

Subject: UAE Food Security 2nd Case Study Competition
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Alternative Food Will Shape the Future of Global/ Local Food Security

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Alternative Food Will Shape the Future of Global/ Local Food Security

The case study I present here covers the global challenges facing food security within the context of the new agricultural vision outlined by various relevant international entities, including UN's SDGs. The paper sheds light on how both changes at the supply and demand sides are needed to ensure food security for all, globally and locally, with special emphasis on alternative food, and to lesser extent feed. It presents the current megatrends in alternative food and feed, with possibilities on how the UAE can leverage those as part of its strategy moving forward.

The Challenges and the New Agricultural Vision

The Food and Agriculture Organization of the United Nations (FAO) estimates that by 2050, a global population of 10 billion will demand around 70% more food than is consumed today. Feeding this growing population nutritiously and sustainably will require substantial improvements, and perhaps complete disruptions, to the global food system on both supply and demand sides

The Sustainable Development Goals (SDGs), specifically SDG2, looks forward to ending hunger and achieving food security by building inclusive, sustainable, efficient and nutritious food systems through active leadership, public-private action and collaboration, informed by insights and innovation.

In developing new insights; especially for priority action areas in the Food Value Chain, governments and private sector entities should leverage technology and innovation for food systems change; to achieve a new vision for agriculture and food production by mobilizing new investments, partnerships and best practices to achieve concrete results. In that particular new vision, alternative food and feed have come to play a major role. Let's consider below options set forward by the World Resources Institute.

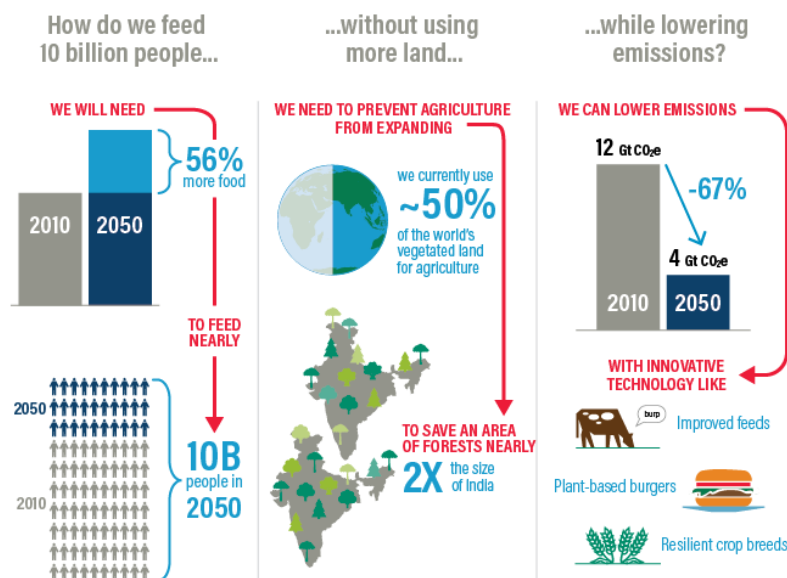


Figure 1 – Options for the Future of Food; Source World Resources Institute (WRI)

Besides the pressure to reduce carbon emissions, the need for more food means new paths, of which alternative food forms are needed with a major emphasis to reduce the current animal-based meat consumption by both substitution with other sources as well as reducing demand. The switch to alternative proteins presents challenges and opportunities to be discussed.

The Need to Switch to Alternative Protein

Recent research by the Food Innovation working group of the World Economic Forum finds that balancing meat consumption with alternative sources of protein can lead to significant health and environmental benefits. It also shows that a sustainable food industry and healthier human life can be achieved through further innovation in the development of alternative proteins, livestock production and consumer behavior. While the data highlights the positive joint health and environmental benefits of alternative proteins, it also details the scale of the challenge in building a more sustainable food system. On the technical side, for example, while lab-grown beef is seen by many as a much more environmentally friendly alternative to traditionally-reared beef, the group finds that current production methods are energy intensive. The food industry, which is called on to invest in new alternative proteins to help scale up production and offer consumers a wider range of options. Government and regulators, which must design rules to govern a wave of new alternative proteins to protect the public from health risks and unsubstantiated claims, and to support the various sectors in their transformations.

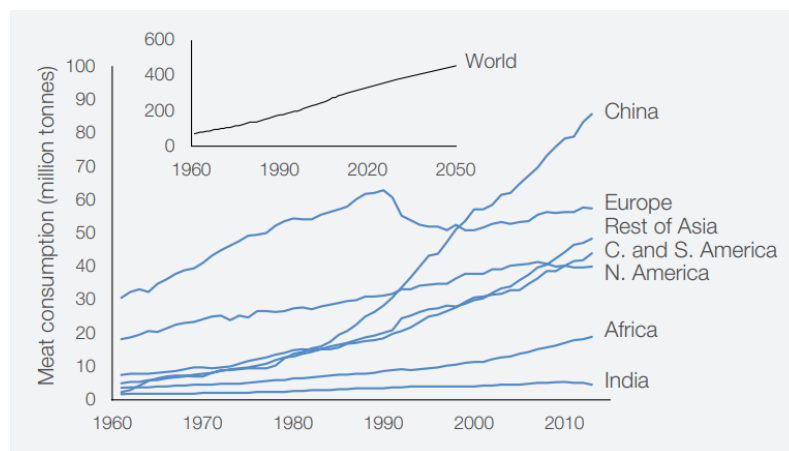


Figure 2 - Trends in the consumption of meat; regional data and global data to date and projections to 2050 (FAOStat)

Thus all three potential pathways to meet the needs of the world's growing population for protein in a sustainable and healthy way are to be considered: alternative proteins; changes to current production systems; and consumer behavior change. There has been a burst of recent innovation involving new purely plant-based alternatives, products based on insects and other novel protein sources, and the application of cutting-edge biotechnology to develop cultured meat.

Further Options: Insects as both Food and Feed Globally and in the UAE

On the insect-based products a lot of applied research and commercial pilots have sprung around the world. Meticulous Research, a market research company predicts the global market for edible insects could grow to \$1.18 billion by 2023. That's almost triple its current level. So, what's behind this anticipated increase in appetite for insects? There are a number of factors in play and the answer is wrapped up in an understanding of how insects compare with the production and farming of other food types.

Per kilo of live weight, bugs emit less harmful gas than more mainstream farm animals. A cow, for example, produces 2.8 kg of greenhouse gas per kilo of live body weight. Insects, on the other hand, produce just 2 grams. They also consume fewer resources than traditional livestock. For each kilo it weighs, a cow needs 10 kg of feed. Bugs on the other hand need just 1.7 kg. The image below (source Bloomberg), sheds more light.

Farming's environmental impact by species





	 Insect	 Chicken	 Pig	 Cow
Greenhouse gases released per kg of live weight, g	2	NA	1,130	2,850
Feed required per kg of live weight, kg	1.7	2.5	5	10
Land required per g of protein, m ²	18	51	63	254
Water required per g of protein, li	23	34	57	112

Figure 3 - Food production footprint by type; Source Bloomberg

Water, which is becoming an increasingly scarce resource in some parts of the world – and which is used liberally in intensive farming – offers another interesting comparison. To produce a single gram of insect protein, you'd need 23 litres of water. That might sound like a lot. But to get that same gram of protein from cattle, you'd need 112 litres of water. From the farmer's point of view, raising insects is going to be radically different from raising sheep, pigs, or cattle. No more coping with mud, muck and filth. An end to shifting heavy sacks of feed. And forget about having to go outdoors in all weather to manhandle livestock. The requirement for investment in equipment will be different too. This will be farming on a much smaller scale, reducing the need for large and expensive machinery.

It may not be too long before we can all buy a bag of edible insects at our local grocery store. In 2017, Switzerland changed its food safety laws and became the first European country to allow the sale of insect-based food for humans. And the same year, the Coop unveiled a range of mealworm burgers and balls in some of its Swiss supermarkets. IKEA's external innovation lab SPACE10 revealed it is "reimagining" popular dishes at the retailer's in-store restaurants. In a blog post, the researchers explain that they are working on bug burgers and mealworm meatballs, but add that the new ingredients are being tested so customers won't find them on IKEA menus. As scarcity of resources and sustainability become increasingly important issues for food production and distribution, it will not be long before we are asking for insects in our food.

Enterra Feed, one of an emerging crop of insect growers, will process the bugs into protein-rich food for fish, poultry - even pets. After being fattened up, the fly larvae will be roasted, dried and bagged or pressed to extract oils, then milled into a brown powder that smells like roasted peanuts.

Now not only are insects aimed for human consumption, but also feeding bugs to fish and chicken - a natural palate – is an objective of production as well. Cargill conducted an insect-based feed trial on poultry in 2015, but the company's efforts with insects have since focused on bolstering its growing aquaculture business, where demand for alternative proteins is most acute. Beta Hatch is chasing the same market. The small company's mealworms - larvae of the mealworm beetle - will likely end up as fish food with the help of an investment from fish-farming customers that have pressed for sustainable alternatives to fishmeal. Fishmeal has a limited supply, and aquaculture is continuing to grow globally as it is currently at 50% of global consumption with the dwindling stocks in the oceans. Insect meal is a piece of a solution. Fish farming is growing fast with growing consumer demand and increasing concerns about overfishing, resulting in catch restrictions in many depleted fisheries. Warming oceans in some areas have also disrupted supplies; that means fish eaten by humans will increasingly come from farms - driving up demand and prices for fish feed and thus making it more lucrative business.

Algae: a competitive food/feed alternative

Options are many, below is just another example on how algae can grow new economic sectors.



Figure 4 - Food start-ups eye algae as a green protein source

Recent developments in research and development show algae to be a promising alternative for the conventional production of meat, either for direct human consumption or for indirect use as feedstock. Nevertheless, a tremendous amount of work still needs to be done by a wide range of stakeholders over many years to fully realize the potential that algae offer for food and feed security.

Impacts of the Adoption of Alternative Proteins

Alternative-protein products have the potential to disrupt a major economic sector. Whether this will happen and at what speed will depend in part on how the alternatives benefit society and whether consumers chose to purchase them. It also depends on the political economy of the food system, the interactions between the different stakeholders who believe they will benefit or suffer from the transition, the narratives used and how governments respond to their arguments. However, this disruption should not be approached as a zero-sum game; constructing a future in which as many people as possible gain from the spread of alternative proteins can both maximize human welfare and deliver the best outcomes for global health and the environment; and thus a win-win.

Switching from animal protein to alternative proteins can lead to significant reductions in greenhouse-gas emissions, especially for transitions to plant- or insect-based alternatives. While current estimates of emissions from cultured beef suggest only modest reductions, depending on how production of cultured beef is scaled up, there is the possibility of significant emissions reductions as well.

Conclusion and Recommendations for the UAE

To meet the protein needs of a projected population of 10 billion people by around 2050 in an inclusive, sustainable, healthy and nutritious manner is, as discussed above, a significant challenge. But it can be done. The UAE is a pioneer and should start the movement regionally. Transformation of the food system is essential to achieve the Sustainable Development Goals and to meet the Paris Agreement climate-change targets. Innovation and experimentation in both alternative and traditional proteins will be critical.

It is hoped that the cases presented in this study will provide a starting point for further analysis by UAE Food Security entity, one that will need to evolve as new alternatives are developed and as production processes and technologies are scaled up. The discussion will need to respond to developments in how traditional animal-based protein is produced and to changes in what consumers believe is an equitable food system producing nutritious food.

This simple case study is intended to facilitate further dialogue between stakeholders, and to identify areas of opportunity and critical intervention points. It seeks to encourage a step-change in progress, in particular by harnessing the transformational possibilities of the Fourth Industrial Revolution. It argues for a systemic, multistakeholder approach – the building of new platforms of action to accelerate and scale this new protein economy – in order to help create the future we want and need.

The challenge of meeting the protein needs of a mid-century population of the UAE people in an inclusive, sustainable, healthy and nutritious manner is enormous, but achievable. What is clear is that this will not happen on our current, business-as-usual trajectory. Significant transformation of the protein system is essential to achieve this. The recommendation is for the UAE government to actively accelerate the adoption of alternative proteins but policy that changes the ecosystem and incentivizes the private sector alongside the government led initiatives that helps with building the difficult pieces of the value chain. For the foreseeable future, the meat and alternative-protein industries will coexist and have the opportunity to complement one other. Both incumbents and new players, and the various stakeholders who are involved throughout the protein supply chains, will gain from a nuanced debate about how to evolve and reshape regional and ultimately global food systems to provide healthy and sustainable diets, and thus the UAE has to be at the heart of these discussions. Only through dialogue and structured collaboration will society be able to transform the protein system, to create a future where safe, sustainable, affordable and healthy protein is provided to all.

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