



REVIEW

Research and Overview of Beyond Meat's Disruptive Innovation

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ARTICLE INFO

Article history

Received: 6 March 2020

Revised: 13 March 2020

Accepted: 9 April 2020

Published Online: 16 April 2020

Keywords:

Vegetarianism

Artificial meat

"Vegetable meat"

Beyond Meat

Plant-based meat

ABSTRACT

In the past, meat is considered to be a luxury because of its high price that not everyone can afford, which only enjoyed on special days or festivals. However, it has become a daily necessity for life nowadays with the rapid economic development, an essential ingredient in every staple in the restaurant or home kitchen, and the main source supply for people to increase energy. Besides, as health education launched, "how to eat healthily" has become the most significant difficulty that needs to be solved for every family. There is no doubt that the market has been increasing and the demand for meat has been growing with the population growth all over the world. The market value of processed meat is expected to rise from 714 billion U.S. dollars in 2016 to over 1.5 trillion dollars by 2022. Poultry is the most popular kind of processed meat, with a 38 percent share of the global market and red meat, which includes pork and beef, takes up about a 33 percent share. From the official report of the worldwide meat market, the quality and the inflated price of meat have become the most concern of the majority people, who deem it as the primary source of protein and nutrition supply.

1. Introduction

Since the 1970s, a wave of vegetarianism has swept the West. At first, it was just a hippie movement and started on a small-scale population, basically in the profound effect of religion. By the 1990s, tens of millions of Americans had declared themselves vegetarians, accounting for 3-6% of adults (figures from different sources vary widely)^[1] and the proportion of vegetarians has exceeded 5% in many Western countries. Although it is still a minority, it is far from an alternative. With the development of economy and popularity of education, more and more people have realized the significance of healthy diet and are trying to find a balanced dietary structure that can provide them a compelling and energetic body to

adjust fast-paced life efficiently (Maurer,2010).^[2] Meanwhile, people's increasing concerns of ecological environment and how mankind lives in harmony with the animals have prompted the movement of vegetarianism, which can protect the living beings in nature and decrease the waste and air pollution caused by farms (Appleby,1999).^[3]

Many people indeed become healthier after adopting a vegetarian dietary structure. However, few people can eat vegetarian food for life, and it is tough for people who give up halfway to start eating meat again. Especially in the recent two years, the low-carbon ketogenic diet has become more popular abroad, which encourages eating meat and also fat, contrary to a vegetarian diet in many ways. As ketogenic diets that promote eating meat become more popular, many vegetarians are beginning to waver,

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and some experts who have previously recommended vegetarian diets are also turning around and recommending ketogenic diets for meat because recent studies have demonstrated the real benefits of eating meat (Fox & Ward, 2008). A recent study from the Humane Research Council showed that 84% of vegetarians eventually gave up their vegetarian diet and switched to meat. More than half (53%) ate meat again within a year, and almost one third (30%) persisted for less than three months, which indicates that people's deep desire for meat is not only come from physical but also mental. Of the 11,000 participants, 88% said they had never tried a vegetarian diet and had eaten meat all the time.^[5] 10% admitted that they had tried a vegetarian diet, but later returned to eating meat. Only 2% were vegetarians from beginning to end. The former vegetarians (who then ate meat) agreed that "Chicken is the most difficult meat to resist and can't stop eating it." The original intention that some vegans choose vegetarian is to lose weight and keep healthy. Since vegetarian food is light and strictly no fat, they are easy to get hungry and choose unhealthy food like processed food. Meanwhile, vegans are accessible to a lack of vital substances for the body, such as high-quality protein, B12, and choline, which may also cause anemia and inflammation. In sum, there are various reasons that impel vegetarian back to regular diet and begin to eat meat, and the demand of meat has been increasing from earliest times to the present day (Moe, 2011).^[5]

2. What Is the New Offering?



Figure 1. Types of Beyond Meat products

To cope with the above problems, artificial meat emerged as a substitute and became more popular in recent years (Bonny, 2015).^[6] Beyond Meat, founded by Ethan Brown, Dr. Fu-hung Hsieh and Harold Huff of the University of Missouri in 2009, is a company focus on artificial meat. They used legumes and other vegetable proteins as raw materials to arrange vegetable proteins into meat fiber struc-

ture by using heating, cooling and pressurizing, and continuously carried out experiments and improvements, making it closer to the composition of animal meat fiber, so that the taste of vegetable meat and meat closer, which called "vegetable meat". The company has created a "chemical repository" of numerous plant proteins and fats. Thus scientists have chosen the best combination from that: pea protein as protein and coconut oil as the fat. To imitate the taste more similar, vegetarian meat pie also added some modified wheat starch and potato starch, so that it tastes more naturally. Depends on the advantages of healthy ingredients and the same taste as real meat, the company has launched several products based on "vegetable meat," mainly focus on beef, pork, and poultry. As the figures at the front shows, they have six types of products on sale right now. They are Beyond Burger, Beyond Beef, Beyond Brat Original Sausage, Beyond Hot Italian Sausage, Beyond Feisty Meat, and Beyond Beefy Beef. The star product is the Beyond Burger which contains 20 grams of protein, no soybean, gluten, and no cholesterol. Its saturated fat content is half of the traditional lean fat ratio of 80/20 beef hamburger steak. Nevertheless, the product cannot avoid the vulgar claim that it does not contain GM ingredients, and Bill Gates has always advocated the idea that GM foods are healthier and more environmentally friendly. By 2013, its products had been sold at Whole Foods Market, an American food supermarket chain. In addition to the United States, its products also appear in Canada, the United Kingdom, and other countries. But this year they stopped selling chicken products, saying they were developing better alternatives. With the gradual acceptance by more people, there are new entrants cropping up across the market and take a specific place in the artificial meat industry. Still, the company claimed that they have absolute advantages on healthier protein source that is beneficial for human and it's coloring comes from beet extract, rather than heme from the leghemoglobin like in the Impossible patty (Amanda, 2019).^[7]

In addition to reducing fat by 15% and cholesterol by 90%, the significance of "artificial meat" may lie in maintaining the Earth's energy pyramid in a broader sense. A senior engineer at the Beijing Environmental Protection Monitoring Center has professionally introduced the benefits of eating less meat on micro-blog: human consumption of plant-based food is the first nutritional level in the food chain. In the energy flow of food web, the efficiency of energy transfer from one trophic level to the next trophic level is about 10%. In the energy transfer between vegetable protein and animal protein trophic levels, ecological efficiency alone loses 90% of the energy from grains.^[8] Beyond Meat highlighted these concepts when promoting its products: to solve four increasingly serious

problems caused by livestock production, namely human health, climate change, and natural resources, through the transformation from animal meat to a vegetable meat diet. “We believe there are better ways to feed the planet.” This is Beyond Meat’s introductory opening remark, an idea that fits the company’s investor Bill Gates’ consistent environmental behavior (Hopkins & Dacey, 2008).^[9]

3. Results

Asking the question, how has the Beyond Meat changed the market? Actually, whenever a product or an invention has been capitalized, the market will be affected in a certain way. In the case of Beyond Meat, there are two markets that have been changed since the expansion of beyond meat.

One of the changing markets is the plant-based meat market. According to a recent Nielsen report, annual U.S. sales of plant-based meat jumped 42 percent between March 2016 and March 2019 to a total of \$888 million, compared to 1% growth of traditional meat (Trefis Team, 2019).^[10] This indicates that the plant-based meat market is rising rapidly since 2016, and during this process, Beyond Meat changed the plant-based meat market in all respects.^[11]

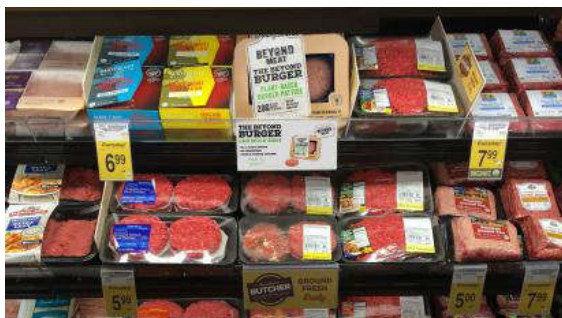


Figure 2. Beyond Burger on meat session



Figure 3. Traditional Vegetable-Meat in Vegan session

First, Beyond Meat changed the target customer for the plant-based meat industry. Traditionally, plant-based meat has mainly been designated on “vegan” areas. But even with the rapidly growing movement of Veganism, only 3.4 percent of the population are vegetarian (Meyer, 2019).^[12]

Consider the price of natural fresh vegetables, and those vegetable lovers, the real buyers of plant-based meat, were extremely limited. In 2016, rather than competing with traditional brands for limited customers, Beyond Meat decided to target “meat reducer” and “omnivores.” They introduced the beyond burger, which is similar to the real beef in many aspects such as texture, flavor, red meat juice, etc. This decision ignited the whole plant-based meat industry and obviously Beyond Meat put the beyond burger on regular meat sessions which competes with authentic beef burgers. Once they stepped to the regular meat market, they got more chances to sell their products to all kinds of customers because approximately 97 percent of the population in the world is the “omnivores.” On the other hand, one key thing that must be mentioned the technology that makes the fake meat able to compete with real beef. They use the beets to give the burger a red-meat appearance and the coconut oil with cocoa butter to make the white marbling which not only looks like animal proteins but also tastes as juicy as real beef (Beyond Meat, 2019).^[13] At the industry level, this new vision introduced by Beyond Meat also brought fast movers like Impossible meat and drew more attention from investors which accelerated the evolution of plant-based meat industry.

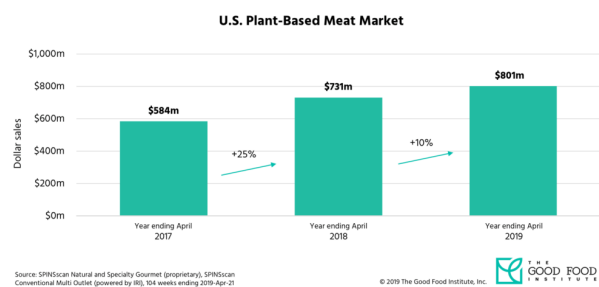


Figure 4. U.S. plant-based meat market

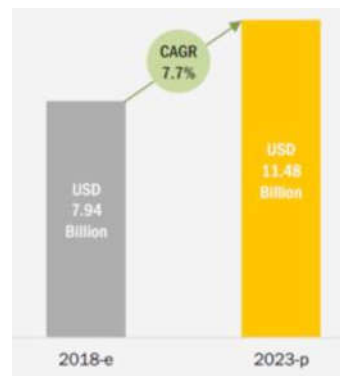


Figure 5. U.S. meat market

The other market that has been changed is the meat market. Based on Figure 6 and 7, during 2018, the meat market in the United States was still ten times larger than the plant-based meat market. Also, Figure 8 indicates that

the meat market in the U.S. will grow steadily in the following years. With no doubt the meat market is still a giant, stable market with a room of improvement comparing to the plant-based meat market; therefore, the meat market is changed less obviously and mainly on a macro level. In general, Beyond Meat provided a possibility to the whole meat market that plant-based meat could replace meat; nevertheless, this possibility may not occur in the following decades due to the sustainable ability of animal raising the industry and the meat demand of the whole world. Also, the revelation of Beyond Meat may set them to an awkward situation.^[14] The original vegan buyers may feel uncomfortable with the “bleeding” and juiceless of the beyond burger. They may stop buying and even criticize Beyond Meat for its movement. On the other hand, it is tough to transfer a meat lover to a daily beyond burger customer because the beyond burger is more expensive than a regular burger and there are still some differences between the beyond burger and the real meat.



Figure 6. Meat VS meat substitute

All in all, even though Figure 8 shows a trend that people are willing to switch to the meat substitute side, there is no guarantee for the rapid growth of meat substitute in the next few years. In real life, it will be a long-term process for Beyond Meat to take over a significant number of customers from the meat industry due to price, quality issues, and the acceptance of ordinary people.



Figure 7. Beyond Meat return since IPO

Should the Beyond Meat consider to be a disruptive innovation? The answer is based on how to define the disruptive innovation. Once Beyond Meat became the first-ever plant-based meat public traded company, media and analysis started to obsess with this company and plant-based meat industry. According to Wall street analyst, the plant-based market would potentially grow to be a 140 billion U.S. dollar market.^[15] There are also a lot of media claimed that they think Beyond Meat is going to ignite the whole meat industry shortly by their disruptive innovation. The author believes that, it is a solid disruptive innovation, but it has been overvalued. Beyond Meat will not replace the traditional meat market in at least the next 30 years and may be placed by better technology such as cell-based meat anytime. Even with all those conditions, I still consider it to be a disruptive innovation for several reasons.



Figure 8. Process of Chinese vegan duck



Figure 9. Traditional Chinese vegan duck



Figure 10. Beyond Meat lab



Figure 11. Beyond burger

Firstly, even though people in China and Indian started to make fake meat such as vegetarian duck and vegetarian chicken by isolating soybeans in a traditional manual way a thousand years ago, modern plate-based meat can be identified as a different creature comparing to the conventional vegetarian meat. Traditionally, people manually fold the bean skin first, roll it into a shape they want, and steam it. After it is cooked, they must season or marinated hardly to hide the “bean flavor.” As the figure shows, it may finally look like a decent meat meal, but it will taste very different than a regular meat meal which is impossible to replace the daily meat. On the contrary, the research of Beyond Meat is more like an interdisciplinary science. As the figure shows, Beyond Meat research team study the material and process of the beyond meat in a professional lab first. They basically process vegetable proteins by stirring, decomposing, expanding, steaming, cooling first, and then they will use the beets, the coconut oil, and the cocoa butter to create the flavor, juiceless and texture similar to real meat. Those technologies were works of many scientific areas such as Biochemistry, Synthetic Biology, Macromolecular physics, etc. Those technologies are not related to the traditional meat market at all. Originated from the ancient vegetarian meat, Beyond Meat was certainly disruptive innovation by introducing a new way to substitute regular meat.

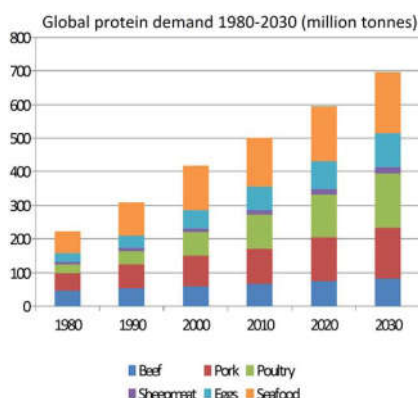


Figure 12. Global protein demand 1980-2030

Secondly, by the developing of the whole world, especially the third world countries, Figure 12 shows that the demand for the protein was increasing and will increase steadily every year. Unfortunately, the costs of livestock in many ways have been a complicated problem for the whole world. In recent years, basic on the research from Cowspiracy shows that livestock system holds 45 percent surface area of the entire world and 51 percent of global greenhouse gas emissions are driven by livestock rearing and processing. People started to feel nervous for the environment and the price rising for the proteins. On the contrary, Beyond Meat’s products are one of the best substitute meat products on the market now, and it is possible for them to improve their technology and able to produce plant-based meat with extremely low cost one day. With time elapsing, traditional meat rearing will become more costly and cause more pressing environmental issues while the technology of plate-based meat will improve. There is a chance that plate-based meat could entirely substitute meat. This also makes Beyond Meat a disruptive innovation.

Thirdly, Beyond Meat didn’t focus directly on the traditional customers of the meat market on this stage. Their focus was “Meat reducer” and “Omnivores.” Those people want to buy less meat and are looking for some substitute either healthier or cheaper. The decision of Beyond Meat would avoid direct competition with traditional meat manufacturer since those people are not their clear customers once Beyond Meat can improve their products in two ways. First, it is to lower the cost of the beyond meat, and second, it is to improve the texture and flavor of the plate-based meat further. They will able to satisfy the majority of the bottom meat market. By that time, Traditional livestock rearing industry may still have advantages on some exclusive meats like Wagyu steak or Iberian pork, but the majority of the market will be taken. In real life, this might be a very long-term process for Beyond Meat, but the potential is there. Therefore, Beyond Meat’ movement is a sign of the first stage of disruptive innovation, in my opinion.

4. Conclusion

In general, Beyond Meat is overall a very successful company so far. Beyond Meat successfully became the first plant-based meat listed company. This obviously shows investors’ interests and the trend of the venture market.

Stepping into details, First Beyond Meat was one of the first movers of the new plant-based meat industry. According to the principle of disruptive innovation, large companies choose to overlook disruptive technologies

until they become more attractive profit-wise (Butler, 2019).^[16] So far Beyond Meat was investigated by Bill Gates, Donald Thompson and rose as much as 800 percent from its initial price. It means that this disruptive innovation and the plant-based market were recognized by the majority of investors. Secondly, even though Beyond Meat has several strong competitors like Impossible meat now and the competitors have more capital and better tech team. But Beyond Meat caught their first-mover advantage and managed to cooperate with KFC, HelloF-resch.



Figure 13. Impossible burger vs beyond burger

All in all, with no doubt, Beyond Meat was doing great so far and has been successful. But the future of this company is very uncertain in many ways. First, in my opinion, Beyond Meat has been overvalued. People expected them to take a great part market by 2023, but in reality, this company will soon face two significant challenges. The first challenge is in domestic. Impossible Meat already raised 300 million U.S. dollars which were three times of Beyond Meat before and also managed to cooperate with some large food franchises like Burger King and me. Also, Impossible Meat started their business two years later than Beyond Meat, but most customers claimed that the Impossible burger tasted a lot more similar to beef than the Beyond burger.^[17] One important truth is that Beyond Meat has been lost money until now. The retail product revenues are not enough to pay for research and maintenance fees; therefore, the investor always values this company as a tech company rather than a food manufacturer. The real value of their technology is a question now, especially all of those fast followers also have the right products and strong technical teams.^[18,19] Once a few companies have better outcomes than Beyond Meat, Beyond Meat will not be able to lead the new plant-based meat industry like Tesla.



Figure 14. Chinese plant-base meat lab



Figure 15. Chinese plant-based meat mooncake

The second one is about international trades. China and Indian will be the most significant potential market for plant-based meat in the future for two reasons. One reason is that there is a rapidly increasing for the demand of meat since the developing of China and Indian. The second reason is that they lake enough surface for livestock rearing. Unfortunately, the main product from Beyond Meat is the beyond burger which requires only pan-fried, but China and Indian people like to stew or fry proteins. After a long time of stewing or high temperature fried, the beyond meat will break down and taste like bean soup. Beyond Meat might not notice that many companies in Asia like ZhenRou, Starfield have already started to study the project of how to create Asian plate-based meat. Zhenrou even has already begun to sell a plant-based meat mooncake in China as the pictures at the front shows. Impossible Meat also intended to start a business in China next year.^[20] Beyond Meat will not able to be the first mover in Asia. The Chinese government also started to support this project in many ways since the unbalance intake of typical Chinese food. Base on the government research, Chinese intake too much meat protein every day; therefore, according to the Chinese government plan, the national dietary intake

of animal protein should be reduced by 50% by 2030. In this context, there are huge potentials in Chinese plant-based meat research and products.^[21]

Also, on the one hand, the price of plant-based meat is a huge obstruct. Right now, the price range of beyond burger and Impossible burger is between the cost of regular beef and Wagyu beef; nevertheless, the regular beef still tastes better than plant-based meat. It is hard to persuade customers to eat plant-based meat daily unless it is both cheaper and healthier than animal meat. On the other hand, cell-based meat also has great potential to substitute animal meat, and it will not be too hard to have the same taste as real meat. The big obstruct for cell-based meat is the cost.^[22] Once this problem has been solved, Beyond Meat and plant-based meat will have another strong competitor.

All in all, the author believes that Beyond Meat will keep expanding until their technology has been surpassed, and Beyond Meat is a great disruptive innovation to both traditional plant-based meat industry and meat industry. Their products are suitable for the environment and human health. But their future potential is limited so far, and their technology has been overvalued. They must be cautious with their research direction and marketing strategy because the fast followers from all over the world are chasing them quickly.

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