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3-D Printing for Food Security: Providing The Future Nutritious Meal

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Synopsis

Burgeoning cities, growing economies and changing dietary preferences, have resulted in both undernourishment and overnutrition plaguing populations of Southeast Asia. Can 'printed' food address this double threat?

Commentary

SOUTHEAST ASIAN countries are plagued by malnutrition resulting from both the quality and quantity of food being consumed. Limited access to food and overconsumption of the wrong types of foods has resulted in various health issues that affect populations.

A possible solution might be to turn to the third wave of technology to address these concerns. One possibility is 3D printing. We may even be able to print 'acceptable' foods. In a region prone to natural disasters, 3D printing may well be the way to tackle food and nutrition insecurity in disaster-hit areas.

Undernourishment and Overnutrition in Southeast Asia

Beyond a doubt Southeast Asian countries has done exceedingly well in reducing numbers of hungry in the region. In the 2015 *State of Food Insecurity in the World*, the UN Food and Agriculture Organisation (FAO) states that hunger or undernourishment in Southeast Asia was reduced from 30.6% (prevalence of undernourishment or PoU) in 1990-92 to 9.6% PoU in the 2014-16 time frame.

However, according to the World Food Programme's (WFP), 2015 Hunger Report, five Southeast Asian countries - Laos, Cambodia, Myanmar, the Philippines and

Indonesia - still have serious cases of hunger or undernourishment, and one country - Timor Leste, struggles with ‘alarming’ rates. WFP has outlined factors such as low female literacy rates, gender inequality, and even frequent occurrences of natural disasters, as reasons for chronic and sustained malnutrition.

At the same time, given rapid economic growth, urbanisation and an ever-expanding middle class with its ensuing changes in lifestyle and dietary preferences, the urban centres of Southeast Asia have also seen an unprecedented increase in non-communicable diseases (NCD), associated with the way people live their lives.

These include heart disease, stroke, obesity and type II diabetes. Unfortunately, it has been determined that the occurrence of these types of illnesses increases with greater industrialisation and longer lifespans of individuals.

Both these scenarios have given rise to issues of health and wellness of the labour force that powers the region. Scientific and technological innovations such as that of 3D printing allow us to address both issues with similar technology where outputs are designed to fit the very specific needs in each case.

Technology and Nutrition Security

3D printing, also known as additive manufacturing, refers to processes where a three-dimensional object is synthesised through successful layering of materials under precisely programmed commands stored on a storage medium. We are a few years away from a ‘printed economy’ but 3D printing is certainly impacting the way we think of everyday things - from health to retail to even food.

As a matter of fact, printing food is already in the pipeline for the US military – creating appropriate and timely rations, potable for easy mobility in the field, and personalising diets to deliver sufficient nutrients – all while keeping costs low.

Employing similar logic, I see the usefulness of 3D printing in addressing nutritional crises in the region. 3D printing allows for customisation of output. When employed in producing food there are a number of benefits to this.

Firstly, the technology can help to realign nutrient-deficit diets by customising food that match individual or age/gender specific dietary requirements. By printing only necessary amounts, almost instantaneously, it not only does away with preparing large amounts but also reduces costs and wastage. Printers are significantly more portable than actual food stocks making it easy to bring into areas that may become inaccessible due to disruptions in transport networks. All these come to play when we think about crises-induced malnutrition.

Tackling Food Insecurity: Printing ‘Acceptable’ Foods

Natural disasters are a regular occurrence in the region. Food and nutrition insecurity are a mainstay in disaster-hit areas, especially extended periods of food insecurity, and chronic malnutrition. With minimised logistical concerns and reduced costs, it is not hard to see how see how 3D printing, where output is specifically designed to address the need, can be utilised effectively.

It can be something as simple as creating micronutrient tablets or cubes (similar to sugar cubes) to be mixed in with locally consumed carbohydrate sources such as rice; a staple commodity stockpiled especially in readiness for the onslaught of natural disasters. And because we expect transport networks to be disrupted, 3D printing of emergency food or nutrient sources becomes more attractive considering that there is less to transport and printing can be done on-site.

One of the most attractive qualities of this technology lies in how it can convert easily available and highly nutritious, but not necessarily the most palatable, ingredients to 'acceptable' foods. Both algae and certain insects are excellent sources of protein. They are already, though not widely, consumed in the region.

They are inexpensive and abundant and can be converted to more acceptable forms using 3D printing. An example would be to print 'chocolate bars' with these ingredients as a core component that might be distributed to children as part of schools' feeding programmes.

Yet another advantage is how 3D printing might be a positive step towards addressing resource constraints, especially in the light of climate change. It can be healthy for the environment with its reduced ecological 'footprint'.

Addressing Malnutrition Through Technology

With more women (and men) joining the urban labour force and the popularity of 'food-on-the-go', it is easy to see the lure of such food by making sustenance tasty, readily available and cheap. Highly processed foods also find their way into diets in poorer communities as well because they are easily available, they store better, and often such foods (especially canned varieties) are donated to organisations that distribute them to poorer communities. Poor levels of awareness can also result in high consumption of unhealthy foods.

One solution to overcome hunger and malnutrition lies in the tripartite action between the state, businesses and communities. 3D printing could also be the link between public and private action in addressing food and nutrition insecurity in the region.

A vibrant and healthy labour force is necessary for dynamic and growing economic region. They go together. Those interested in attempting to reduce nutritional deficits should look into all ways and means, including exploring new technologies to provide some of the answers. We should not wait for a 'trickle down' effect of these technologies to reach us but embrace them at present as potential solutions.

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