plant-based products., just like our portfolio company La Vie !

Impossible Foods: their products are based on soy and potato proteins, and yeast to produce leghemoglobin for the heme (so kind of a mix between plant-based and precision fermentation). Impossible raised a huge Series H of 435m€ in Nov 2021 led by Mirae Asset Global Investments.

Oatly: The renowned oat-based dairy company raised $1.43 billion in its initial public offering on May 20, 2021. After the offering, the company was valued at $10bn!

Traditional meat companies are seeing the disruptive potential of those technologies and the shift in the market. As a result, M&A activity has increased. Quite a few food industrials acquire vegan startups to complete their offer, such as the Brazilian meat giant JBS that bought Vivera for a staggering $341M in June 2021.

🇫🇷 Our **French stars** (don't hesitate to give them a call):

- Alternative meat: La Vie, Umiami, Hari&co, Happyvore ;
- Alternative dairy: Nature&Moi, Jay&Joy, Les Nouveaux Affineurs, Tomm' Pousse ;
- Alternative eggs: Yumgo, Les Merveilloeufs.

It seems plant-based companies are starting to realize the hurdles they have standing before them. Indeed, consumers seem to want a high quality of texture & taste and less processed foods. The newest technologies might actually answer those needs and drive further growth.

Fermentation

Fermentation is a metabolic process enabling the production of energy through chemical changes in carbohydrates. In the food industry, it generally refers to the activity of microorganisms on foodstuff, leading to an edible product. Regarding the production of protein and fat alternatives, we distinguish two types of fermentation:

- **Precision fermentation:** microorganisms used to produce a molecule (protein or fat) that will be extracted. Generally, for dairy products, as the matrix is made of molecules.
- **Biomass fermentation:** microorganisms producing a molecule used entirely in the final products, for animal muscle alternatives, as the matrix is made of cells.

We think fermentation has a bright future ahead, and we are actively looking for the best startups to position ourselves on these technologies.

Perfect Day: the leader in precision fermentation, already on the market, produces dairy molecules for dairy products using microflora microorganisms. They raised a Series D of nearly 300M€ in September 2021, putting the company's pre-money valuation at $1.24bn, and preparing the ground for a third IPO in the alternative protein sector!

Nature's Fynd: also on the market, they use biomass fermentation via fungi for alternative meat products. They raised a Series C of nearly 290M€ in June 2021, putting the company's pre-money valuation at $1.4bn.

Last year, Hormel's venture arm, 199 Ventures, entered into an exclusive partnership with fermented meat analog maker The Better Meat Co. to develop meat alternative products and bring them to market. In mid-November, Perfect Day revealed its partnership with the large agri-food group General Mills. Together they launched Bold Cultr, a fresh cheese made from dairy proteins.

🇫🇷 Let's not forget our **French stars**: Standing Ovation (ex Baio Foods), Algama, Nutropy, Bon Vivant.

Fermentation enables vegan products to increasingly mimic the animal-based products in terms of organoleptic and functional properties (fancy words to say taste, texture and nutrients). But cellular agriculture wants to go even further: they want to identically replicate them.

Cell-based

Cellular agriculture relies on tissue engineering techniques traditionally used in regenerative medicines. The process generally starts with a biopsy of an animal muscle or embryo. Stem cells are then extracted, leading to the creation of immortal cell lines banks, a never-ending source (those who don't use immortal cells need to regularly do biopsies). The next step is the amplification and differentiation of the cells in bioreactors with a very specific media: one of the challenges of this sector is to reduce its cost by reducing the need for growth factors , and especially for the not-so-vegan fetal bovine serum (as it comes from fetal cow blood, sampled when pregnant cows are slaughtered). Regarding the food design, you can find various technologies: mixing/filling, edible plant-based scaffolds, 3D printing, etc.
Bringing these proteins to market will be a long and tough path, and today it remains unsure when the cell-based products will really make it to the stores at a reasonable price. However, we identified a few champions in this area and we are sure they will definitely invent a new way of producing meat.

Eat Just: AKA, the first cell-based company ever to be commercialized (you can find the product in Singapore): a mix of plant-based and cell-based egg products. The company raised $267 million of Series F (when will they stop?) venture funding in September 2021.

FUTURE MEAT

Future Meat: producing cell-based meat alternatives. The company raised $347 million of Series B venture funding in a deal led by ADM Ventures in December 2021, putting the company's pre-money valuation at an estimated $553 million. Future Meat Technologies has recently reduced the production cost of its cell-based chicken breast to $4/110g, bringing it closer to price parity with conventional chicken meat.

We have noticed sector consolidation with several startups acquiring other startups in this sector to complete their range: Meat Tech (cell-based proteins) acquired Peace Of Meat (cell-based fat) in Feb. 2021 for €15m, Shiok Meats (cell-base meat) acquired Gaia Foods (cell-based fish products) in Aug. 2021 for an undisclosed amount., Upside Foods (cell-based meat) acquired Cultured Decadence (cell-based fish products) in Feb. 2022 for an undisclosed amount. And we had the first startup-industrial M&A last year: Brazilian giant JBS acquired the Spanish startup BioTech Foods in Nov. 2021 for €36m.

🇫🇷 Again, let's not forget our **French stars**: Gourmey and Vital Meat.

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One of the major hurdles of cellular agriculture is the production price, mainly linked to the cost of the growth media's components (fetal bovine serum, growth factors, etc). The other strong hurdle is the novel food regulation. One might also have the feeling that those products are too synthetic, especially regarding the cultivation in bioreactors: plant molecular farming could be the answer as they use the plants directly as bioreactors.

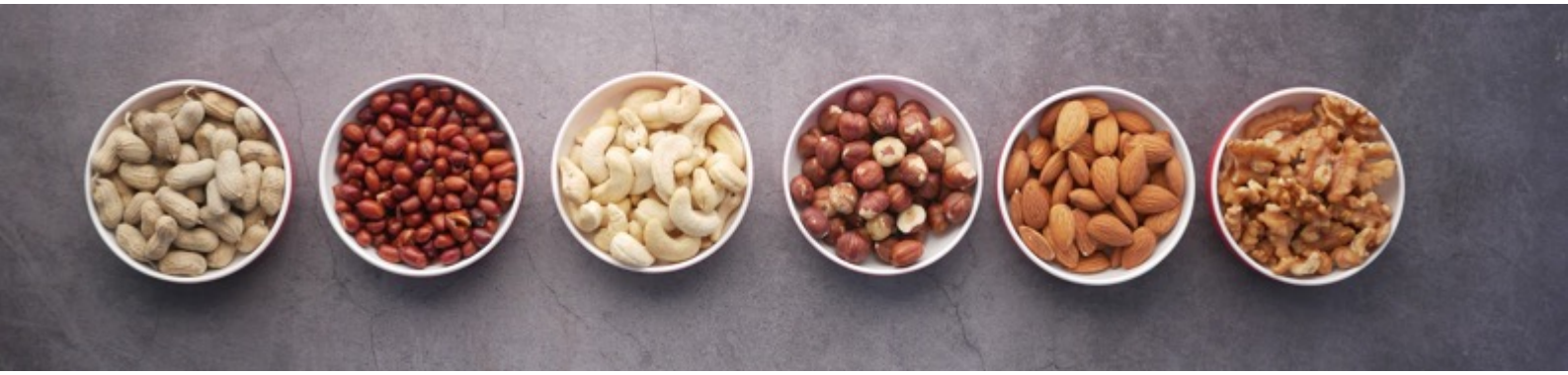
Plant molecular farming

Plant molecular farming is a new technology that uses plants as bioreactors to produce various molecules, such as animal fat or proteins. This technology uses vectors to transfer the production genes of certain molecules to those plants: for example, one could use the bacteria Agrobacterium to transfer the casein gene to soy.

This sector presents only **3 companies** to our knowledge for protein production.

For dairy alternatives: Mozza Foods which raised an undisclosed amount for their first round in 2020, and Nobell Foods which raised a $75M of Series B venture funding in July 2021, putting the company's pre-money valuation at $325M!

For both meat and dairy alternatives: Moolec, which raised an undisclosed amount at an undisclosed date in 2021 (lots of words to say not much in the end).



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The food industry is reinventing itself, and proteins are a major source of opportunities for growth. Corporates are searching for diversification and ways to integrate ESG and impact in their core business. And they do not do so out of philanthropy, but because relying on sustainable business models is not an option anymore. As a VC, we have a key role to play in bringing game changing innovations to life. We are on the watch for the best-in-class technologies, skilled teams with a sharp vision of the market and a strong and differentiated value proposition. This is exactly what we found in our latest investment La Vie. And our job does not stop at investing, it is also about creating value for our start-ups, and offering open-innovation solutions to our investors.

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