Fertilizers and Climate Change

Media Backgrounder

Paris, December 1, 2015. With a growing world population and ever increasing global demand for food, it is more important than ever to maximize crop yields, and fertilizer will play a critical role in achieving that goal. Accordingly, the focus of greenhouse gas (GHG) reduction efforts must be on improving the relative carbon intensity of agricultural crops grown with the assistance of fertilizers, rather than on reducing absolute emissions. In other words, efforts should be placed on increasing nutrient use efficiency without jeopardizing productivity.

It also bears emphasis that fertilizer related GHG emissions can be substantially mitigated as a result of enhancing crop intensity through the use of fertilizers. Fertilizers play a key role in helping to maintain the integrity of the globe's forests (an essential carbon sink) by allowing for increased productivity on arable land, thus forestalling deforestation and its associated GHG emissions. Fertilizers also increase the carbon sequestration potential of agricultural soils by contributing to the building up of soil organic matter. Increased soil organic matter generates higher nutrient uptake, and nutrients stimulate plant growth, which, in return, contributes to absorb more CO_2 from the atmosphere.

Considering that global agricultural output would be reduced by 50% without the use of mineral fertilizers, the 2.5% of total GHG emissions related to fertilizers seems rather negligible—especially when compared to the 11% directly associated with agriculture and the additional 10% that relate to forestry and other land uses.

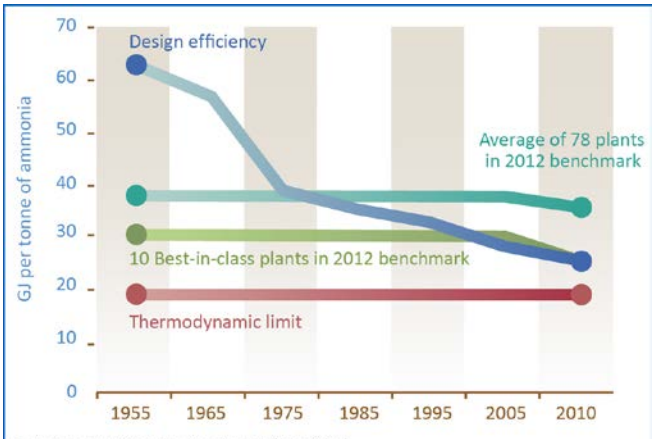
Nonetheless, the industry is strongly committed to continue reducing fertilizer-related greenhouse gas emissions. As 1.5% of their total emissions derive from product applications, the biggest scope for ongoing emissions reductions are to be found at the farm level.

Industry engagement to limit greenhouse gas emission

The fertilizer industry works with scientists, farmers, international organizations and governments to develop and adopt innovative agricultural practices that contribute to reduce greenhouse gas emissions. A large number of programs are developed worldwide to implement soil- and crop-specific nutrient management practices with the objective to optimize product efficacy and minimize nutrient losses to the environment:

1. Fertilizer best management practices consist in applying the right fertilizer source at the right rate, right time, and right place. This initiative is called the **4Rs**.
2. Research and training on **soil analysis** allow for the development of locally adapted protocols on application rates, for instance in relation to the moisture content, pH or temperature of soils.
3. **Precision agriculture** offers a range of monitoring technologies that help farmers to apply precisely the right amount and the right type of fertilizer.
4. **Integrated plant nutrient management** promotes a better integration of locally available organic nutrient sources such as animal manure and compost with mineral fertilizers.

As far as production-related emissions are concerned, fertilizer manufacturers across the globe have been taking substantial measures to reduce their carbon footprint and continually strive to improve their energy efficiency, as evidenced in IFA's benchmark results on energy efficiency and greenhouse gas emissions. For instance, consumption of energy by ammonia plants has decreased by more than 15% over the past decade. Overall, fertilizer production has become increasingly efficient over the last several decades due to the adoption of best available technologies.



Global energy efficiency benchmark (IFA, 2012)

To facilitate carbon sequestration, the number one priority is to prevent further deforestation through sustainable intensification.

Making the most of existing farmland is essential to meet the world's food security needs and to protect forests from being destroyed, burned and converted to agricultural land.

Crop yield intensification has proven to lead to measurable carbon dioxide reductions. However, intensification must be driven **by sustainability objectives**: To that end, the industry engages in multiple partnerships to disseminate knowledge of responsible, balanced and site-specific fertilizer use.

STANFORD STUDY: A 2010 research study has estimated that about one billion of hectares of land had been preserved from conversion to cropping between 1961 and 2005 because of advances in crop productivity, leading to carbon emission savings of 317 to 590 Gt CO_2-eq from not converting that area (Burney *et al.*, 2010). The authors conclude that "*although GHG emissions from the production and use of fertilizers have increased with agricultural intensification, those emissions are far outstripped by the emissions that would have been generated in converting additional forest and grassland to farmland.*"

ICCA: The International Council of Chemical Associations (ICCA) squarely puts fertilizers into the category of (chemical) products whose use can lead to emissions reductions in excess of the amount of GHG emitted during their production.

Intensification does not automatically stand for an increase of fertilizers, but for well targeted use, illustrated by protocols like "*microdosing*" (the equivalent of a full bottle cap per seed hole) or the broad development and marketing of "*specialty fertilizers*", such as slow- and controlled-release fertilizers. The ultimate aim of correct fertilization is to increase fertilizer uptake by the plant while reducing losses to the environment.

More information:

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