PHOSPHATE STEWARDSHIP

PRESERVATION OF THE PHOSPHATE RESOURCE:

Better recovery of P at phosphate rock level: OCP has developed a reverse flotation process to enrich its phosphate production, first for the low-content deposits in the Youssoufia and Khouribga area. This process is being rolled out to other sites such as those in Bou Craa and Benguerir. As a result, 33% of Moroccan phosphates, considered to have a very low phosphorus content, are now more economically viable and fully utilized.

Byproducts valorization linked to phosphorus: One of OCP's research axes for the preservation of Phosphate resources is on valorizing byproducts, which are generated during the various stages of production. The most significant are waste rock and phosphogypsum: the first being derived from post-wash extraction and drying processes while the second is a byproduct resulting from processing phosphate into phosphoric acid.

Among the most important initiatives are:

- The reintroduction of waste rock, containing low concentrations of phosphorus, in the process, enabling the recovering of a fraction of this material and extending the reserve life.
- The use of phosphogypsum as an amendment to saline soils and as a low-cost fertilizer. Pilot tests have been conducted in different areas of Morocco, using different crops and different dosages. The aim : to correct the amount of saline and sodium soils or to boost the fertility of degraded soils. In addition, a second pilot test has taken place at developing phosphogypsum to rehabilitate mining lands that have lost their beneficial soil properties.

PHOSPHORUS RECOVERY:

Nutrient recovery feasibility study: In coordination with JESA, OCP has designed and launched a feasibility study for integrating phosphorous and nitrogen nutrient recovery systems into three existing wastewater treatment facilities developed by OCP in Khouribga, Benguerir and Youssoufia. OCP also launched a study for the production of organic and organo-mineral fertilizers from organic waste.

Innovations and research in phosphorous recycling: Through its participation in Fertinagro, OCP is committed to providing farmers with new products that consist of integrating macro and micro nutrients into organic fertilizers, commonly known as "Organic Fertilizers". These new products are derived from the recovery of nutrients (N, P, K, ...) from organic waste and are incorporated into new formulas that have not undergone the conventional value chain of fertilizer production. In addition, UM6P has initiated a preliminary study on phosphorous recycling in the academic realm and anticipates further collaboration with international universities.

PRODUCTS AND TECHNOLOGY DEVELOPMENT FOR IMPROVED PHOSPHORUS EFFICIENCY:

- In less than ten years OCP has developed more than forty **new customized fertilizer formulas** (NPK, enriched liquid fertilizers, nitrogen-enriched TSP, Phosfeeds, TSP coated to be blended with urea, etc.) with agronomic tests carried out to confirm & maximize the performance of new fertilizer formulas (high-sulfur fertilizers, polymers for P bioavailability, silicon as a stimulant, biopesticides, etc.).
- **Bio-Agritech: biostimulants for better nutrient absorption:** Development of a new products range through new biotechnology solutions. These biostimulant products result in better nutrient absorption, higher resistance to different climatic stressors (heat, rainfall, etc.), as well as producing fruits and vegetables with higher nutritional value.

HACKING PHOSPHATE :

- Development of pilot test for fluorine production and launch of a second pilot test using Fluorsid technology.
- Carrying out elimination and reduction management tests for Cadmium contained in phosphate and its derivatives.
- Launch of innovation and R&D initiatives to develop phosphate-based materials for batteries in collaboration with the UM6P (LFP for lithium-ion batteries, NVPF for sodium-ion batteries).
- In partnership with Prayon and the École des Mines in Albi, the development, in test mode, of phosphate-based materials for thermal energy storage.
- Development of ways to use elements with high added value such as rare earth elements.

CORPORATE ENGAGEMENT IN SUSTAINABLE PHOSPHOROUS:

- OCP is a founding member of The Sustainable Phosphorus Alliance (SPA) since its inception in 2016. SPA is North America's central forum for discussion on the sustainable use, recovery, and recycling of phosphorus in the food system. As a membership organization, SPA collaborates with numerous stakeholders and supporters, to innovate and implement evidence-based solutions to the phosphorus sustainability challenge. The type of members include those from the mining and processing companies, biosolids and manure companies, wastewater treatment plants, startups, innovators, academic leaders and others, all engaged in the advancement of sustainable phosphorous. As a founding member, OCP has demonstrated its commitment to the circular economy across North America and leadership in the area of phosphorous sustainability.