



Food Security and Nutrition Flagship Project

Tecnologico de Monterrey

The School of Engineering and Sciences at Tecnológico de Monterrey has unveiled its **Food Security and Nutrition** Flagship Project in Mexico, an applied research initiative aimed at transforming the country's food and nutrition landscape.

Food security is defined as the condition in which all individuals have physical, social, and economic access at all times to sufficient, safe, and nutritious food to lead an active and healthy life.

This concept is based on six fundamental dimensions: **availability**, which ensures a sufficient supply of food through production, storage, and distribution; **access**, which guarantees that people can afford food while considering economic, social, and physical factors; and **utilization**, which promotes the proper use of food, including its nutritional value, access to clean water, and health conditions.

Additionally, **stability** ensures that access to food remains unaffected by economic, climate, or political crises, while **policy influence** empowers communities to shape decisions about their food system. Lastly, **sustainability** ensures that food security efforts do not compromise natural resources.

Access to sufficient, safe, and nutritious food is a fundamental human right. However, global and national figures present a concerning reality. In 2022, 783 million people faced hunger worldwide, while 821 million were malnourished. Among children under five, 151 million suffer from stunted growth due to malnutrition, and 613 million women and girls (ages 15–49) experience iron deficiency. Meanwhile, 2 billion adults suffer from obesity, reflecting a global food and nutrition crisis.

In Mexico, one in four people experiences moderate or severe food insecurity, while more than 3% of the population suffers from malnutrition, and 25% of Mexicans cannot afford a healthy diet. Since 1961, per capita food supply has increased by 30%, but this growth has been accompanied by an 800% rise in nitrogen fertilizer use and a 100% increase in irrigation water consumption, placing unprecedented pressure on ecosystems and global food security.

A Comprehensive Strategy to Address Food Insecurity: To tackle these challenges, Tecnológico de Monterrey has developed the **Food Security and Nutrition** Flagship Project, a multidisciplinary initiative that focuses on mitigating food insecurity and improving child nutrition in vulnerable communities. This effort encompasses the entire food production chain, from sustainable agriculture to food processing, distribution, storage, and consumption. The project aims to produce sustainable and diversified crops, livestock, and functional ingredients through innovations in agronomy, engineering, and computing. Additionally, it seeks to develop strategies that ensure more nutritious foods with a longer shelf life while optimizing natural resource use.

The initiative also addresses food waste reduction through circular economy strategies and strengthens food safety and traceability systems to guarantee product quality. Research efforts focus on making nutrition more accessible and balanced for vulnerable populations, while artificial intelligence and digital technologies are integrated into the food supply chain to improve efficiency. Moreover, the project works on shaping evidence-based public policies by engaging key stakeholders in decision-making processes.



Part of a Broader Strategy: This initiative aligns with the new applied science research strategy of the School of Engineering and Sciences, which focuses on three key areas. The health research cluster explores biotechnology, nanotechnology, informatics, and electronics applications for human health. Meanwhile, the climate and sustainability cluster address environmental challenges such as climate change and the transition to renewable energy. Finally, the industrial transformation cluster integrates digital technologies, artificial intelligence, and innovative manufacturing processes to optimize supply chains.

Robust infrastructure and global partnerships to implement this project: Tecnológico de Monterrey has established a strong research infrastructure across multiple campuses. In Monterrey, it houses the Biotechnology Center and CIDPRO Food Technology Laboratories. In Querétaro, researchers work at the Bioengineering Center, CAETEC, and pilot plants, while in Guadalajara, the Climate Change Laboratory drives sustainability-focused projects. The Bioengineering Laboratory in Puebla and the Biotechnology Laboratory in Toluca further support the initiative's objectives.

The university has also forged strategic alliances with major companies, including Bimbo, Ragasa, La Moderna, Corteva, Veinte Soles, PepsiCo, and Heinz, as well as international organizations like the Global Alliance for Food Security and the FAO.

The project's impact is already evident. Currently, a team of 33 principal researchers, 17 affiliated researchers, and 8 postdoctoral fellows are driving its progress, with the participation of 105 graduate students. The project has also yielded more than 100 high-impact (Q1/Q2) scientific publications in the past year and has submitted funding proposals to Danone Institute, Valent Agricultural Inputs, and the Conservation, Food & Health Foundation.