

Overview of nanotechnology and Other Technologies

Nanotechnology is the study of and manipulations of materials at atomic, molecular and macromolecular scales, where the properties differ significantly from those of normal scale. One micron is 1000 nanometers (a human hair is 80,000 nanometers wide). The small size of a nanoparticle gives a larger surface area in proportion to size and increases reactivity or intensifies color and flavor. Particulate clay and ash are nanoparticles in nature. New products now in use include stain repellent in clothing and sunscreens to absorb light. Current research in agriculture includes production of precision farm sensors to be linked through GPS to detect soil conditions, insects or disease and smart delivery systems to deliver chemicals in controlled targeted manner. Use of multiwall carbon nanotubes that penetrate through the thick coatings on seeds could stimulate germination of seeds. Food industry is currently using nanoparticles, for example titanium dioxide is an approved coloring and anticaking additive used in sugar products. Nanotechnology may be important in the future, but with the rapid expansion and new uses questions as to safety and potential toxicity needs to be addressed. Risks include the ability of the particles to cross the blood-brain barrier, dermal, placental and other barriers with potential impacts on biological system and controls. The University of Missouri had a recent study that indicated silver particles used as pesticide on pears, can be retained on the surface, and be taken into the body. The EPA is in the process of developing rules and guidance. They are maintaining a product focused, science based regulatory policy and will continue post market monitoring. The need for transparency in research, use and labeling is essential. Public involvement and education is also critical as these new technologies develop.

New More Efficient Agriculture Equipment results in tractors and harvester that emit less particulate matter and are more productive. Planting equipment modifications reduces tillage and lessens soil erosion.

Light Resources. Agriculture is dependent on light for photosynthesis process. New green house and vertical farming techniques are being developed using LED artificial light sources. The controlled environments eliminates many disease, insects and weed problems, but nutritional quality and required input of energy questions still need to be answered.

Biofactories Biotech companies are creating organism to manufacture chemicals and compounds that are currently being extracted from plant sources. Yeast has been genetically modified to convert sugar to medicine, create biofuels and other products. In the future these new products may impact agriculture and food.

Energy Resources. Farmers have long used wind power to pump water and generate electricity; and now they are turning to add wind turbines, solar power and biomass energy. Biofuels are being used for transportation. Anaerobic manure digesters collect manure; convert it to methane that is then used as energy for the farm or to sale. This adds additional protection of water from pollution.

Use of Satellites, GPS and Computers to control field operation, monitoring irrigation, tracking soil nutrients, and forecasting weather conditions, and predicting yields.

New technologies require investment in both labor and capital. Farmers need to evaluate the technology on what they can gain and look at all ideas.