

Future of Technology on Global Food Production

By Max Winders, AFMA Forum 2016

Is there a nobler endeavour than to nourish a hungry world? Food is the basic human need and civilisations were built and now stand or fall on its foundation, whether it is stable or unstable. As Khosrow I, the twenty-second Sasanian Emperor of Persia, recognised 1 450 years ago: “The throne depends on the army, the army depends on revenue, revenue on agriculture and agriculture on justice.”

Green Revolution

Today’s farmers, supporting scientists and allied industry have never been more successful at producing food in terms of quantity, quality and safety. The looming food crisis in the 1960s that was prevented by the Green Revolution saved billions of lives from famine and malnutrition. Yet the Third Horseman still rides, with famine raging across South Sudan, Yemen, Somalia, North Korea, and now Venezuela, to name a few.

Dr Norman Borlaugh (1914–2009), the ‘father of the Green Revolution’ and Nobel Peace Prize recipient, warned that unless scientific technology was accelerated and embraced, the progress he and his ‘wheat apostles’ created would be ephemeral. He realised that the trajectory of technology’s role in agriculture should continuously curve upward and constantly push boundaries, with the battle not yet won.

Anti-GMO campaigns

The wealthy West is the cradle of food production technology, investment, innovation and science, and the leading producer of food, equipped with rich farmlands, advanced infrastructure and technical know-how. Yet there exists a paradox whereby these same countries have become the epicentre of a growing anti-science/technology zealotry, and a call for – and return to – lesser productive farming practices.

The mass media routinely presents modern agriculture as the destroyer of resources, pillager of the land, ‘warmer’ of the environment and poisoner of children. Hollywood also serves up a steady stream of films showing a post-apocalyptic world caused by man’s war on the environment. The ‘elite’ have a disproportionate influence and we see this undue effect playing a role in maize ethanol, organic farming, veganism, animal rights/anthropomorphism, anti-GMO, anti-pharmaceutical/therapeutic and anti-biotechnical policy, regulation and ideologies.

After a vast number of meals containing genetically modified organisms (GMOs) have been safely consumed, GMO crops are still maligned as ‘Frankenfood’. Governments ban their use while people starve and or remain needlessly sick, as with golden rice and its potential to relieve vitamin A deficiency that can cause blindness or even death in underprivileged children. The fact is that the elite are immune to high food prices and food scarcity; it is the poor of the world that suffer.

The broader effect of this dystopian view of agriculture and biotechnology has dire implications for science funding, invention, adoption and deployment. In 2000 Dr Borlaugh authored a paper where he opined that the question is not “can we feed 10 billion people, but will we be allowed to”!

Future food requirements

The global human population of 7,3 billion is steadily increasing and is projected to reach 9,5 billion by 2050. That is an additional 2,2 billion people – constituting an increased population equal to double the size of that of China! United Nations (UN) data suggests a 70% gap between the food produced today and that which will be needed by 2050.

Not only will there be more mouths to feed, but also shifting diets driven by rising incomes. As the poorest peoples' incomes increase, so too will their appetite for more meat, milk and eggs, resulting in a larger portion of animal protein in the 'caloric pie' of the future.

Furthermore, the demographic pressures of population density and age combined with food production geography, present great opportunities for distribution technologies. For instance, the greatest concentration and number of people will be born and live in relatively poor, low-tech, low-infrastructure, low-yield agricultural countries in Sub-Saharan Africa and Asia. Most will live in urban centres – 50% today and an expected 70% by 2050 – where these masses will be food consumers, not food producers.

More than two billion people currently have an income of less than US\$1,50/day. How much food can one purchase for \$1,50?

Developments in technology

The total available, fertile and arable land for food production is already largely employed. Technologies that drive the efficiency of limited resources – such as land, water and fertiliser – increase the yield of crops and animals, increase the harvest of said crops and animals by way of pest and disease prevention, decrease wastage by improving consumer habits and inhibiting spoilage, and improve distribution from areas of abundance to those of need.

This means that technology has to boost the entire global food system and therefore must feature centrally in our epic endeavour – feeding mankind. The future of technology on global food production is a pie too big to be swallowed whole.

The following principles and opportunities are therefore suggested for discussion:

- The nature of technology and breakthroughs, the diffusion of innovation.
- The force multiplier effect.
- Disrupter technologies within reach, 3D printing, CRISPR/Cas9, Transgenic, GMO Ug99-resistant wheat, drones.
- Disrupter technologies within sight, entomophagy, hydrogenomonas microbial protein.
- Faster horses, robotics, driverless machinery, precision agriculture.
- Fresh horses, aquaculture, hydroponics, algae, neo-spatial farming (subterranean to rooftop).
- The speed of now, big data, web/cloud.
- MyBio, wearable bio-analytics and bio-informatics, 'print your meal'.