International Journal of Culture and Modernity
ISSN 2697-2131, **Volume 28 | May-2023**
https://ijcm.academicjournal.io

Future of Food

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ANNOTATION

As the human population increases, the average income rises, standards of living are changing, and our environment is increasingly strained, the demand for food will continue to grow. By some estimates, there will likely be two billion more people to feed by 2050. The foods we eat are always evolving and new tastes are being created. The future of food is at stake. Business-as-usual is no longer an option. Something has to change. This paper predicts the changes that will take place and affect the future of food. It explores the major drivers affecting the food system between now and 2050.

KEYWORDS: food, future of food, trending issues.

INTRODUCTION

Food is very essential for obvious reasons. Food, like air and water, is needed for human survival. It provides the body with energy, which is vital for its existence. The importance of food is increasingly included on the urban agenda in many nations. Because we all need food for our survival, health, and well-being, food is regarded as a human right by the United Nations. The foods we consume directly or indirectly impact our health. Food has been a driver of social movements, who are focused on different aspects of the conventional food system and seek to reshape the system. Food studies in anthropology, sociology, and philosophy reveal that people think about food in many different ways. The main factors affecting the demand for food include population growth, climate change, changes in consumption patterns, the effects on the food system of urbanization, and the importance of understanding income distributions [1].

The food Industry plays a crucial role in both national and global economy. The industry is a dynamic system that changes fast due to natural, demographic, technological, political, and economic reasons. The 2020 pandemic had a serious impact on the global food industry as many businesses were forced to close down or file for bankruptcy. The shift in the consumer's demands will ultimately change the industry in the future. Figure 1 shows the future of global food systems [2].

A range of converging powerful forces are fundamentally redefining how humanity lives. They are reshaping what we eat, and where and how our food will be grown. Agriculture is a

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major factor in climate change, producing over one-third of human-made emissions. With the blue revolution, aquaculture has started facing the same problems as agriculture. This means we need to rethink food.

With our planet's limited resources, we must feed a global population expected to increase from 7.6 billion to 10 billion by 2050, resulting in an estimated 50% increase in the amount of food crops required. Local food production potential is forecast to decline in areas where population growth is greatest, and where there is already significant hunger. Figure 2 shows the hunger map for 2019 [3].

What will food be like in the future? This question can be examined from many different perspectives: the foods of the future, future of food production or delivery or consumption, future of food packaging, future of food technology, and future of food safety or security.

FOODS OF THE FUTURE

By replacing 50% of the beef we eat with plant based alternatives, we can reduce our footprint immensely. In the near future, one should expect to see a range of healthier options being added to the menus of your favorite takeaways. One will be able to choose between pork, beef, chicken, and fish. Alternative ways of producing proteins include plant-based "meat," cultured meat, insects, and algae. The benefits of eating edible insects have been noted. Many insects including mealworms and crickets are incredibly high in protein, amino acids, healthy fats, vitamins, and minerals and are good for human consumption. Insects emit less greenhouse gases and can be cultivated on organic waste. Over 2,000 species of insects are already eaten worldwide. Insects require fewer resources than most meat. For example, crickets are one of the most sustainable sources of meat on the planet [4]. Although eating insects or bugs is still considered taboo in the West, it will have broader acceptance in the future.

FUTURE OF FOOD PRODUCTION

For the last 50 years, the focus has been on producing more for less. To meet the increasing demand for food and accelerate food production, we need to change the way we grow our foods and veggies. Food production needs to liberate itself from over-dependence on fossil fuels and imports. Modern agriculture, bad farming practices and unsustainable fertilizers are ruining the soil underneath. Irresponsible farming practices and bad irrigation systems have caused significant decreases in soil health, making it more susceptible to drought and erosion.

Fish requires on average seven times less resources than beef to produce. It can be a very efficient source of protein. Fish farming is becoming popular. It has enabled a lot of farmers to make big money and feed billions of people around the world. It will eliminate the problem of overfishing, which has accelerated the loss of ocean species and can threaten our well being [5]. Sushi-grade fish is being grown in laboratories. GMOs can help us develop plants that are resistant to pests, plants that need less fertilizing meaning less soil contamination, and plants that can turn more carbon dioxide into oxygen helping to reverse climate change.

FUTURE OF FOOD DELIVERY

The food delivery industry has experienced rapid growth in the last two years. COVID-19 is often accused of being the defining factor. Since the beginning of the pandemic, we have

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witnessed an unprecedented demand for food deliveries from supermarkets and restaurants. Online ordering from digital devices is now commonplace due to convenience. Same-hour and same-day delivery all play into the always-connected lifestyles of the modern consumers. Food delivery has become a global market. Food delivery companies must meet the huge increase in orders while keeping carbon. The globalization of the food system has occurred due to cheaper transport and communications, but also because of reductions in trade barriers and agricultural tariffs. The method of transportation that brought meals into our homes went from the motorcycle, bicycle, robot, and a broadband connection. Some of the diverse delivery options being tried right now include robot delivery, drone delivery, and drop menus via parachute [6].

FUTURE OF FOOD CONSUMPTION

Using the data generated through delivery platforms, restaurants can build custom menus for each consumer, increasing sales, and total order value. Consumers, businesses, and investors are starting to think more about nutrition and sustainability. Many foods we will eat in the future may not exist yet. Although some claim that the future menu may involve less meat and dairy, it is more likely that we have customized diets, outlandish vegetables, and robot chefs. Although it may not be palatable for some poeple, creepy crawlies such as crickets, caterpillars, and silkworms may be future of food. Lab-grown or cultured meat is already on the rise. Consumption of fruits, vegetables, nuts and legumes will have to double. Consumption of foods such as red meat and sugar will have to be reduced by more than 50%. A diet rich in plant-based foods and with fewer animal source foods confers both improved health and environmental benefits. Algae and other marine sources of food will become more abundant [7].

FUTURE OF FOOD PACKAGING

Plastic pollution is a huge environmental problem. There are millions of tons of plastic that end up in our oceans. The plastic fragments into particles, which ends up in the bellies of animals and consequently in our own bellies. As a result, innovators, entrepreneurs, governments, and researchers are working together to find solutions to this problem. Innovative ways of packaging food have been used to reduce damage, prolong freshness, and fight off bacteria. Each of them has the potential to make what we eat healthier or more sustainable. The development of edible food packaging has enables producing edible water bottles made out of algae, biodegradable plastic. The solutions serve as an alternative to conventional packaging and have been recognized by many food and pharmaceutical industries. In the near future, food packaging could monitor foods to detect ripeness and even actively prevent foods from spoiling.

FUTURE OF FOOD TECHNOLOGY

Technology is the main driver of trends. It is transforming food production. From lab-manufactured, plant-based meat alternatives to AI farming solutions, the past few years have seen inventions designed to address various agricultural and food challenges. Some newly developed agricultural techniques are better for the environment than traditional methods. With many new tools and machines, the manual labor was reduced which resulted in growth in food production. Through newly emerging technologies, we will definitely see a lot of foods and food trends that are hard to predict. The last few decades have seen huge leaps in agricultural and food processing innovation due to emerging technologies. Agriculture is

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being transformed with new approaches, like vertical farming, precision agriculture, genome editing, and 3D printing. Technology holds the key to ushering in a new, more sustainable era in the food industry. Industry 4.0 is a key part of the future of food agenda. The robotic chef in Figure 3 does the cooking while you relax [8]. GMOs as a technology is actually an ally and not an enemy in that fight helping to save and protect nature and minimize our impact on the environment.

There are 3D printers that can print food. A typical one is shown in Figure 4 [9]. 3D-printed food offers endless opportunities for creating intricate dishes. Everything from toys to aeroplane parts are already being made with 3D printers. 3D-printer can produce snacks that sprout plants and mushrooms for flavor. It reliably prints savory, fresh ingredients, and tortilla chips made from hydroponic black bean paste. The printer could be used to shorten the food production chain drastically. 3D printed food has the potential for using a wide range of ingredients. 3D printing of food will dominate customized meal assembly in hospitals, schools, institutions, and fast food outlets. FoodInk, a high-end restaurant, opened a pop-up restaurant inn 2016 that serves 3D printed food. Everything except the people is 3D printed, and it looks incredible! 3D printing is yet to reach its full potential and technology will greatly impact the food industry in the future [5]. Much of the criticism of this technology is actually criticism of modern agriculture and the business practice of the huge corporations that control our food supply. This criticism is not only valid it is also important we need to change agriculture to a more sustainable model.

FUTURE OF FOOD SAEFTY AND SECURITY

Food supply, safety, and security are global, national, and local issues. Public health is directly or indirectly affected by the food supply. Unsafe food is considered unhealthy. Safe food refers to food prepared on clean and sanitized surroundings with clean utensils and dishes. Food safety is the concept that food will not cause harm to the consumer. In other words, food safety ensures that food will not induce food-borne illness in the consumer [10]. Over the years we have faced a number food safety challenges. It would be unwise to think we would not encounter more as different obstacles cross our path.

Although food prices in major world markets are near a historical low, there is increasing concern about food security. Food security occurs when all people in a community have access to sufficient, safe, and affordable food. Food secure individuals and households do not have resort to begging, stealing or scavenging for food. Food security is a universal human right, involving access to adequate nutritional sources. Food production and supply are important for food security [11]. After 1945 most nations looked internally to solve their food security needs. The 60s, 70s and 80s are characterized with a boom in many food-related industries, as production methods evolved. With the pace of global population growth coupled with climate change, how secure is the food supply?

BENEFITS

The supply and availability of food has been a crucial factor shaping human civilizations throughout the ages. Consumers are becoming increasingly aware of the relationship between food and health and are changing their purchasing behavior accordingly. Within the next decade, grocery stores will stock cell-cultured proteins. Cultured meat could be part of the solution to feeding the world's growing population. It is potentially more efficient and environmentally-friendly. People will have personalized nutrition. Kitchens will change. In

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restaurants, people will find a space full of sensors that track operations in the kitchen and diners' movements. Imagine eating a burger grown in a laboratory, a strawberry picked by a robot or a pastry created with a 3D printer. We have gone from having urban gardens at home to robotic greenhouses that produce food at high speed.

CHALLENGES

Food culture is an integral part of most societies, and most people will probably not want to change it. Exactly which foods will become fashionable in the future is impossible to predict. For the ambitious home cook, getting creative is going to be a lot more fun.

Given the difficulty of predicting future average food prices, it is not surprising that forecasting volatility (or fluctuations) is harder.

The food industry will face numerous challenges in the coming decade. We are facing a breakdown of critical systems on multiple fronts: the pandemic, climate change, and rising hunger. Critics claim that international companies are gradually driving farmers off their land in many countries, that monoculture farming might lead to global dependence of the human race on food corporations. Each of these challenges is tied to fragile food systems that degrade the environment and undermine public health. Around the world, governments, organizations, and the private sector are attacking the challenges from multiple angles. There is a need for a new science-policy body for food security and nutrition. We also need investments in research on mechanization, cultivation practices, millet production, and harvest technologies.

CONCLUSION

Foods and flavors are always evolving. Whatever your favorite dishes may be today, they will look quite different in 20 to 30 years from now. Cookbooks in 2030 will have some weird recipes. The crops we cultivate and the food we eat today will undergo significant changes in the future. The future will definitely bring us more creative food to the market. If everyone does their part (farmers, scientists, researchers, manufacturers, retailers, governments, and consumers), we can save the planet and have enough food for everyone. It is important to plan ahead and forecast future global food needs under a variety of different assumptions or scenarios that are as accurate as possible.

The European Union and 12 emerging economies give over $700 billion a year to the agricultural sector, which includes payments to producers, input subsidies, consumer support, infrastructure investment, and research and development. Future Food-Tech brings together international entrepreneurs, investors, and major food brands to explore the latest opportunities in supply chain traceability, nutrition and health, and alternative proteins in the food-tech space. Researchers, companies, financiers, and consumers must work together to enable new collaboration opportunities for a more sustainable future. The future of food has started to change in tandem with population increase and advances in science and technology. More information about the future of food can be found in the books in [12-21] and the following related journal: *Future Foods.*

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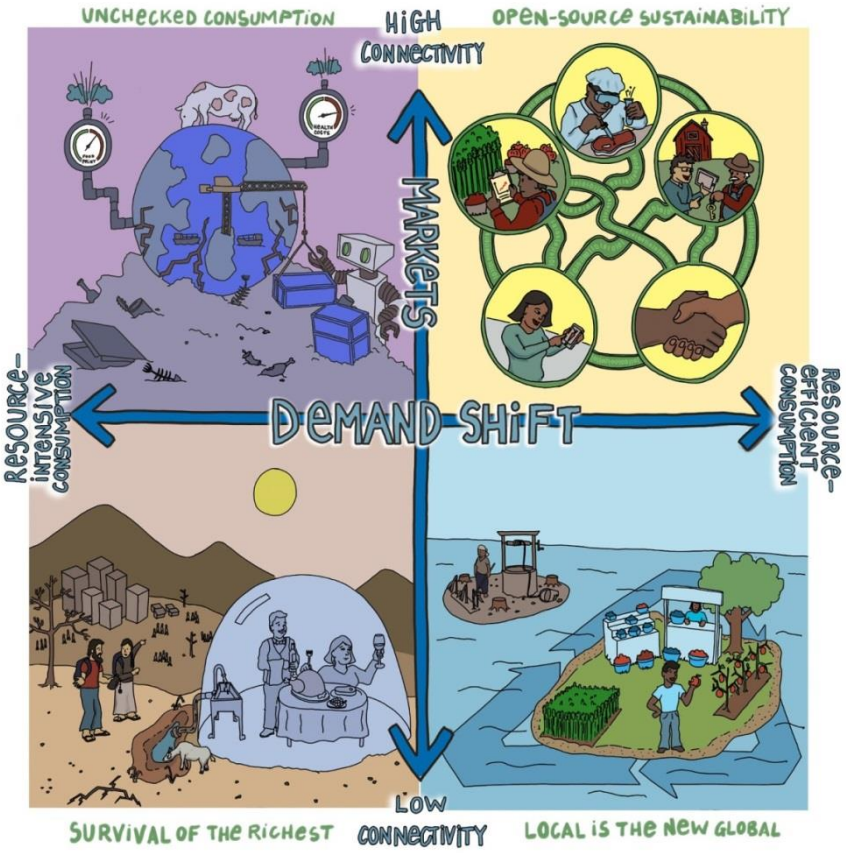

Figure 1 The future of global food systems [2].

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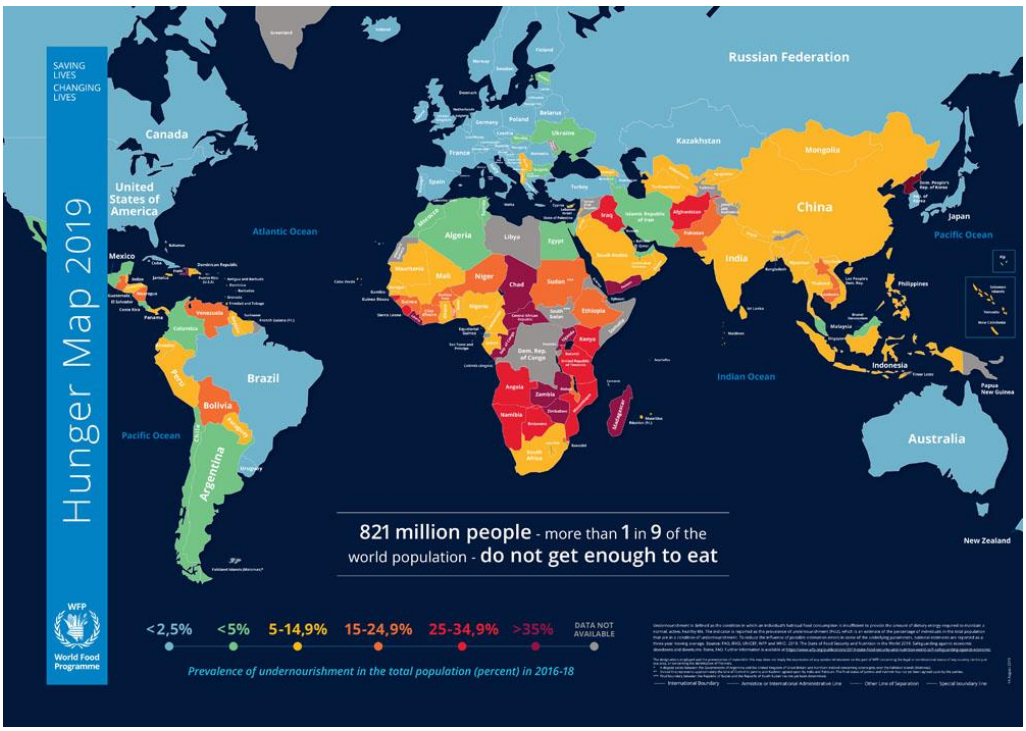

Figure 2 The hunger map for 2019 [3].

Figure 3 The robotic chief does the cooking while you relax [8].

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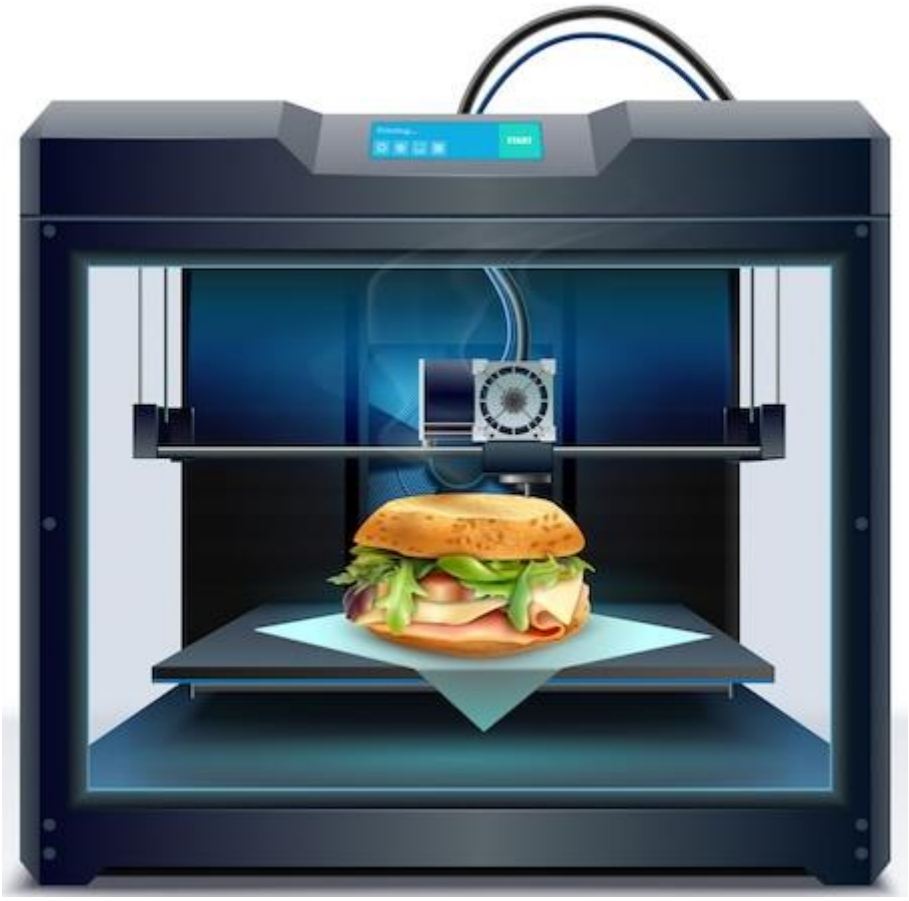

Figure 4 A 3D printing of food [9].