



2016

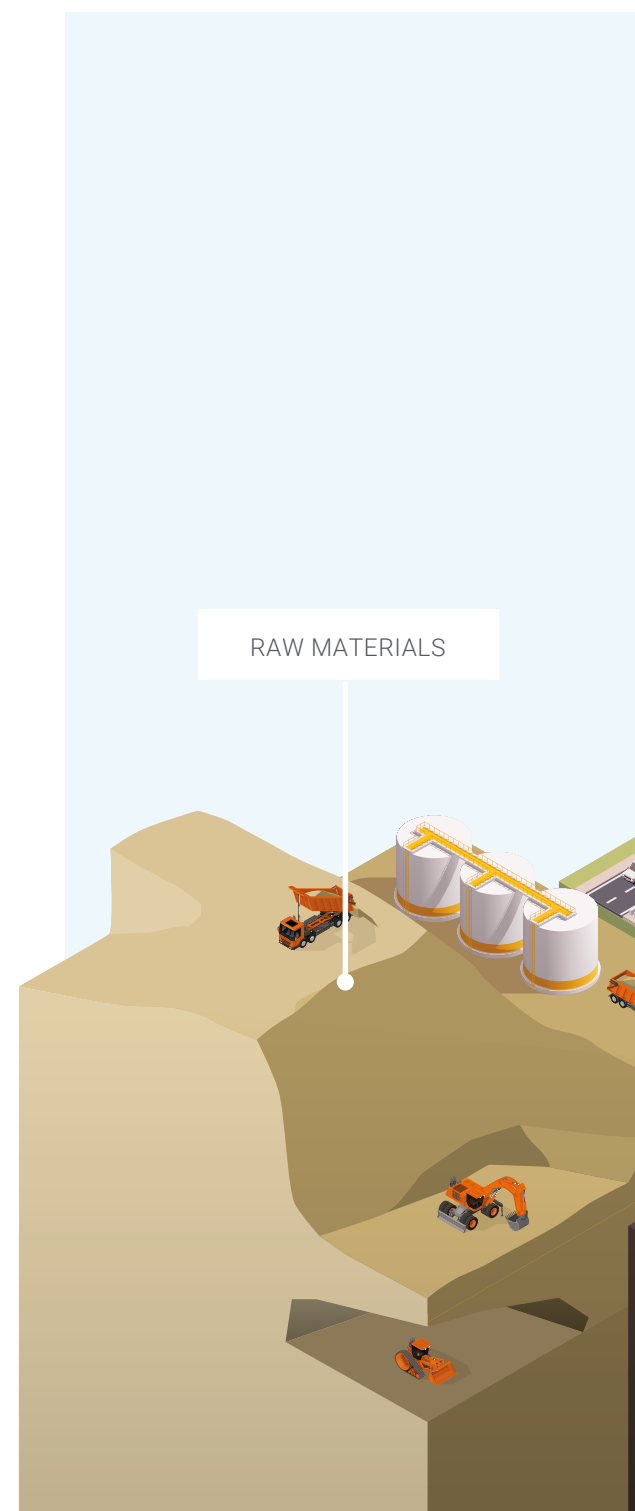
STATE OF THE
**FERTILIZER
INDUSTRY**
REPORT



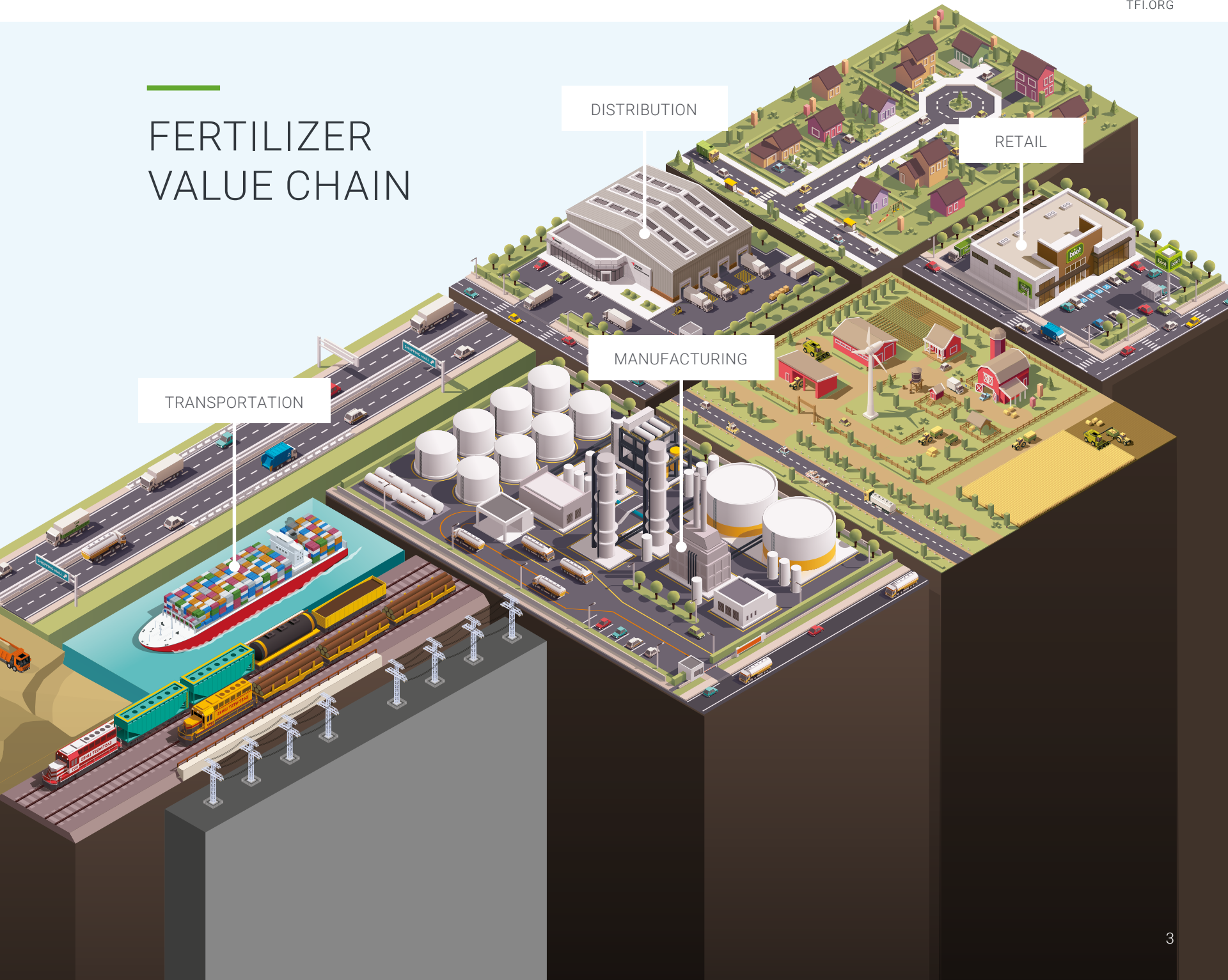
The
Fertilizer Institute

TABLE OF CONTENTS

• FERTILIZER SUPPLY CHAIN	3
• PRESIDENT'S LETTER	4
• ABOUT THE INDUSTRY	6
• INTRODUCTION	10
Participating Companies	11
• PEOPLE AND COMMUNITIES	12
Capital Investments	14
Community Safety	18
Responsible Ag	22
Employee Safety	24
• ENVIRONMENT AND ENERGY	26
Water	28
• Phosphate & Potash Producers	29
• Nitrogen Producers	30
Land Reclamation	31
Energy	34
Greenhouse Gas Emissions	38
• FERTILIZER TRANSPORTATION	40
• FERTILIZER ON THE FARM	46
Agronomic Professionals	48
Nutrient Stewardship Partnerships	52
Enhanced Efficiency Fertilizers	56
• FOOTNOTES	58



FERTILIZER VALUE CHAIN



A LETTER FROM THE PRESIDENT

I am pleased to introduce The Fertilizer Institute's (TFI) second State of the Industry Report. This publication and its corresponding digital version track industry performance on environmental, economic, and social indicators. Only by measuring and evaluating our efforts can we identify areas we can target for improvement.

The future depends on our ability to provide goods and services that help growers feed the world, improve lives, and protect the environment. In short, sustainable growth requires the fertilizer industry to balance economic performance with environmental and social responsibilities. I hope that this report helps you understand the significant steps the fertilizer industry is taking to make positive contributions to the environment, the economy, and society.

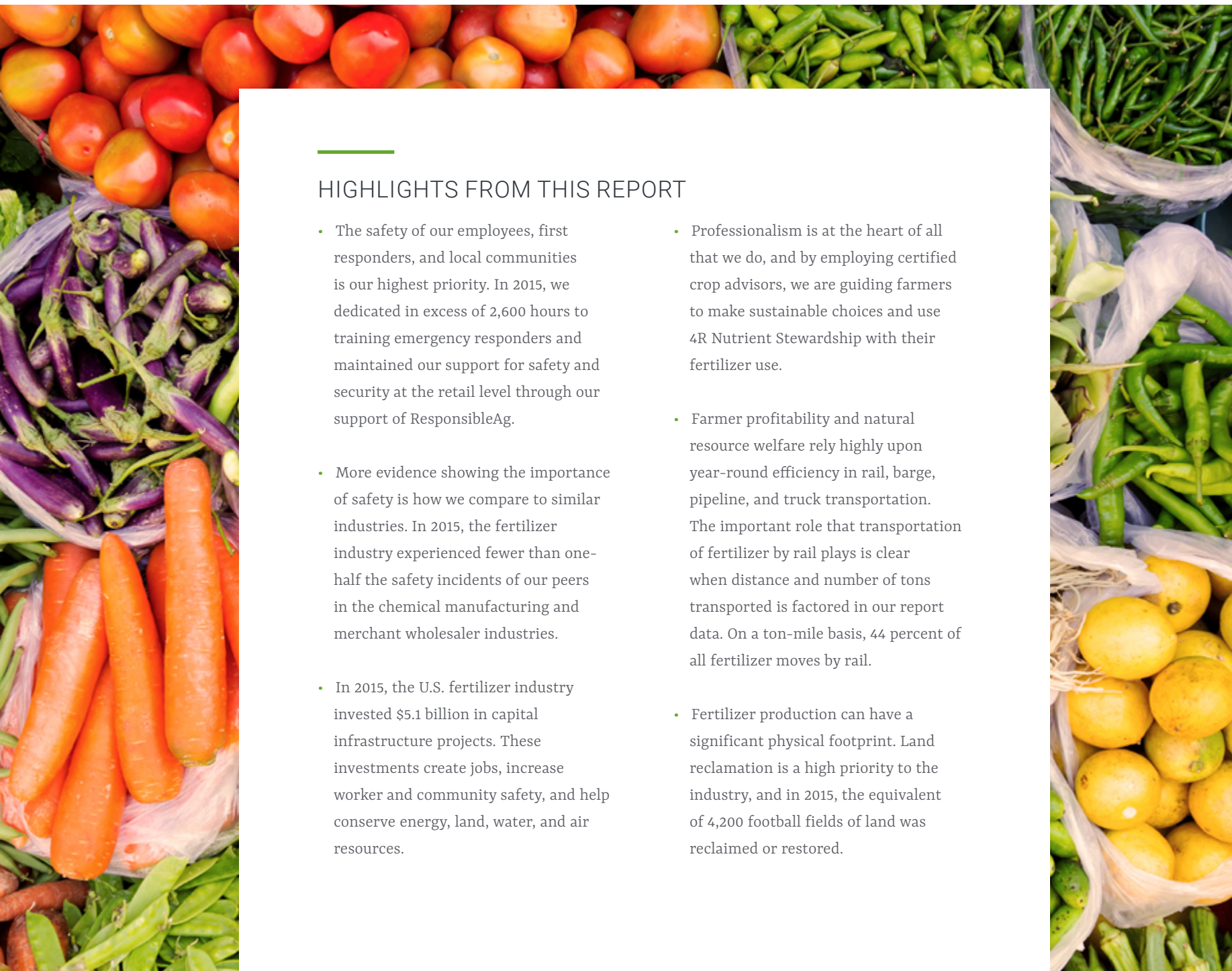
Sincerely,



Chris Jahn

President of The Fertilizer Institute





HIGHLIGHTS FROM THIS REPORT

- The safety of our employees, first responders, and local communities is our highest priority. In 2015, we dedicated in excess of 2,600 hours to training emergency responders and maintained our support for safety and security at the retail level through our support of ResponsibleAg.
- More evidence showing the importance of safety is how we compare to similar industries. In 2015, the fertilizer industry experienced fewer than one-half the safety incidents of our peers in the chemical manufacturing and merchant wholesaler industries.
- In 2015, the U.S. fertilizer industry invested \$5.1 billion in capital infrastructure projects. These investments create jobs, increase worker and community safety, and help conserve energy, land, water, and air resources.
- Professionalism is at the heart of all that we do, and by employing certified crop advisors, we are guiding farmers to make sustainable choices and use 4R Nutrient Stewardship with their fertilizer use.
- Farmer profitability and natural resource welfare rely highly upon year-round efficiency in rail, barge, pipeline, and truck transportation. The important role that transportation of fertilizer by rail plays is clear when distance and number of tons transported is factored in our report data. On a ton-mile basis, 44 percent of all fertilizer moves by rail.
- Fertilizer production can have a significant physical footprint. Land reclamation is a high priority to the industry, and in 2015, the equivalent of 4,200 football fields of land was reclaimed or restored.



ABOUT THE FERTILIZER INDUSTRY

Fertilizer is a key ingredient in feeding a growing global population, which is expected to surpass 9.5 billion people by 2050. Half of all food grown around the world today, for both people and animals, is made possible through the use of fertilizer. As demand

continues to grow, farmers around the world will continue to rely on fertilizer to increase production efficiency to produce more food while optimizing inputs. Fertilizers play an essential role in replenishing nutrients in the soil that are used by plants each

growing season. Three primary nutrients are necessary for plant growth: nitrogen, phosphorus, and potassium. All must be present in soil in the right amount to grow healthy crops.



7

N

Nitrogen

15

P

Phosphorus

19

K

Potassium

NITROGEN IS ESSENTIAL IN THE FORMATION OF PROTEIN, WHICH MAKES UP MUCH OF THE TISSUE PRESENT IN LIVING THINGS.

The earth's atmosphere is about 78 percent nitrogen by volume; however, most plants can't get their nitrogen directly from the air and require nitrogen fertilizer.

Nitrogen fertilizer is made by capturing nitrogen from the air and combining it with hydrogen derived from natural gas. This production method is called the Haber-Bosch process.

PHOSPHORUS IS INVOLVED IN MANY PROCESSES CRITICAL TO PLANT DEVELOPMENT. KEY AMONG THEM IS PHOTOSYNTHESIS, THE PROCESS THAT PLANTS USE WHEN CONVERTING SUNLIGHT TO ENERGY.

The phosphorus in most commercial fertilizers comes from phosphate rock found in fossil remains originally laid down beneath ancient sea beds. Fertilizer manufacturers mine deposits of phosphate rock, which are converted into phosphate fertilizers.

POTASSIUM, ALSO KNOWN AS POTASH, IS ESSENTIAL FOR CARBOHYDRATE AND STARCH SYNTHESIS, AND IT ALSO HELPS PLANTS RESIST WILTING.

Up to 98 percent of potassium in the soil is unavailable to plants in its existing form, making potash fertilizer essential for crop production. Potassium, like nitrogen, also helps plants produce protein as they grow. Potassium, like phosphate, is mined from mineral deposits.



*THE SAFETY OF EMPLOYEES
AND THE COMMUNITIES
LOCATED NEAR FERTILIZER
PRODUCTION AND RETAIL
FACILITIES IS A TOP PRIORITY
FOR THE INDUSTRY.*

WHO IS INVOLVED?

The fertilizer industry is made up of companies who represent the entire supply chain from production to distribution to retail, all working together to deliver fertilizer to farmers in a safe, timely, and sustainable manner.

The safety of employees and the communities located near fertilizer production and retail facilities is a top concern for the industry. ResponsibleAg serves the industry as a resource for retail agribusinesses working to comply with federal environment, health, safety, and security regulations.





POLICY & SUSTAINABILITY CHALLENGES AHEAD


The production of fertilizer is energy intensive. Natural gas is used in the production of nitrogen and in manufacturing dry phosphate fertilizers. Natural gas can account for between 70 and 90 percent of the nitrogen fertilizer manufacturing cost. Government policies that encourage fuel switching to natural gas from other sources may affect demand by creating energy supply or pricing issues. This can impact the U.S. fertilizer industry's competitiveness in the global market.

Natural gas can account for 70-90% of the nitrogen fertilizer manufacturing cost.

Because fertilizer is produced near natural resource deposits and not near most farms, a reliable transportation network is vital to moving fertilizer around the nation. A ton of fertilizer might travel by ocean-going ships, railroads, trucks, and river barges

before reaching the farmer. Disruptions in service, especially rail, can negatively impact a farmer's ability to apply the right fertilizer at the right time.

Just as important to the sustainable production of fertilizer is the sustainable use of nutrients on the farm. 4R Nutrient Stewardship (use of the right fertilizer source at the right rate, the right time, and in the right place) is a framework for sustainable nutrient management. Helping farmers maximize crop yields while protecting air and water resources is an ongoing challenge. Use of more nutrients than plants need, and conversely, the use of too few nutrients, can have negative impacts on the environment and farm profitability. The industry is committed to these principles and takes an active role with our customers and stakeholders to improve 4R adoption. These efforts are helping address regional hotspots where excess nutrients are contributing to impaired water quality.





INTRODUCTION

ERM, a third party sustainability services consultant, conducted a quantitative and qualitative data collection program on behalf of TFI to understand more fully the economic, social, and environmental impacts of the U.S. fertilizer industry. The project built on the lessons learned from the pilot data collection project conducted in 2015, which was used

to report 2013 to 2014 data.

This report¹ accounts for 93 percent of total fertilizer nutrient production capacity in the United States and expanded representation of industry wholesale and retail sectors². All quantitative metrics data in this year's report represent TFI members' products (nitrogen, phosphate, and potash materials

produced in, imported to, or transported within the United States) in 2015.

TFI considers the following operations to be within the report boundary: fertilizer manufacturing sites; crop nutrient wholesalers; agricultural retail facilities, including but not limited to, blending facilities; and specialty crop nutrient providers.

PARTICIPATING COMPANIES

Building on the pilot report, 20 companies participated by providing data confidentially to ERM. To protect an individual company's private data, totals are only provided if three or more companies submitted data for a particular metric. The number of companies providing data for a particular metric is disclosed within each section in the report.

- **AGRIUM** including Crop Production Services
- **CALAMCO**
- **CF INDUSTRIES**
- **CHS**
- **COFFEYVILLE RESOURCES**
NITROGEN FERTILIZERS
- **COMPASS MINERALS**
- **DAKOTA GASIFICATION**
- **GROWMARK**
- **J.R. SIMPLOT COMPANY**
- **KOCH AG AND ENERGY SOLUTIONS**
- **LSB INDUSTRIES**
- **OCI FERTILIZERS USA**
- **POTASHCORP**
- **SQM NORTH AMERICA**
- **THE ANDERSONS INC.**
- **THE MCGREGOR COMPANY**
- **THE MOSAIC COMPANY**
- **TRADEMARK NITROGEN**
- **WILLARD AGRI-SERVICE**
- **WINFIELD SOLUTIONS**



PEOPLE & COMMUNITIES

The U.S. fertilizer industry is one of the world's largest. The United States is the fourth-largest producer of nitrogen-based fertilizers in the world and the second largest producer of phosphate³. The U.S.

fertilizer industry generates more than \$139 billion in economic benefit and provides more than 80,000 direct jobs and 370,000 indirect jobs for a total of more than 450,000 U.S. jobs⁴.





CAPITAL INVESTMENTS

In 2015, 14 participating companies made \$5.12 billion in capital investments. Whether purchasing equipment, building a new plant, or improving an existing facility, these investments do more than help companies operate. Each dollar spent strengthens the U.S. economy and the financial well-being of individual

communities. What's more, investments that improve infrastructure often have positive impacts on safety, environmental, and energy performance.





LSB INDUSTRIES | EL DORADO, ARKANSAS

The trend toward globally competitive U.S. energy prices has enabled the nitrogen fertilizer industry to reverse a decades old decline in domestic manufacturing capacity. LSB Industries, Inc., (LSB) used this opportunity to upgrade facilities and expand manufacturing capacity for products sold into agricultural and industrial markets. All three of LSB's main manufacturing sites are now fully integrated to produce nitrogen fertilizer and other products from natural gas.

Ammonium nitrate still produces superior nutrient value for many agricultural applications, and LSB is committed to being a reliable ammonium nitrate supplier to the agricultural and industrial markets. Over the past four years, LSB has invested more than \$800 million dollars in capital projects at its facility in El Dorado, Arkansas. The expansion includes upgraded facilities and infrastructure with the latest environmental control technologies, including a modernized 1,150 ton per day anhydrous ammonia

plant, new ammonia storage and shipping facilities, a 1,100 ton per day nitric acid plant, acid concentrator, boiler house and electricity co-generating facilities, and new particulate controls and warehouses for both agricultural and industrial ammonium nitrate prill manufacturing and storage. These investments are helping the U.S. fertilizer industry remain successful in an increasingly competitive global fertilizer market.

TRADEMARK NITROGEN

TAMPA, FLORIDA

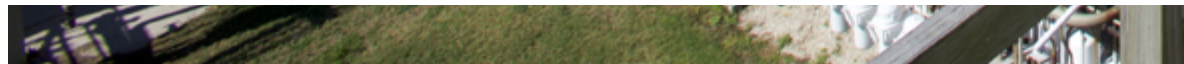
TradeMark Nitrogen began operating in what was a very rural part of Hillsborough County, Florida. After more than 60 years, the surrounding area, just east of downtown Tampa, Florida, has developed into a major Tampa suburb. To protect the site and the people who now work in the area, TradeMark Nitrogen had to make some changes. These came in the form of two major additions; a security fence surrounding the facility and the installation of several Detcon Ammonia Sensors.

While the property immediately surrounding TradeMark Nitrogen is still mostly undeveloped, adding a security fence prevents most would-be intruders from gaining access to the facility. “Although, someone is on site 24 hours a day, 7 days a week, 365 days a year, this, along with the accompanying camera system, gives staff the added confidence that they are working in as secure a facility as possible,” said Jeff Kirk, Environmental Health and Safety Manager at TradeMark Nitrogen.

Additionally, TradeMark added several Detcon Ammonia Sensors. These sensors alert the staff in the event of an ammonia release. Early



detection is the key to resolving an issue and alerting the surrounding neighbors of the situation. “Sixty years ago, management could not have anticipated the future development around our facility; nevertheless, today we are doing everything in our power to protect our staff and the surrounding community from potential dangers,” Kirk said.





GROWMARK | MELBOURNE, IOWA

New Century FS, a retail division of GROWMARK, expanded its facilities in Melbourne, Iowa, which serves six of the nine counties in which New Century FS does business. The new facility increases customer service and safety.

The new site features a dry fertilizer shed with a total storage capacity of 11,500 tons, accommodating eight products. The state-of-the-art blending capabilities assure growers get exactly what they ordered, underscoring how New Century FS is helping farmers carefully manage their inputs. The

inside loading scale takes precision a step further and facilitates the fast loading of up to 200 tons of product per hour.

Scott Schmidt, a customer from the Grinnell area, thought the new fertilizer plant's capacity and accurate measurements were the most impressive parts of the facility.

"Its size, volume, and technology mean these guys can deliver exactly what they recommend for my fields and do it safely and accurately. My job is to put it into the ground. Theirs is to tell me exactly what I need," he said.

Safety is a priority for GROWMARK, and the Melbourne facility has several new features that highlight this priority. The anhydrous loading station features a safety shut off system capable of being remotely triggered. Additionally, the ag chemical blending building, with its drive-through loading, is designed to protect the environment. The buildings, including the new shop and warehouse, also feature safety curbs that can contain any spills.



COMMUNITY SAFETY

The fertilizer industry is committed to safety at and beyond the confines of its facilities and distribution networks. Companies in the industry actively promote safety in the communities in which they operate. In the unlikely event that an accident occurs, local

emergency responders may be called upon to assist. For this reason, fertilizer companies regularly conduct emergency preparedness exercises to educate and train first responders and others about potential incidents, prevention, and mitigation measures.

Fertilizer industry members participating in the report spent more than

2,600 

HOURS training emergency first responders.

All in all, more than



➤ 13,000

PEOPLE outside of the fertilizer industry were trained.



DAKOTA GASIFICATION

BISMARCK, NORTH DAKOTA

Dakota Gasification Company has public and employee safety as its number one priority, as evidenced by its inclusion in all of their mission and vision statements. Every year the company re-evaluates its everyday working practices and encourages its employees, vendors, customers, and community members to make safety suggestions. In 2015, the company continued this commitment to safety through participation in Responsible Care®, which is a voluntary safety and security

improvement program established by the American Chemistry Council. Dakota Gas became recertified after completing an extensive external audit, which looked at the company's production, maintenance, and loading practices, as well as other plant areas.

Dakota Gas also added new emergency and first-responder equipment on the plant site this year. The company continually trains employees and works with surrounding community stakeholders on emergency

safety and wellness plans. Dakota Gas has held a number of external training events, including tank car training for customers, vendors, competitors, and industry stakeholders. The company also provides truck load-out training for new and current trucking personnel in the anhydrous ammonia load-out station. This reaffirms that trucking personnel, employees, and the communities surrounding the facility are more knowledgeable about safety, resulting in reducing or eliminating incidents.

CALAMCO |

STOCKTON, CALIFORNIA

For the past thirty years, CALAMCO has provided awareness, safety, and emergency response training to those in California who are most likely to come in contact with anhydrous ammonia – either intentionally or unintentionally. The effort has also expanded from the company's non-profit roots in California to Washington, Oregon, Nevada, and Arizona.

CALAMCO has been fortunate to educate customers, as well as federal, state, and local regulators and law enforcement from a number of various agencies. From highs of 1,500 attendees annually 20 years ago to about 700 currently, the interaction has always been positive, and has helped bolster the strong partnership approach that CALAMCO strives for.

The decline in attendees is being driven by the increased efficiency of farmers and fertilizer dealers, which is resulting in fewer individuals working directly with ammonia. And today, with far-reaching internet capabilities, CALAMCO is also able to share much more information regarding releases, accidents, best practices, and recommendations from around the world.



CF INDUSTRIES | RITZVILLE, WASHINGTON

CF Industries maintains an unwavering commitment to “Do It Right,” which advances the highest safety standards, strengthens the business and enables employees to thrive. In 2015, CF Industries created the Stephen R. Wilson Excellence in Safety Award to recognize a CF site that best embodies the company’s culture of safety excellence by implementing innovative ideas

that enhance safety practices. The award honors Stephen R. Wilson’s commitment to excellence in safety during his more than 20 years of service to CF Industries and helps cultivate a workplace where everyone is engaged, empowered, and continuously improving safety. The inaugural 2015 Stephen R. Wilson Excellence in Safety Award went to CF’s Ritzville Distribution

Facility in Washington state for its enhanced ammonia rail rack protection system. The fall protection system that Ritzville designed and implemented first arrests a fall, and then slowly lowers the person to the ground, thereby eliminating the need for assisted rescue. This innovative system avoids the potentially fatal effects of being held upright in a harness without any movement.



ResponsibleAG

From global entities to small and medium sized retail businesses, the fertilizer industry consists of companies of all sizes. Although regulatory compliance can be time-consuming and complex for small businesses, the fertilizer industry is united in its commitment to ensure that safety and security throughout the value chain are top priorities.

Following the 2013 explosion at a small fertilizer retailer in West, Texas, TFI and the Agricultural Retailers Association formed ResponsibleAg to help all retailers assess and address safety and security issues. ResponsibleAg operates as an independent certifying organization that provides retail agribusinesses a federal regulatory compliance assessment and educational resources related to the safe storage and handling of fertilizers.

Participating facilities receive an assessment by a credentialed ResponsibleAg auditor once every three years. Up to 17 areas (dry fertilizer, liquid fertilizer, anhydrous ammonia, shop, office, and grounds, for example) of a facility are assessed by the auditor. Education is a key component of ResponsibleAg's mission. If the auditor identifies compliance issues, the facility will receive a corrective action plan, information on how to correct outstanding issues, and a recommended timeframe for action. Certification may not be obtained until all outstanding issues are addressed.

KNOWLEDGEABLE AUDITORS ARE THE CORNERSTONE OF THE RESPONSIBLEAG INITIATIVE. IN ORDER TO ASSURE EXCELLENCE AND CONSISTENCY, ALL AUDITORS ARE REQUIRED TO SUCCESSFULLY COMPLETE A RIGOROUS RESPONSIBLEAG TRAINING COURSE.



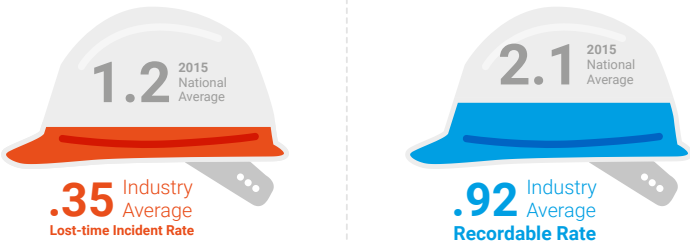
An isometric illustration showing a supply chain from a farm at the top to a retail store at the bottom. The farm includes a red barn, silos, and fields. The middle section shows a processing facility with large white storage tanks and a factory building. The bottom section shows a large warehouse with loading docks and trucks, and a retail store with a 'boon' logo and a parking lot with cars and trucks. A central white box contains the following text:

By the end of **2016**
ResponsibleAg registered
2,260 Facilities,
resulting in
1,330 Audits,
of which
475 were
Certified

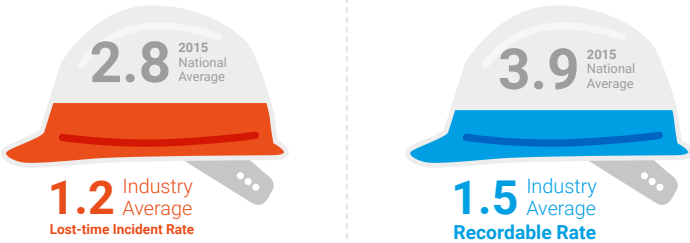
EMPLOYEE SAFETY

OSHA requires companies to report safety data, which is then aggregated into nationwide safety statistics by sector. The employee safety graphics show how the 13 fertilizer companies participating in this metric are performing more safely than their sector's national average. **Fertilizer manufacturers, wholesalers, and retailers experience fewer than one-half the safety incidents of their peers in the chemical manufacturing and merchant wholesaler industries when comparing available OSHA's safety data⁵.**

CHEMICAL MANUFACTURING



MERCHANT WHOLESALER

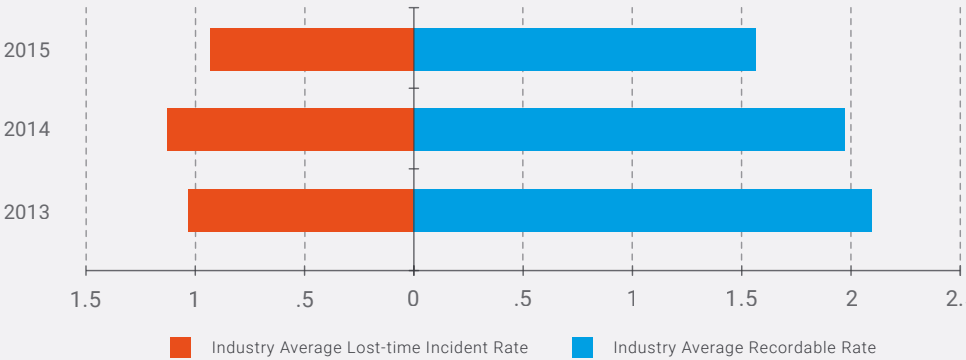


LOST-TIME INCIDENT RATE

The number of employees per 100 full-time employees involved in an injury or illness case which resulted in the employee losing a day of work.

RECORDABLE RATE

The number of employees per 100 full-time employees involved in a recordable injury or illness.





POTASHCORP | AURORA, NORTH CAROLINA

A fresh set of eyes is always valuable, and PotashCorp is using that theory in its new safety initiative, “SIF in the Routine.”

The goal is to discover when workers are unintentionally putting themselves at risk of a serious injury or fatality (SIF) as they perform routine jobs. “We want to find potential dangers that exist in our everyday tasks, before they can lead to harm,” said Rob Bubnick, PotashCorp’s Vice President of Safety, Health, and Environment.

Small teams observe their colleagues as they complete common tasks, paying special attention to when their gut feelings tell them that something may not be right.

“We’re looking for those moments when the person observing the work begins to feel uneasy about the task,” said Bubnick. “That’s our cue that we need to look a little deeper at how the work is being done. People familiar with the task won’t see the SIF exposure the way a person with a fresh set of eyes will.”

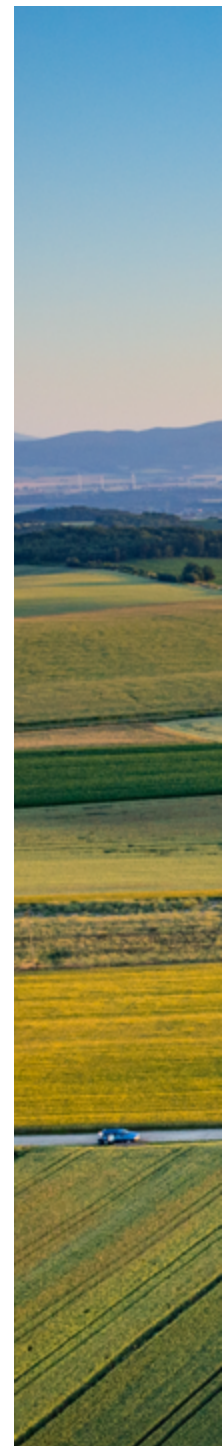
The audits are a blend of investigation, conversation, and observation. “We’re not looking to find fault. Sometimes people develop more efficient ways to do a task, and they’re still being safe and that’s great,” explained Bubnick. “In other cases, maybe we need to redesign the system in which people are required to work, instead of just asking them to work safer.”



ENVIRONMENT & ENERGY

From raw material mining, to fertilizer production, transportation, distribution, and retail, TFI's membership spans the fertilizer industry value chain. Because the mining

and production processes in the industry are the most resource-intensive, this section of the report focuses primarily on companies operating in these parts of the value chain.





WATER

Responsible water use is fundamental to sustainability efforts and conservation. Water is a significant resource in the production of phosphate and potash, and to a lesser extent for nitrogen fertilizers. Because some fertilizer operation's processes are water intensive, **many industry members have established water efficiency and zero discharge targets to be achieved through water conservation and reuse or recycling within their operations.**

By quantifying industry water usage, we can assess the magnitude and usage per-ton of water consumed to provide

benchmarks for continuous improvement. In this report, TFI gathered water-related data from member companies based on volume (in gallons) of water purchased and water withdrawn from wells and surface water. Volume of collected rainwater, reclaimed water, and reused or recycled water are of interest; however, fewer than three companies reported preventing inclusion in this report.

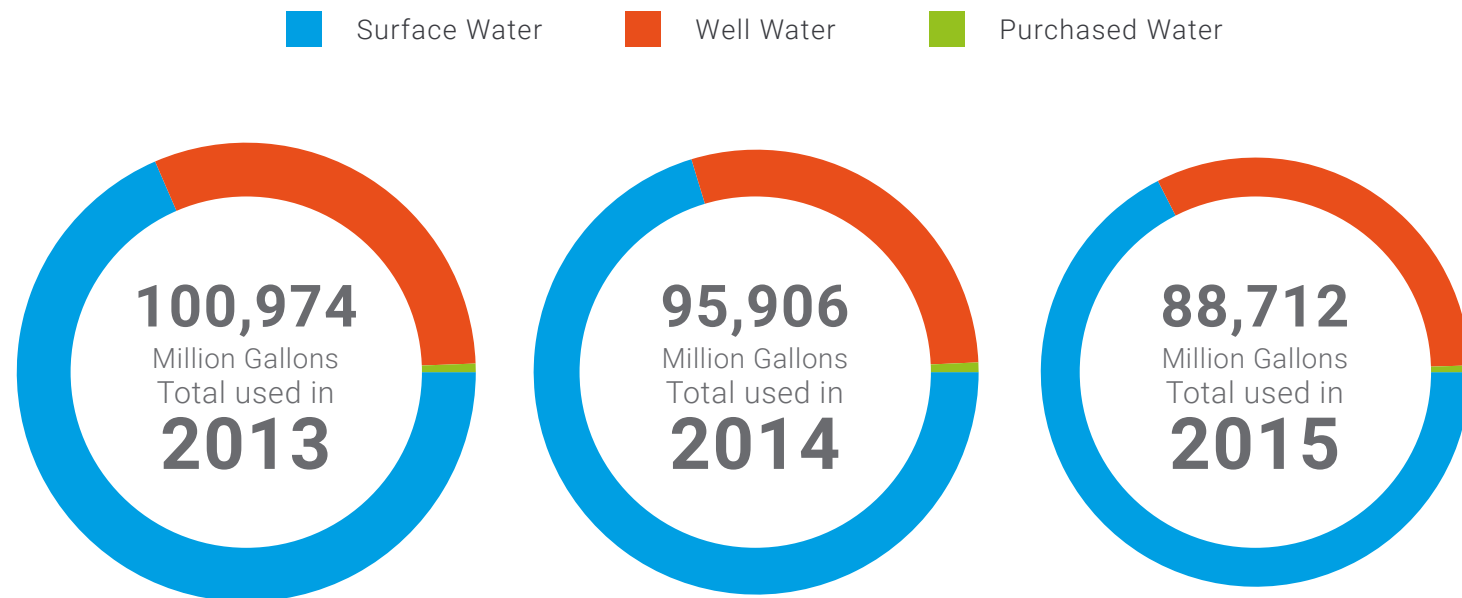
Three TFI member companies reported that, collectively, they have 56 zero-discharge facilities in their retail and distribution operations. A zero-discharge facility is defined as having no direct

liquid discharge to surface or ground water, other than stormwater drainage. These facilities are beneficial because they avoid adding any pollution load to waterways, except for runoff from precipitation.

Nine companies reported water data for 2015, compared to seven companies who reported in the pilot report. The manufacturing companies that provided data for 2015 account for 52 percent of nitrogen and 84 percent of phosphate and potash fertilizer nutrient production capacity in the United States².

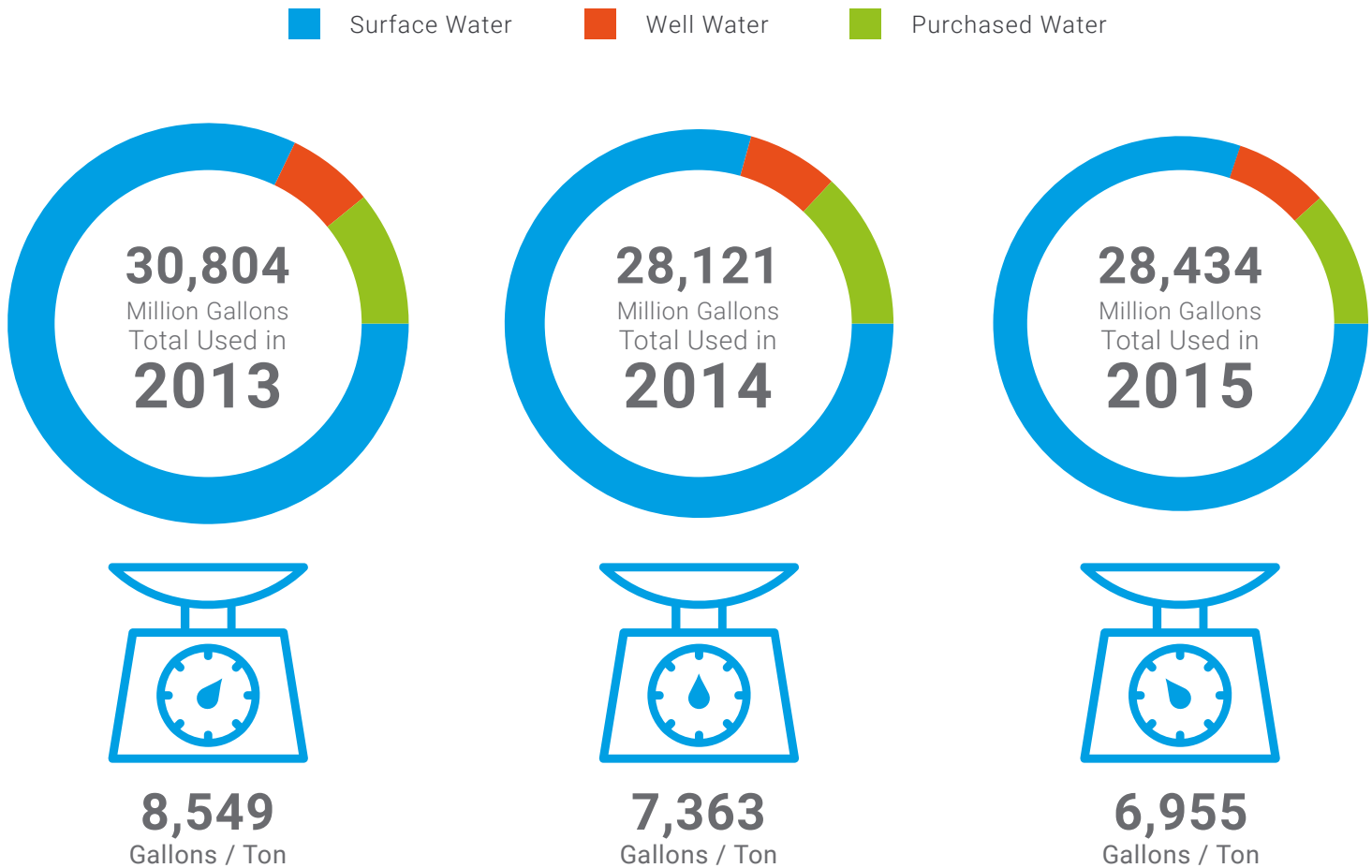
PHOSPHATE & POTASH PRODUCERS

The same four phosphate and potash producing companies reported water use data for 2015 as well as for 2013-2014. Among these companies, total water use declined over the three-year period, primarily as a result of decreased fertilizer production. **In 2015, the total water use for phosphate and potash production decreased by 7.5 percent compared to 2014.** On a normalized basis, water use per nutrient ton varied only slightly from 2013 through 2015 with water usage at 12,829 gallons per ton of phosphate and potash.



NITROGEN PRODUCERS

Water use efficiency for nitrogen production increased among the reporting member companies. Total water use over the three-year period declined, considering the six companies that reported data for all three years. On a normalized basis, all seven companies were included across the three-year period. **The water use per nutrient ton declined by 18.6% from 2013 to 2015.**





LAND RECLAMATION

Fertilizer production can have a significant physical footprint, especially in the mining sector. However, every surface acre mined is reclaimed, restoring such lands for productive uses for both wildlife and people. The land use metric is aimed at capturing how many acres of habitat or wetland the fertilizer industry has reclaimed or improved. This metric, while primarily focused on mine reclamation, is applicable to any fertilizer producer that has disturbed and/or reclaimed land around their facilities.

*IN 2015, THE EQUIVALENT OF 4,200
FOOTBALL FIELDS OF LAND WAS
RECLAIMED OR RESTORED.*

J.R. SIMPLOT COMPANY | *UNITAH COUNTY, UTAH*

Environmental stewardship and reclamation play a key role in every aspect of the J.R. Simplot Company's phosphate mining operations. Throughout each phase of every project, the company focuses on how to best reclaim disturbed lands after mining activities have ceased.

"Our ultimate goal is to leave the land in as good or better condition than the way we found it," said John Spencer, Simplot Environmental Manager.

Restoration has been a key consideration of the company's work at its mining operation

located at the foot of the Ashley National Forest in Uintah County, Utah, as it has returned more than 2,000 acres of land to its original state.

Employees took care to minimize environmental impact while saving native topsoil for use during reclamation efforts. Once mining concluded, the company regraded and contoured disturbed areas to match the existing landscape, while controlling erosion and managing storm water. The topsoil was returned and seeded with native grasses and shrubs. The reclamation team worked with Utah's

Division of Wildlife Resources to manage dense growth of juniper and pinion pines, thus establishing an ideal habitat for the region's elk and sage grouse populations.

Whether it's conducting a tour for Utah high school agriculture teachers or supporting an Eagle Scout with his mining and society badge, John Spencer and Simplot's crew never hesitate to share the benefits of their reclamation efforts with the community. For their dedication to the land, the State of Utah recognized the J.R. Simplot Company as the 2015 Earth Day award recipient.



THE MCGREGOR COMPANY

CRESTON, WASHINGTON

When The McGregor Company acquired an abandoned biofuels plant in Creston, Washington, many thought no one could turn the site into anything productive, let alone profitable. “The place was a mess,” said John Poffenroth, Washington state environmental specialist, who had written more than 30 pages of violations, including photographic documentation, of the site.

However, The McGregor Company had a vision for the site, and the company literally dug in to turn things around. The building and tank farm were covered in oil and slime; the walls were blackened; the floors were slippery from the oil; the ceiling sagged from the vast weight of rodents; and 140,000 gallons of biodiesel byproduct had been left behind. The McGregor Company cleaned up the site and turned it into a state-of-the-art regional fertilizer distribution facility.

The company has earned numerous community and environmental awards for their renovation efforts. According to Poffenroth, “Alex McGregor’s vision for the Creston location successfully turned a dilapidated, environmentally-neglected property into a viable and operating facility.”

ENERGY

Energy is a necessary component in the process of creating fertilizer products. The energy metric in this report aims to capture energy consumption, energy intensity, and innovative or low-impact energy sourcing to provide a benchmark for continuous improvement. Facility upgrades to improve energy efficiency are resource intensive; therefore, when significant capital investments are considered, plant energy use is evaluated. Significant efficiency improvements are generally undertaken when process lines are upgraded or new capacity is built.

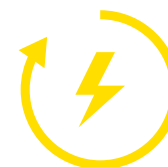
The quantity of energy consumed is important when environmental regulations that affect energy costs and natural gas policy are discussed. **Within the fertilizer industry, some manufacturers cogenerate energy or use other low impact energy sources, such as solar or steam from waste heat.** Such steps contribute to sustainability goals by reducing the industry's overall energy footprint.

For the purpose of understanding the magnitude of energy consumed and

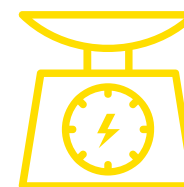
types of energy used in the industry, participating companies provided data for direct and indirect energy use. Direct energy use was reported either as total fossil fuel consumption or as a breakdown of the individual fuels used (diesel, propane, fuel oil, natural gas). For indirect energy use, member companies provided data for electricity use generated offsite and purchased steam use. Data also reflects waste heat captured for reuse.

Nine companies provided energy data. The manufacturing companies that provided data for 2015 account for 52 percent of nitrogen and 84 percent of phosphate and potash fertilizer nutrient production capacity in the United States². Both total energy use and energy use per ton increased by 8 percent compared to 2014 reported data. Direct energy use was 113 million gigajoules (GJ) in 2015, and indirect energy use was 21.1 million GJ.

Participating member companies reported a total of 1.54 billion GJ of natural gas used as feedstock for fertilizer production in 2015. This is separate from the use of natural gas as a combustion fuel.



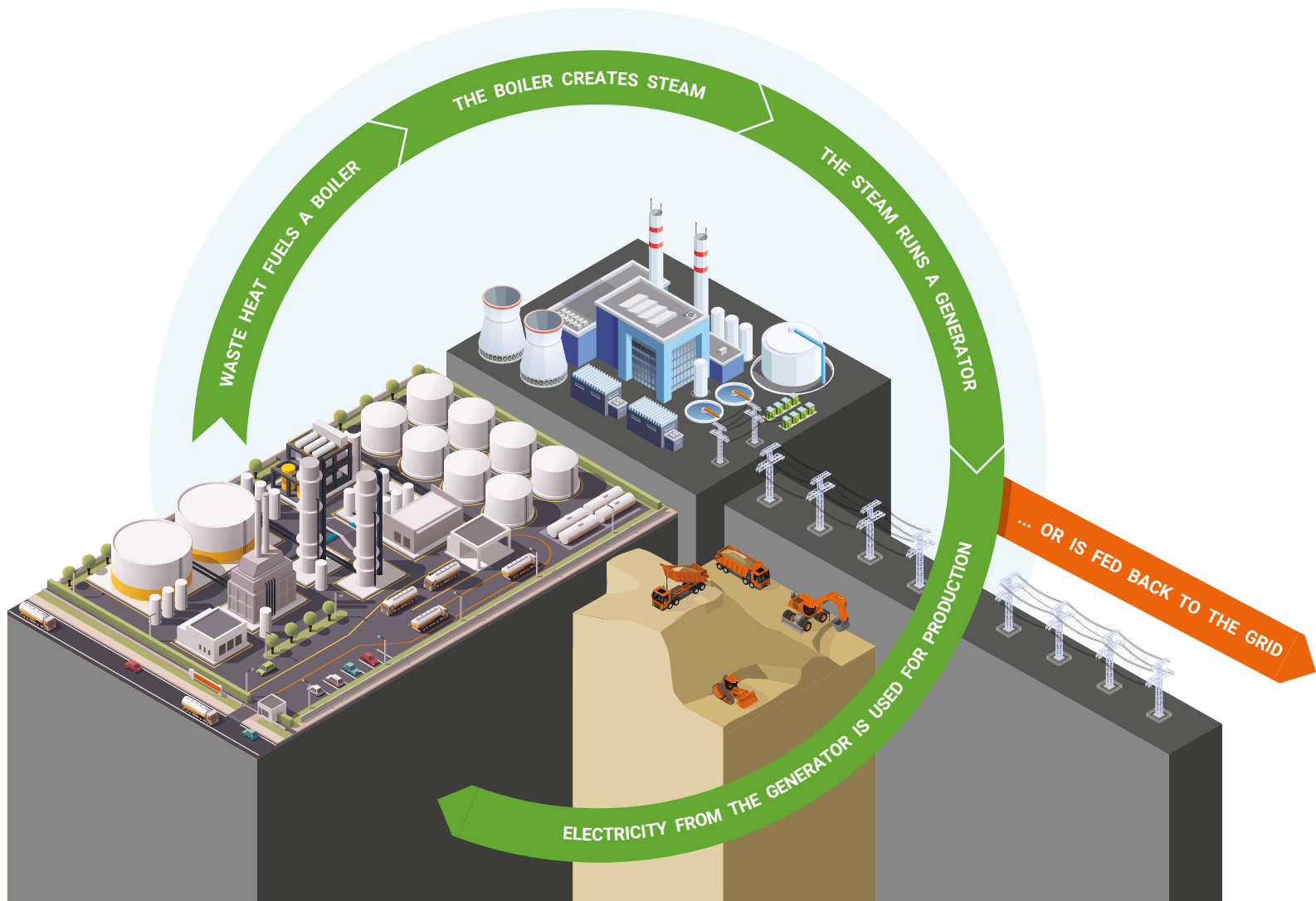
134.1 Million
Gigajoules
Total Energy Used In 2015



10.6 Gigajoules
per Ton
Energy Used Per Nutrient
Ton Produced In 2015

WASTE HEAT RECAPTURE

Companies reported capturing more than 107 million GJ of waste heat in 2015 and using that thermal energy for steam production, heating, and electricity generation. This represents energy that otherwise would have had to be purchased or supplied by fuel combustion.



WILLARD AGRI-SERVICE

WORTON, MARYLAND

Many times, customers look to their agricultural retail providers for advice and ideas, but for Willard Agri-Service in Maryland, a bright idea came from an enterprising customer. Harborview Farms, a very progressive customer of Willard Agri-Service, unveiled a 200 kW solar array to provide enough electricity for their entire grain system. Chairman Bob Willard knew

that Herman and Trey Hill of Harborview Farms were smart managers and would only invest in a project with a good return, so he began to explore the possibility of bringing solar power to Willard Agri-Service.

Willard applied for and received a rural small business grant from USDA. The grant, along with a combination of federal and

state tax credits, put the solar power project on a strong financial path. The installation of the 64 kW system began immediately and came online in 2014. Willard has virtually eliminated the company's electricity expense through the generation of solar power and selling solar credits. **CO₂ emissions have also been reduced by more than 179 tons** in the short time the system has been in operation.





COMPASS MINERALS

GREAT SALT LAKE, UTAH

Compass Minerals believes a holistic, collaborative, and comprehensive approach to protecting valued resources while facilitating smart growth is the best approach to managing their facility at the Great Salt Lake in Utah. Two projects at the company's Great Salt Lake solar evaporation facility highlight the positive results a company can achieve when projects are approached in this manner.

The all-natural sulfate of potash production

process used at the Great Salt Lake relies on a steady supply of brine to fill its solar evaporation ponds. As one of several key stakeholders in the region who rely on the lake, the company has cultivated strong relationships with stakeholders, state and federal agencies, and others to advocate for the lake's preservation and protection.

To improve the functionality of their solar evaporation ponds, Compass Minerals sealed many of them with inert materials to reduce

leakage, which has reduced the annual amount of brine consumed from the Great Salt Lake by 20 percent.

In addition to the sustainability project, the reclamation plan enables restoration of key regions of the Great Salt Lake while creating avian habitats. The plan provides for 30 isolated nesting islands that will protect shorebirds from predators and will create new habitat along a migratory bird flyaway of international importance.

GREENHOUSE GAS EMISSIONS

Greenhouse gas (GHG) emissions are a matter that all industries must manage carefully. While the fertilizer industry represents a small portion of total U.S. GHG emissions, the industry is the focal point of many discussions as stakeholders across the food value chain engage in discussions to reduce GHG emissions.

As with improvements for energy efficiency, upgrades to further reduce GHG emissions from manufacturing are capital intensive. Therefore, emission reduction technologies are generally assessed when process lines are upgraded or new capacity is built.

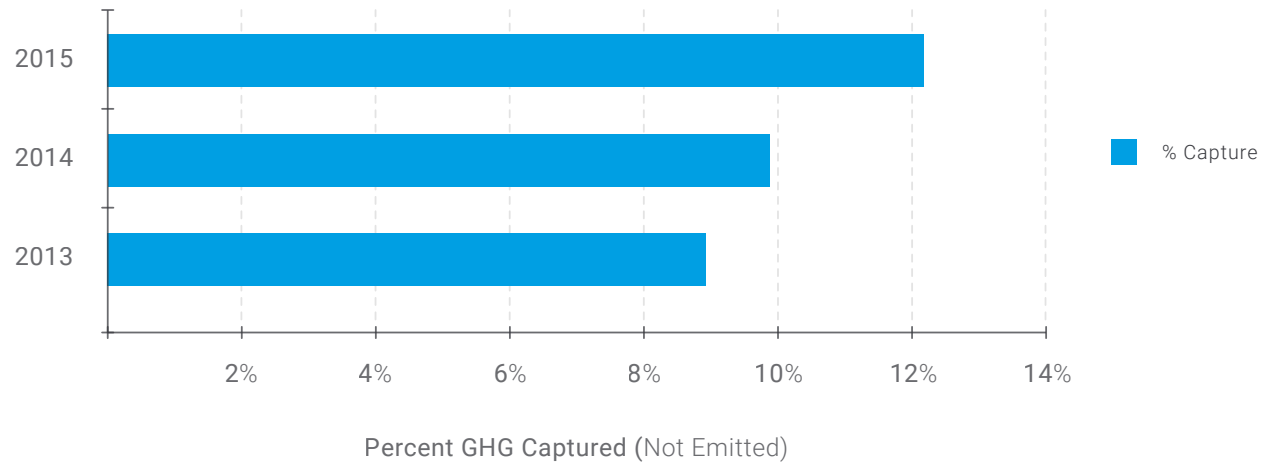
Because high purity carbon dioxide is a byproduct of ammonia production and it is a necessary ingredient in the production of urea fertilizer, the industry captures CO₂ for downstream processes.

The captured CO₂ is also used for other industrial operations such as enhanced oil recovery and the carbonization of soft drinks.

Participating companies provided total GHG emissions as reported under the U.S. Environmental Protection Agency's Greenhouse Gas Reporting Program (GHGRP), broken down by ammonia manufacturing, other nitrogen fertilizer, phosphate/potash production and manufacturing, and stationary combustion sources. Companies also reported the percentage of CO₂ that was captured and not emitted, which is not part of the GHGRP data requested by EPA. The percentage of GHGs (reported to EPA by participating companies) that were captured and not emitted has increased steadily over the past three years.

THE PERCENTAGE OF GHGs THAT WERE CAPTURED AND NOT EMITTED HAS INCREASED STEADILY OVER THE PAST THREE YEARS.





In 2015, TFI revised the data collection template for GHG emissions to be more consistent with EPA's GHGRP requirements. Ten companies provided GHG emissions data in 2015, compared to eight companies in the pilot project (2013-2014 data). Total GHG emissions reported to the EPA increased from 2013-2015, in part because the number of participating companies increased. With 91 percent of total fertilizer nutrient production capacity reporting², 2015 will become the baseline year. The total GHG emissions reported for nitrogen and phosphate fertilizer production were 28.4 million and 2.5 million metric tons CO₂e, respectively.

Based on the 2015 data reported by participating member companies, normalized GHG emissions per ton of nitrogen fertilizer production was 1.65 tons CO₂e per metric ton N. For phosphate fertilizer, the normalized emissions were 0.36 tons CO₂e per metric ton P.



FERTILIZER TRANSPORTATION

Fertilizer is produced and transported year-round to meet U.S. farmers' needs for crop nutrients. Fertilizer's journey from production to application on the farm requires a variety of transportation modes including: marine vessels, railroads, trucks, and for some materials, pipelines.

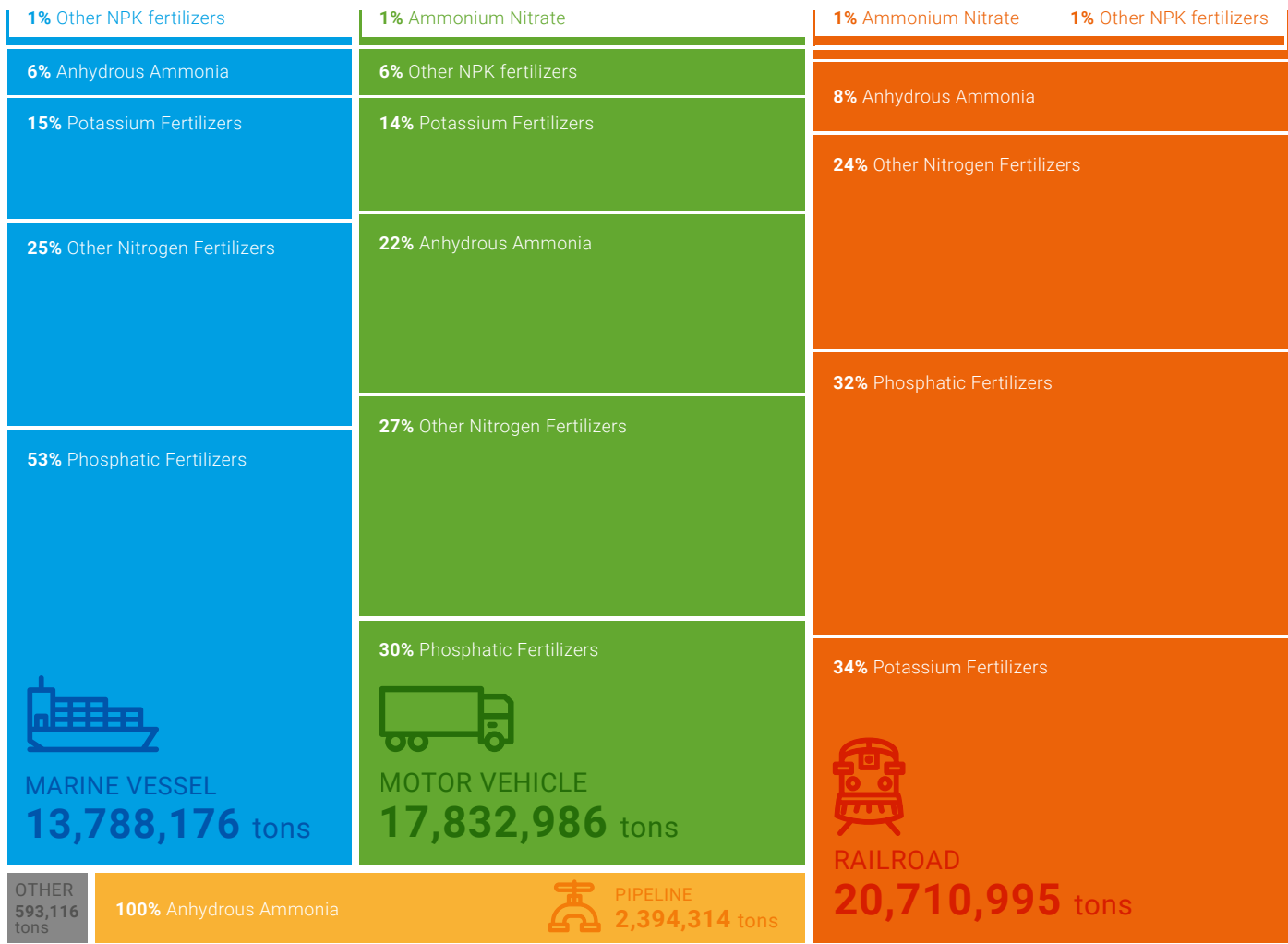
Distribution bottlenecks and service issues may restrict nutrient access during key utilization periods. This disruption could lead to reduced crop yields and lower food production levels. Fourteen companies participated in this metric.





2015 TOTAL TONS OF MATERIAL TRANSPORTED BY MODE

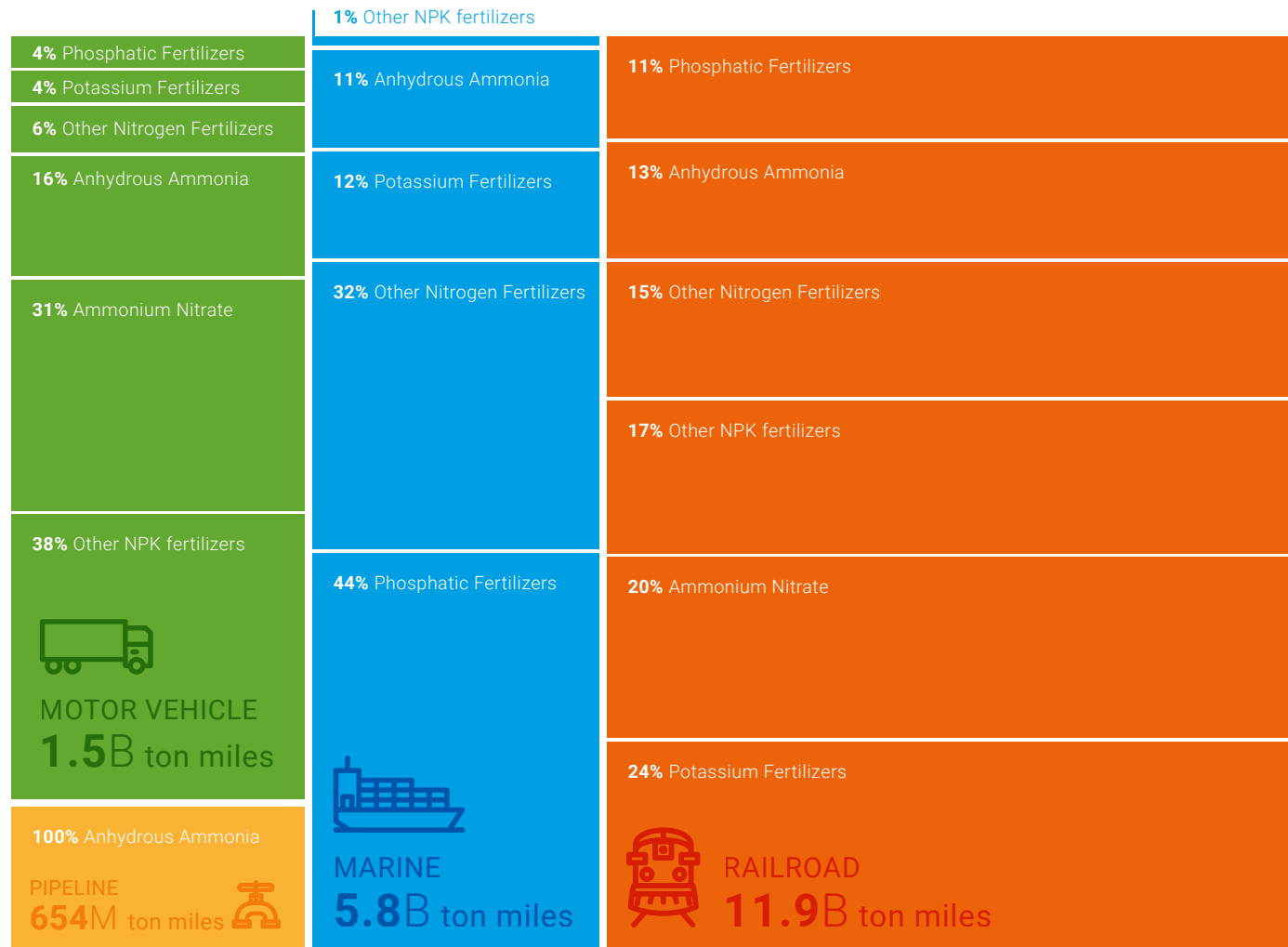
A balanced transportation network is critical as each mode of transit plays a part in the distribution of fertilizer. Marine vessel, rail, and motor vehicle transportation are all prominent modes for fertilizers transportation. When looking at total tons of material transported by mode, truck shipments may appear inflated. Each ton of fertilizer is moved by a motor vehicle at least once, and often several times, during its journey.



2015 DISTANCE WEIGHTED MATERIAL TRANSPORTED BY MODE

When the transportation data is weighted by distance traveled, also known as ton-miles, the importance of rail stands out.

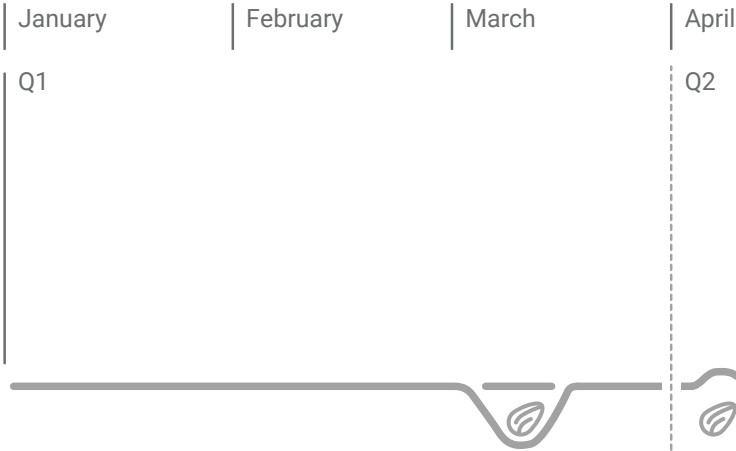
On a ton-mile basis, 44 percent of all fertilizer moves by rail⁶. Marine vessels also carry a significant amount of fertilizer, and motor carriers are critical to shorter hauls, particularly as the product gets closer to its farmer customers. Rail and marine vessels often move fertilizer from the production facility to and throughout the United States to warehouses, terminals, and retailers.



YEAR-ROUND TRANSPORTATION

The demand for safe and efficient transportation of fertilizer is year-round. The volume of shipments by rail, marine vessel, and pipeline are relatively steady from quarter to quarter.

Trucking shipments are more seasonal. Fifty percent of all fertilizer in the United States is applied to corn. Corn is a seasonal crop and, due to the many factors that determine when and how fertilizer can be applied to corn, farmers are generally on a very tight schedule to apply the necessary nutrients. Trucks are used for shorter distances and to fill “just-in-time” orders, creating the most identifiable busy season in the second quarter (April through June).

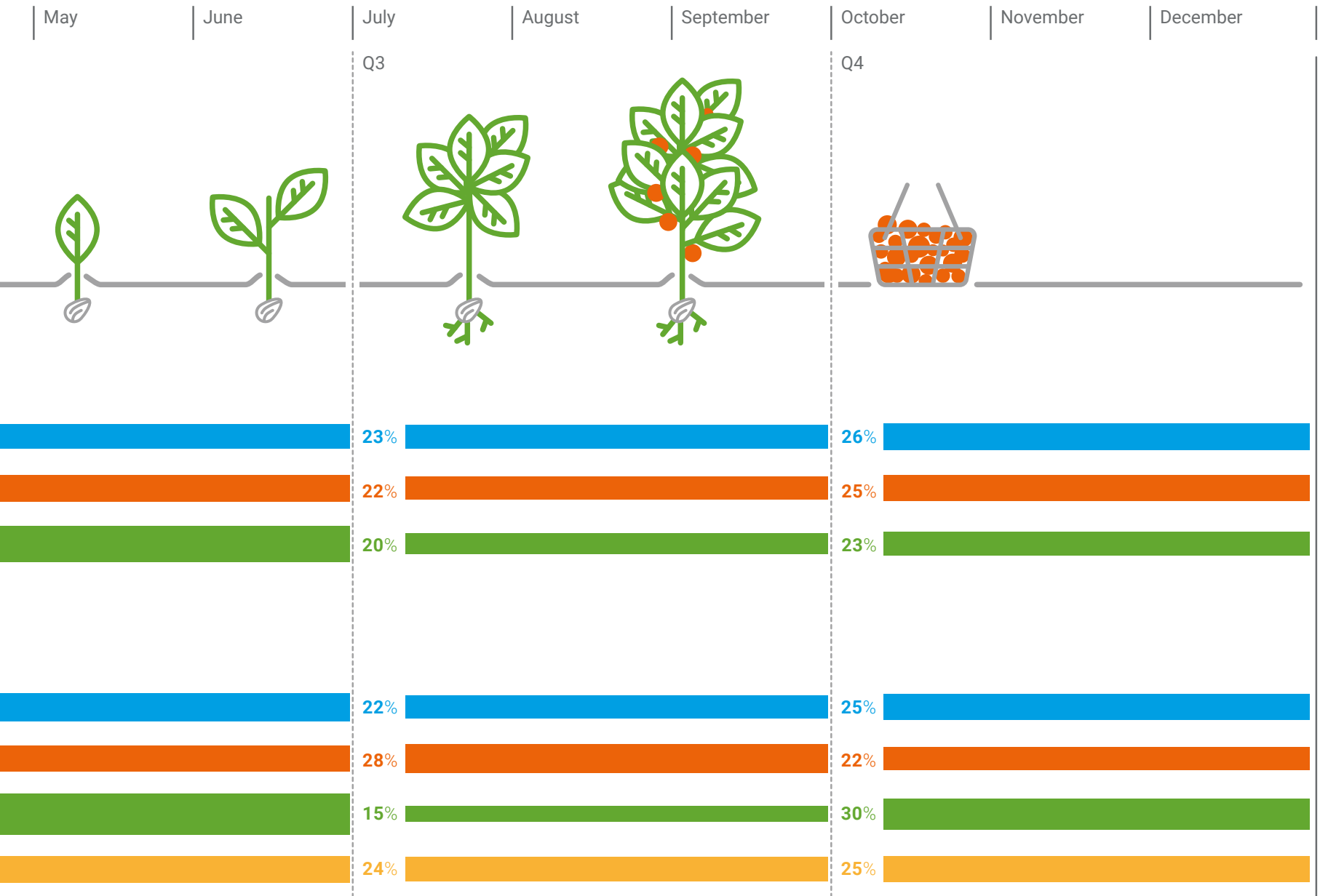


TOTAL OF ALL FINISHED MATERIAL SHIPPED BY:



ANHYDROUS AMMONIA SHIPPED BY:







FERTILIZER ON THE FARM

TFI members support a vision where all plant nutrients are applied using a measurable and recognized 4R nutrient stewardship framework evidenced through better crop performance, improved soil health, and cleaner air and water. For fertilizer use to be sustainable, it must

support cropping systems that provide economic, social, and environmental benefits. The 4R principles are the same globally, but how they are used locally varies depending on numerous variables including soil, cropping system, management techniques, and climate.





RIGHT SOURCE

Matches fertilizer type to crop needs.



RIGHT RATE

Matches amount of fertilizer to crop needs.



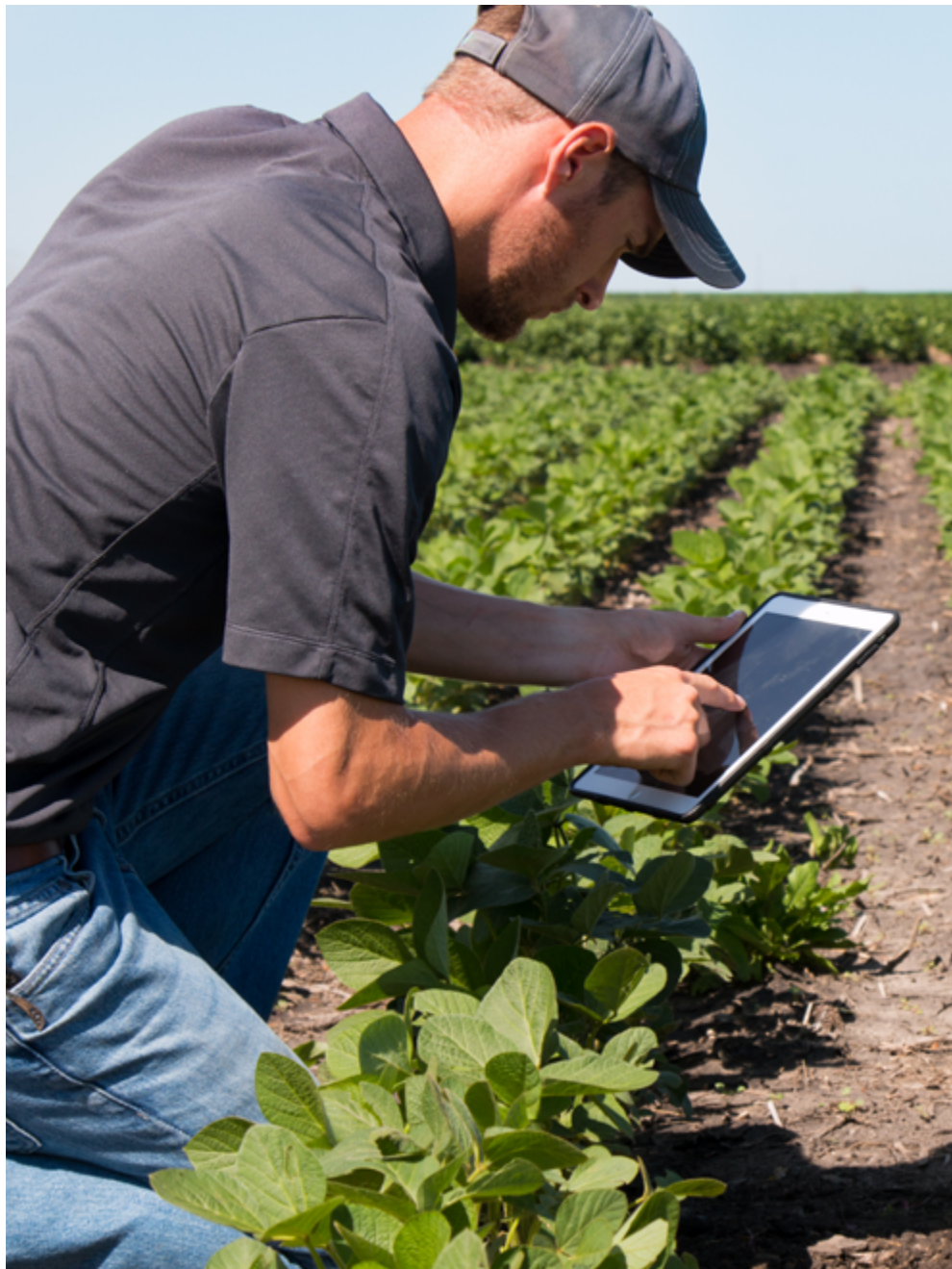
RIGHT TIME

Makes nutrients available when crops need them.



RIGHT PLACE

Keeps nutrients where crops can use them.



AGRONOMIC PROFESSIONALS

Agronomic professionals lead efforts to assist growers with 4R implementation on the farm and are an important part of the industry. Whether creating custom blends of bulk fertilizers or through precision agriculture techniques for soil analysis and crop mapping, agronomists are a valuable farmer resource. Many industry agronomists are Certified Crop Advisers (CCAs), having met rigorous standards prescribed by the American Society of Agronomy. CCA certification assures farmer customers that their crop advisers are equipped to apply leading edge technical knowledge to fertilizer recommendations.

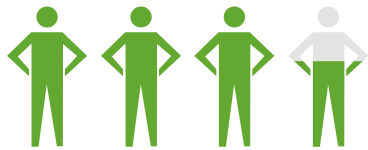
In 2015, participating industry members reported the number of agronomic professionals within their organizations, as well as the number of professionals maintaining Certified Crop Advisor (CCA) status. Seven retailer organizations reported accounting for 0.58 CCAs per location. Ten non-retailer organizations reported accounting for 2.85 CCAs per location.

ALL PARTICIPATING NON-RETAIL LOCATIONS

There are a total of
217 Certified Crop
Advisors (CCAs)
across non-retail locations

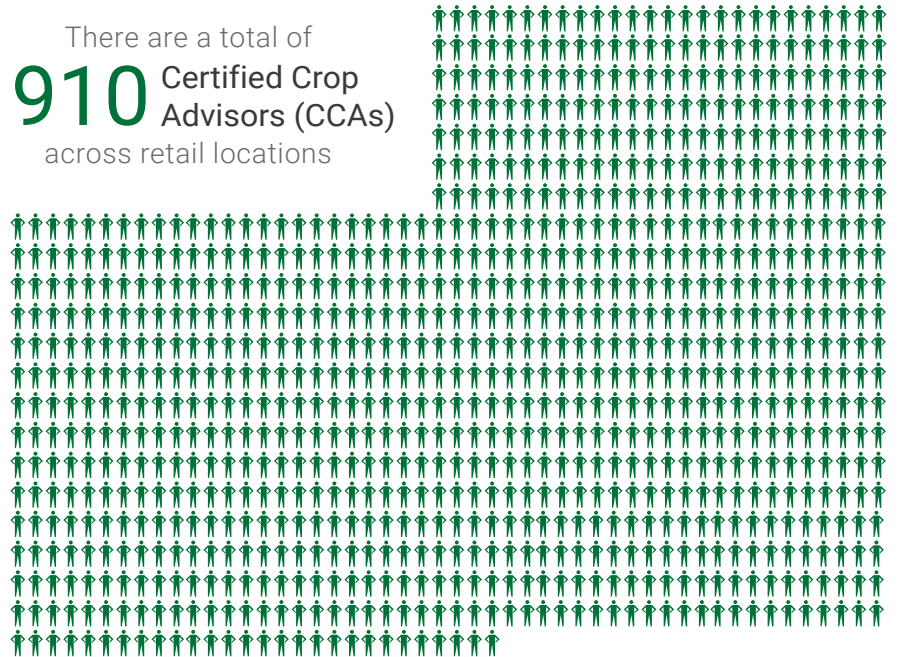


3.61 Agronomists
at each non-retail location

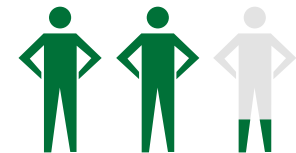


ALL PARTICIPATING RETAIL LOCATIONS

There are a total of
910 Certified Crop
Advisors (CCAs)
across retail locations



2.12 Agronomists
at each retail location





AGRIUM | *CENTRAL VALLEY, CALIFORNIA*

By implementing 4R principles and best practices to reduce fertilizer and water consumption, growers in the California Central Valley are trimming their costs, while stewarding precious water resources in the region.

The valley between the Sierra Nevada Mountains and the California Coast Range is arguably the world's most productive agricultural region. However, persistent drought conditions have challenged the industry in recent years. Growers are paying

up to 10 times more for their water, changing the value of certain crops and contributing to price hikes in produce.

The quality of California's drinking water has also become a concern after high levels of nitrates were discovered in 2012, causing the State Water Board to enact stringent regulation, requiring growers to regularly report water quality to the Board.

Using Agrium's Certified Crop Advisors, growers are closely monitoring their nutrient and water usage to maximize

their yield while minimizing their inputs. Agrium's crop advisers work with growers to use lysimeters (devices that measure the movement of water through soil) to monitor nitrate levels at the crops' root zone to help prevent the leaching of nutrients into groundwater.

By using lysimeters and field monitoring services, Agrium is providing growers with best management tools and data to help meet financial and environmental goals on the farm.



CERTIFIED CROP ADVISOR

4R NUTRIENT MANAGEMENT SPECIALTY CERTIFICATION

Certified Crop Advisors (CCAs) must meet rigorous standards that form a knowledge benchmark for practicing agronomy professionals. In 2014, the 4R Nutrient Management (4R NMS) Specialty Certification was developed by the International Certified Crop Adviser (ICCA) program to meet the demand for advisers with focused nutrient management knowledge and skills. The 4R NMS Specialty Certification gives CCAs greater visibility for their ability to help growers meet the need for improved water quality and environmental stewardship. The CCA 4R NMS Specialty Certification builds upon the nutrient, soil, and water components of the International CCA Certification by allowing candidates to demonstrate proficiency in the 4R concept and with building it into nutrient management planning. In 2015, the program was made available in seven states (Iowa, Illinois, Indiana, Ohio, Michigan, Minnesota and Wisconsin). More than 70 CCAs participated in the first exam offered in August 2015. The program geography and number of certified individuals continues to expand.

NUTRIENT STEWARDSHIP PARTNERSHIPS

TFI and its members engage with non-governmental organizations and research groups to enhance fertilizer management on the farm. Nutrient stewardship and land quality protection are two important topics on which TFI regularly interacts with scientists, community members, customers, and others to better understand their issues. Organizations that participating member companies engaged during 2015 include:

4R RESEARCH FUND • AG IN THE CLASSROOM • AGRIBUSINESS ASSOCIATION OF IOWA • AGRICULTURAL RETAILERS ASSOCIATION • AMERICAN FARMLAND TRUST • AMERICAN SOCIETY OF AGRONOMY • AUBURN UNIVERSITY • CLEMSON UNIVERSITY • CONSERVATION TECHNOLOGY INFORMATION CENTER • COUNCIL ON BEST MANAGEMENT PRACTICES • DUCKS UNLIMITED • AMERICAN FARM BUREAU FEDERATION • FIELD TO MARKET • FLORIDA RESEARCH CENTER FOR AGRICULTURAL SUSTAINABILITY • FOOD PRODUCERS OF IDAHO • FUTURE FARMERS OF AMERICA • ILLINOIS FERTILIZER AND CHEMICAL ASSOCIATION • ILLINOIS NUTRIENT RESEARCH AND EDUCATION COUNCIL • INSTITUTE OF FLORIDA AGRICULTURAL SCIENCE • INTERNATIONAL FERTILIZER ASSOCIATION • INTERNATIONAL JOINT COMMISSION • INTERNATIONAL PLANT NUTRITION INSTITUTE • IOWA AG WATER ALLIANCE • IOWA NUTRIENT RESEARCH AND EDUCATION COUNCIL • IOWA STATE UNIVERSITY • KANSAS STATE UNIVERSITY • MICHIGAN AGRIBUSINESS ASSOCIATION • THE NATURE CONSERVANCY • NUTRIENTS FOR LIFE FOUNDATION • OHIO AGRIBUSINESS ASSOCIATION • OHIO STATE UNIVERSITY • OREGON STATE UNIVERSITY • PURDUE UNIVERSITY • SOIL SCIENCE SOCIETY OF AMERICA • UNITED NATIONS SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK • UNIVERSITY OF ARKANSAS • UNIVERSITY OF CALIFORNIA • UNIVERSITY OF FLORIDA • UNIVERSITY OF IDAHO • UNIVERSITY OF MISSOURI • USDA NATURAL RESOURCES CONSERVATION SERVICE • UTAH STATE UNIVERSITY • WASHINGTON STATE UNIVERSITY • WESTERN LAKE ERIE BASIN NUTRIENT STEWARDSHIP COUNCIL



THE MOSAIC COMPANY

PLYMOUTH, MINNESOTA

The Mosaic Company Foundation supports the Nutrient Stewardship Council's 4R Nutrient Stewardship Certification Program. This voluntary certification program is regionally focused on significantly reducing and preventing applied nutrients from running off fields by providing 4R nutrient recommendations or application services. By the end of 2015, the Nutrient Stewardship Council announced it reached an important milestone: more than one million acres in the Western Lake Erie Basin (WLEB) were under the guidance of nutrient service providers that have earned certification through this program.

"At Mosaic, we support and promote the 4R Nutrient Stewardship framework to help farmers achieve the benefits of fertilizer while reducing nutrient loss to the environment," said Rick McLellan, board member of The Mosaic Company Foundation and Senior Vice President – Commercial for The Mosaic Company. "We are proud to partner with the Nutrient Stewardship Council, and we look forward to ongoing collaboration that builds on this significant certification milestone."



THE ANDERSONS | WATERLOO, INDIANA

The Andersons, Inc., provides agronomic services and expertise through their multi-state network of agricultural retail outlets. 4R Nutrient Stewardship serves as a model for the company's nutrient stewardship efforts. Cary Myer, director of farm center operations, believes the 4Rs are not only the right thing to do, but are also a solid business model that can be applied to all of The Andersons's farm centers, regardless of location. "It's consistent, it's measurable, it's practical, and it's effective. Those are four critical boxes that we want to checkmark

when we evaluate new business processes."

Nick Jackson is the general manager of The Andersons's farm center in Waterloo, Indiana, The Andersons's newest retail dealer to achieve 4R certification. Located on the far west edge of the Western Lake Erie Basin (WLEB), Nick recognized the need to incorporate the 4Rs into the business model as 95 percent of their growers operate in the WLEB. The educational aspect of the 4R program helps The Andersons reach out to growers in nontraditional ways and

raise awareness of the need for nutrient stewardship. The Waterloo farm center hosted a 4R grower outreach event with USDA Natural Resource Conservation Service staff in attendance. Events such as this bridge the gap between nutrient stewardship and conservation.

"4R puts us in a position where we can really partner with our growers at a much deeper and more comprehensive level. It expands our level of service and value-add to our customers," Nick said.

NUTRIENTS FOR LIFE FOUNDATION

WASHINGTON, D.C.

The Nutrients for Life Foundation (NFLF) is focused on educating the next generation of leaders on the value of fertilizers. Celebrating its 10-year anniversary in 2014, NFLF released *Feeding the World & Protecting the Environment* for use in AP environmental science classes. Through targeted efforts to increase adoption of these classroom materials, students use them to examine the 4R Nutrient Stewardship framework, learn about essential plant nutrients, and study the fertilizer manufacturing processes. Additionally, students consider various federal regulations, such as the Clean Water Act, in relation to fertilizer-manufacturing.

NFLF has built strategic partnerships with the Smithsonian Institution and Discovery Education. Through these partnerships, resources, and regional representative network, NFLF brings these resources to teachers in each of the 50 states.

In the past three years (2012–2015), more than 23,775,000 people have been impacted by using one of NFLF's

educational resources. In the last year, NFLF distributed 365,406 resources and outreach materials to 237,514 teachers from across the country. In just the past year, 6.1 million students were impacted.



ENHANCED EFFICIENCY FERTILIZERS

Enhanced efficiency fertilizer (EEF) products can facilitate increased plant uptake and therefore reduced nutrient losses to the environment when compared to similar

fertilizers that don't contain EEF additives. In 2015, 640,004 nutrient tons of nitrogen fertilizer were treated with EEFs and sold by four reporting companies.

This represents 11.5 percent of the total nutrient tons of nitrogen sold at approximately 1,500 retail locations across the United States.



KOCH AG & ENERGY SOLUTIONS | WICHITA, KANSAS

Research is an important component in product development, and Koch Ag and Energy Solutions is working with land-grant university researchers to evaluate the impact of their enhanced efficiency fertilizer products on yield and farm profitability.

“Working with university researchers allows us to geographically expand our product assessments while supporting tomorrow’s scientists and agronomists,” said Dr. Greg Schwab at Koch Ag and Energy Solutions where he directs a 12-member agronomy team.

In addition, the research team evaluates innovations that hold the potential to further improve nutrient use efficiency in the field. In 2015, Koch invested significant resources to evaluate products in 55 field research trials. Recognizing the need for science and research needs in the future, Koch provides support for graduate students and post-doctoral students who will be the next generation of scientists working with farmers.

4R RESEARCH FUND

In 2013, the 4R Research Fund was created by the fertilizer industry to help establish sustainability indicators and environmental impact data to expand 4R nutrient stewardship implementation across North America. The fund provides needed resource support with a focus on measuring and documenting the economic, social, and environmental impacts of 4R nutrient stewardship. The industry is committed

to providing growers the tools they need to remain profitable while protecting the environment.

In 2015, the U.S. fertilizer industry contributed \$1,006,000 to the research fund, and four U.S. projects totaling \$366,365 were awarded to university researchers.

Information about projects awarded in 2015 are available online. The 4R Research Fund is

maintained by the Foundation for Agronomic Research (FAR), a non-profit 501(c)(3) research and education foundation managed by the International Plant Nutrition Institute (IPNI). Funded projects are reviewed and recommended by a multi-stakeholder technical advisory group before final approval by an industry fund management committee.



SQM | ATLANTA, GEORGIA

SQM North America partners with leading universities — North Carolina State University, Clemson University, University of Vermont, Colorado State University, and Oregon State University — to run trial studies on efficient nutrient use and yield improvement. This total investment of around \$500,000 in recent and ongoing trials has provided numerous data points helping improve the use of fertilizer across numerous crops throughout the United States.



FOOTNOTES

1. The information provided herein is on an “as is” basis. TFI (including its Officers, directors, employees, and member companies) accepts no responsibility for any inaccuracies, does not make any warranty or representation, either express or implied, regarding its accuracy, completeness, or utility; nor does TFI (including its Officers, directors, employees, and member companies) assume any liability of any kind whatsoever resulting from the use or reliance upon any information, material, or procedure contained herein, including but not limited to any claims for damages, loss, or injury regarding health, safety, or environmental effects.
2. Calculated using participants U.S. production capacity as reported for the year ending June 30, 2015 in the September 2016 North American Fertilizer Capacity Report prepared by the International Fertilizer Development Center.
3. International Fertilizer Association’s Production and International Trade Committee, 2015 Ammonia and Processed Phosphates Production Statistics.
4. John Dunham and Associates, Inc. Economic Contribution of the U.S. Fertilizer Industry, 2016.
5. Employee safety data is self-reported to the U.S. Occupational Safety and Health Administration using the North American Industry Classification System (NAICS). This data represents codes 325311, 325312, and 325 for manufacturing and 325314, 424910, and 424 for blenders and wholesalers.
6. This data on transport distance represents 64 percent of the total tons transported by the reporting companies.