

TRANSFORMING RICE: AN ECOSYSTEM FOR CLIMATE RESILIENCE AND PROFITABILITY

An integrated strategy for sustainable rice production in the Americas.

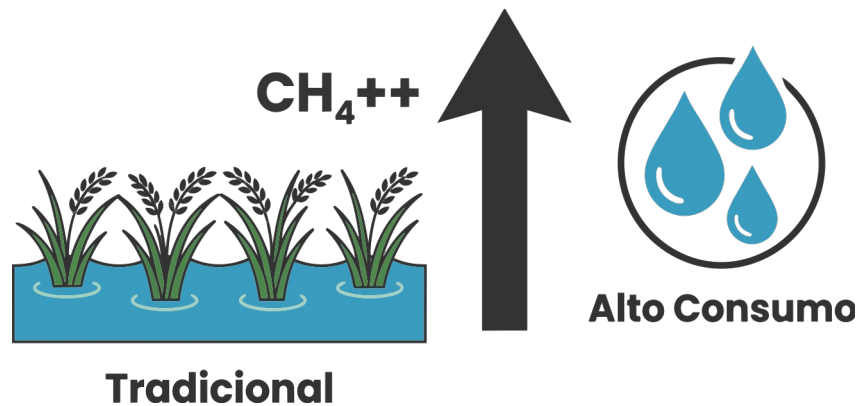
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THE DOUBLE EDGE OF RICE: A CLIMATE CHALLENGE, AN ECONOMIC OPPORTUNITY

The Challenge

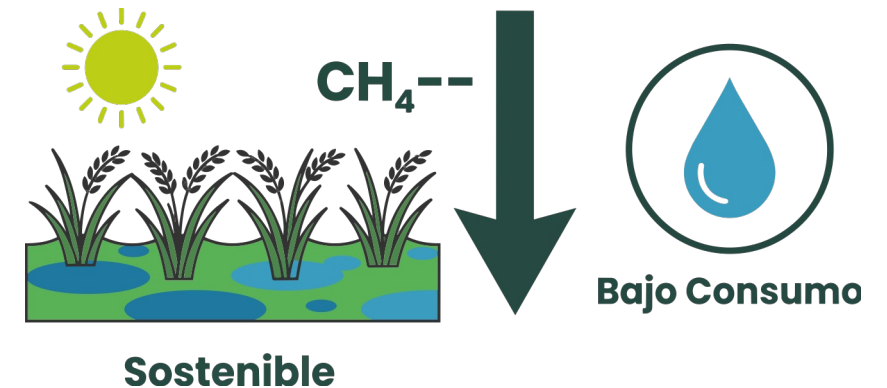
Traditional flooded rice production is a significant source of methane (CH_4), a greenhouse gas 25 times more potent than CO_2 . This method contributes to climate change and represents inefficient use of resources such as water.



The Opportunity

The transition to sustainable production offers a triple gain:

- **Environmental Benefits:** Sharp reductions in GHG emissions and water savings.
- **Economic Benefits:** Lower production costs and new commercial opportunities.
- **Social Benefits:** Greater resilience and knowledge for farmers.

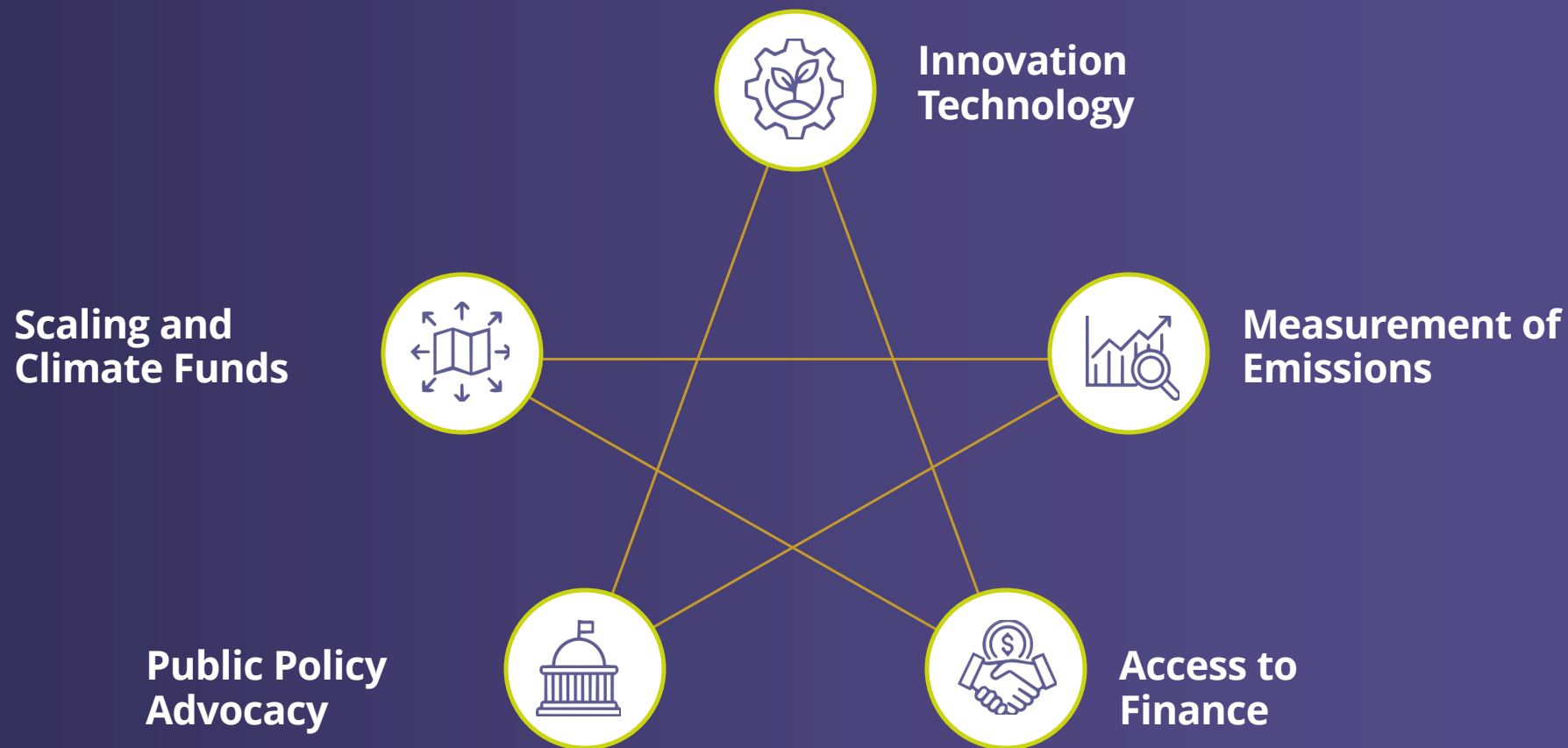


Our Strategy



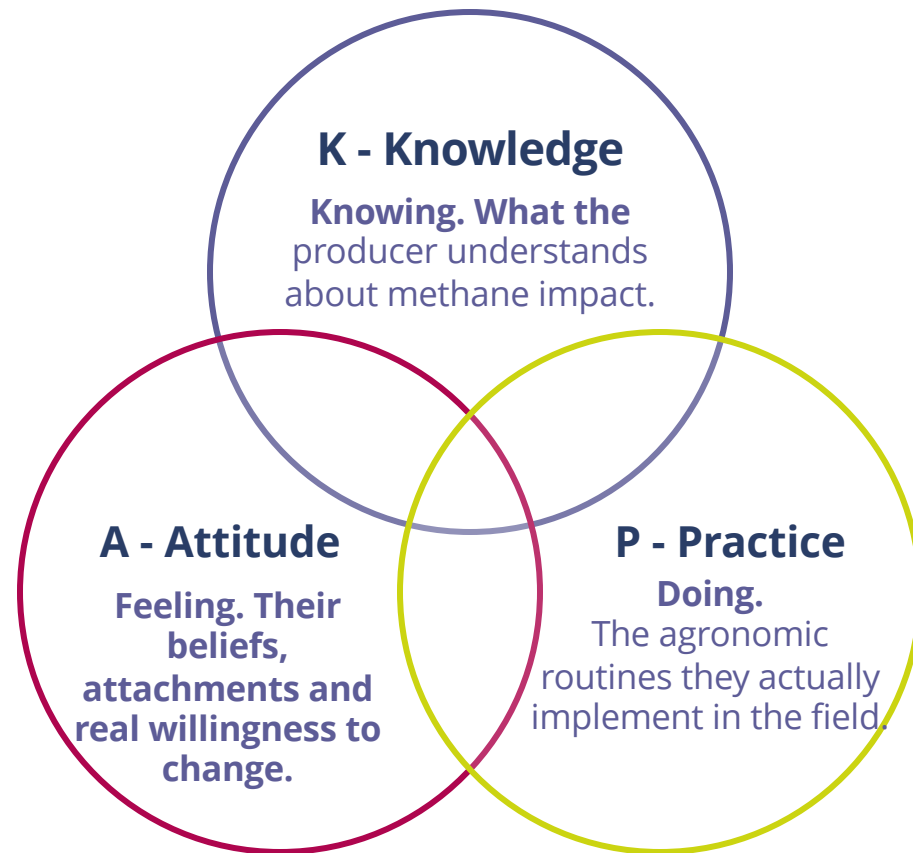
An Integrated Ecosystem of Five Core Pillars

We have designed a holistic strategy in which each component strengthens the others, creating a robust, scalable system to transform the rice sector.



The Human Factor in Methane Reduction: Why assess KAP?

Agronomic innovations, such as alternate wetting and drying, fail if they ignore the people who implement them.



Origin of the Method

KAP surveys (Knowledge, Attitudes and Practices), which originated in public health in the 1950s, reveal an individual's baseline state when facing a challenge.

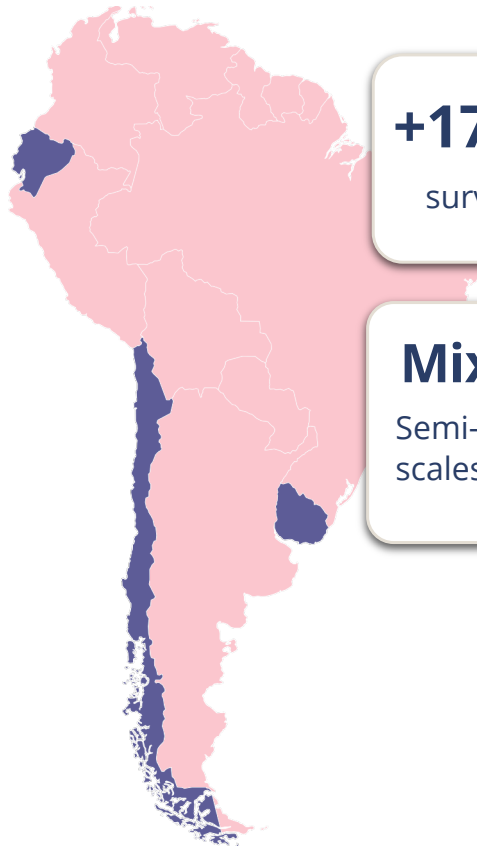
In rice, diagnosing this state enables precision extension and supports real adoption.



Diagnosing the KAP state prevents wasted resources by identifying exactly where technology adoption is blocked.

SNAPSHOT OF THE LATIN AMERICAN RICE PRODUCER

Map and Scope



+170 Producers

surveyed in the field.

Mixed Methodology

Semi-structured interviews, Likert scales (1–7) and focus groups.

The Dual Analytical Lens

The assessment measured not only crop management, but also the producer's mindset through two key dimensions:



Lens 1: Enabling KAP (The Mental Context)

Assesses cross-cutting elements: the producer's perception of climate change and self-perceived capacity to adapt and innovate.

Lens 2: Implementation KAP (In the Field)

Assesses direct willingness to adopt critical agronomic practices, such as flood management and crop rotation.



KAP DIAGNOSIS: BETWEEN WILLINGNESS AND RESISTANCE TO CHANGE

Gap Matrix

Knowledge	Critical Gap	There is widespread lack of awareness of the true scale of methane emissions in flooded rice cultivation.
Attitude	The Paradox	High willingness to improve the production system, but it coexists with a low sense of urgency regarding climate-change adaptation.
Practice	Technical Resistance	Strong reluctance to reduce flooding periods due to fear of losing yield or quality. However, acceptance of and interest in short-cycle varieties is growing.



Context Barriers



A producer may have an ideal KAP state, but adoption can be blocked by external factors: soil type, land tenure, high transition costs and lack of timely access to suitable machinery.



The Differentiating Factor: Co-creation with Farmers

The Participatory Innovation Groups (GIP) model.

We ensure farmer participation from the earliest stages of technological development. Representative producers from different scales (small, medium, large) and agroecological conditions are selected.

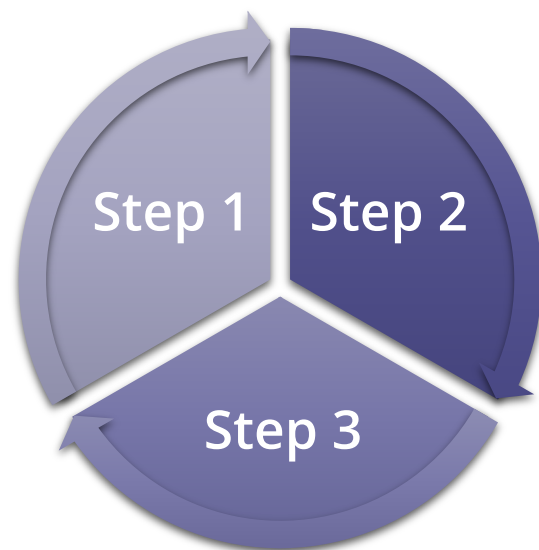
Results of the GIP Approach:

- ✓ Greater Acceptance
- ✓ Contextualized Adaptation
- ✓ Knowledge Appropriation
- ✓ Reduced Resistance to Change

Phase 1

Participatory diagnostic workshops where researchers, extensionists, advisors and farmers sit at the same table.

Exploration of Perceptions:
What real constraints do farmers perceive when facing new practices?



Bi-directional Transfer: Science shares its findings (key SICA points); the field shares its operational constraints.

Critical Analysis:
Each required adaptation is analyzed. Can it be implemented with our machinery, or will it create a new problem?



Phase 2

Translate the diagnosis into an executable seasonal strategy based on four critical aspects.

1. Irrigation



Frequency, days to flooding and phenological stage for flooding. Technology implementation (e.g., use of soil-moisture sensors).

2. Direct Seeding



Selected varieties, exact seed rates (e.g., 70 kg/ha), row spacing and optimal sowing-date windows.

3. Weed Control



Herbicide-use strategy (pre- and post-emergence) combined with machinery for mechanical control.

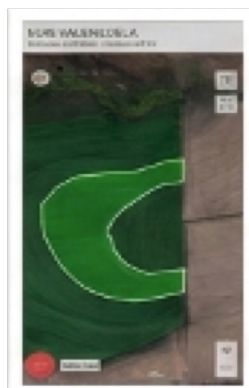
4. Cost / Benefit



Calculation of labor, required machinery, expected yields and use of a field notebook.

Phase 3

Collaboratively agree on the location and size of the area to scale the innovation.
It is not a laboratory experiment; it is a real-scale test.



1. Experimental Plot:

Baseline scientific research. Small scale, hyper-controlled environment managed by INIA.

2. Practice Plot (The Key Link):

GIP adjustment and validation. Larger area (approx. 1 ha) within a producer's field. Here, the co-created strategy is tested (costs, logistics, local climate).

3. Demonstration Plot:

Mass training, technical dissemination and territorial commercial scaling.

Phase 4



Feedback during

Repeat:
Review lessons
planning
next season.

Collaborative Monitoring:

Joint visits to the practice plot to assess vigor and health (e.g., root and visual evaluation).

Real-time Adjustment:

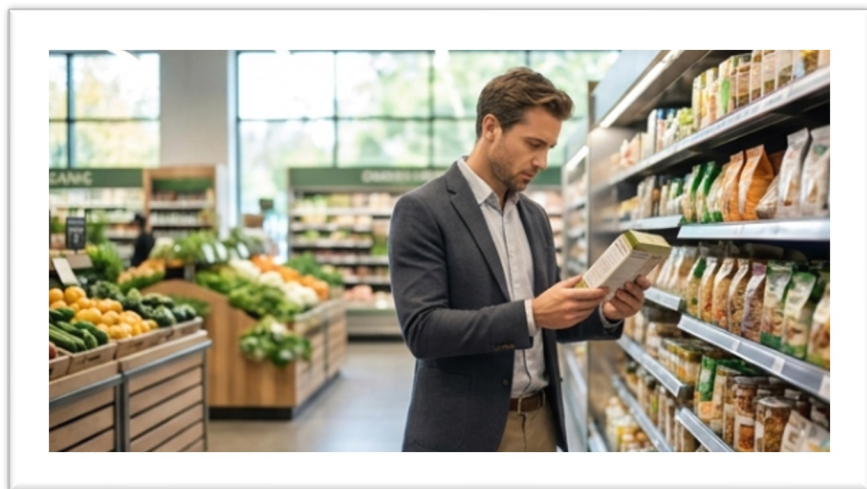
Participatory decision-making in response to emerging climate stressors or weed pressure.

1 Closure:

Final visual assessment of the full system (Irrigation, Seeding, Weeds, Costs).

THE DEMAND DRIVER: ACTIVATING THE CONSCIOUS CONSUMER

The Universal Predictor

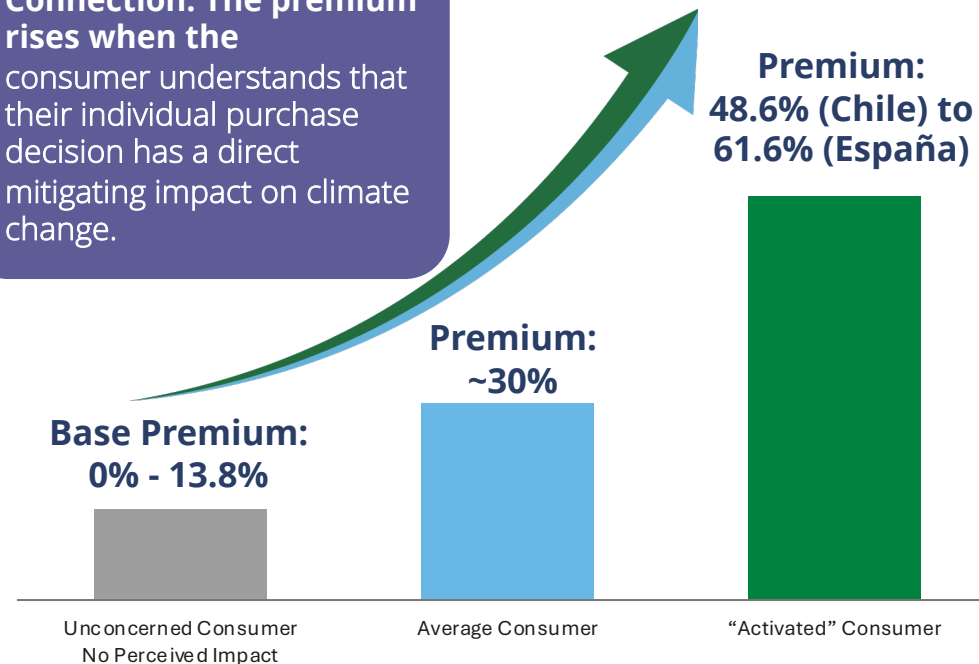


Dominant Factor: In all markets studied, concern about climate change is the strongest and most significant predictor of WTP, outperforming traditional demographic variables.

Information Challenge: Labeling is not enough. In Chile, 64.1% rarely or never read labels. In Europe (except Italy), fewer than one-third do so frequently.

The Behavior Gap

The Value of Cognitive Connection: The premium rises when the consumer understands that their individual purchase decision has a direct mitigating impact on climate change.

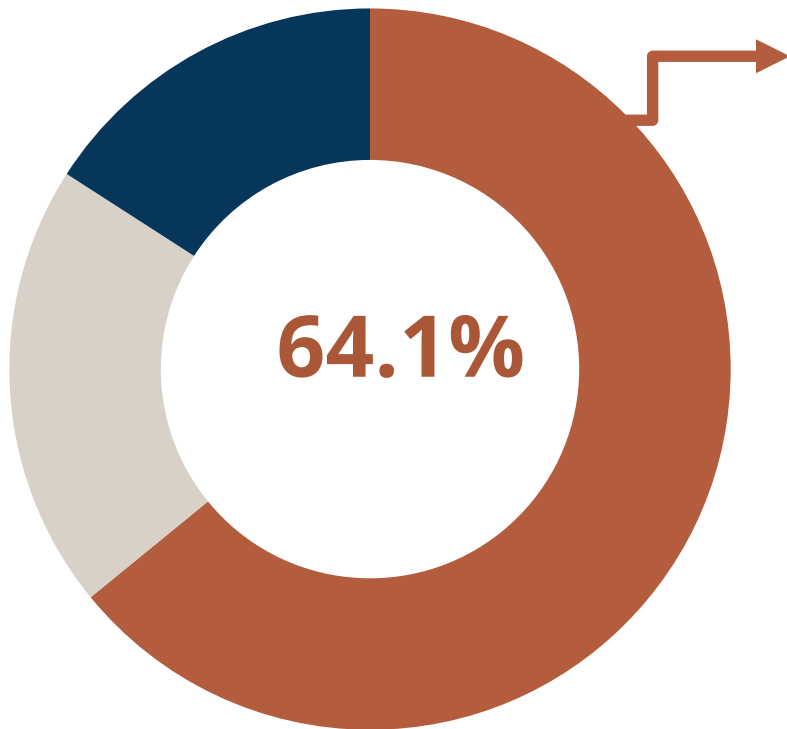


TARGET MARKET DIAGNOSTIC MATRIX: SOUTHERN CONE VS. EUROPE

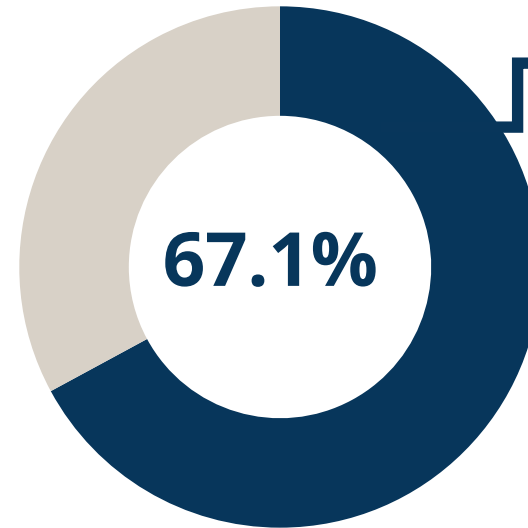
Region	Premium Average (WTP)	Secondary Drivers	Origin Dilemma (Export)
Southern Cone (Chile & Brazil)	26% (Brazil) to 38.4% (Chile)	Income level and household size (households with >2 members pay more, prioritizing collective health and the intergenerational future).	Strong preference for food sovereignty and local rice-growing tradition.
Europe (UK, Spain, France, Italy, Germany)	23% (Germany) to 36% (Spain)	University education (Germany, UK) and high incomes (France).	A Penalty (~50%): They would pay less due to fear of 'Food Miles' (transport emissions). B Reward (~50%): They would pay more to support global sustainability and farmers in other regions.

STRATEGIC CONCLUSION: To export from the Southern Cone to Europe, it is essential to build narratives that neutralize the transport-emissions objection ('Food Miles'), demonstrating a net emissions reduction and highlighting advantages such as the very low arsenic levels in South American rice.

THE INFORMATION DEFICIT: THE FAILURE OF TRADITIONAL PACKAGING



Of consumers
rarely or never read
rice labels.



Of those who do read,
**seek only nutritional
information,**
ignoring environmental
seals.

Strategic Implication:

For those who do not read labels, information comes through family tradition and word of mouth (20.8%). The industry cannot depend on packaging; it must move the environmental narrative into omnichannel advertising and social media.

INDUSTRY STRATEGY: VALUE REDESIGN

PHASE 1: Niche Entry (Short Term)



Position the product in organic aisles and sustainable stores where WTP already exists and has been validated, reducing initial financial risk.

PHASE 2: Narrative Redesign (Long Term)



Make environmental impact tangible at scale. Instead of using the word 'sustainable,' use exact visual metrics ("X liters of water saved per bag").

Structural dynamics of carbon markets for rice

Carbon markets offer new sources of financing, but they require overcoming significant technical and institutional barriers.



Integrating the Rice Sector into Carbon Markets

Methodological guide for designing a National Roadmap focused on climate mitigation and sustainable finance.



Structured, sequential and participatory methodology.



Adaptable to local regulatory and productive frameworks.



Focus on MRV systems and voluntary/compliance markets.



Vision toward sustainable sector modernization.



TERRITORIAL STRATEGY FOR LOW-EMISSION RICE

From theory to action: guidelines for extension and research programs.

Scaling Pathway



Pillar 1: Strengthen Enabling KAP

Before demanding irrigation changes, it is essential to educate producers on the specific impact of methane. Expose them to future opportunities in carbon markets to create real incentives.



Pillar 2: Peer-based Participatory Extension

Attitude change happens through exchange. Key farmers should be identified to lead joint field demonstrations that reduce fear of yield loss when flooding is reduced.



Pillar 3: Systemic Barrier Approach

Agronomic research must actively connect with state and financial institutions to solve critical bottlenecks: access to capital, specific machinery and secure land tenure.





Scientific Consolidation: Public Policy and Cooperation

Generating the local database needed to validate sustainability globally.

Scientific Validation Pathway

The Regional Bridge: South-South Cooperation

A priority challenge is to expand and strengthen the positive aspects of joint work and scientific data exchange among rice-producing countries in the region.

Local Research

Evaluate new technological alternatives and sustainable practices adapted to the reality of South American producers.

Emission Factors (EF) TIER 2

After an extensive learning process, at least one additional season is needed to obtain local EFs that accurately reflect improvements in national inventories.

The Driver of Change: Economic Incentives and Carbon Markets

Structuring the value of emissions reduction to make the producer's transition profitable.

1. Regional Digital MRV

Development of robust Monitoring, Reporting and Verification systems (aligned with IDB Regional Public Goods concepts) as core infrastructure.



2. Carbon Roadmaps

Direct and institutional support for implementing strategies to effectively insert the rice sector into climate markets.



3. Investment Attraction

Actively position South American rice as a sector with high strategic potential for carbon project developers.



4. Commercial Strategy

Low-Emission Label

The ultimate objective for differentiating and positioning the South American product before global consumers.





**Arroz
sostenible**
en Latinoamérica