

Dear reader,

The Andean páramos occupy less than 2% of the South American continental surface, yet they regulate a significant portion of the water supply that sustains more than 60 million people downstream. Over the past decade, these ecosystems have transformed from “lands of mist” into real natural laboratories where high-altitude ecology, community water management, and environmental governance converge. Aware of this historical moment, *La Granja, Journal of Life Sciences*, presents a Special Issue featuring research that illuminates diverse aspects of the páramo–water dynamic and outlines pathways for its conservation and sustainable use.

The first contribution, from Colombia, titled “*Characterization of Andean Wild Fruit Species as a Strategy for Environmental Conservation in the Western Colombian Páramo*” by Manuel Galvis Rueda and Manuel Torres, documents 48 fruit species in 14 botanical families. It demonstrates how ethnobotanical knowledge can be integrated with páramo-guardian programs and community ecotourism to mitigate degradation

caused by mining and intensive livestock farming. The findings confirm that conserving plant diversity not only safeguards key hydrological functions—such as water storage and release—but also diversifies local livelihoods, a critical element in the face of climate change.

From the perspective of engineering and water policy, the article “*Analysis of Sustainability Challenges in Andean Irrigation Systems*” by Gina Berrones and Rolando Célle-ri analyzes 235 irrigation systems in Ecuador and identifies structural bottlenecks: disproportionate water allocations, weak regulatory enforcement, and increasingly irrelevant sources of agricultural income. The study shows that water sustainability does not depend solely on physical supply, but rather on robust institutional arrangements. Governance thus emerges as an “invisible infrastructure” that ensures efficiency and equity in water use.

Complementing this approach, the study “*Community Management and Sustainability in Andean Irrigation Systems*

through Efficient Water Use Indicators” by Charles Cachipundo, Mercy Ilbay, and Narcisa Requelme, employs the MESMIS methodology and the Delphi technique to develop 31 indicators aligned with the SDGs and the Principles for Responsible Investment in Agriculture. The result is a locally grounded tool that empowers water boards to audit their own performance and negotiate public policy with evidence in hand. This is a vital contribution, as it translates global frameworks into locally comprehensible metrics for community leaders, technicians, and policymakers.

Together, the articles in this issue demonstrate that the hydrological resilience of the páramos is rooted in biocultural diversity: protecting wild fruit species is as strategic as monitoring streamflows. Moreover, the sustainability challenges of irrigation systems are not purely hydraulic; they require clear rules, appropriate incentives, and informed participation. Measuring matters: without shared indicators, dialogue among communities, academia, and the state remains stalled in perceptions.

From our Miscellanea Section and venturing into the field of Biotechnology, Elias Mjaika Ndifon from the Faculty of Agriculture at Alex Ekwueme Federal University Ndufu-Alike, Nigeria, evaluates the effectiveness of plant extracts and antibiotics in controlling bean blight caused by *Xantho-*

monas axonopodis. Developed under laboratory and greenhouse conditions, the study shows that antibiotics such as tetracycline, lincomycin, and erythromycin achieve inhibition levels above 50%, while extracts from *Eucalyptus globulus* and *Aframomum melegueta* also exhibit significant bactericidal effects, proposing new phytosanitary management approaches.

From Ecuador, Jaime Naranjo-Morán (Universidad Politécnica Salesiana, UPS), Karen Olivo-Fernández, Milton Barcos-Arias, and Rodrigo Oviedo-Anchundia (all from Escuela Superior Politécnica del Litoral, ESPOL), with Barcos-Arias also affiliated with Universidad Espíritu Santo (UEES), present a study on selecting trap plants and suitable substrates for the production of mycorrhizal inoculum. The work identifies *Plectranthus tomentosa*, cultivated in a mixture of sand, rice husk, and peat, as the species with the highest mycorrhization and sporulation, contributing to biotechnological advances in the propagation of arbuscular mycorrhizae.

Likewise, from the University of Mosul in Iraq, Dr. Ali Adel Dawood investigates the therapeutic potential of the TRK inhibitor Vitrakvi (Larotrectinib) in treating solid tumors carrying NTRK gene fusions. Using molecular docking techniques, the author analyzes the drug’s interaction with TRK receptors, particularly in the presence of TRKC mutations, revealing structural

changes that may affect its efficacy. This work provides a valuable contribution to the development of targeted, personalized therapies in molecular oncology.

From the Earth Sciences domain, the research team from the Universidad Técnica del Norte (UTN), the researchers Paúl Arias-Muñoz, Evelin Chamorro-Benavides, Sandy Patiño-Yar, Gabriel Jácome-Aguirre, and Oscar Rosales, examine the combined effects of land use change and climate change on the potential distribution of sugarcane in the Chota Valley, Ecuador. Based on land cover projections and climate scenarios RCP 4.5 and RCP 8.5, the study reveals a 14.65% reduction in cultivable area due to anthropogenic factors, but also a projected increase in optimal zones under future climate conditions, emphasizing the complexity of agricultural planning in a changing environment.

In the field of Agricultural Sciences, Lucero Perera Hau, Juan Carlos Alamilla, Tomás Gonzales Estrada, and José Humberto Caamal of the Colegio de Postgraduados Campus Campeche (BIOSAT), along with Alberto Santillán Fernández (IxM-CONAHCyT) and Norman Aguilar Gallejos (Universidad Panamericana, Mexico), conduct a meta-analysis of scientific research on *Carludovica palmata* Ruíz Pavón, a species traditionally used in hat-making. The study shows that despite growing interest in craft transformation and traditio-

nal production, there remains a marked gap in propagation techniques-especially *in vitro*-highlighting a crucial issue in meeting increasing market demand.

Within Environmental Sciences, researchers from the Faculty of Engineering and Applied Sciences at Universidad Técnica de Manabí, including Josseline Solís Bermúdez, Gabriela Zambrano Varela, Dr. Ramón Eudoro Cevallos Cedeño, and María Antonieta Riera, analyze the potential of various agricultural residues for the establishment of a small-scale biorefinery. Through a multicriteria approach using the AHP method, they identify sugarcane bagasse and coffee husk as the most promising biomasses for producing biofuels and chemical products, reaffirming the relevance of bioeconomy in the sustainable utilization of agro-industrial waste.

Finally, a multidisciplinary team from Escuela Superior Politécnica del Litoral (ESPOL) and Universidad de Guayaquil, led by Tatiana Zamora, along with Joel Vielma-Puente, Luis Galarza Romero, Meribary Monsalve, Joan Vera, Viviana Corrales, Fernanda Chacha, Darling Balón, Leticia Villacis, and Rodrigo Espinoza, presents a study on the production of bioethanol from cocoa shells (*Theobroma cacao*). The process integrates alkaline pretreatment, enzymatic hydrolysis using *Trichoderma reesei* and *T. ghanense*, and alcoholic fermentation with *Saccharomyces cere-*

visiae, resulting in a promising output of bioethanol, relevant to sustainable energy transitions.

We therefore invite our readers to explore this special issue through an interdisciplinary lens. You will find robust empirical data, replicable methodologies, and above

all, examples of collective action that transcend national borders. We trust that this issue will inspire new collaborations so that, in the páramos, water may continue to flow not only through the streams but also through science and the hope of those who depend on it.

Sincerely,

PhD. Ignacio de los Ríos
Universidad Politécnica de Madrid, España
EDITOR-IN-CHIEF

PhD. Sheila Serrano Vincenti
Universidad Politécnica Salesiana, Ecuador
EDITOR-IN-CHIEF

PhD. Benito Guillermo Mendoza Trujillo
Escuela Politécnica del Chimborazo, Ecuador
GUEST EDITOR