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MEMORANDUM

TO: 4R Committee

FROM: Sally Flis, Director of Agronomy

SUBJECT: Comments on 'Air-quality-related health damages of maize'


DATE: April 10, 2019

The Fertilizer Institute (TFI) has compiled comments on the recent paper 'Air-quality-related health damages of maize' published in Nature Sustainability (<https://doi.org/10.1038/s41893-019-0216-y>). In the article, the authors calculate a life-cycle-emissions inventory for ammonia emissions from corn production.

Statements and responses for the paper:

The authors state that the dominate contributor to maize production-related ammonia emissions is from the use of synthetic fertilizer and manure application. However, the authors focused on corn production areas which resulted in 70 percent of the ammonia emissions in the 2,000 counties that were evaluated estimated to be from synthetic fertilizers. The authors do recognize in the paper that ammonia emissions from animal production represent 55 percent of US ammonia emissions. Further, ammonia emission from urea is assumed to be over 16 percent, this would seem to assume all urea is applied by broadcast with no incorporation. Other work also supports a much lower emission coefficient for urea applied and incorporated.

The authors state that reductions in NH₃ emissions of 16 to 88 percent can be achieved with the use of precision ag, optimum fertilizer types and application methods. The paper does not attempt to credit or recognize the amount of implementation of these practices that is available in the literature. The 4R Framework recommends selection of the right source, right rate, right time, and right place, and includes precision ag practices and enhanced efficiency fertilizer products. Enhanced efficiency fertilizer products, like those that have urease inhibitors and a combination of urease and nitrification inhibitors have been shown to decrease both NH₃ and N₂O losses from fertilizer applications.



²The following information is available on the use and implementation of precision ag and optimum fertilizer types and application methods and should be recognized in emissions calculations:

- Precision ag practices like, soil mapping with GPS and yield monitor data, provided by agricultural service providers have increased every year since 2008 (CropLife, April 2018).
- A 2016, Economic Research Service report based on USDA farm survey data, reported that 28 percent of corn acres in the US have implemented variable rate application for nutrients.
- 4R practices around timing of N application can also reduce N loss and improve N use efficiency. Around 80 percent of the total nitrogen applied to corn covered by ARMS was applied in the spring, at planting, or after planting in 2016 was reported by the USDA in the “Agricultural Conservation on Working Lands: Trends from 2004 to Present”.
- At the national level, the use of enhanced efficiency fertilizers (EEFs) in corn increased from 8.5 percent in 2005 to 12.5 percent in 2010 by the USDA in the “Agricultural Conservation on Working Lands: Trends from 2004 to Present”.

The authors recommend rewarding good practices in the right locations could offer large benefits per tonne of maize produced. The Fertilizer Institute supports the use rewarding good practices and has been involved in the following programs that are currently available:

- USDA-NRCS programs are available to help farmers implement 4R practices, precision ag, and the use of enhance efficiency fertilizers

The authors state that the East Coast has the largest potential for mortalities per tonne of maize produced. The Fertilizer Institute has recognized farmers and ag retailers in these geographies that are implementing practices related to reduced ammonia emissions.

- 4R advocates in DE, MD, and VA are implementing precision ag practices like variable rate application for N in addition to only applying N in the growing season and placing N fertilizer in the soil for reduced losses. These 4R advocates are also using EEF products when they fit in the 4R program to further reduce NH₃ and N₂O losses.
- Case studies with 4R advocates demonstrate that more advanced 4R practices reduce the cost per acre for growing a crop while also reducing GHG emissions.

For questions on the paper or the sources for the comments contact Sally Flis, sflis@tfi.org