Nanotechnology: engineering better building blocks for agriculture

BY PETER GREDIG

It's hard to find a simple definition for the science of nanotechnology. The key word is small. Super small. To get a handle on just how small, if we compare a nanometre to a metre, a nanometre would be a marble. A metre would be the size of the earth.

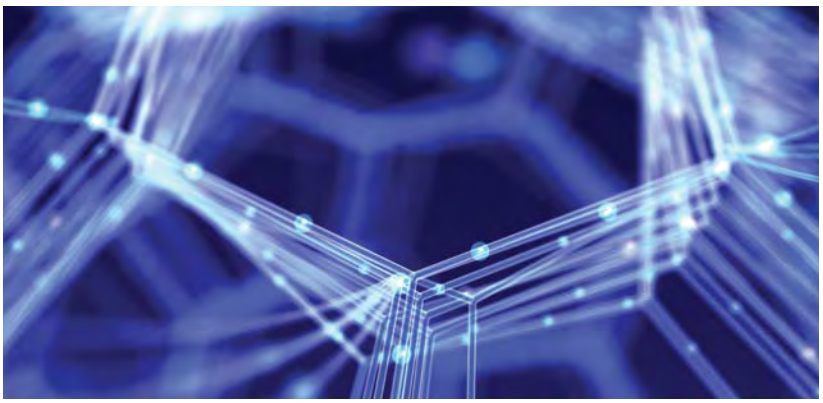
The power of this science is the ability to engineer items from the bottom up. Instead of building or using existing components or molecules to engineer products or devices, nanotechnology is used to create building materials at the molecular level with optimal features for the task at hand.

Existing examples include lighter, stronger tennis rackets and golf clubs, sunscreen lotions, stain-resistant clothes and carpet, and packaging to keep food fresh longer. There are hundreds of nanotech products we are using daily without knowing it.

There are big opportunities for nanotechnology in agriculture. Nanopesticides could be more environmentally benign and provide more effective and targeted control of weeds, diseases and insects. Nanofertilizers are being developed to minimize leaching, control the release of nutrients and improve the uptake of nutrients by plants. Nanoparticles could also be used to administer vaccines or animal health products more effectively with less potential for resistance.

Nanosensors work by detecting electrical changes in the sensor materials. There is ongoing research to create nanosensors to closely monitor plant health and growth. The information could be delivered wirelessly to smartphones to alert farmers if plants are under stress of any kind. Nanosensors can also be built to detect bacteria and viruses. This is already used in food-processing scenarios and could be applicable for livestock operations.

The potential for nanotech in agriculture is significant, but to date, commercially available products have been slow to develop. The problem is return on investment – the development costs are significant and the benefits can be difficult to measure.



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The United States Department of Agriculture recently announced an investment of $5 million to support nanotechnology research at 11 universities.

Auburn University proposes to improve pathogen monitoring throughout the food supply chain by creating a user-friendly system to detect multiple foodborne pathogens simultaneously, accurately, cost effectively and rapidly. Mississippi State University will research ways nanochitosan (a polymer used extensively in the medical field) can be used as a combined fire-retardant and antifungal wood treatment that is also environmentally safe. Experts at the University of Wisconsin will work to develop nanoparticle-based poultry vaccines to prevent emerging poultry infections.

While nanotechnology has been slow to emerge in mainstream agriculture, the research is under way and we will see nanotech products in the near future. ■

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