

## SCENARIO 1

### Hi-tech nutrition for all

Forum for the Future is upbeat about the technology option, provided we don't mind being "divorced from nature" and "dependent on technofixes". UK innovation charity Nesta believes "the future farmer will need to know how to fly a drone and repair robots".

Agribots with a connoisseur's eye already select, pick and grade grapes in Chablis. Shropshire's Harper Adams University is developing a strawberry harvester. The University of Lincoln's broccoli bot hopes to choose the best brassicas. No wonder Shaun Price, a precision farming specialist at CNH Industrial, says a farm staffed entirely by 24/7 mechanical labourers is only five years away.

Sensors will proliferate, reporting back from locations as diverse as inside a cow's stomach (from eCow's disease-monitoring tablet) to Tasmanian oyster farms (a salinity detector by start-up The Yield eliminates guesswork about when it's safe to harvest). Drones will gather further intelligence, including advance crop-disease detection using infrared energy. One New Zealand sheep farmer has said that his drones could have up to 400 uses.

Nesta says the average (81-hectare) UK farm could reap an estimated 17.9% increase in annual profit thanks to the efficiencies, decreased costs and improved yields of tech-driven precision farming.

Skipping the farm altogether, Maastricht University famously unveiled a \$325,000 bioengineered, 3D-printed burger in 2013 (the price has since fallen to \$11). The university expects this development to be commercially mainstream within eight years, although David Read, CEO of food supply chain consultants Prestige Purchasing, said: "Manufactured meat will probably become more dominant after the next couple of decades, but will eventually be a major impactor."

As well as reducing the strain on animals and the environment, cellular agriculture and genetic engineering could foster bespoke nutrition. Scotland's Roslin Institute (of Dolly-the-sheep fame) has produced chickens whose eggs contain a protein that could treat liver damage.

While some – perhaps, the public at large – will not welcome playing with nature, John Bassett, policy and scientific development director at the Institute of Food Science and Technology, says: "As we focus our methods on solving big challenges and deliver outcomes that consumers see benefiting our species and our ecosystems the 'heat' around some new technologies will dissipate."

Certainly technology could help consumers track the source of food. Nicki Perrott, from Procure4, says as shoppers demand more information more quickly, UK wholesale distributors need to enhance the technology that supports their ability to trace and audit.

Automation will disrupt logistics as well as lettuces. "Driverless vehicles and increases in more fuel-efficient and electric vehicles could reduce costs," says Perrott. She adds that 3D printing could lead to lean logistics: "It could revolutionise supply chains. Having 3D printing of packaging onsite in factories would reduce inventory and inbound traffic."

### • Aeroponics: Growing crops without the need for soil

*NASA has developed aeroponics for the Mir Space Station; now Caleb Harper from Massachusetts Institute of Technology aims to popularise it. NASA research showed their prototypical "climate-in-a-box" technique, as Harper calls it, has the potential to grow crops 20 times faster using 98% less water. Harper's crops tweet him their moisture levels, while precisely controlled conditions allow the grower to tailor flavour.*

## SCENARIO 2

### Natural, localised food systems

But what if millennials' quest for the local, the sustainable and the authentic steers us away from labs and robots to "the community-centred world"?

Seattle start-up Crowd Cow auctions every edible part of a cow online. Waste is reduced and consumers are linked almost directly to local farmers, but as the forum points out: "With these new supply chain structures comes an increased demand for packaging, storage and transport solutions for smaller units of fresh products."

Another tension inherent in the community-centred world is the balance between the demand for sustainability against additional cost.

What are the alternatives for consumers wary of lab-coated farmers yet concerned by humanity's resource-devouring protein demands? "We need to fundamentally change our diet and eating patterns," Andy Kerridge of Wyvern Food Solutions tells SM. "Improving efficiency of production only delays the moment the population outstrips the Earth's capacity to produce. Meat production is an inefficient, land-intensive way of using the Earth's resources. We, especially in the West, need to overcome our irrational disgust for eating insects or protein derived from insects."

Bassett says: "The 'yuck factor' of these new proteins is being worked on. I'm intrigued by the sound of the 'nutty' flavoured insect pasta in recent reports." Seaweed is another fast-growing, protein-rich alternative; Oregon University has patented a strain of dulse that tastes like bacon when fried.

Insects and seaweed may make test-tube meat sound inviting, but we may not need to eat them ourselves. Several companies and projects have begun rearing insects on food waste for conversion to animal feed.

The community-centred world could be facilitated by companies such as Gousto. It ticks millennial boxes on traceability (100%), waste (less than 1%) and organics (not quite 100%); and the exacting demands of supplying seasonal ingredients for weekly rotating recipes require teamwork with suppliers (who are chiefly British). Alice Brown, Gousto's head of procurement, says the company brings the realities of the supply chain to customers who want to regain control from supermarkets. Perrott sees this happening in reverse too: "Suppliers are desperately trying to reduce over-dependence on what they see as low-margin contracts with the big supermarkets."

Read's Prestige Purchasing worked with the National Trust last year on a project that showed how local sourcing could flourish – rationalising their buying lists and regionalising their supply chains. The Trust can select the best suppliers in each region and become a significant customer by pooling volumes, yet is still able to source a rich variety of quality produce.

### • Closed-loop protein systems

*Food multinational Findus will meet all its shrimp demand in Sweden using microorganisms that digest shrimp excrement and are themselves food for shrimp, producing 10 to 40 times the usual yield. Last year, Denmark's From Piss to Pilsner project even recycled festival-goers' urine as a fertiliser for beer ingredient barley.*

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