

The US fertilizer industry: sustainability champion

The priorities of the US fertilizer industry are becoming strongly aligned with United Nations Sustainable Development Goals (SDGs). **Lara Moody** and **Melinda Sposari** of The Fertilizer Institute explain how US fertilizer producers, distributors and retailers are raising the bar on sustainability and making a very real contribution towards SDGs.

Sustainable Development Goals (SDGs) are an urgent call to action. The 17 SDGs, formally adopted by the United Nations in 2015, are designed to eradicate global poverty and create a more prosperous world. The culmination of decades of global collaboration, they recognise that efforts to improve health and education and tackle climate change will also bring economic benefits by spurring world growth.

Through their support of SDGs, more than 178 countries have committed themselves to a global partnership on sustainable development, with a particular focus on improving lives and protecting the environment. Over the next two decades, governments across the globe will be expected to collaborate with stakeholders, including industry, to meet the 17 SDGs. Expanding and accelerating efforts to protect the earth's oceans and forests will be central to achieving these objectives.

The 17 SDGs form the core of the recently-published *Transforming our world: the 2030 Agenda for Sustainable Development*¹. Each SDG includes a number of specific targets to help monitor progress towards achieving the overarching goal. In turn, each target comes with its own quantifiable indicator. These indicators, adopted by the UN General Assembly in 2017, provide a standard and common template that allow businesses, industries and countries to measure and report on progress towards achieving the SDGs.

Why link business actions to SDGs?

Valuably, the SDGs provide a ready-made platform that industry can use to guide its own efforts on sustainability when communicating and engaging with employees. In 2010, the US Department of Commerce

recognised that better understanding of sustainable practices improves competitiveness, profitability and job growth².

The SDGs require countries, governments, and businesses to work together collectively, taking a three-pronged, integrated approach towards protecting human rights, promoting gender equality and protecting the planet and natural resources. The benefits to business are two-fold.

First, sustainable investing – making investments that specifically target and reward sustainable business behaviour – is on the rise and experienced triple digit growth between 2012 and 2014. This exponential growth is being linked to the rise in 'ethical' investments by millennials entering the workforce. A report by Morgan Stanley found that millennials incorporate sustainability into their investment decisions and overall consumer behaviour³. The collective influence of millennials is certainly rising. As a group, they became the largest generation in the workforce in 2018. This desire for more sustainable investing is reflected by the work of the Sustainability Accounting Standards Board (SASB). It recently published a set of industry-specific standards. These focussed on those sustainability indicators most likely to financially impact companies⁴.

Second, SDGs offer companies a standard, common language for communicating their priorities on sustainable development. Referring to SDGs can help businesses strengthen their employee and stakeholder relations. Having a common language on sustainability also opens the door to partnerships with governments, other companies and social enterprises. By acknowledging and addressing the SDGs, companies can create and implement their own sustainable solutions and

innovative practices. Such actions mitigate risks for the company, their employees, surrounding communities, and the wider environment. In summary, integrating the SDGs within the corporate structure and across the value chain is a win-win-win for companies, people – both employees and wider society – and the environment.

Aligning US fertilizer industry actions with SDGs

The Fertilizer Institute (TFI) released its fourth annual *State of the Industry Report* in February 2019. The report's key performance indicators (KPIs) are based on a rigorous assessment by TFI in partnership with its fertilizer industry members. Using the KPIs, the US fertilizer industry can track continuous improvements across a range of economic, social and environmental activities. The KPIs also provide a valuable yardstick for comparing US fertilizer industry actions and achievements with United Nations Sustainable Development Goals.

While some industry members are contributing to sustainability more widely, the following five SDGs have been identified as particularly relevant and a focal point for TFI:

- Goal 2: Zero hunger
- Goal 6: Clean water and sanitation
- Goal 7: Affordable and clean energy
- Goal 9: Industry, innovation and infrastructure
- Goal 13: Climate action

How the US fertilizer industry is contributing to these goals, and specific SDG targets and indicators, is summarised below. Sustainability achievements are illustrated by case studies from TFI member companies.



Goal 2: Zero hunger

The aim of Sustainable Development Goal 2 is to end hunger, achieve food security, improve nutrition and promote sustainable agriculture.

The fertilizer industry clearly has a vital role to play in achieving zero hunger. After all, we supply the nutrients needed to grow the crops that feed the world. Fertilizers, in the apt words of Bill Gates, are: “A magical innovation that’s responsible for saving millions of lives from hunger and lifting millions more out of poverty by boosting agricultural productivity.”

But, as an industry, we also have an important role to play in increasing agricultural productivity while simultaneously reducing the environmental impacts of farming.

Goal 2 includes the wide-ranging Target 2.4. Its objectives include ensuring that food production systems are sustainable as well as implementing agricultural practices that:

- Are resilient
- Increase productivity and production
- Help maintain ecosystems
- Strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters
- Progressively improve land and soil quality.

Progress towards this target will be measured by Indicator 2.4.1. This monitors the proportion of agricultural land being farmed productively and sustainably.

The objectives and actions of the fertilizer industry overlap and align very strongly with Goal 2 and its subsidiary targets and indicators. In the US, for example, the fertilizer industry is leading the way on sustainable agriculture through its efforts to boost farmer awareness of 4R nutrient stewardship.

The 4Rs approach is based on best management practices (BMPs) for fertilizers. These identify the right nutrient source and apply it at the right rate, the right time and in the right place. Actions by TFI member companies on 4Rs in the US include:

- Employing accredited agronomic professionals to advise farmers
- Investing in product research, technological innovation and infrastructure
- Creating partnerships with leading academic, agricultural, and environmental organisations including the World Wildlife Fund.

TFI members contributed \$1.1 million to the North American 4R Research Fund in 2017. To date, this fund has awarded a total of \$8.1 million to 4R researchers in the US and Canada. Additionally, three TFI member companies are investing \$5.5 million in research and development that specifically supports the 4Rs and innovative product development.



Goal 6: Clean water and sanitation

The objective of Sustainable Development

Goal 6 is to ensure water and sanitation is available for all and is sustainably managed. The goal includes a specific target to increase **water-use efficiency** across all sectors (Target 6.4). This is needed to substantially reduce the number of people suffering from water scarcity by 2030.

Another target covers **the protection and restoration of ecosystems**, including mountains, forests, wetlands, rivers, aquifers and lakes (Target 6.6.) It includes an indicator that measures improvements in these water-related ecosystems over time.

The US fertilizer industry’s efforts on water use efficiency and environmental protection are closely aligned with Goal 6 and these two specific targets.

Water-use efficiency

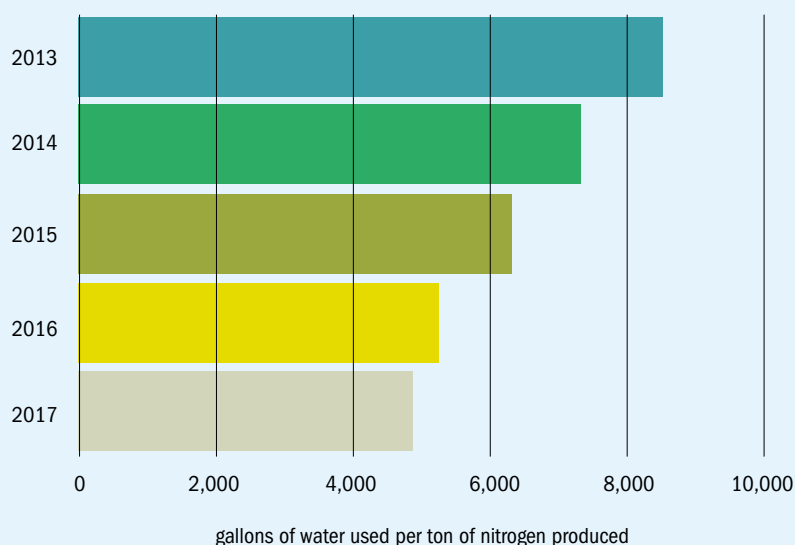
Sustainable water use is a key part of resource conservation for many industries which consume large volumes of water in production processes. US fertilizer manufacturers have been prioritising water recycling and reclamation for a number of years by setting water efficiency and zero-discharge goals.

Indeed, some 29 fertilizer production sites run by TFI members have now achieved zero-discharge status, as shown in TFI’s 2018 *State of the Industry Report*. These efforts contributed to the recycling of 516 billion gallons of water during US fertilizer manufacturing in 2017.

Additionally, water use in US nitrogen fertilizer production (per ton of product) has fallen by 42 percent since 2013, thanks to production upgrades at existing plants and the opening of new, more efficient plants (Figure 1). This is a significant and remarkable reduction, given that the United States is the world’s fourth-largest nitrogen fertilizer producer.

In summary, the water efficiency improvements achieved by the US fertilizer industry over the last five years directly contribute to the UN Sustainable Development Goals (SDG Target 6.4, Indicator 6.4.1), and help meet the obligation of all sectors to deliver major water-use efficiency savings by 2030.

Fig. 1: The US fertilizer industry has reduced water use per ton of nitrogen produced by 42 percent over five years



Source: TFI

CASE STUDY Apache Nitrogen Products, Inc (APNI)

APNI's Benson, Arizona, site produces nitric acid and ammonium nitrate (AN) in dry and liquid form. Process heating and cooling requires 650 gallons per minute of water. The site's water requirements are sourced from groundwater held in deep aquifers.

Two recycle methods are used to capture and treat different water streams generated by the nitric acid production process. First, all liquid waste streams are captured and reprocessed using state-of-the-art, automated Swiss technology to generate clean feedstocks. Second, blowdown streams from cooling towers and boiler systems are collected and reprocessed in a brine concentrator to generate high purity water for AN production. Comprehensive water recycling has increased on-site water use efficiency and allowed APNI to operate Benson as a zero-discharge plant. ■

Protecting and restoring ecosystems

Industry action to reduce the environmental impacts of fertilizer products can contribute directly to the protection and restoration of water ecosystems (SDG Target 6.6). Increasing farm adoption of fertilizer best management practices – based on 4R nutrient stewardship – is a high priority for the US fertilizer industry. Wider uptake of 4Rs by farmers can reduce nutrient move-

ment into surface waters and groundwater, so protecting ecosystems, by limiting nutrient losses from cropping systems.

The US industry is committed to educating, advising and engaging with farmers on 4R nutrient stewardship and best management practices. On average, the industry currently employs 2.3 agronomy professionals at each retailer location. Around 25 percent of these agronomists have a professional accreditation, such as Certified Crop Advisor.



Goal 7: Affordable and clean energy

Sustainable Development Goal 7 is designed to ensure access to affordable, reliable, sustainable and modern energy for all. More specifically, this goal requires a substantial increase in the renewables share of the global energy mix by 2030 (Target 7.2). The US fertilizer industry, being an energy-intensive sector, is participating in this wider shift to more affordable and clean energy.

Fertilizer manufacturers can capture the waste heat generated during the production process and use this for heating and electricity generation to reduce their energy footprint. In TFI's latest *State of the Industry Report*, 101.8 million GJ of waste heat was captured by participating US fertilizer companies in 2017. This is equivalent to 51 percent of their total energy use. Additionally, companies were able to generate 2.3 billion kilowatt hours of electricity using waste heat sources.

The above achievements on energy generation and reuse by the US fertilizer industry make a direct contribution to the SDG target to increase the contribution of renewable energy to final energy consumption (SDG 7, Target 7.2, Indicator 7.2.1).



Goal 9: Industry, innovation and infrastructure

Resilient infrastructure, sustainable industrialisation and innovation are all promoted by Sustainable Development Goal 9. Achieving this will require widespread infrastructure upgrades and industry retrofits to make these more sustainable (Target 9.4). Countries will deliver on this by increasing their resource-use efficiency and adopting 'cleaner and greener' technologies and industrial processes by 2030. Progress will be partly judged by monitoring industry CO₂ emissions per unit of value added (Indicator 9.4.1).

All these themes chime with the US fertilizer industry, which is continuing to innovate and invest sustainably in production capacity and infrastructure.

Recent investments across the US fertilizer sector meet the objectives of Goal 9.



Joe Huebener, CHS Shipman (left), and farmer Kyle Brase (right).

PHOTO: TFI

CASE STUDY CHS Shipman

Joe Huebener is a *YieldPoint* precision ag specialist at CHS Shipman in Shipman, Illinois. Joe works closely with farmers in his area, enabling them to make decisions based on profitability, environmental impact and time management. Corn farmer and customer Kyle Brase says Joe's advice has improved nitrogen use efficiency (NUE) at his farm from 1.5 to 0.9 pounds per bushel. The approach recommended by CHS Shipman has increased corn yields – while using less fertilizer – to deliver a \$10-12/acre cost savings. Improving NUE can increase crop production using less applied fertilizer. It also means applying the right type of fertilizer exactly when and where the crop needs it. Over time, these practices have an environmental benefit too, as they reduce the amount of nitrogen making its way into surrounding ecosystems. ■

Yara International's joint venture with BASF, Freeport, Texas



CASE STUDY Yara North America

Yara in partnership with BASF opened a new ammonia production plant in Freeport, Texas, in April 2018. This first-of-its-kind plant produces ammonia from hydrogen feedstock, rather than the natural gas used at conventional plants. Hydrogen is sourced as by-product from nearby chemical plants, along with nitrogen feedstock supplied by several air separation plants. This innovative plant uses resources more sustainably and avoids GHG emissions, as its hydrogen feedstock was unwanted previously and burned by the chemical plants. ■

The evidence shows that the industry's capital expenditure is having positive impacts on safety, environmental and energy performance. Companies participating in the *2018 State of the Industry Report* invested an average of \$3.8 billion annually in new production plants and infrastructure upgrades between 2015 through 2017. These investments have increased operating efficiency, reduced energy and water use, and cut greenhouse gas (GHG) emissions. The shift towards more sustainable production also strengthens the US economy.

The amount of GHGs associated with fertilizer production fell from 1.6 to 1.1 metric tons per nutrient ton, as a result of upgrades and new plants coming online in 2016. This emissions reduction fulfils SDG objectives on reducing the amount of CO₂ emissions per unit of value added (Indicator 9.4.1).

Investments in technology and tools to protect the environment are equally important in the fertilizer retail sector, as these enable retailers to help farmers deliver 4R nutrient stewardship in their nutrient management plans. High-tech farm equipment often comes with a price tag well into six figures. Retailers, by deploying expensive precision agriculture tools on customer farms, can help farmers meet or exceed their economic and environmental goals.



Goal 13: Climate action

Sustainable Development Goal 13 requires urgent action to combat climate change and its impacts. It includes a target to integrate climate change measures into national policies, strategies and planning (Target 13.2). Progress towards this is monitored by the successful introduction of integrated policies/strate-

CASE STUDY Foundation for Food and Agronomic Research project

In 2017, the US fertilizer industry in partnership with the Foundation for Food and Agronomic Research jointly funded a \$2 million, multi-state research project. This was organised through the 4R Research Fund and coordinated by Iowa State University. The project is measuring phosphorus and nitrogen losses, including N₂O emissions, from multiple sites where the 4Rs are practiced at locations across the US Midwest. Project observations and outcomes will be used to improve knowledge about the 4Rs and fine-tune strategies that help reduce the environmental impact of fertilizer use in food production systems. ■

gies/plans that foster climate resilience and low GHG emissions but do not threaten food production (Indicator 13.2.1).

TFI has successfully added a priority research area in the latest US Farm Bill. This ensures funds are available to evaluate and advance 4R practices. This is a prime example of how the fertilizer industry can contribute directly to Sustainable Development Goals on climate action (Goal 13, Target 13.2, Indicator 13.2.1).

Under certain conditions, GHGs in the form of nitrous oxide (N₂O) can be emitted from the nitrogen fertilizer applied to soils on farms. Such emission are site-specific, however, being linked to location and weather conditions as well as the 4Rs (fertilizer source, rate, timing and placement).

In 2018, the 4th National Climate Assessment identified the 4Rs as an effective climate change adaptation tool. The US fertilizer industry is working closely with others to raise awareness of the ability of fertilizer management to reduce GHG emissions. Companies in the food supply chain are key stakeholders when it comes to mitigating GHG emissions from crop production. The industry is therefore working with these companies, helping to inform and engage, through its 4R research. It is also collaborating with Field to Market, an NGO that unites those working in the food supply chain to deliver sustainable outcomes for the whole of agriculture.

The 2018 State of the Industry Report

The Fertilizer Institute is proud of the great strides being taken by the US fertilizer industry and its member companies to address UN Sustainable Development Goals. For greater insight and more examples of US industry actions on sustainability, the full *2018 State of the Industry Report* can be viewed here: tfi.org/our-industry/state-of-industry ■

About the authors

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