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21st Century Food: NüFood

Sergio Cevallos, Ricardo Miranda, and Beatriz Cifuentes, engineering students from the Universidad del Valle of Guatemala (UVG), were discussing different alternatives of commercialization of their non-traditional product, the Black Soldier Fly (BSF), for the Latin American market. Sergio, Ricardo, and Beatriz worked for the last couple of years developing their venture, NüFood, a Guatemalan entrepreneurship that sought to change the way humans look at insects. They acknowledged the taboo surrounding the market of transforming insects into food for human consumption. Still, they considered the BSF as an alternative product with a low impact on the environment. BSF had proven to produce fewer greenhouse gases than common livestock. BSF also consumed less water and food, and their waste was a fertilizer source (FAO, 2013:1).

Different companies were using the BSF in the quest for a solution to satisfy the need for environmentally friendly products around the world. Taking this into account, NüFood did not want to follow the expected industrial path. From the first day, they looked for a way to make the business model their own by incorporating the social aspect. The project itself was born gradually, but by October 2020, it received much attention from industry experts. It all started with a young man reading articles on the internet. No one would have thought that the result of an internet search would be the factor that set everything in motion.

However, there was one thing they did not see coming: the different fields of application of its product. BSF was a very versatile insect: It could turn into protein meal, dried or alive larvae, biofertilizer, larvae oil, chitin, chitosan[1], and other products having various usages all over the world (see annex A). For some people, BSF versatility would improve the environment and living conditions on the Earth and could be very beneficial because it opened the possibility of entering multiple

[1] Chitosan is a natural, biodegradable, nontoxic, and bioactive polymer, which has shown fungicidal effects against certain plant pathogens and the ability to induce defense mechanisms in plant tissues" (Gutiérrez et al., 2016)

This case study was written by Estefanía Arriola Ordóñez, Isabella García Caffaro, Teresa Velásquez, Pablo Coma y Sofía Castillo under the supervision of Professor Alvaro Figueredo as a basis for class discussion rather than to illustrate either correct or incorrect handling of an administrative situation.

INCAE Business School and Cátedra René Morales de Emprendimiento

markets. Still, it was a matter of thinking clearly and focusing on one product to start mainly for a young group of entrepreneurs with no investors.

Industry

By 2020, the world consumed more resources than it could produce. Eventually, it started to upset the balance of the planet. Multilateral efforts such as the United Nations Sustainable Development Goals (United Nations, 2020) sought to reduce hunger, climate change, irresponsible consumption, and production. Having more population and animals than as a society we could feed, 820 million people were undernourished worldwide (Roser and Ritchie, 2013); these efforts did not prevent the lack of food and shelter affecting the vulnerable population and animals from dying from hunger.

Organizations promoted different options to modify human interaction with the environment, seeking a more sustainable approach. Among the options, shifting from a linear economy to a circular one gained attention in scholar and practitioner spaces. Circular Economy Foundation (2020) defined it as:

> "... an economic concept interrelated with sustainability and whose ultimate goal is to maintain the value of the product, materials and resources (water, energy,...) the longest period possible and reduce to a minimum the creation of waste. It consists of the implementation of a new economy, circular -not linear-, based on the «closing the life cycle» principle of products, services, waste, material, water, and energy."

The shift into this new type of economy was a challenge that humanity had to face. Like Germany, some countries changed most of their production methods to keep products and materials in use. Other countries shifted the whole production system by setting up committees integrated by small and large businesses, industries, governments, and individuals to adapt to the new market needs.

The BSF market started to grow in Europe by 2017 and with a projection of growing significantly worldwide in the next few years, reaching $539.4 million by 2025 (Meticulous Research, 2020:13). The BSF's main competitor, as a sustainable source of animal feed, soy meal, increased its price. So, the BSF demand also increased, influenced by the higher meat consumption due to population growth. The BSF products' problem was the lack of standardized regulatory frameworks to work with the insect and the limited approval for its introduction in human diets. Different governments had started to support the use of insect meal in livestock feed, but until the necessity of this product grew, they did not see it as a priority and continued to restrain the insect's use in most fields (see annex B).

Black Soldier Fly's usage was an example of the adaptation of different markets to a circular economy. Projects were using the full potential of every part of the BSF. For instance, flies' larvae were rich in protein, overgrew at a fast pace, and could feed on an enormous spectrum of food, from manure to food waste (Meticulous Research Pvt. Ltd., 2020). The predominant product that helped this industry grow was protein meal and dried larvae. These products are made of high-quality larvae

with a protein percentage within 28% and 48% and a lipid percentage between 12% and 42% (Universidad Nacional de Colombia, 2019). These parameters made the larvae extremely attractive for different companies and stakeholders worldwide (see annex F). They started to work with the BSF because businesses realized the insect's potential with its rapid expansion, especially in the Asia-Pacific region, where they were more open to approving its use (see Annex G). The fact that many products could be extracted from the BSF also influenced many producers around the world.

The beginning of NüFood

Sergio Cevallos, an industrial engineering student in UVG, found that companies experimented with crickets as a new protein source with little effect on the environment. As he started entering the world of insects as a food source, he found the BSF and its attributes.

> "Three years ago, I began to study this whole subject of insects. I realized that they were very rich in protein and effortless to harvest at a low cost... At that moment, I knew that it was something I wanted to carry out sooner or later, but I did not have all the knowledge" (Sergio Cevallos, 2020).

After his initial search, Sergio decided to share his findings with Ricardo Miranda, an electronic engineering student at the same university. They had already talked about doing business together, and after a failed try in the past, the only thing they were missing was a fantastic product, so Sergio's findings turned out to be perfect. They kept reading about the fly and everything they could extract to turn it into a well-rounded business, one with different products and various potential customers. As they embraced the idea with more enthusiasm every day, they realized that the team was missing someone that could understand the nutritional value of the possible products and the regulatory and sanitary conditions they needed to fulfill in the food industry. After looking for the right partner, Beatriz Cifuentes, a food engineering student, joined the team. Beatriz understood the processes that the fly and the larvae had to go through to become a product that met the industry's needs and the final customer. "I liked the idea, mostly because of the idea of recycling… reusing organic waste. In my career, they [professors] always showed us the problem of what to do with the industry's waste" (Beatriz Cifuentes, 2020).

Not being experts in the field, they did not know where to start, but one thing that united them gave them the bust they needed: Universidad del Valle de Guatemala (UVG). The institution opened its doors to its technology, contacts, and years of experience in entrepreneurship. From that point on, people who worked in the field saw potential in the project and decided to help. It was not easy, but each day they were more convinced that it could happen. Experts knew that using BSF was not a new approach, but if NüFood succeeded, it could be the first company of its kind in the mesoamerican region.