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From Fish Waste to Regenerative Agriculture: How BioChalllwa Is Turning Discarded Biomass into a New Life for the Soil

Key Concepts- Circular economy, Organic agriculture

Peru's fishing and agricultural sectors are two of the country's most important productive engines. Yet both face a shared sustainability challenge. Large volumes of organic residues from fish processing are often discarded without adequate treatment, generating environmental pollution, unpleasant odors, greenhouse gas emissions, and pressure on surrounding ecosystems. At the same time, many agricultural systems remain highly dependent on chemical fertilizers that increase production costs and progressively degrade soil health. This creates a double burden: waste that pollutes on one side, and farming systems that depend on increasingly unsustainable inputs on the other. For a country rich in biodiversity and agricultural potential, this disconnect highlights the urgent need for circular solutions capable of transforming waste into value, restoring soil health, and reducing environmental impact across productive chains.

Giving Fish Waste a Second Life in Agriculture

BioChalllwa is a Peruvian startup that transforms fish waste into sustainable liquid biofertilizers, creating a bridge between the fishing industry and ecological agriculture. Its value proposition lies in converting an underutilized organic residue into a high-value agricultural input capable of partially replacing conventional chemical fertilizers.

By applying principles of Green Chemistry, biotechnology, and circular economy, the company produces an organic liquid fertilizer designed to nourish crops, support soil regeneration, and reduce the environmental footprint associated with both waste disposal and agrochemical use. Rather than treating fish residues as a disposal problem, BioChalllwa sees them as a renewable resource with the potential to strengthen agricultural productivity and resilience.

This startup's technology has reached TRL 7, meaning its functional prototype has already been demonstrated in a real operational environment.

Its biofertilizer is formulated from valorized fish residues and complementary organic substrates, generating a nutrient-rich liquid product that can be applied to crops and soils. The solution is designed not only to provide nutrients, but also to stimulate soil microbiota, improve soil conditions, and contribute to more sustainable crop development.
This makes BioChalllwa more than a fertilizer producer. It is a circular platform that connects waste management, biotechnology, and regenerative agriculture into a single model with environmental and productive value.

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A Circular Production Process Inspired by Nature

This innovation is strengthened by a production process designed around resource recovery and environmental responsibility. The life cycle of the product begins with the collection and conditioning of fish residues from markets and processing centers, where materials are selected, segregated, weighed, and prepared for transformation.

These residues are then integrated into a controlled biotechnological process that includes the incorporation of plant-based organic substrates, beneficial microorganisms, water, and energy inputs. Through a fermentation-based production system, the mixture is carefully monitored for temperature, pH, and process stability over several days. This stage allows the organic matter to be transformed into a liquid biofertilizer rich in agricultural value.

Once the product is ready, it is packaged, labeled, stored, and distributed to farmers, associations, and agricultural businesses. In the field, BioChalllwa is applied either directly to the soil or through foliar use, where it supports nutrient absorption, stimulates microbial activity, and contributes to soil regeneration. At the end of its cycle, the product aligns with a circular model: the nutrients return to the soil, the packaging can be reused or recycled, and the agricultural system benefits from a lower dependence on synthetic inputs.

This combination of principles allows the company to position itself not only as a waste valorization startup, but as a practical example of how scientific innovation can create solutions that are environmentally sound from the very beginning of the design process.

Benefits

- Provides essential nutrients and organic compounds.
- Improves soil structure, aeration, and moisture retention.
- Helps regenerate degraded soils and correct alkaline conditions.
- Stimulates root growth and overall plant development.
- Activates beneficial soil microbial life.
- Increases crop yield and quality.
- Reduces dependence on chemical fertilizers.

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BioChalllwa contributes to the partial replacement of synthetic fertilizers such as urea ($CO(NH_2)_2$), ammonium nitrate (NH_4NO_3), and diammonium phosphate ($(NH_4)_2HPO_4$), which are widely used in intensive agriculture but are also associated with nitrate leaching, eutrophication, soil acidification, and nitrous oxide (N_2O) emissions when overapplied. By converting fish waste into a liquid biofertilizer, the startup offers a circular nutrient source that can reduce dependence on highly soluble mineral fertilizers while promoting a more gradual nutrient release and a lower environmental burden on soils and water bodies. Replacing these compounds is increasingly important for the agricultural sector, as it supports the transition toward more regenerative fertilization strategies with reduced pollution and improved soil health.

The final stage of BioChalllwa's life cycle reflects the circular logic at the heart of its innovation. Once applied to crops—either directly to the soil or through foliar spraying—the biofertilizer supports nutrient uptake, stimulates beneficial microbial activity, and contributes to soil regeneration. At the end of its use phase, its nutrients re-enter the biological cycle, returning to the soil rather than persisting as harmful residues. This biodegradable pathway, combined with the potential reuse or recycling of packaging, allows BioChalllwa to close the loop from fish waste to agricultural productivity, reinforcing a model where nutrients are recovered, soils are restored, and waste is designed back into the system.

BioChalllwa demonstrates how one industry's waste can become another's resource when innovation is guided by circular economy and green chemistry principles. By transforming fish residues into a sustainable liquid biofertilizer, the startup is not only reducing organic waste and dependence on synthetic fertilizers, but also helping build a more regenerative relationship between agriculture, soil health, and resource use. In a world increasingly shaped by the need for cleaner production and resilient food systems, BioChalllwa offers a compelling vision of how sustainability can begin with what we choose to recover—and what we choose to return to the earth.

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