FEEDING OUR HUNGRY CITIES
WITH VERTICAL FARMS
AND OTHER APPROACHES

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UNITARIAN UNIVERSALIST
ADVOCACY NETWORK
OF ILLINOIS

The UN World Urbanization Project estimates that global population will increase to around 9.8 billion by 2050, of which 6.7 billion humans will live in urban areas. Meat consumption is expected to climb at a greater rate than population increase.

The environmental problems such as deforestation and pesticide run-off, caused by large scale agriculture, are well known. The problem is that, according to experts in the field, there is not sufficient arable land to provide a diet which will satisfy the needs of the expected global population. We will consider several approaches which limit and in many cases eliminate the need for arable land and also reduce the amount of water used to produce food. Some of these innovations are currently being implemented.

Vertical and other Forms of Urban Farming: The Netherlands, which is only a fraction of the size of the United States, has produced much of the world's produce for years in green houses as well as indoor vertical farming. In the United States most of our food, whether imported or grown in our country, is transported hundreds or even thousands of miles before we consume it. Nevertheless, American consumers still appreciate fresh food, which tastes better and is more nutritious when it can be consumed closer to where it is grown. Currently, 40,000 indoor farms in the U.S. produce $14.8 billion worth of produce annually. Much of this is taking place in under-utilized space in our own cities.

For example a 75,000 square foot greenhouse, is located on the roof of a soap factory in the Roseland area on the Southeast side of Chicago. A non-profit, Growing Home Chicago presently utilizes unheated hoop houses, which enables them to harvest organic produce in empty lots, from March to December. At another facility "The Plant", a repurposed meat packing plant near the former Chicago Stockyards, green edibles from bock choy to radishes are grown hydroponically in nutrient rich water under LED lights and in temperatures selected to bring out the plants' unique flavors. There are six vertical farms currently housed at "The Plant."

In Brooklyn, New York, Square Roots a company founded by Tobias Pegg and Kendal Musk has established "urban gardens in three dimensions". The equivalent of a two-acre field is folded vertically into each of several large temperature-controlled shipping containers. LED lights provide the spectrum of lighting for optimum growth.

Another company, Aero Farms maintains eight vertical farms in abandoned buildings in the New York Area. Trays of growing plants are stacked above each other in a growth medium of 100%

recycled plastic under their appropriate spectrum of lighting. Plants reach harvest in only sixteen days and, as a result, the output of each of these farms is about one hundred thirty times as large as could be field grown in the same space. At Aero Farms, as in all of the enterprises mentioned above, the water is recycled, pesticides are not used, and the plants are not subjected to genetic manipulation. Urban agriculture is also helping the younger generation to become reconnected with nature. For example. students at Phillip's Academy Charter School in New Jersey grow their food for lunch, both outdoors, and during colder weather, in indoor gardens.

Other countries are studying ways to increase food production within their own boundaries. For example, some leaders in Dubai, U.A.E., have consulted with Swedish developers about the possibility of creating new Sustainable Neighborhoods clustered around greenhouses in the city centers.

"Cultured" Meat: About 30% to 45% of the world's arable land is currently devoted to livestock production, and our planet lacks sufficient land to accommodate a greater production capacity. The serious environmental and personal health problems caused by our current over-consumption of meat products is widely recognized. Some plant-based meat alternatives are gaining popularity, but humans continue to favor the texture and taste of animal products. Several companies are attempting to satisfy this taste with lab-grown meats which do not require raising large herds and butchering them.

Just Products in San Francisco has transitioned from producing plant-based meat alternatives to growing meat from animal cells. Tissue samples are taken from living animals, without harming the animals. The stem cells are isolated and allowed to grow in a nutrient-rich serum. When mature, the cells are harvested and prepared. The company has produced a chicken nugget which approximates the texture and taste of the traditional meat product. They are currently talking to countries in which the regulatory climate is receptive to this product. As expected, the U.S. cattle industry in the United States strongly opposes these products. Missouri has recently passed a law declaring that "Meat" must come from an actual animal.

Aleph Farms in Tel Aviv, Israel has produced thin slices of lab-grown beef which they believe capture 60 to 70% of the taste of traditional steak, at a current price of $50. per slice. They recently obtained capital investments totaling $11.65 million from food tech investors and international companies such as Cargill and M Industries to support developing their prototype into a commercial product.

In addition, two California Firms have created fish from cell cultures (Blue Naha yellowtail fillets and Wild Types's salmon)

Grains: The production of grains dominate global arable land use by area. Several grains e.g., rice, corn and quinoa can be grown indoors, but there are no efforts to do so on a commercial scale so far.

Looking Ahead: Humans will probably continue to farm outdoors for as long as they are able to do so. There will be advances in urban agricultural practices decreasing the cost of produce grown near to our kitchens. Farmers in Washington State are working on a hybrid of organic wheat with perennial grasses. If successful, this perennial organic grain, eliminates tilling and re-seeding annually. It will take all branches of science to support these innovations, e.g., with improved technology in the area of energy production and distribution. Perhaps it is possible, if things go well, for our species to experience a "win, win" allowing more arable land to be returned to natural habitat.

Sources

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