

Nanotechnology - Unforeseen Agricultural Damage

2015

Nanotechnology - Unforeseen Agricultural Damage

It all started with one word, six resounding syllables- sustainability. Within agricultural communities and industries, we are undoubtedly faced with many daunting challenges. One of which is putting food on the tables and clothes on the backs of people from every part of the globe while global population continues to rise. We- as Americans- diligently rise to such challenges, putting the best and brightest minds to work, creating the most viable technological solutions; it is what we do. Although, as a very famous Marvel superhero once quoted so eloquently, “with great power comes great responsibility.” We mustn’t ignore the innovations laid before us, but it is crucial that we proceed with caution in pursuit of them.

Good afternoon everybody. My name is Samantha Young, and I am here today representing the Amanda-Clearcreek FFA Chapter. Biotechnology continues to thrive in agriculture. We have all heard about it; GMOs are a hot topic, and animal mortality composting is slowly replacing current methods of livestock disposal. But I would like to inform everyone about a relatively new scientific discovery that could be devastating to agriculture if left uncontrolled: nanotechnology. So, what is nanotechnology? What may sound like a very unlikely agricultural topic may determine the world’s agriculturally economic future. When a majority of people think nanotech, they think of science fiction, or “shrunk, invisible” life forms. This is not the case. Explored by Japanese researchers, and later developed by American engineers in the 1970s, it is the research and engineering of everyday particles to exponentially smaller sizes, thus erecting the nanoscale. Materials have different properties at the nanoscale as opposed to macroscale- the size we all learn about in high school chemistry. For example, some

are more combustible or have different transparencies and even colors. This science has been applied to agricultural methods over the last few years. "From precision farming to granular plant health monitoring, or even food packaging to food processing, these particles are being implemented in devices, chemicals, and sensors that we may be using on our farms or putting on our market shelves" (Soutter, 2012).

With an entirely new batch of particles to engineer with, nanotechnology and nano-engineering yield unimaginable developments in the ever-changing, technological American society; however, with an evident lack of regulations as it progresses, are we as an agricultural community, nation, or ultimately planet, ready to take on such a uncharted area of science without being counterproductive? With the endless variety of suggested benefits and production increases, is the field perhaps too good to be true? Currently, the answer is yes. Despite its seemingly promising future in technology, especially agriculturally, this future is unattainable without proper development and control. What we as a society must consider are the proven effects of nano-materials on plant development and animal health that should and must be addressed before nanotechnology is allowed to advance.

Beneath the surface, the risks significantly outweigh the benefits. "According to the National Institute for Standards of Technology, certain metallic nanoparticles can lead to 22% plant reduction and even unintentionally alter plant DNA through oxidation" (Beyond Pesticides, 2010). Imagine the production losses suffered if our fields produced 22% less than their intended crop yield. Widely infused in cosmetics, sunscreens, clothing, food, and food packaging, the particles can also end up in wastewater through- say- taking a shower to wash sunscreen off after coming home from the pool. "Because

of their miniscule size, they accumulate in biosolids at wastewater treatment plants, and in some states, this sludge is often sold as fertilizer" (Scherer, 2012).

Naturally, with the industry expanding, it is better to scrutinize and proceed with caution, or develop environmentally safe methods rather than pay the price later. "Yet, the U.S. Food and Drug Administration's Nanotechnology Task Force 33 declared that despite the proven special properties of nanoparticles, no further testing is needed" (Soliman, 2012). So we are exposing our farm animals and crops to untested nanoparticles, which many states do not take measures to filter in waste treatment, and are eventually eaten by us. Additionally, we are operating on a leap-of-faith basis with a field that has been dubbed the industrial revolution of the 21st century. The potential consequences are far too great. Nanoparticles could have very desirable advancements, but preventative measures have not been taken in its rapid pursuit. In short, we could be creating larger problems than we are solving.

Not to mention the harm that nanotechnology has when exposed to animals. Recent experimentation performed by the International Agency for Cancer Research revealed that nanoparticles are known to harm various mammals, damaging their brain cells, lung tissue, and liver cells after breathing and ingesting small concentrations of nanoparticles because of their molecular reactivity. "In a specific study, laboratory mice inhaled trace samples of nano-sized titanium dioxide and within two days, their brain chemistry was found to be significantly and negatively altered" (Benninghoff, 2008). With nanocapsules containing similar particles recently being applied to animal feed, we are subjecting our farm animals to such chemicals and equipment without any

methodology advanced enough to deem whether or not it won't harm them, or even us, in the near future.

With the correct approach, nanotechnology could revolutionize farming, but it should not be advocated without very extensive safety measures and experimentation. Otherwise, it could directly damage agricultural land through exposure from farm technology, let alone contaminated compost from wastewater, which we have no way of properly filtering yet. This, in turn, could threaten the agricultural industry. As the technology becomes more widespread, the problem is only worsened, not only from an industrial standpoint. When the agricultural products developed with nanoparticles are spread across the market and used at home on the family farm, they could alter crop DNA and harm animals that help rural communities thrive. That's only the beginning; a ripple effect will inevitably ensue.

The implications of nanotechnology are- without a doubt- profound. But with an apparent lack of regulations, lack of technology suited to test materials with such special properties, and lack of means of filtration for its materials, the harm outweighs the good insurmountably. We must advance as a society, but we do not want our technological maturity to destroy and surpass our agricultural availability. The possibility that animals, land, and humans all around the world- including here in Ohio- could be negatively affected because of nanotechnology, is all too realistic unless we take steps now. The world needs agriculture, and as we continue to utilize it, we must protect it for generations to come. The degree of caution with which we choose to pursue such monumental endeavors is in our hands. I encourage each student, teacher, farmer, and

legislator to educate themselves on the subject of nanotechnology, to evaluate it, and most importantly to act. Thank you.

References

- Beyond Pesticides. (2010, August 13). *Antimicrobial Nanoparticles in Soil Can Harm Plant Growth*. Retrieved from <http://www.beyondpesticides.org/dailynewsblog/2010/08/antimicrobial-nanoparticles-in-soil-can-harm-plants/>
- Benninghoff, A., & Hessler, W. (2008, November 11). *Nanotechnology Damages Brain Cells*. Environmental Health News. Retrieved from <http://www.environmentalhealthnews.org/ehs/newscience/nanoparticles-damage-brain-cells/>
- Scherer, C. (2012, April 27). *Nanotechnology May Damage Plant DNA*. Agronews. Vance Publishing Corporation. Retrieved from <http://news.agropages.com/News/NewsDetail---6764.htm>
- Soliman, A. (2012, October 16). *The Need for Stronger Nanotechnology Regulation*. Food Safety News. Retrieved from <http://www.foodsafetynews.com/2012/10/why-we-should-have-more-regulations-on-nanotechnology/#.VaQyXsKh0aI>
- Soutter, W. (2012, December 7) *Nanotechnology in Agriculture*. AzoNano.com. Retrieved from <http://www.azonano.com/article.aspx?ArticleID=3141>