

Nitrogen optimization: Strategies to address the climate crisis in food production

CHILE, ARGENTINA, PANAMÁ, PERÚ, REPÚBLICA DOMINICANA



Webstory



Technological solution

The technology resolves national inventory inaccuracies by replacing generic Tier 1 default factors (1% of applied nitrogen) with empirical, locally calibrated Tier 2 emission factors. In the field, it synchronises fertiliser application with the physiological nutrient uptake curves of crops and pastures, optimising rates and split timings. Formulations with enzyme inhibitors and controlled-release matrices retain nitrogen within the root zone, curbing denitrification bursts that produce N₂O while mitigating ammonia volatilisation and nitrate leaching. This agronomic adjustment safeguards crop yields, avoids over-fertilisation, and lowers direct production costs amid climate variability.



Technological description

This regional platform quantifies and mitigates nitrous oxide (N₂O) emissions from nitrogen fertilisers in pastures and crops across Argentina, Chile, Panama, Peru, and the Dominican Republic. It implements the 4R nutrient stewardship framework: Right source, Right rate, Right time, and Right place. Utilizing a standardised protocol based on closed static chambers and gas chromatography, the initiative generates local Tier 2 emission factors aligned with Intergovernmental Panel on Climate Change (IPCC) standards. The platform also evaluates enhanced-efficiency technologies: nitrification and urease inhibitors, controlled-release fertilisers, nanofertilisers, and the agronomic recycling of dairy slurry effluents.



Impacts and results

The project aims to determine 20 Tier 2 emission factors and validate 20 mitigation strategies across six regional pilot sites. In maize, wheat, potato, vegetable crops, and pastures, nitrogen fertiliser rates will be optimised by 10% to 20%, projecting direct cost reductions of 5% to 10% in grains, 5% to 7.5% in potatoes, and 7% to 21% in pastures. The initiative will transfer these practices to 2,000 direct beneficiaries across 10 workshops and 3 webinars, reach 17,500 indirect beneficiaries, train 20 public-sector specialists, support 5 undergraduate and postgraduate theses, and produce 3 peer-reviewed scientific articles to underpin national targets within Nationally Determined Contributions (NDCs).



- 5 %

Projected direct fertilization cost reduction



20

Tier 2 emission factors determined



10 %

Nitrogen fertilizer dosage optimization



6

Experimental pilot sites established



20

Scientific and technical personnel trained



10

Participatory workshops held

MAIN DONORS



PARTICIPATING ORGANIZATIONS

