

ABOUT ALTERNATIVE PROTEIN

Growing global population and changing demographics are leading to a huge increase in protein needs. Dietitians in many countries are increasingly recommending that people significantly reduce their consumption of animal meat and dairy products and generally switch to a healthy diet that consists mainly of plant-based foods rich in fruits, vegetables, whole grains and plant-based protein.

The decreased dependence on animal-based diets and the gradual transition to plant-based diets has led to increased market demand for next-generation sustainable meat alternatives.

There are a lot of alternative protein products developed and sold by the industry including alternatives to beef, pork, lamb, chicken, collagen, seafood, eggs and dairy. Traditional plant-based meat alternatives have included foods such products as tofu, tempeh and seitan. Plant ingredients are used to develop various plant-based meat alternatives, i.e. alternative proteins.

Alternative protein usually refers to food products that consist of non-animal protein. The preference for alternative protein over animal protein is due to:

- a more favorable environmental impact;
- not accepting cruelty to animals and, in general;
- healthy food choices.

Switching to alternative protein is not only beneficial for humans, but also helps to reduce the generation of greenhouse gases and the use of land and water than is typical for the production of animal protein.

Alternative protein can be made from plants, algae, microorganisms, fungi, animal cells, etc.

During the last few years, alternative protein products have turned from a niche product into a mainstream phenomenon. Today, alternative meat is an integral part of supermarket shelves and restaurant menus around the world.

The emergence of alternative protein is an objective need for the transformation of animal protein under the influence of a combination of the following factors:

- (1) public concern about climate. Many consumers want to reduce the amount of animal protein in their diet, especially if they can do so without sacrificing taste;
- (2) improving and scaling existing technologies to achieve parity, where the taste, texture and price of alternative protein meats are approximately equal to animal-based meats;

The first 2 factors will allow alternative protein to capture 10% of the global meat market by 2035.

- (3) technology evolution, increased production efficiency, improved taste and texture, and reduced costs. **As a result, the 3rd factor will lead to earlier parity and 15% market share by 2035;**
- (4) support from the state, private investors and regulators. Higher carbon prices and support for the farmers who switch from livestock to alternative protein sources **could increase alternative protein meat consumption by up to 20% by 2035.**

Thus, by 2035, 20% of the world's meat will be based on alternative proteins

Several large meat companies in North America and Europe are already rebranding themselves as “protein” companies, producing and selling their own alternative proteins. According to experts, the transition to meat based on alternative proteins by 2035 will generate revenues (prize size) along the entire production and supply chain of 300-600 billion USD.

By 2035, 9 out of 10 favorite dishes in the world will have a real protein alternative.

Protein alternatives won't require new recipes or change the taste of what people like.

The alternative protein market is expected to grow to 100 million metric tons by 2035, when it will account for 10% of the global meat market. If we assume that the average income is 3 USD per 1 kilogram, then **the total income of the entire production and supply chain will be 300 billion USD by 2035.**

The growth of the alternative protein market is directly dependent on achieving parity with animal protein in three key areas:

- **Texture.** Alternative proteins should look and feel just like animal proteins. When we eat meat ,the feelings are largely determined by its fibrous structure.
- **Taste and odor.** Alternative proteins should effectively deliver the taste and odor of meat, poultry and seafood that are well known to all consumers.
- **Price.** Currently, the price of alternative proteins is often higher compared to animal proteins. If large groups of consumers are to continually purchase alternative proteins, then their cost should match or be lower than that of animal protein.

Today and until 2025, the existing plant-based alternative protein technologies (soybeans, peas, etc.), having reached the parity, show the rapid growth in interest, implementation and scaling (**I level of technology development**).

Alternative proteins based on algae, microorganisms and fungi (**II level of technology development**) will likely reach parity by 2025, and then will show rapid growth until 2032.

By 2032, alternative proteins based on animal cells will reach parity (**III level of technology development**) and then the growth rate of this protein will exceed the growth rate of the other two proteins.

At the same time, it should be noted that the market size assessment does not take into account the possibility of using **alternative proteins as a basis for animal and fish feed**. Replacement of fish and bone meal used as feed in aquaculture and other livestock production could become a significant market even faster than alternatives for human consumption.

Regionally, North America and Europe represent the most mature markets for alternative proteins. Consumption and introduction of alternative proteins in these markets is likely to grow rapidly driven in part by a climate- and health-conscious population.

However, the biggest opportunity lies in the Asia-Pacific region. Growth in this region is driven by a large and growing population that consume more proteins as wealth increases.

By 2035, the Asia-Pacific region will account for 2/3 of global alternative protein consumption.

Latin America and the rest of the world will also see rapid growth, but it will remain much smaller.

These data will vary to some extent depending on the term of alternative protein-based meat reaching parity with animal-derived meat at each transformation stage.

In 2020 alone, the alternative protein industry attracted about \$3 billion investments, i.e. 3 times more than in 2019.

Alternative plant-based protein

Plant-based alternative proteins (**I level of technology development**) are the most well-known and popular form of modern alternative protein. Plant-based alternative protein is a protein isolate concentrated from plants (soybeans, yellow peas, etc.) that comes close to parity with conventional animal proteins. Products from such companies as Impossible Foods (USA) and Beyond Meat (USA) are very similar to regular animal proteins in taste and texture, and are sold successfully in supermarkets, US restaurants and fast food outlets such as McDonald's, KFC and Pizza Hut.

Proper texturing remains a major bottleneck for the industry. To reduce the unit cost of product to a reasonable level, it is necessary to increase the productivity of the final product from the current hundreds to thousands of kilos per hour.

Alternative protein based on microorganisms

The 2nd place in the race for parity is occupied by alternatives based on microorganisms (**II level of technology development**) . These include alternative proteins produced using bacteria, yeast, unicellular algae, fungi and other microorganisms.

Fermentation or related technologies are used to produce alternative proteins from microorganisms.

Microorganisms can also play a role in improving the flavor and texture of an alternative protein, giving it the natural red color and meaty flavor, and this is successfully used in our technology.

While plant-based alternative protein technology extracts (isolates, concentrates) the protein of the plant, microorganism-based alternative protein technology converts carbohydrates and fiber through microorganism metabolism into highly digestible protein.

Fungi based protein occupies a special place among alternative proteins based on microorganisms. Fungi based protein contains all essential amino acids and practically no saturated fat. Fungi based protein can solve the main inconveniences of vegetarians and vegans, who, in order to obtain a sufficient amount of amino acids, are forced to combine several different proteins.

The leader of Fungi based protein production in Europe is Quorn - the British company, and in the USA - Nature's Fynd, the Chicago company invested by Bill Gates and Jeff Bezos (total investments about 450 million USD). In 2024, Meati Foods successfully entered the market with Fungi based alternative protein products in the United States.

Alternative proteins based on microorganisms will reach parity in taste, odor, texture and price by 2025, and then will show rapid growth until 2032.

If sustainability is your long-term goal, then the future of alternative protein lies in microorganism fermentation technology.

Alternative protein based on animal cells

Alternative protein based on animal cells (also called cultured meat) - **III level of technology development** - is grown from animal, poultry and fish cells. Cultured meat is already starting to appear on the market and can be enjoyed in restaurants in Singapore and Israel. The growing of cultured meat usually starts with a couple of cells, such as stem or muscle cells, that are placed in bioreactors where the cells are fed by growth medium. But growing cells in this way is an order of magnitude more expensive than animal meat. It will take several years to scale up, improve the rate and productivity of cultivation process, reduce the cost of cultivation media, introduce key non-muscle meat ingredients to replicate the fibrous quality of conventional meat, and optimize the price to make this alternative protein available to many people.

Highly structured large cuts of cultivated meat, such as marbled brisket or bone-in steak, are least likely to be replaced at parity by 2035.