

Food systems and the bioeconomy

September 13 2021, by Matthew Morell



Credit: AI-generated image ([disclaimer](#))

The COVID-19 pandemic has sharpened our focus on food—whether it be due to concerns relating to supply chain integrity, the viability of rural communities, or a rediscovery of home-cooking during lock-down.

Now more than ever, modern food systems must take into consideration the complexities of sustainably producing [nutritious food](#) while reducing the use of increasingly scarce and fragile resources to meet the needs of

consumers, societies, ecosystems, and economies.

The COVID-19 pandemic has created concerns for [agriculture](#), such as labor supply which, although a perennial issue, has now become more acute due to the impact of the pandemic.

Similarly, supply chain integrity and capacity has become more of a concern due to the availability of inputs to agriculture and the ability to get produce to market.

The pandemic reminds us that in a global economy, it remains imperative to maintain sovereign capacities in areas of critical national importance—and there can be very few things more important than agriculture and food.

We need to ensure we can support the national capacity to protect ourselves against future shocks, be they widespread droughts, new epidemics of pests and diseases, or socio-political disruption to major global food production regions.

During the pandemic we've also seen a renaissance of consumer interest in food—where it comes from, its nutritional profile, and how to prepare it.

The pandemic reminds people that food does not appear magically on their plates. An entire system is behind delivering food to the plate, a system that is poorly understood in our increasingly urbanized world.

It's the (bio)economy, stupid

Former President Bill Clinton's famous 1992 election phrase 'it's the economy, stupid' was coined in an era when economies were dominated by the fossil fuel industry.

But in the 21st century the emphasis has shifted to the production and use of renewable biological resources to sustainably provide goods and services—the "bioeconomy."

And it is within this framework that The University of Queensland's "Building Better Bioeconomies" research theme operates.

In this context, the bioeconomy functions as an umbrella term, referring not only the production of food from agriculture but also to the use of biological resources to produce fiber, feedstocks for industry, or novel compounds, such as medicinal agents.

Bioeconomy also implies an additional value beyond the production of commodities, and there is an underlying emphasis on sustainability.

Agriculture has been under pressure for its perceived focus on productivity and profitability at the expense of sustainability.

Modern food systems are now entering an era where accelerating technological development and multidisciplinary sciences can be harnessed to meet consumer demands for safe, ethically, and sustainably produced foods.

A game-changing transformation

Back in the 20th century, if you walked into an agriculture department in a university, you would typically find separate, discipline-based departments such as soil, crop, animal science, or plant pathology departments, and perhaps an agricultural economics unit, who all saw themselves more as silos than as a continuum.

Now we see agriculture very much as being an integrating process, a point of intersection between, not only that historical requirement for

food security, but also for its very important role in responding to climate change through the sequestration of carbon, climate change adaptation and the need to mitigate emissions, particularly methane and nitrous oxide emissions.

Then we have the whole question of environment, the use of land—[soil quality](#), [water quality](#), impact on habitats, impacts on biodiversity.

There has been a tendency to view resource use as a "competition" between agriculture and the environment.

To move beyond such a dichotomy, investment in future food systems must be directed towards providing solutions that minimize environmental consequences while delivering a win-win solution for producers, society and the environment.

Another set of issues linked to agriculture relate to the vibrancy of rural communities. Often in these communities if agriculture fails, people must relocate, or face a depletion of services.

Additionally, food systems of the future will need to address equity issues that are currently unresolved, such as use of indigenous knowledge, access to farmer developed germplasm, gender equity in participation and decision making, and concentration of ownership.

Under and over nutrition

Rightly or wrongly, agriculture and the food system, are seen as central to the debate about over-nutrition, in terms of producing food that is very low-priced but also low in nutrition, which is fuelling global over-nutrition and the obesity crisis.

Conversely, we also have issues with low nutrient food resulting in

populations experiencing under-nutrition; that is, too few essential micro-nutrients. While this is not so much an issue in Australia, globally there are still 900 million people who suffer from malnutrition.

There is a combination of factors at play in both under and over nutrition. These include an inability to produce food where the population is located, and an inability of supply chains, societies and economies from a governance and physical capacity perspective to feed those people.

Our challenge now is to integrate between the needs of those outcome areas so that we come up with the best possible options.

Producing commodities based on steady depletion of natural resources isn't a sufficient future for agriculture in Queensland and Australia.

We can do more in reducing the footprint of agriculture, and we can do more to value add in Australia, so we are exporting the fruits of the knowledge, technology, innovation and skills of Australians.

This will enable us to derive a greater return on our use of scarce resources.

A multidisciplinary approach

Agricultural research at UQ is among the world's best—the University ranks second globally for Agriculture in the 2021 NTU Rankings.

At QAAFI, we leverage this unique combination of skillsets to mine information gained from the genomes of plants and animals. Our genetics work is helping to develop animals and plants that require fewer inputs, in terms of nitrogen fertilizer, water use and improved feed efficiency, enabling us to produce more from less.

Another of our critical research capacities is to produce food which is more nutritious and has higher consumer appeal—either due to an improved nutritional profile, or through sensory qualities.

Increasingly, our research is about traceability to give consumers confidence in understanding where and how food their food is produced.

In the case of beef, traceability starts from the birth of an animal. We can collect its DNA and sequence it. We can identify the animal when it comes to the crush and select whether it is used for breeding or sent off to the abattoir.

We can follow all the cuts of meat that come from that animal. We can encode quality information along with its genetics and origin (provenance) information and that it can be tracked right through into the hands of the consumer at a very low cost.

We are also working very actively in the livestock area on carbon, methane gas emissions reduction.

In the horticulture area, the focus is also on the production of high-quality, nutritious produce, but also in ensuring this produce can be delivered to export markets to generate higher rates of return.

And this is where our work in protected cropping is focused—to facilitate year-round servicing of high value markets in a resilient and reliable manner.

Other game-changing innovations include reducing reliance on pesticides through our BioClay technology.

These projects reflect our focus of not just producing more yield to create higher levels of profit, but also reducing pressure on the

environment.

Digital agriculture

Much like water, digital technologies are critical to all modern agriculture and food production systems.

Our work in predictive breeding is based on digital information—the capacity to genotype, the use of artificial intelligence and machine learning supported by a high-powered computational capacity—so that we can predict which varieties might perform best in different environments.

Digital information also underpins the Agricultural Production Systems sIMulator (APSIM) model and our remote sensing work, providing powerful tools to optimize use of inputs and maximize crop productivity.

Land versus lab?

In terms of food grown on land or increasingly in laboratories or factories, these foods are all part of a smorgasbord of options available to consumers.

Alternative meat sources are unlikely to put our livestock farmers out of business in the short term.

In the long term, it may become a contestable proposition, but we don't see our livestock industries standing still.

They will address concerns of consumers around environmental footprint, around nutrition, around traceability, so there will be innovation in both novel and traditional food sectors.

The idea of agriculture as static is a very inaccurate and erroneous concept. It's a dynamic industry with a lot of innovation and a lot of technology, and with a great future if we look after these important balancing of considerations.

As the incoming Director of QAAFI, I am particularly keen to see a new generation of researchers choosing a career in food systems, excited not only about the advanced technology that is a part of modern agriculture, but also the evidence-based impact that they can make on society and the world.

Our researchers have a special role to play for Queensland, for Australia and the global tropics and sub-tropics, as a world leader in the training of agricultural and food scientists for the bioeconomy of the future.

As a central and vibrant element of the bioeconomy at UQ, it's "game on" for a revitalisation of agricultural systems that meet the needs of the 21st Century.

QAAFI is a research institute at UQ that is supported by the Department of Agriculture and Fisheries and works with the Department in identifying areas of strategic priority for Queensland, as partners in conducting the research, and in delivering outcomes.

Our vision is to enable Queensland and Australia to be the globally recognized leader in high impact subtropical and tropical agrifood research and knowledge leadership, advancing the competitiveness and sustainability of agriculture and [food](#) systems.

Provided by University of Queensland

Citation: Food systems and the bioeconomy (2021, September 13) retrieved 2 May 2024 from

<https://phys.org/news/2021-09-food-bioeconomy.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.