

Presentation Jochen Weiss

Technology helps to shape the future of the world food system, but not alone!

New technologies have made it possible for agriculture to keep pace with the tremendous increase in world population that has more than tripled over the course of the twentieth century, and technology is once again expected to provide solutions for the challenges that lie ahead of us. In this context, Jochen Weiss, professor in food nanotechnology at the University of Hohenheim in Frankfurt, gave his perspective on the impact of new technology applications – such as nanotechnology and biotechnology – on food supply over the course of the next fifteen years.

The Nano evolution

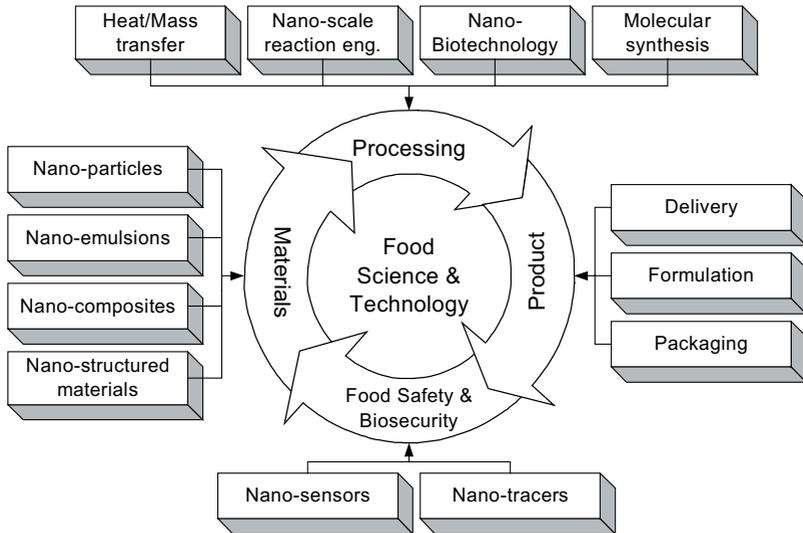
Nanotechnology is an evolution - not a revolution as was predicted during the 1980's – deriving from such disciplines as chemistry, physics, interface science and micro fabrication. The prefix 'nano' refers to the specific properties and behaviour of processes and material structures at 10^{-7} – 10^{-9} m. In relation to food science and technology, nanotechnology has evolved into a conceptual framework that enables the design of more complex structures using nano-scale building blocks, and thereby constitutes a paradigm shift from traditional food manufacturing – the results of which are yet unknown.

Nanotech is already part of our daily life

Nanotech is already present in technical and household products. Indeed, nanotech devices are used as catalysts in petrochemical refinery, as “data collectors”, in cosmetics and tennis racquets and in the fabrication of stain resistant textiles.



Applications of Nanotechnology in Food Science and Technology



The use of nanotechnology in the food industry can lead to a multitude of applications. For instance, porous nanofibers give an extremely high surface to volume ratio and can therefore be used where enzyme immobilisation is required. In the field of food safety, nanotech bio-molecular sensors are developed for food pathogen detection, proving far more rapid than other conventional methods. Functional food ingredients derived from nanotechnology have the potential to be very different components with different functions. Examples include micro-emulsions with varying characteristics, liposomes and nanoparticles which form the basis of modern anti-cancer drug delivery systems.

Nanotechnology can make processes more efficient

Nanotechnology has various implications for a world with diminishing resources, especially in developing countries. Its application could enable better use of natural processes (i.e. self assembly or 'assisted' assembly), resulting in less labour and energy intensive production. It could also help to improve the use of previously underutilised resources and materials to achieve both current and new functionalities. The art of using nanotechnology lies in its initial design and its functional structure, and less in the actual process.

The virtues of nanotechnology

An important question to ask is whether nanotechnology can bridge the gap between consumer demand and diminishing resources. The following examples help to answer this question:

With respect to diminishing resources, nanotechnology can be used for:

- Saving energy: nanofabrication processes may require less energy consumption than traditional processes, resulting in substantial energy savings.
- Less production of waste & increased sustainability: raw materials may be used more effectively, while materials that were not used previously (as a result of performance issues) may come to be used (e.g. wider use of cellulose based renewable materials);
- Water usage & purification: while probably having only very limited impact on the overall usage, nanotechnology does have the potential for improving water purification methods.

The impact of nanotechnology on growing consumer demand can be:

- Healthier food: nano encapsulation will be a key tool for incorporating bioactive ingredients into food, while new structures may also help to hinder the performance of 'less healthy' ingredients (e.g. fat reduction, replacement)
- Safer foods: Food safety may be improved with enhanced detection methods.

Consumer driven developments

Currently, the development of nanotechnology is being stimulated by scientists and not by consumers, while information pertaining to the benefits and the risks of this technology are not being effectively communicated to the public in general. This could very well generate a scenario in which nanotechnology is not used to its full potential.

Therefore, "there is a strong need to increase the involvement of industry, government and consumer organisations in the debate on nanotechnology. This needs to happen immediately and will be the major focus of the next ten to fifteen years while new applications are being developed."