

# Knowledge grows



# CEO Water Mandate Report 2017: Communication on Progress



## About Yara

## Our Mission

Responsibly feed the world and protect the planet.

## Our Vision

A collaborative society; a world without hunger; a planet respected.

### Our Values



Ambition



Collaboration



Curiosity



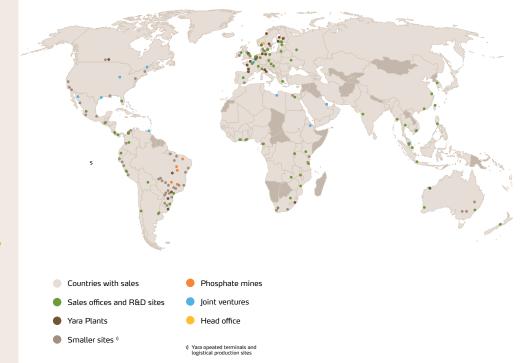
#### Accountability

In collaboration with customers and partners, Yara grows knowledge to responsibly feed the world and protect the planet, to fulfill its vision of a collaborative society, a world without hunger and a planet respected.

Our crop nutrition solutions and precision farming offerings allow farmers to increase yields and improve product quality while reducing environmental impact. Our environmental and industrial solutions improve air quality and reduce emissions, and are key ingredients in the production of a wide range of products. We foster an open culture of diversity and inclusion that promotes the safety and integrity of our employees, contractors, business partners, and society at large.

Founded in 1905 to solve emerging famine in Europe, Yara has a worldwide presence with more than 17,000 employees and operations in over 60 countries. In 2017, Yara reported revenues of USD 11.4 billion.

www.yara.com



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## About this report

The CEO Water Mandate was launched in July 2007 in partnership with the UN Global Compact, civil society, organizations, governments, and other stakeholders. It is a voluntary, business-led initiative to mobilize business leaders and advance water sustainability solutions.

Yara has been a CEO Water Mandate signatory since July 2014. We share our water strategies and performance with the initiative and the public in our corporate reports and on our website. This report contains extracts from our latest GRI and financial reports along with concrete examples of our development and implementation of water sustainability solutions across our operations and value chain.

## Yara's approach

Yara is dedicated to growing farmers' businesses profitably and responsibly, while protecting the planet. We apply our expertise in crop nutrition to help increase nutrient and water use efficiency in agriculture and continuously raise the bar for environmental stewardship in our own operations.

Smarter and more efficient use of water in agriculture is critical to future food security. Agriculture today accounts for about 70% of freshwater withdrawals worldwide. Due to population growth and competition for water resources, it will have to produce 50% more food by 2050 with essentially the same – or less – water.

Irrigated agriculture is two to three times as productive as rainfed agriculture. Irrigation today enables 40% of the global food production from only 20% of all cultivated land. The downside is a much larger impact on water resources. Expansion of irrigated land could become a necessity to produce more food, but more resource efficient technologies and improved agricultural practices also hold great potential.

# Proper nutrition promotes water use efficiency

Through agronomic research, Yara has identified a close relationship between crop nutrition and crop water consumption. Our analyses demonstrate that optimum crop nutrition is directly linked to more efficient water use by reducing soil evaporation and drainage losses, and by increasing the harvestable portion of the plant's biomass. Similarly, crops that are not optimally fertilized require more water for every kilo of final product. We see potential in exploring new knowledge and innovative technologies to advance water use efficiency through optimized crop nutrition.





Using fertilizers correctly is, at the same time, of great importance in avoiding adverse impact on the environment. Oversupply or misdirected application can lead to nutrient pollution of freshwater bodies and undesired growth, such as algae blooms in rivers and seas. This pertains to both organic and mineral fertilizers. Knowing which nutrients to add, along with the right amount, and the place and time, is key to achieving optimum crop growth and mitigating the loss of nutrients. We believe that any organic nutrients available at the farm should be used first and supplemented with mineral fertilizers to close the nutrient gap.

#### Solutions for farmers

Yara promotes nutrient management systems designed to achieve high nutrient and water use efficiency based on optimum crop nutrition and growth. Essentially, we help farmers to add just the nutrients needed, in the right amount and at the right time. We offer tools and services to calculate fertilizer demand based on soil analysis, yield expectations, desired crop quality and climate, and we see a potential in exploring new knowledge and innovative technologies to further advance water use efficiency through optimized crop nutrition.

Given the potential for better water management and improved water use efficiency in agriculture, we focus our activities and reporting on our downstream operations and value chain engagement. While we systematically assess water consumption and discharge practices in our own operations, our largest contribution to solving the global water challenges occurs in the fields, at the hands of farmers across the world.

#### Our policies and commitments

Through our HESQ Policy and Code of Conduct, we commit to excellence in our performance on health, environment, safety and quality (HESQ) and to promote sustainability in agriculture.

Our key commitments related to water sustainability are:

- We use a precautionary approach to identify risks and take preventive measures to mitigate the potential harm to people or the environment.
- We will provide knowledge-based solutions to improve agricultural productivity, at the same time addressing food security and climate change.
- We will continue to engage in sustainable water consumption through R&D activities and active participation in the CEO Water Mandate and Water Footprint Network.
- We will ensure compliance and continuous improvement of our environmental performance by implementing Environmental Management Systems and Product Stewardship programs throughout our operations.
- We commit to having all our major production sites certified according to the environmental management standard ISO 14001. This includes assessing risks related to both the use of water as well as emissions to water, as a part of the environmental impact assessment.
- Where public regulations do not provide adequate controls, Yara will work with governments, society and businesses to shape regulations and practices that work to this commitment.

Read the full policy and code here:

#### Yara HESQ Policy (pdf)

#### Yara Code of Conduct (pdf)

#### How we address the UN Sustainable Development Goals

The UN Sustainable Development Goals (SDGs) provide a common and necessary roadmap for the business sector and part of the framework for our long term strategic processes. All 17 goals are relevant to our activities, but goals 6 and 14 stand out in the context of water sustainability.



Water-use efficiency is a focus area on our R&D front, which includes research to increase nutrient use efficiency and minimize loss of nutrients to waterways from agriculture. We test and develop novel wastewater treatment technologies for our own operations, and participate in partnerships to find solutions to help reduce emissions from agriculture.



Our solutions for precision farming and Digital Farming can significantly reduce nutrient losses from the field to the air and waterways. Similarly, we develop feed supplements that can contribute to reducing effluents and eutrophication issues related to aquaculture.

Examples of our contributions to these goals are presented throughout this report.

#### Crop nutrition increases crop water use efficiency

Water use efficiency can be expressed as crop yield per unit of water used by the crop.

Two major factors determine water use in agriculture:

 Evaporation describes unproductive water loss from the soil surface
Transpiration is productive water consumption linked to photosynthesis and crop growth These two factors are connected and significantly influenced by crop nutrition. As much as 60% of seasonally available water can be lost through the bare soil evaporation of crop land, but optimal fertilizer application promotes crop canopy development and ground cover by leaves, minimizing the soil's exposure to direct sunlight. In addition, well-nourished crops produce better root systems, thereby extracting more water from the soil and reducing drainage losses. Altogether this leaves more water available for crop transpiration and growth.

Yara does extensive R&D to help improve the water footprint of growing crops. The water footprint quantifies crop water use through evaporation and transpiration, the amount of irrigation water used, and to what extent freshwater is polluted.

## Water management in operations

Yara carefully manages its own use of and emissions to water. We use water primarily for cooling purposes in our production sites and, to a lesser extent, in steam production and manufacturing processes

#### Managing water and related risks

Yara's environmental policy was last updated in February 2017. The latest update highlights our precautionary approach to environmental management, in which we identify risks and take preventive measures to mitigate the potential harm to people and the environment. Where public regulations do not provide adequate controls, Yara will work with governments, societies and businesses to shape regulations and practices to uphold this commitment.

For Yara's own production plants, this implies a continuous focus to reduce emissions, set targets, and initiate actions to improve environmental performance. Compliance with statutory requirements, permits and corporate standards is a minimum expectation for any operation.

Most of the Yara sites have certified environmental management systems in place. 19 out of 28 sites are currently certified to the ISO 14001 standards. Each certified site has assessed risks related both to the use of water as well as emissions to water as a part of their environmental impact assessment. In addition, ten sites have carried out specific water risk assessments to address potential concerns related to use or discharge of water. The main risks identified in the assessments are related to flooding, access to or shortage of water and effluents to water. See the table opposite.

Risk category	Identified at
Flooding	Ravenna, Italy Ambes, France
Shortage of or access to water	Köping, Sweden Luis Eduardo Magalhaes, Brazil Angico dos Dias, Brazil
Regulatory constraints	Rostock, Germany Montoir, France Luis Eduardo Magalhaes, Brazil
Drainage or treatment of effluents	Kokkola, Finland Montoir, France Paulinia, Brazil Angico dos Dias, Brazil Luis Eduardo Magalhaes, Brazil

In addition, five sites are working together with local communities and other stakeholders to discuss water quality and address water risks and issues.

The Yara site in Ravenna, Italy, has identified the potential flooding of the Candiano Canal as representing a risk to the site. The site has emergency procedures in place to prevent nutrient leakages in the event of flooding. The Yara site in Ambes, France, has also assessed its emergency measures in light of the potential flooding of the nearby Garonne river.



Water management related to mining operations has triggered significant public interest in Finland. Yara's Siilinjärvi apatite mine has assessed water management in detail as a part of the national Mining Stress Test program, conducted by the Finnish Ministry of Environment. The assessment covered dam constructions, tailings dams, and water lagoons, the potential leakage risks of harmful substances, water balance scenarios (for example in a case of extraordinary precipitation), and, finally, emergency preparedness and communication practices.

The need for improvement with regards to sanitary systems has been identified at four sites. A sanitary water treatment plant is under construction in Cartagena, Colombia. The sanitary water system of the Yara Pardies plant in France has been connected to the municipal waste water treatment system, and today manages about half the sanitary water from the site. The Yara plant in Kokkola, Finland, has initiated a project to lead sanitary water from part of the production area to a municipal waste water treatment plant, thus ensuring adequate treatment for all sanitary water generated on site. At the Rio Grande site in Brazil, work is ongoing to expand the sanitary system thus increasing the unit's effluent treatment capacity.

Risks related to rivers providing the main water supply have been assessed in Köping, Sweden, and Rostock, Germany, where the River Warnow is also the source for drinking water for the city of Rostock.

#### Water use for production

Yara used a total of 783 million m<sup>3</sup> of water in 2017. This includes all of Yara's major production sites – 27 large volume chemical and mining sites. Most of the water used (98%) was surface water, which includes water from wetlands, rivers, lakes and oceans. The rest was split between ground water and water purchased from municipal water supplies or other water utilities. Water is used in Yara's production primarily for cooling purposes, and, to a lesser extent, steam production and manufacturing processes. Thus, nearly all the water withdrawn by Yara is returned to the water course unpolluted. Water recycling corresponded to ca 10% of fresh water withdrawal (75 million m<sup>3</sup>).

Yara is systematically exploring more cost-effective and emission-reducing production technologies through the Plant of the Future concept. One of the tasks of the project is to assess water consumption and discharge practices in Yara's plants, and to identify potential for cutting water consumption and reducing emissions.

#### Water discharges

Yara's water emissions are measured, analyzed and registered according to national regulations. The primary potential impact on water caused by nitrogen and phosphorus emissions is eutrophication.

In 2017, the total volume of water discharges was 722 million m<sup>3</sup>. A large part of this is cooling water which is returned unpolluted. 85% of the water volume was discharged into the sea, 4% into rivers and 11% into lakes.

Several Yara sites are taking actions to separate their waste water streams more efficiently and to prevent spillages and accidental emissions. Yara's site in Le Havre, France, has isolated an area with earlier contamination and equipped the ponds with pumps to drain polluted water for treatment. Yara's sites in Porsgrunn and Glomfjord, Norway, Köping, Sweden, and Uusikaupunki, Finland have all invested in the improvement of their waste water treatment systems with the goal of reducing nutrient emissions to water. The Yara mine in Angico dos Dias, Brazil, and the Belle Plaine plant in Canada are investigating how to improve treatment and separation of water from storm flooding. Yara's Uusikaupunki and Siilinjärvi plants in Finland as well as the site in Cartagena, Colombia are taking steps to improve the circulation of nutrient-containing waters. The Yara site in Rio Grande, Brazil, has an action plan in place to reduce emissions and effluents, and to increase water recycling.

The Yara site in Rostock, Germany, discharges its waste water to a small river, the Mühlbach. Ongoing cooperation with local authorities aims to establish the water status of the river by detailed data sampling, in order to protect and enhance the water quality. As a first step, Yara Rostock has increased its basin capacity for rainwater prior to biological treatment in order to reduce nitrogen emissions to the river. The result of these efforts is the lowest releases of nitrogen in the history of the plant.

#### Raising awareness

Yara's activities are guided by the principles of Product Stewardship. Based on a commitment to promoting sustainability and safe practices throughout the life cycle of fertilizers, these principles ensure that proper care is taken along the entire value chain, from product development and the sourcing of raw materials, through production, storage and distribution, to sales, delivery and application.

At year-end 2017, all our relevant European units were certified by the Fertilizers Europe Product Stewardship Program. Another 21 units outside Europe were certified by the IFA Protect & Sustain initiative, which is the other major product stewardship program we have chosen to apply in our operations. The certified units outside Europe represented 75% of all relevant operations across North and Latin America, Asia, Australia and Africa. We aim to have all operational sites outside Europe certified IFA Protect & Sustain by 2018.

# Water sustainability incorporated in decision-making

Yara prepares an environmental impact assessment for any new major operation or extension. the potential for damage to nature or impact to natural resources is part of each assessment, and necessary prevention, management and remediation measures are considered. This also applies to Due Diligence assessments of new acquisitions.



# Value chain engagement

We engage with farmers and partners along our value chain to share knowledge and collaborate on projects seeking to sustainably intensify agricultural production, meeting future food demand.

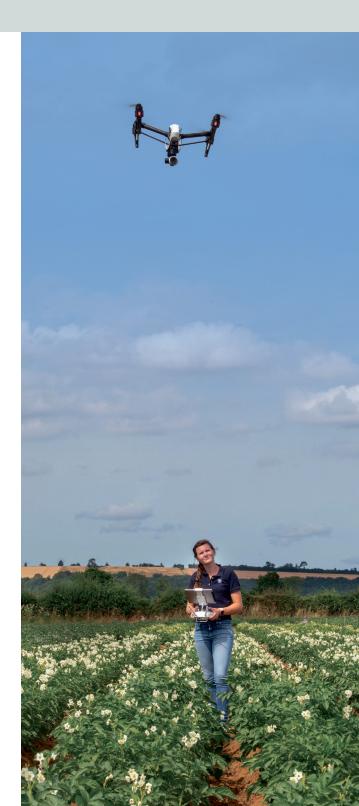
Yara is the world's leading producer of mineral fertilizers and a key player in facilitating and promoting sustainable agriculture. For more than a century, we have developed extensive agronomic knowledge that we share with farmers, helping them to boost their yields while contributing to sustainable agriculture. With our global reach, we help farmers to optimally apply fertilizer and engage with a wide range of both public and private stakeholders to find sustainable solutions for agriculture, including water management.

We are committed to promoting sustainability and safe practices throughout the life cycle of fertilizers. Assessments of the health, safety, environmental, and security impacts of our products and services cover all life cycle stages, and we have a systematic approach to monitoring and reviewing the quality and handling of all our products.

#### Digital Farming

Yara has defined an ambitious strategy to become the global leader in digital crop nutrition. Digital technologies can yield multiple benefits to the farmer in terms of productivity, profitability and sustainability. Deeper insight, machine learning and connectivity lay the groundwork for informed decision making, smarter choices and unmatched precision in the field. Through a deeper understanding of the complex drivers of yield and quality, input can be used to its full potential, tailored to weather, soil and local eco-systems, and with less waste and reduced impact on the environment.

Yara was a pioneer in precision farming and has initiated Digital Farming to contribute to a step-change in food production. Existing technologies and digital solutions, such as the tractor mountable N-Sensor and the N-Tester, designed to measure nitrogen demand of the crop, form a strong foundation on which to build new, digital crop nutrition solutions. In 2017 Yara also acquired Agronomic Technology Corp, which operates Adapt-N, a leading nitrogen recommendation platform in the US that improves farmer profitability and agricultural sustainability. See separate story to learn more about Adapt-N.





#### Prizewinning tool reduces nitrogen loss

Adapt-N is a core element of our digital strategy to offer best in class products and solutions for agriculture. In 2017 Adapt-N was awarded the Tulane Nitrogen Reduction Challenge for its ability to reduce nitrogen losses.

Adapt-N is a software tool providing precise recommendations for optimal use of nitrogen. This leading digital solution was launched commercially in 2014, and has surpassed over one billion cumulative field recommendations. It is built on more than a decade of university research and continuous multiregional, on-farm testing in the US since 2011. It relies on high-resolution soil, weather and field management data and modeling to give farmers nitrogen recommendations for every section of their field that helps them to improve their profitability and nitrogen efficiency.

Adapt-N was added to Yara's portfolio following the acquisition of Agronomic Technology Corp in November 2017. With its ability to reduce nitrogen loss by 35 – 40%, it is a highly valuable tool in contributing to our mission of responsibly feeding the world and protecting the planet. Furthermore, the deep scientific and agronomic approach fits well with our knowledge-driven culture and approach.

In 2017 an advisory board of 16 academics, scientists, environmentalist, entrepreneurs, farmers and national experts selected Adapt-N as the winner of the Tulane Nitrogen Reduction Challenge. The grand prize of USD 1 million was awarded Adapt-N based on crop yield, nitrogen reduction and its cost and market viability.

Agronomic Technology Corp's platform extends beyond Adapt-N's field recommendations to provide instant nitrogen diagnostics, soil-water dynamics, and a host of environmentally focused outputs that quantify the loss of nitrogen to air and water pathways.

# Plug & play solution for fertigation

# YaraTera Easyfeed offers greenhouse growers a plug & play solution for fertigation – the combined application of water and nutrients to the crop.

2018 has seen the first installment of the YaraTera Easyfeed concept, at Le Jardin de Rabelais, a large producer of cherry tomatoes in France. This new concept combines advanced telemetry, crop nutrition software and dosing systems to deliver, through the greenhouse irrigation system, precise amounts of plant nutrients based on the exact needs of the crop. All the necessary hardware comes wrapped in a container for easy plug & play installation. Telemetry ensures ondemand deliveries of our fertilizers into the system, and maintenance is included.

All in all, YaraTera Easyfeed optimizes resource use while easing the farmers of practical burdens, at a low investment.

Yara offers a wide range of fertigation solutions for growers – both for greenhouses and open fields. Fertigation allows the application of fertilizers to match the plants' needs and uptake during different growth stages. When combined in an efficient irrigation system, both nutrients and water can be managed to obtain the maximum yield and quality. We offer growers fertigation solutions to meet any crop situation, along with sophisticated fertigation software available in our digital engagement portal.





#### Irrigation on-demand saves water

#### Yara is actively developing and expanding the Yara Water Solution to accurately manage combined water and fertilizer needs under water-scarce conditions.

The Yara Water Solution forms part of our Farm Management System offering. It enables farmers to irrigate on-demand, typically saving 20–30% of their water, without sacrificing yield or quality. The innovative Yara Water-Sensor is a key component of our solution for better water management. It provides a continuous, non-destructive and remote measurement of plant water status, and the irrigation recommendations are accessible via our digital engagement platform. The sensor is calibrated and marketed for citrus and olives, and validation work is ongoing for other crops, such as grapes, almonds, stone fruits and coffee.

Our digital engagement platform harnesses the potential of our most advanced farming tools by bringing them together in one portal to help farmers improve profitability, crop performance and sustainability. It covers both broad acre crops and fertigation solutions, and has been implemented in a number of countries, including Germany, Australia, the Benelux countries, Brazil, Poland, South Africa, Spain, Portugal, the UK, and the US.

#### All about almonds – and water

Water quality and irrigation practices is of paramount importance for almond growers in California, a region facing severe and repeated droughts. Yara is working to help the growers improve the water situation by bringing them the Yara Water Solution. During a visit to North America in the spring of 2018, Yara's Board of Directors and CEO witnessed firsthand how the Yara Water-Sensor has been set up at a Californian almond farm for trial. Yara collaborates with the Almond Board of California on sustainability programs and R&D, and aims to commercialize and make the sensor technology available to almond growers in 2019.





#### Better for the fish - and the environment

Yara's new feed grade phosphate supplements help fish feed producers to optimize phosphorous content in their feed, supporting fish growth and health, and reducing nutrient loading of water ways.

Fish feed formulations are changing and are increasingly plant-based due to the limited availability of sustainable marine ingredients. While higher usage of plant protein and plant oils supports the sustainability of aquaculture, it represents a challenge for fish performance and welfare due to a lack of key nutrients.

One such example is phosphorous. Fish rely on it for growth and health, but new feed ingredients often contain an inadequate amount of digestible phosphorous. Fish feed producers therefore add mineral supplements to their feed. Choosing the right form of supplement is critical in ensuring that the fish digests and retains the phosphorous, lest it will be excreted into the environment.

Yara's novel feed phosphates, known by the brand Bolifor®, offer concentrated levels of digestible and retainable phosphorous. They ensure better nutrient uptake and enable fish feed producers to meet the exact needs of different aquaculture species while helping to minimize discharges and organic loading of water ways.

# Collective action, public policy and community engagement

Yara works broadly to develop and to seek the implementation of new technologies that can improve water use efficiency in farming. We engage in dialogue and cooperation with a wide range of stakeholders, both locally and globally.

Agriculture has often been perceived as an environmental problem, but our view – that it can also be part of the solution – is becoming increasingly widespread. Yara promotes resource efficiency, inducing green growth and sustainable agriculture, and we have a particular African engagement. We have entered several value chain business partnerships, promoting food security and sustainable agriculture. Water use efficiency is a central topic in several of the partnerships and collaborative initiatives we are involved in.

Yara participated actively in the process leading to the UN Sustainable Development Goals (SDGs), and is committed to help meet the goals. We took an active role in promoting the goals as the official private sector respondent for Norway at the UN High Level Political Forum in 2016, and continued to support the implementation of the SDGs by engaging at several events in Norway and globally throughout 2017.

2017 saw the conclusion of the project WEAM4i (Water & Energy Advanced Management for Irrigation). It was co-founded by the EU under the 7th Framework Program to improve the efficiency of water use and reduce the costs of power irrigation systems. Yara was one of 17 partners in the project, which developed an ICT platform better irrigation management, integrating different information services and smart applications. The Yara Water-Sensor was one of three irrigation technologies showcased at the final project presentation in April 2017.

#### Learn more in our position papers

A century in fertilizer and food production has given us extensive knowledge about agriculture, resource use and the environment. Our position papers on water use efficiency, the EU Common Agricultural Policy and the EU Baltic Sea Region strategy offer more insight and our positions on these water-related topics.

Follow this link to read our position papers on these and other key sustainability topics.

Read Yara's positions here: **Position Papers** 





#### IMPROVED water treatment

# Yara Sluiskil has served as a testing ground to support better water reuse in the Zeeland Delta on the coast of Belgium and the Netherlands.

Yara's largest European plant, Yara Sluiskil, was one of three pilot plants chosen to conduct on-site testing of purification methods in order to improve water reuse in the industrial sites in the Zeeland Delta. This area hosts a large chemical industry, but is water-stressed and has significant potential for improved water reuse.

Through the public-private IMPROVED project (Integrale Mobiele PROceswatervoorziening Voor een Economische Delta), Yara Sluiskil hosted the testing of a mobile plug & play water purification module. Equipped with a variety of technologies, the module has enabled tests and demonstrations of three different treatment techniques (reverse osmosis, electrodialysis and membrane distillation) to purify process water and recover nutrients at Yara Sluiskil in 2017–2018. The testing was overseen by representatives from Ghent University and HZ University of Applied Science, and findings from the project will be used to develop future water treatment strategies to deal with the local water stress.

# Temporary nature – good for water, biodiversity and neighbors

In another project, Yara Sluiskil rehabilitated the natural and cultural-historical value of idle parts of its plot. Yara Sluiskil was the first private company to join this 'Temporary Nature' initiative, which has included the establishment of a nature trail; a water pool, accommodation for birds, bats, and bees, and cultivation of traditional crop varieties to promote biodiversity. Yara Sluiskil joined the initiative in 2014, and it has now expanded to cover 44 industrial sites in the province of Zeeland.

# Partnering for water recycling in greenhouses

Yara participates in public-private efforts to achieve near 100% water recycling in Dutch horticultural greenhouses.

Following the European Water Framework Directive (WFD), the Dutch government and the greenhouse horticulture sector have agreed to pursue a virtually zero emissions standard for nutrients and pesticides by 2027. Under the leadership of Business Unit Greenhouse Horticulture of Wageningen University & Research, Yara is collaborating with several partners from the public and private sector to develop solutions to minimize the leaching of nutrients and pesticides from greenhouses, thus preventing eutrophication and the contamination of waterways. This will help the horticultural sector to comply with the new regulations and meet societal demands.

This two-year project includes four work streams: investigating optimal management of water flows, investigating purification technologies, studying the effects of decontamination and cleaning products, as well as the development of cultivation strategies to handle mineral and nutrient content in recycled water. Phase one of the project was concluded in a report in March 2018, and further research and trials will continue throughout 2018.

## Transparency

Yara emphasizes transparency and accountability. We have chosen the Global Reporting Initiative (GRI) framework to guide our reporting, and to communicate principles and performance to our stakeholders. We also report according to the UN Global Compact framework, based on our commitments and policies, as well as to the CDP Water platform. Our engagement, actions and performance are strongly linked to our vision and strategic framework.

#### Read the complete reporting here: Yara Sustainability and GRI reporting

Our commitment to the CEO Water Mandate has been confirmed in our Annual report 2017, in the Report from the Board of Directors

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