MEMORANDUM

TO: Interested Parties
FROM: Andrew Green
DATE: September 4, 2012
SUBJECT: Recent publication on effects of nanoparticles on soybean plants

A recent publication of a study on the effects of nanomaterials on soybean crops (PNAS Plus, August 20, 2012) has been reported by numerous online media centers including BBC News, Discovery, notable science news sites, and several other journalists. The publication and related articles highlight that nano ZnO improves crop productivity and zinc concentration in plants, but it is suggested that the latter result is negative and poses a potential risks to humans.

One of the findings in the study states:

> *"Zn substantially moved aboveground from nano-ZnO treated soils: Zn concentrations increased in a dose-dependent fashion in the stem, leaf, and soybean pod tissues, with more than six times more Zn in the stem, four times more in the leaf, and nearly three times more in the soybean pod, when comparing the high nano-ZnO treatment vs. control."*

Though this finding is, in fact, positive, the authors deem it as potentially harmful, following it up with somewhat ambiguous statements such as, *"Very high Zn accumulations could cause long-term impacts to either plant or human health, but the extent and relationship to Zn form (including nano-ZnO) in the plant are unknown."*

In reality, increased crop production and zinc concentration in plants is an encouraging result and one we would anticipate—indeed, these are the two key objectives of adding zinc fertilizer to crops. Numerous publications have highlighted the need for zinc fertilizers and research into improvements in crop production and zinc concentration in plant tissue (Welch and Graham, 2004; Cakmak, et al., 2010; Cakmak, 2012).

Journalists have adopted the negative connotation toward increased zinc uptake in plants despite the fact that in the appendix of the report the authors of the study conclude that there is absolutely no risk to humans. Although, unfortunately, this statement is not included in most of the articles and blogs that have reported on this study:

> *"…Ingesting 100g dry soybean mass from our study would deliver approximately 8mg Zn,*

which is well below the tolerable UIL for adults. Since children would consume less, as their protein requirements are less than adults, they should also not be at risk. Bioaccumulation levels would need to be approximately five times more total Zn than we report to reach bean Zn concentrations that are harmful to human health."

Zinc deficiency is a global problem that many organizations have been addressing for a number of years—including IZA through programs such as Zinc Saves Kids and the Zinc Nutrient Initiative as well as partnerships with a number of active international health organizations such as the Gates Foundation, the MDG Health Alliance, GBC Health, the Clinton Health Access Initiative, USAID, and the United Nations Foundation.

In conclusion, although we find the results of this study, specifically increased crop production and zinc uptake, to be very positive, we have great concern over the inappropriate interpretation of the these results. The risk of over-exposure to zinc in any capacity is negligible compared to the life-threatening reality of underexposure to zinc—which is far and away the bigger, more immediate danger. The misplaced concerns created by this report and the subsequent articles are capable of overshadowing the *real* problem of zinc deficiency in humans and crops, a serious global issue affecting food security and children's lives.

References

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