Research and EDUCATION

PhosAgro runs the Samoilov Scientific Research Institute for Fertilizers and Insectofungicides (NIUIF), Russia's only institute specialising in this area. The Company actively cooperates with the Russian Ministry of Agriculture, the Russian Academy of Sciences, scientific and educational institutions in Russia and abroad, and innovation funds.

Research and education has always been an integral part of our operations.

Fully aware of our responsibility for ensuring efficient and safe agricultural production, we develop new innovative fertilizers, and work to minimise the environmental impact of both mineral fertilizer application and production.

GLOBAL SUSTAINABLE DEVELOPMENT GOALS (SDGS)

2 ZERO HUNGER

4 QUALITY EDUCATION

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

15 LIFE ON LAND

17 PARTNERSHIPS FOR THE GOALS

NIUIF ACTIVITIES

The NIUIF is Russia's oldest and so far only research institute focusing on downstream technologies for phosphate rock, production of phosphoric and sulphuric acids and manufacturing of phosphate- and nitrogen-based mineral fertilizers. It is the country's leading issuer of standards and certificates for mineral fertilizers, sulphuric and phosphoric acids, and other associated products, and No. 1 provider of metrological solutions for production facilities. The institute holds around 70 patents for phosphate processing and fertilizer production technologies.

The NIUIF cooperates with the leading agricultural institutes from Russia and abroad, and studies mineral fertilizer properties and the ways to make their use more efficient and produce healthy foods for the planet's growing population.

SOLUTIONS DEVELOPED BY THE NIUIF IN 2020

R&D FOR SULPHURIC ACID PRODUCTION

- The first stage of creating the in-house production of high-performance vanadium sulphuric acid catalysts: providing input data for the feasibility study. Run jointly with the Boreskov Institute of Catalysis (Siberian Branch of the Russian Academy of Sciences), the project will continue in 2021.
- Development of as-built documentation and support for the design of the SK-800 sulphuric acid plant in Volkhov (the NIUIF technology).
- R&D support for the commissioning and deployment of a new SK-3300 sulphuric acid unit in Cherepovets (the NIUIF technology and design).

R&D SOLUTIONS FOR MINERAL FERTILIZER PRODUCTION

- Intensifying MFPU-2 operation in Cherepovets using a catalytic converter.
- R&D support for the start-up and deployment of MFPU-3 in Volkhov (developed and designed earlier by the NIUIF).
- Development and implementation of the ammoniator-granulator and dryer drum technology in Balakovo.
- R&D support for the commissioning and start of crystalline ammonium sulphate production in Cherepovets.
- Analysis of available technologies, research, substantiating the choice of water-soluble monoammonium phosphate (MAP) technology.

DEVELOPMENT OF ADVANCED TYPES OF FERTILIZERS AND OTHER PRODUCTS

The project has environmental and climatic significance

- Trial and research (together with the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy) to study the possibility of creating innovative fertilizers with enhanced environmental and agrochemical efficiency. This relates to slow and controlled-release fertilizers produced by applying inorganic digestible coatings / shells on granules. The preliminary results are positive, and the work will continue in 2021.

- R&D support for the start-up and deployment of the granulated ammonium sulphate production powered by the NIUIF technology and design.

Plans for 2021

- Conduct research to develop technologies for water-soluble fertilizers, primarily monocalcium phosphate.

R&D SOLUTIONS FOR PHOSPHORIC ACID PRODUCTION

The project has environmental and climatic significance

- Development of solutions for the vacuum evaporation of wet-process phosphoric acid in Cherepovets, Balakovo, and Volkhov. The project will help reduce fluorine content in fertilizers, recycle fluorine into popular chemical products, and optimise the use of chemical reaction heat, which in turn will reduce natural gas consumption and greenhouse gas emissions.
- Development of hemihydrate and dihydrate process for the production of wet-process phosphoric acid at all sites, increasing the efficiency of raw material processing.

ENVIRONMENTAL R&D, INCLUDING WITH A FOCUS ON THE USE OF RECYCLED MATERIALS

- Upgrade and improvement of scrubbing systems in Cherepovets and Balakovo.
- Closer examination of the Volkhov branch water use plan to confirm the possibility of implementing a zero-discharge scheme for the purpose of new production facilities.
- Monitoring the condition and stability of dump sites in Balakovo. Collaboration with St Petersburg Mining University.
- Research and development support for the design of an acidic waste water treatment station in Volkhov.
- Analysis of high-potential fluosilicate acid processing methods.
- Research and development support for the design of a unit for the integrated treatment of by-products from wet-process phosphoric acid – fluosilicate acid and phosphogypsum production (based on a NIUIF technology).
- Research and development support for the design of aluminium fluoride shop reconstruction with increased capacity.
- Research on recovery and processing of waste water phosphorus.
- Research to create a technology for hydrogen sulphate treatment of nepheline.

Plans for 2021

- Development of a technology to produce crystalline ammonium sulphate by processing phosphogypsum and carbon dioxide.
- Development of an action plan to optimise the use of chemical reaction heat, reduce natural gas consumption and, consequently, greenhouse gas emissions at the fertilizer drying stage.

PHOSAGRO INNOVATION CENTRE

The Innovation Centre was created in 2018 to develop innovative products and technologies in collaboration with research institutions in Russia and abroad. The Centre also conducts market research and shapes the product portfolio expansion strategy for the Company.

Today, PhosAgro's portfolio includes 52 fertilizer grades, including 12 with micronutrients. We plan to develop 50 new products by 2025, and 70 by 2030, including innovative biomineral fertilizers, fertilizers with inhibitors and ameliorants, as well as fertilizers with prolonged effect.

PhosAgro Innovation Centre cooperates with 15 federal research centres and institutes. It has signed 22 research and development contracts for the total of RUB 34.9 mln. The Centre has put in place a procedure to develop and register innovative agrochemicals comprising the following stages: laboratory analysis – growth chamber – field – product concept – registration. It also collects information on new developments in the field of fertilizer production and application, and works to create educational and training films.

It has signed

22

research and development contracts for the total of

34.9 **RUB mln**

PHOSAGRO'S AGRONOMIC SERVICE

Educational activities of the agronomic service include the following:

- field days (over 35 field days annually);
- seminars and training for farmers, distributors and sales managers (over 60 seminars and conferences annually);
- internal training for agronomists and traders;
- agronomic advice and support;
- creation of a knowledge base focusing on the efficiency and benefits of PhosAgro fertilizers (150+ trials per year).

PhosAgro's field trial stations are a tool for transferring advanced agricultural technologies from scientific community to producers.

The field trial stations are used to:

- demonstrate growing technologies;
- test new fertilizer grades and prepare recommendations on their safe and effective use;
- conduct field conferences;
- provide on-the-job training for students.

In 2020, PhosAgro launched its YouTube channel named PhosAgro Pro Agro. It features the Company's agronomic service specialists and invited experts discussing advanced technologies and effective plant nutrition systems.

INNOVATIONS IN EDUCATION

We believe that availability of human resources for the agro-industrial sector is an essential part of ensuring the country's food security.

- PhosAgro, together with the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy and Innopraktika non-government development institution, has established an applied academy-based research educational centre to train highly qualified personnel for the agro-industrial sector.
- Training centres were established at the Kuban State Agrarian University and the Russian State Agrarian University – Moscow Timiryazev Agricultural Academy.
- A university of innovations was established, and a course of 20 lectures and webinars was developed and implemented. The project involves globally renowned scientists, innovative companies that are PhosAgro's partners, PhosAgro specialists and university professors.
- Video lectures designed to promote knowledge about new products through PhosAgro's digital education programme are being prepared.
- The first online conference held in June 2020 was attended by a total of 290 participants.

GREEN CHEMISTRY FOR LIFE

At the onset of the Green Chemistry for Life project, we were thinking, first and foremost, about influencing the scientific search criteria, and directing the efforts of young scientists toward the development of new technologies to secure the efficient and rational use of available resources, as well as application of recycled materials. Our common goal has been to promote and popularise new progress ethics making sure that scientific and technological advances of today do not compromise the planet's natural diversity and well-being of future generations. Our ideas have been strongly supported by the scientific community, and the project was widely discussed and became an effective mechanism for stimulating scientific research. The efforts of an ever increasing number of people united by this project are aimed at benefiting all mankind.

Andrey Guryev
PhosAgro's CEO

GLOBAL HUMANITARIAN PROJECTS

IUPAC
INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

UNESCO
United Nations Educational, Scientific and Cultural Organization
In partnership with UNESCO

Since its launch in 2013, Green Chemistry for Life, an initiative run by UNESCO and PhosAgro in close cooperation with the International Union of Pure and Applied Chemistry (IUPAC), has reviewed over 700 applications and awarded grants to over 40 young chemists from 29 countries for research in health, sustainable development, environmental protection and human health.

It is the first ever project under the auspices of the UNESCO and the entire UN system funded by a Russian company.

PhosAgro's contribution to the project over 2013–2022 will amount to

2.5 **USD mln**

IUPAC GREEN CHEMISTRY SUMMER SCHOOL

In 2018, the Company's partnership with UNESCO and IUPAC reached a new milestone as the first session of the IUPAC Summer School on Green Chemistry kicked off.

PhosAgro has been a general partner of IUPAC's Summer Schools on Green Chemistry providing scholarships to young researches from developing economies. Over the course of three years, our total spending to support this project exceeded USD 40,000. Sessions have been held annually with PhosAgro's support, attracting hundreds of young talented scholars from emerging and transition economies.

In 2020, the IUPAC Summer School was held online for the first time. Dictated by the new reality, the format made the school's events accessible to a record number of participants. More than 200 postgraduates and young scientists engaged in innovation activities based on the principles of sustainable development and about 40 professors and teachers from 25 countries participated in the sessions.

PROMOTING SUSTAINABLE AGRICULTURE

PhosAgro is helping farmers and the industry understand how to improve soil management while avoiding the accumulation of contaminants in it.

In order to preserve soil fertility and purity, boost yields, and ensure stable agricultural production in a high-risk farming environment, the Company shares its research results with farmers in various countries and arranges their training and professional development.

PhosAgro cooperates with the United Nations Food and Agriculture Organisation (FAO), which has 197 member states. In 2018, the Company became a partner in FAO's **Global Soil Partnership.** PhosAgro is the first Russian company in the history of this organisation to implement a global soil protection initiative, promoting new technologies and knowledge for sustainable agricultural development.

In 2019, PhosAgro launched a large-scale project to promote sustainable soil management among farmers and create the Regional Soil Laboratory Network (RESOLAN) in Africa, Latin America and the Middle East, with USD 1.2 mln allocated for these purposes. Results of the laboratory activities are aggregated in a global international network of such laboratories allowing to assess soil quality and the role of fertilizers in boosting yields.

PhosAgro has also financed the creation of a rapid soil testing kit as part of the **Soil Doctors programme**. The project will see more than 5,000 farmers across 30 countries receive these kits.