



DEMAND FOR COMPOST IN CHILE

Analysis of Results

Prepared by:

coovalue
circular solutions

Rev0

May 2026

EXECUTIVE SUMMARY

Chile's municipal solid waste stream is composed of organic matter at a rate of 58%, making it the primary source of methane emissions within the waste sector. The National Organic Waste Strategy (ENRO) has established binding valorization targets of 30% by 2030 and 66% by 2040. Meeting these targets is not only an environmental obligation but a market viability question: the financial sustainability of composting infrastructure depends on the existence of sufficient, geographically distributed demand capable of absorbing the resulting bio-inputs. This study, commissioned by the Global Methane Hub and executed by CooValue Circular Solutions, quantifies and georeferences that demand, establishing the evidence base necessary to align organic waste valorization infrastructure with territorial needs.

The research was structured under a mixed-method design integrating three complementary components: a systematic review of secondary sources and regulatory frameworks; primary data collection through 30 structured technical surveys and 60 in-depth interviews with strategic stakeholders, totaling 45 hours of recorded qualitative data; and spatial modeling for the dynamic projection of demand scenarios across three intensity levels (high, medium, and low) applied to three sectoral axes: agriculture and livestock, public parks and gardens, and conservation and restoration. This methodological architecture enabled the triangulation of willingness-to-pay (WTP) data with the structural barriers identified through qualitative analysis, producing findings that go beyond aggregate demand figures to diagnose the conditions under which demand can be activated.

Under a medium-intensity scenario, the model projects a national potential demand of 42 million tonnes of compost, distributed across an effective land area of 22 million hectares.

Current demand is fragmented and conditioned by asymmetric sectoral realities. The Agriculture and Livestock sector holds the greatest volumetric absorption potential, driven by the recurrent annual nature of agricultural applications over vast surface areas, yet large-scale adoption remains stagnant. Producers evaluate compost primarily as an operating cost when benchmarked against synthetic fertilizers, with a standard WTP concentrated between CLP \$10,000 and \$18,000/m³. This comparison systematically excludes the multi-year soil health co-benefits of organic amendments, a calculation that becomes increasingly relevant as synthetic fertilizer prices continue to rise: urea CIF import prices in Chile increased 16.3% year-on-year as of May 2026, with FAO projecting further increases of 15 to 20% for the first half of 2026 (ODEPA, 2026). The Public Parks, Plazas, and Gardens sector leads in current operational adoption, sustained by municipal in-situ valorization models that eliminate logistical barriers by closing the organic cycle within the same urban territory. Conservation and Restoration registers the highest WTP in the study, exceeding \$40,000/m³, but its large-scale activation is constrained by the absence of structural financing for ecosystem recovery projects.

The primary barrier to market development is logistical: the geographic concentration of composting supply in the Metropolitan Region, combined with the volume and moisture content of compost, makes freight costs the dominant viability factor. Survey data indicate that 73% of agricultural producers identify freight cost as the primary barrier to adoption. This structural disconnect is compounded by three systemic distortions: a final

disposal system in sanitary landfills that is artificially inexpensive relative to valorization alternatives; an environmental permitting framework that applies disproportionate regulatory requirements to composting facilities; and a persistent sociocultural gap between waste generation and the agronomic value of the resulting product.

A structural pattern identified across the qualitative data, and documented in Section 4.1.5, is that compost adoption in Chile has historically been triggered by crisis events rather than stable market development: fiscal constraints in La Pintana (2005), sanitary emergencies in Ancud (Chiloé), post-wildfire soil recovery in Santa Juana and the Jardín Botánico de Viña del Mar, and the synthetic fertilizer price shock following the 2022 Russia-Ukraine conflict. Each crisis generated measurable behavioral change without prior market infrastructure. This pattern defines both the central weakness of current demand, its episodic and fragile nature, and the design logic for the strategic levers proposed in this study.

To unlock the projected demand, four overarching levers are identified: regulatory modernization through the creation of a national waste authority and the simplification of sanitary permitting; financial reengineering through the reorientation of state instruments, including INDAP's SIRSD-S, from synthetic fertilizer subsidies toward organic amendment incentives; infrastructure decentralization through distributed valorization networks that eliminate the logistical cost barrier at source; and cultural repositioning that communicates compost's function as a water retention asset rather than a conventional fertilizer, aligned with the sustainability requirements of export markets.

This study's methodology and spatial model are designed for replicability. The shared structural patterns identified, including freight cost asymmetry, landfill competition distortion, and regulatory barriers, recur across Latin American markets. The diagnostic framework developed for Chile constitutes a standardized baseline for analogous assessments in Brazil, Colombia, and Argentina, enabling the alignment of multilateral climate financing for methane mitigation at a regional scale.

TABLE OF CONTENTS

1.0	7
2.0	9
2.1	9
2.2	9
2.2.1	9
2.2.2	10
2.2.3	10
2.2.4	11
2.2.5	11
2.3	12
2.3.1	12
2.3.2	12
2.3.3	13
2.3.4	14
3.0	15
3.1	15
3.1.1	15
3.1.2	16
3.1.3	16
3.2	17
3.2.1	17
3.2.2	17
3.2.3	18
3.3	18
3.3.1	19
3.3.2	20
3.3.3	21
3.4	22
4.0	25
4.1	25
4.1.1	25
4.1.2	25
4.1.3	26
4.1.4	26

4.1.5	27
4.2	28
4.2.1	29
4.2.2	30
4.2.3	31
4.2.4	31
5.0	33
5.1	33
5.2	33
5.3	33
5.4	33
5.5	33
5.6	34
5.7	34
5.8	34
5.8.1	34
5.9	35
5.10	36
6.0	40
6.1	40
6.2	40
6.3	40
7.0	42
8.0	44
9.0	46

TABLE OF FIGURES

Figure 1:Stakeholder Distribution by Organizational Sector	17
Figure 2: Stakeholder Distribution by Work Areas and Strategic Axes	18
Figure 3: Stakeholder Distribution by Geographic Zone	18
Figure 4: Application Rates and Price Dispersion (WTP)	20
Figure 5: Compost Application Rates by Sector (tonnes/ha)	22
Figure 6: Projection of total demand under a Low parametric scenario	23
Figure 7: Projection of total demand under a Medium parametric scenario	23
Figure 8: Projection of total demand under a High parametric scenario	24

TABLE OF TABLES

Table 1:Crop-Specific Application Guidelines by Micro-Zone	37
--	----

1.0 INTRODUCTION

Chile is at a critical juncture in the face of the global climate crisis, where municipal solid waste management emerges as a fundamental pillar for decarbonization. Currently, organic waste represents 58% of the national municipal solid waste fraction, constituting the primary source of methane emissions within the waste sector. In response to this reality, the State has consolidated the National Organic Waste Strategy (ENRO), an stated goal that mandates the recovery of these resources with clear targets: achieving 30% valorization by 2030 and 66% by 2040. The fulfillment of these objectives is not only an environmental imperative to mitigate a short-term, high-impact greenhouse gas such as methane, but also a strategic opportunity to transform an environmental liability into a key biological asset for soil health.

This urgency for mitigation converges directly with the challenges of adaptation and water resilience facing the national territory. The National Landscape Restoration Plan, which proposes the stated goal of restoring 1 million hectares by 2030, identifies soil degradation as one of the greatest risks to food security and biodiversity. In this context, the production of compost and bio-inputs derived from the organic fraction is positioned as the primary link between urban waste management and ecosystem regeneration, providing essential organic matter to combat desertification and improve moisture retention in landscapes significantly constrained by the water crisis.

At a global level, Chile has assumed a leadership role by joining the Regional Cooperation Program driven by the United Nations Environment Programme (UNEP), the Climate and Clean Air Coalition (CCAC), and the Global Methane Hub. This international alliance seeks to close the circular economy loop by connecting the significant reduction of methane emissions in sanitary landfills with the actual demand for organic products for soil restoration. This study is situated within this cooperation framework, understanding that the technical and economic viability of composting plants depends critically on the existence of receiving markets capable of absorbing and valorizing these products at a national scale.

The central purpose of this document is to quantify and georeference the potential demand for compost in Chile with horizons toward 2030 and 2040. Through an in-depth qualitative and quantitative analysis, this study seeks to bridge information gaps, ensuring that the valorization infrastructure projected by the ENRO is aligned with territorial needs. The ability to project where and how much compost will be required is fundamental to guaranteeing the financial sustainability of waste management projects and the success of ecological restoration policies.

To achieve a comprehensive vision of this demand, the analysis has been structured around three strategic sectoral axes, which represent the main drivers of compost consumption in the country:

- **Agriculture and Livestock:** Evaluating the transition toward more sustainable practices and the regeneration of productive soils.
- **Public Parks, Plazas, and Gardens:** Focused on the creation of resilient urban green infrastructure and the maintenance of public spaces under circular economy criteria.
- **Conservation and Restoration:** Aligned with international commitments for the recovery of biodiversity and degraded ecosystems.

This report is supported by a methodology that integrates quantitative modeling with qualitative stakeholder analysis. Through a comprehensive data collection process that integrates quantitative data modeling with a qualitative analysis of interviews involving key stakeholders from the public and private sectors, as well as civil society, this document not only projects demand scenarios but also identifies critical market barriers and proposes strategic levers. The objective is to ensure that compost demand acts as a primary driver that successfully drives the country's climate goals, transforming operational challenges into concrete opportunities for sustainable development and territorial resilience.

2.0 METHODOLOGICAL FRAMEWORK AND SCOPE OF THE STUDY

To quantify, characterize, and georeference the potential demand for compost in Chile toward the 2030 and 2040 horizons, the research articulated a mixed and sequential methodological approach structured into three operational components: the analysis of regulatory frameworks and secondary sources, primary information collection through 60 in-depth interviews and 30 technical surveys with strategic stakeholders, and mathematical modeling for the projection of spatial scenarios. This structure enabled the triangulation of quantitative and qualitative data to identify gaps and opportunities within the organic waste value chain.

2.1 Review of Background and Secondary Sources

Product Definition: For the purposes of this study, "compost" refers to stabilized organic matter produced through aerobic biological decomposition of organic waste (food scraps, pruning, agro-industrial by-products, and sewage sludge, among others), compliant with the quality standards established in Chilean Standard NCh 2880. Both Class A (suitable for unrestricted use, including direct food contact) and Class B (suitable for restricted applications such as soil remediation and non-food landscaping) are considered within the scope of the demand model. The study does not include vermicompost, anaerobic digestate, or biochar as separate product categories, although these may complement compost applications in specific sub-sectors. The analysis focuses on commercially available or commercially producible compost, not exclusively on products currently present in the market, in order to capture latent and projected demand.

To establish the regulatory and market baseline, the first phase of the study involved a comprehensive systematic review of secondary sources. This process included the analysis of the current regulatory and institutional framework, with special emphasis on the National Organic Waste Strategy (ENRO), the Roadmap for a Circular Chile by 2040, and the quality standards defined by Chilean Standard NCh 2880. Furthermore, technical reports from the agro-industry, academic literature on degraded soil recovery, and public statistics on final waste disposal were processed.

For the specific determination of compost application rates, the initial bibliographic review considered a larger number of documents than those presented in the results. The search included academic databases, institutional repositories, and international guides. Subsequently, these texts were filtered using technical selection criteria, retaining only those that provided quantitative data, comparable dosage parameters, and methodologies applicable to the scenarios evaluated in this project. Therefore, the documents finally utilized correspond to the subset resulting from said filter.

This documentary review allowed for the structuring of working hypotheses, the identification of empirical information gaps within the industry, and the precise calibration of the dimensions to be explored during the primary data collection.

2.2 Primary Information Collection and Stakeholder Participation

2.2.1 Mixed Methodological Approach

The present study, commissioned by the Global Methane Hub and executed by the consultancy CooValue Circular Solutions, was structured under a mixed-method research

design (qualitative and quantitative) of an exploratory and descriptive nature, grounded in a systemic perspective. The central methodological objective was to identify, quantify, and project the potential demand for compost in Chile, while simultaneously evaluating the structural challenges, entry barriers, and "leverage points" (strategic opportunities) necessary to couple the growing supply of organic waste valorization with the urgent need for soil regeneration at a national level.

To achieve this level of depth, the methodological design transcended traditional transactional analysis of buying and selling. The combination of tools allowed for the identification and characterization of complex dynamics that act as enablers or detractors in the transition toward the circularity of organic matter within the country.

2.2.2 Sectoral Segmentation

To ensure comprehensive representation and to understand demand in all its breadth and complexity, the sampling design and data collection were stratified into three strategic pillars of use, supported by a transversal axis of ecosystem-based governance. This segmentation aligns directly with current public policy instruments:

- **Agriculture and Livestock:** Considered the sector with the highest volumetric absorption capacity. It included conventional and organic producers, export vineyards, and exponents of regenerative livestock farming.
- **Public Parks, Plazas, and Gardens:** An evaluation of the demand associated with the maintenance of green infrastructure and urban landscaping at both the municipal and private levels, where compost acts as a critical substitute to halt the extraction of forest topsoil (*tierra de hoja*) and improve water retention.
- **Conservation and Restoration:** A focus aligned with the objectives of the National Landscape-Scale Restoration Plan. Technical demand was analyzed for native reforestation projects, post-wildfire soil recovery, and the phytoremediation of environmental liabilities (e.g., mine tailings).
- **Transversal Ecosystem:** Mapping of public policy decision-makers (linked to the ENRO), academia, NGOs, and waste managers.

2.2.3 Quantitative Collection and Sampling Design

The quantitative dimension was implemented through the design and execution of a structured instrument (online technical survey), applied to a targeted sample of 30 key demand stakeholders. These actors are directly or indirectly linked to technical specifications and the final decision regarding substrate application.

The instrument was designed to capture critical metrics for the financial and operational modeling of demand, structured across the following dimensions:

- **Institutional Profiling:** Macro-zone of operation, sector (public, private, NGO), and specific role within the decision-making chain.
- **Operational Behavior and Usage Rates:** Application frequency, procurement model (in-house production versus third-party purchase), and standardized dosages (quantities per hectare or m²).

- **Valorization and Willingness to Pay (WTP):** Determination of current market prices and the maximum price range the stakeholder is willing to pay per cubic meter of compost delivered-to-plant (including freight), contingent upon strict compliance with technical requirements.
- **Mapping of Barriers and Accelerators:** Quantification of perceived agronomic benefits, "non-negotiable" technical conditions, and the identification of regulatory or market changes that would trigger a massive scaling of consumption.

2.2.4 *Qualitative Collection: Mapping of Key Stakeholders*

The qualitative phase represented the exploratory core of the study, consisting of 60 in-depth interviews with a comprehensive matrix of stakeholders spanning supply, demand, and regulatory bodies. This process involved approximately 45 hours of recording and intensive qualitative processing, ensuring the technical rigor and depth necessary to capture real market frictions. Sessions were conducted in a semi-structured format, guided by a standardized protocol to ensure information comparability.

The interviews allowed for the identification of findings that numerical data fail to reveal, particularly regarding user trust and market asymmetries.

The research protocol explored five strategic blocks:

- **Context and Profiling:** Scale of operation and the technical role of the interviewee.
- **Usage Reality and Experience:** Contrast between current practices and ideal application scenarios, identifying exclusion zones for compost use.
- **Purchasing Criteria and Regulations:** Evaluation of supplier rejection factors (logistics, traceability, microbiological quality) and the actual weight of Chilean Standard NCh 2880 (Class A or B) in public and private tenders.
- **Economic Factors:** Qualitative analysis of the cost structure (freight vs. product) and the competitiveness of compost against synthetic and traditional substitutes.
- **Scaling and the Future:** Exploration of systemic promotion policies, willingness for long-term supply contracts (offtake agreements), and critical sectoral education needs.

2.2.5 *Systematization and Data Triangulation*

The reliability of this report's conclusions rests on a rigorous process of data organization and methodological triangulation. The information collected was processed by crossing the willingness to pay (quantitative data from the 30 surveys) with the structural barriers described by the stakeholders (qualitative data resulting from the 45 hours of interviews), such as the high burden of environmental permitting, the opacity in the traceability of certain waste streams, and restrictive transport margins.

This analytical crossover made it possible to decipher not only how much the market is willing to absorb, but why it is not doing so at the necessary pace. Based on this triangulation, the consulting team succeeded in isolating the priority areas for intervention and structured a set of tactical recommendations focused on public policies,

market incentives, and local governance models, specifically designed to drive and consolidate compost demand in the short and medium term.

2.3 Strategic Modeling and Dynamic Demand Projection

This chapter presents the methodology implemented for the quantification and spatial distribution of the theoretical compost demand at the territorial level. The objective of this model is to determine compost requirements through the integration of geospatial variables and sectoral statistics, establishing application scenarios defined by land suitability and land use.

The procedure is based on the processing of databases and the use of geographic information tools, concluding with the structuring of data within interactive data analysis platforms. This analytical approach facilitates the identification of territorial patterns and demand clusters, providing quantitative support for the planning of distribution capacities. The stages comprising this methodology are described below.

2.3.1 Integration of Databases

The spatial model is structured based on the integration of four information sources at the territorial level:

- **Municipal territorial database:** Contains the administrative-political division by region, province, and municipality (*comuna*), including the total area of each unit. It features topological compatibility for exportation and analysis within geographic information systems (GIS).
- **Agricultural census:** Provides the classification of soil types and planted areas at the municipal scale. Data were standardized to consolidate the specific surface area by typology.
- **Record of burned areas:** A complementary database integrated to quantify soil areas degraded by wildfires.
- **Cadastral of green areas:** A database from the Ministry of Housing and Urban Planning, incorporated to specify urban surfaces suitable for application.

The database from the Incentive System for the Recovery of Degraded Soils was excluded from the analysis, given that the inventoried erosion corresponds mostly to coastal zones where compost application is neither a common practice nor an economic priority at a territorial scale, thus remaining outside the model's effective demand.

2.3.2 Categorization of Land Uses

Based on the intersection of the aforementioned databases, surface area groupings were generated by municipality (*comuna*) and region. These were classified into three use categories to evaluate the feasibility of compost application:

- **Agriculture and Livestock:** Includes surfaces designated for cereals, legumes, industrial crops, and forage crops. Natural grasslands and uncultivated productive lands were explicitly excluded, as the incorporation of compost in these areas does not represent a common practice under current management schemes.

- **Public Parks, Plazas, and Gardens:** Groups areas corresponding to nurseries, sod (*césped de alfombra*), and surfaces from the urban green area cadastre, whose unit of measurement was standardized from square meters to hectares. Industrial-scale forest plantations were excluded from this category and the model.
- **Conservation and Restoration:** A category intended for the evaluation of surfaces degraded by wildfires. The integration of these areas into the model allows for the projection of soil recovery requirements through the use of stabilized organic matter.

Note on the exclusion of the commercial forestry sector: Industrial-scale forest plantations (primarily *Pinus radiata* and *Eucalyptus* spp.) were deliberately excluded from the demand model. In the Chilean context, the commercial forestry sector operates predominantly as a closed-loop circular economy system: organic residues generated within the production cycle, including bark, slash, and pruning waste, are reincorporated internally as mulch or biomass fuel, or managed under proprietary waste valorization schemes. This self-sufficiency means that commercial forestry does not represent an open or accessible market channel for external compost supply at a commercial scale. Accordingly, including this sector would overestimate accessible demand without reflecting actual purchasing behavior or market openness. This exclusion is consistent with the findings from qualitative interviews with sector representatives, including CORMA and CMPC.

It is important to note that the model does not differentiate between distinct compost formulations by end-use sector (e.g., agricultural-grade versus restoration-grade). The demand projection treats compost as a standardized organic amendment compliant with Chilean Standard NCh 2880 (Class A or B). Product quality differentiation — such as particle size, maturity level, or electrical conductivity — is acknowledged as a relevant variable for adoption, particularly in agriculture, but falls outside the scope of the spatial modeling. Future iterations of this model may incorporate product typology as an additional demand parameter.

2.3.3 Demand Calculation Model

The dimensioning of demand is executed through a calculation matrix that evaluates different territorial intervention scenarios.

- The model assigns application parameters, expressed in tonnes per hectare, to each of the three land-use categories.
- Parameters are structured into three application intensity levels based on the bibliographic review: high, medium, and low. The three intensity levels are defined as follows:
 - **Low scenario:** Reflects conservative adoption conditions, equivalent to minimum application rates documented in the bibliographic review. This scenario represents a context in which compost use is infrequent (e.g., single application over the project lifecycle for restoration, or once-a-year for agricultural amendment), regulatory incentives are absent, and market penetration remains marginal.

- **Medium scenario:** Represents the baseline reference condition, calibrated to average application rates observed in comparable Latin American and international contexts. It assumes partial adoption of compost as a soil amendment across the effective territorial surface, with moderate institutional support and existing market conditions.
- **High scenario:** Reflects optimistic adoption conditions, equivalent to maximum recommended application rates per sector. This scenario assumes full alignment of public policy incentives, elimination of logistical barriers, and widespread technical knowledge of compost benefits among end-users.
- Application rates (tonnes/hectare) for each sector and intensity level are derived from the filtered bibliographic review described in Section 2.1 and are detailed in the Dashboard technical data sheet (Annex A).
- The calculation logic identifies the municipal surface area according to the soil category and multiplies it by the application rate corresponding to the selected level.
- Modeling results are stored and exported in a comma-separated values (CSV) file format for processing.
- The model's directory architecture operates via absolute paths on local storage units, ensuring portability and automatic data updates.

2.3.4 Visualization and Spatial Analysis

The processing of results and the structuring of scenarios are implemented within an interactive data analysis platform. Operational filters based on impact levels are configured, allowing for the dynamic calculation of the following variables:

- **Compost demand:** Summation of the total compost mass required, expressed in tonnes.
- **Usable area:** Summation of the effective areas of the three soil categories, depending on the selected filter.
- **Application rate:** Weighted average of the tonnes applied per hectare at the municipal level.

The results interface consists of a data matrix, a bar chart displaying regional demand ordered from north to south, and a territorial color map. The territorial intensity gradient in the cartography is automatically configured based on the values resulting from the application of the scenario filters.

3.0 STRATEGIC FINDINGS AND RESULTS

This chapter presents a synthesis of results focused on the characterization, quantification, and projection of compost demand in Chile, while simultaneously defining the scaling of supply required to satisfy this potential. Through the integration of regulatory analysis, primary information collection, and geospatial modeling, the study moves from a diagnosis of market and competitiveness gaps toward determining the absorption capacity of soils for the 2030 and 2040 horizons.

The analysis provides technical guidelines to drive the application of compost within strategic sectors, transforming the findings into an actionable roadmap. These results are aligned with the targets of the National Organic Waste Strategy (ENRO), the National Landscape-Scale Restoration Plan, and the methane emission mitigation commitments of the Global Methane Hub.

3.1 Secondary Source Diagnosis

The use of compost and other organic amendments has become globally established as a fundamental strategy for improving soil health, achieving carbon sequestration, and promoting a circular economy through the recycling of organic waste (Department of Climate Change, Energy, the Environment and Water, 2024; Román, Martínez, & Pantoja, 2013). Various research studies and technical guidelines demonstrate that the agronomic, environmental, and economic benefits of compost depend on the quality of the material, the application rate, and the receiving ecosystem or production system (WRAP, 2016).

The recent literature and regulatory frameworks analyzed cover a broad spectrum of applications, ranging from geospatial optimization and fertilization in croplands and pastures (Gravuer, 2016; Luo, Chen, Hinojoza, & Campbell, 2026; Taylor, Rollett, & Chambers, 2010), to green area management, landscaping, and water erosion control (Brown & Alexander, 2023; McGinnis & Myers, 2018). Furthermore, the role of compost in conservation and ecological restoration projects is particularly significant, as its incorporation into highly degraded soils or those contaminated with trace elements has proven to be an effective tool for restoring soil structure, immobilizing heavy metals, and facilitating plant recolonization (Damaschino, 2024; Díaz, Cortés, Álvarez, & Medina, 2023; Hernández Silva, 2011; Wilson, Lee, Sistla, & Decock, 2025; Xiong, 2015).

To properly understand the scope of these practices and facilitate decision-making, a structured synthesis of the different rates, frequencies, and technical application considerations is presented below, categorized into three major target sectors: agriculture and livestock; public parks, plazas, and gardens; and conservation and restoration.

3.1.1 Agriculture and Livestock

In the agriculture and livestock sector, recommended application rates generally range from 6.7 to 30 t/ha, depending on the nitrogen content of the compost and the type of crop. For annual crops, it is recommended to apply between 6.7 and 11.2 t/ha if the compost is high in nitrogen, or between 13.4 and 18 t/ha if it is low in nitrogen. For pastures, the suggested limit is 13.4 to 22.4 t/ha using exclusively low-nitrogen compost (Gravuer, 2016). Certain geospatial models for application on croplands in California optimize the average dosage at 16 t/ha to displace the use of synthetic fertilizers (Luo,

Chen, Hinojoza, & Campbell, 2026). In nitrate-vulnerable zones, the legal limit is typically 250 kg of nitrogen per hectare, which translates to a typical organic matter load of 3 to 7 t/ha (Taylor, Rollett, & Chambers, 2010; WRAP, 2016). Additionally, various guidelines emphasize that the exact rate must be defined variably by analyzing the nutrient extraction of the specific crop against the actual contribution of the compost (Department of Climate Change, Energy, the Environment and Water, 2024; Román, Martínez, & Pantoja, 2013). Regarding application frequency, this is usually annual or periodic every 2 to 4 years, scheduled before sowing or during growth periods. However, maximum dose applications in successive years are discouraged to avoid the risk of leaching and the excessive accumulation of nutrients (Gravuer, 2016; WRAP, 2016).

3.1.2 Public Parks, Plazas, and Gardens

For applications in landscaping, parks, plazas, and public gardens, compost is managed in significantly higher volumes, translating into rates ranging from 150 to 450 t/ha, assuming that a 1-inch layer is equivalent to approximately 150 t/ha. For the initial preparation of seedbeds or gardens, it is recommended to incorporate a layer of up to 3 inches in thickness, comprising up to 50% by volume mixed into the top 6 inches of soil; this is equivalent to the highest rates in the range, namely 450 t/ha (McGinnis & Myers, 2018). For the establishment of turf and gardens, guidelines suggest layers of 1 to 2 inches, while for exclusive use as surface mulch, layers of 2 to 3 inches are applied, taking care not to touch the trunks of the plants (Brown & Alexander, 2023). The application frequency in this sector is divided into two phases: a single application at the time of garden establishment, followed by an annual maintenance frequency. During maintenance, the rate must be drastically reduced to a maximum of 1 total inch per year—approximately 150 t/ha—to prevent phytotoxicity in plants and an excess of soluble salts (McGinnis & Myers, 2018).

3.1.3 Conservation and Restoration

The use of compost in ecological recovery and the remediation of degraded soils requires application rates ranging from moderate to very high, typically varying between 30 and 70 t/ha, and reaching up to 600 t/ha in cases of extreme erosion control. To achieve significant improvements in soil health and carbon sequestration in degraded lands, it has been demonstrated that application rates of at least 44.8 t/ha are necessary, and up to 67.2 t/ha may be required to overcome the limitations of impoverished soils (Damaschino, 2024; Wilson, Lee, Sistla, & Decock, 2025).

In the rehabilitation of soils contaminated by trace elements, the successful use of doses of 30 t/ha per year has been documented to reduce the bioavailability of heavy metals (Xiong, 2015). For slope stabilization and erosion control using soil blankets (compost blankets), rates are equivalent to surface layers of 1 to 4 inches (150 to 600 t/ha), reserving the greater thicknesses for non-vegetated areas with high rainfall (Brown & Alexander, 2023). Furthermore, in the nursery production of native forest species, compost is incorporated by mixing it at 25% or 50% of the total substrate volume (Díaz, Cortés, Álvarez, & Medina, 2023). The predominant application frequency in conservation and carbon sequestration projects is a single dose, as one heavy application is sufficient to trigger long-term benefits in organic matter without overloading or negatively altering the native ecosystem (Damaschino, 2024; Wilson, Lee, Sistla, & Decock, 2025). In the

case of nurseries, the application frequency is per each seedling production cycle (Díaz, Cortés, Álvarez, & Medina, 2023).

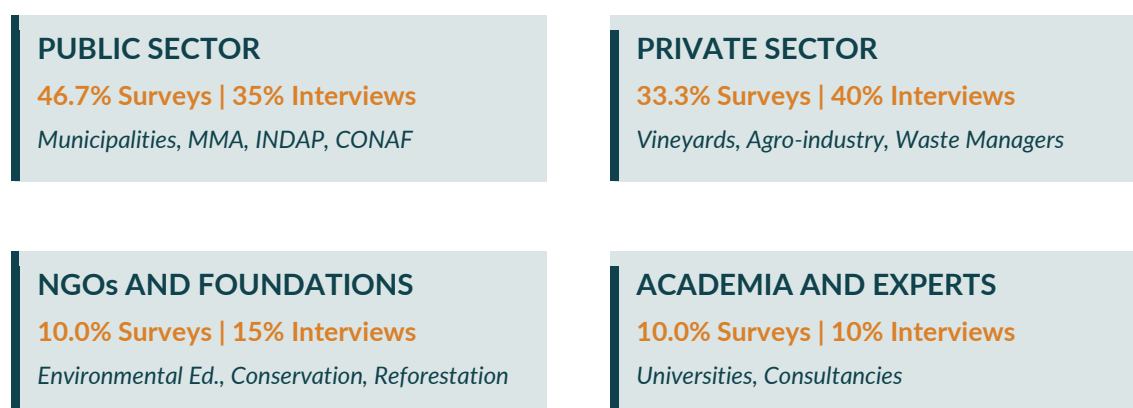
3.2 Characterization of the Sample and Stakeholder Mapping

The present characterization is based on the collection of a general sample comprising 30 online quantitative surveys and 60 in-depth qualitative interviews. The integration of this multi-sectoral participation enables the consolidation of a multisectoral baseline, capturing both quantitative usage metrics and the operational perspectives necessary to map the current state, installed capacities, and transactional dynamics within the organic valorization market.

3.2.1 Profile by Organizational Sector

Management and decision-making regarding organic valorization involve a variety of institutional entities. The sample analysis identifies the distribution of stakeholders currently leading regulatory development, investment in treatment infrastructure, and the direct on-site application of compost.

Figure 1: Stakeholder Distribution by Organizational Sector



3.2.2 Profile by Work Areas and Strategic Axes

The sample characterization was methodologically structured around three primary scenarios of direct substrate demand, complemented by a fourth management axis. This analytical design enables market segmentation by end-user type and the isolation of specific bottlenecks within each application model (note: the quantitative instrument allowed multiple selections; therefore, the sum of variables exceeds 100%).

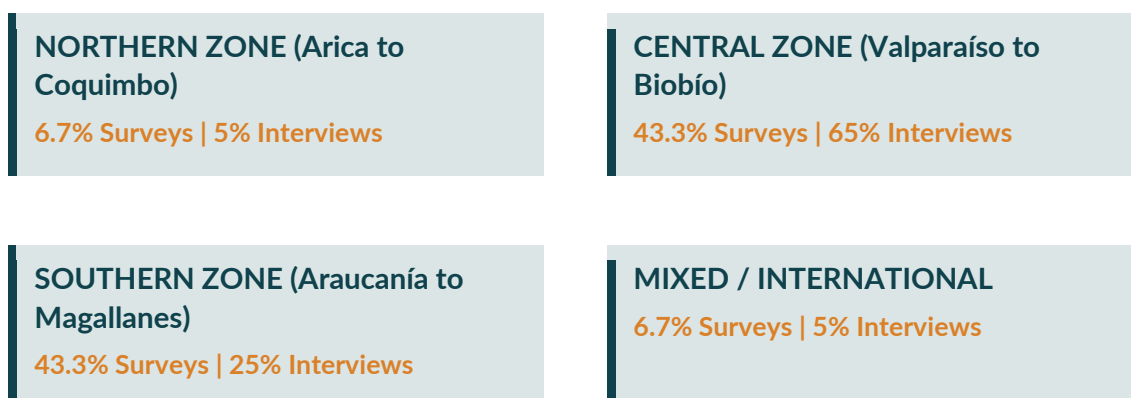
Figure 2: Stakeholder Distribution by Work Areas and Strategic Axes



3.2.3 Profile by Geographic Zone

The territorial distribution of the sample highlights the areas where operations and infrastructure are concentrated. This geographic factor constitutes a critical component for market structuring. The radius of economic viability for transactions is determined by logistical and transport bottlenecks (defined by the technical barrier of "moving air and water," which is inherent to the volume and moisture content of compost).

Figure 3: Stakeholder Distribution by Geographic Zone



3.3 Quantification of Current Demand (Baseline)

The current demand for compost in Chile presents high structural dispersion. The analysis of the surveyed data reveals that no standard rule for consumption or pricing exists at a national level; on the contrary, these variables are heavily conditioned by the specific payment capacity of each sector, the required commercial format (bulk versus bagged), and the strict logistical barriers imposed by the territory's geography.

A key factor explaining the sectoral demand structure, and one that directly informs why Agriculture remains the priority focus despite presenting structural adoption barriers, is the frequency and recurrence of compost application across sectors. In the Agriculture and Livestock sector, compost is applied recurrently: typically once or twice per growing season as a soil conditioning practice, generating a sustained, repeatable annual demand over large surface areas. In Public Parks, Plazas, and Gardens, application frequency is moderate and depends on maintenance cycles and municipal programming. In Conservation and Restoration, compost application is, in most cases, a single, one-time intervention over the lifecycle of the project, applied once during soil preparation or post-fire stabilization, after which natural ecosystem processes are expected to sustain recovery. This structural difference in recurrence explains why agriculture, despite lower per-hectare application rates, generates the highest cumulative and repeatable demand over time, making it the strategically dominant sector for market development and policy focus.

3.3.1 Structural Behavior by Sector (General Analysis)

The dynamics of composting adoption exhibit a differentiated behavior, directly linked to the operational matrix of each industry:

- **Agriculture and Livestock: Stagnant volume.** This sector possesses the highest potential for volumetric absorption, yet its large-scale adoption is hindered by a disadvantageous cost structure. When competing against synthetic fertilizers, large-scale producers perceive compost as a short-term operating expense (OpEx) rather than a structural investment. Consequently, active use is relegated almost exclusively to organic farming niches, export fruit production, and small-scale producers under state advisory services.
- **Public parks, Plazas, and Gardens: High momentum.** This segment leads in practical, daily, and continuous use. Its high momentum is sustained by the implementation of circular economy models at the municipal level (such as those operated in Peñalolén and La Pintana). By producing and consuming the substrate within the same urban circuits, this sector neutralizes the logistical barriers that paralyze adoption in the agricultural sector.
- **Conservation and Restoration: Latent/Lagging demand.** This represents the sector with the lowest level of large-scale use at present. Despite the ecological urgency following wildfires and the technical necessity of phytostabilization, actual demand remains inactive due to a lack of structural financing projects oriented toward this objective.

"Compost is not acquired for large areas because the logistical and operational costs are too high. For traditional agriculture, chemical synthesis fertilization remains much cheaper and guarantees immediate results, unlike organic substrates whose effects are realized in the medium term."

Source: Agricultural sector stakeholders

"Restoration and conservation are almost non-existent operational areas in the country when compared to the volumetric weight of agriculture. Despite having biodiversity frameworks, mitigation projects are currently not being executed at a scale where compost plays a leading role."

Source: NGO conservation specialists

3.3.2 Application Volumes and Price Dispersion (WTP)

Market fragmentation is quantified through the high technical variability in the application rates used and in the willingness to pay (WTP) of the various stakeholders:

Figure 4: Application Rates and Price Dispersion (WTP)

AGRICULTURE AND LIVESTOCK

Application Rates: Ranges between 3,000 and 5,000 kg/ha in traditional pastures, scaling up to intensive rates of 40 m³/ha in organic production systems

WTP: Presents the widest range. Starts at a commercial cost of \$0 (self-production). The standard range fluctuates between \$10,000 and \$18,000/m³, rising to \$18,001 - \$28,000/m³ for certified compost. The premium biological niche reaches between \$40,000 and \$90,000/m³.

PUBLIC PARKS, PLAZAS, AND GARDENS

Application Rates: Tactical applications ranging from annual maintenance micro-doses to 40 bags per 300 m² for the establishment of new vegetative covers.

WTP: The institutional/municipal sector operates with a WTP of \$0 (self-production) or below \$10,000/m³. In contrast, private landscaping and foundations assume costs of \$4,000 to \$4,500 per bag.

CONSERVATION AND RESTORATION

(Application Rates: Requires volumetric precision use (recipes of 1/3 compost per cavity) up to massive industrial volumes, such as 4,000 m³ for covering environmental liabilities (tailings).

WTP: Registers the highest willingness to pay. Premium quality demands > \$28,000/m³. Bulk is traded between \$40,000 and \$45,000 + VAT/m³. Due to topographical access, 40L bags are prioritized at values of \$26,000 - \$27,000

"In reforestation projects on slopes or hillsides, compost is a vital input to ensure plant survival during droughts. For this reason, moisture content is a non-negotiable technical factor; if the substrate is dry, it loses its quality and is immediately rejected, which justifies the technical willingness to pay higher rates."

Source: Urban reforestation foundations

3.3.3 Geographic Determinants of Demand

The spatial allocation of demand potential across municipalities (comunas) and regions is governed by the intersection of four primary variables embedded in the spatial model:

- **Effective territorial surface area by land-use category:** The total area classified under agriculture/livestock, urban green areas, or burned/degraded land determines the volumetric absorption ceiling per administrative unit.
- **Application rate by scenario:** The selected intensity level (low, medium, or high) directly scales the demand estimate per hectare within each category.
- **Proximity to organic waste generation hubs:** Logistical viability is implicitly considered through the geographic overlap between demand zones and existing or projected composting supply nodes, prioritizing short-radius distribution circuits.
- **Sector-specific demand drivers:** For agriculture, the presence of high-value export crops and soil degradation indicators (salinity, erosion) increase the weighting of demand potential. For restoration, the extent of wildfire-affected area (sourced from CONAF and SENAPRED records) is the primary trigger. For urban landscaping, the cadastre of green areas (MINVU) defines the base surface.

These variables collectively inform the choropleth maps in the Dashboard, enabling users to identify priority micro-zones for pilot project design and compost distribution logistics.

The territorial configuration defines the operational and commercial viability of the product, partitioning demand into three zones with asymmetric behavior:

- **Northern zone (scarcity and freight):** This zone presents a high technical necessity for the recovery of degraded and saline soils; however, it records a zero local supply of feedstock. The freight requirements from plants in the Central Zone increase operating costs to the point of making the product economically unviable for traditional agriculture. In this zone, effective demand is restricted to mining requirements for the production of technosols.
- **Central zone (operational epicenter):** This zone concentrates the industry's productive matrix and the primary composting facilities. Demand is steadily driven by export viticulture (through the circular absorption of grape pomace) and by municipal networks that, by operating local models, successfully absorb large volumes without interruption.
- **Southern and far southern zone (logistics and climate):** With a predominantly livestock-oriented focus, the high logistical costs of transport to geographically isolated areas force farmers into an extremely high dependence on self-production. Additionally, a thermal barrier is identified in the Magallanes region: low temperatures inhibit microbiological activity, paralyzing the demand for solid compost in favor of fast-acting liquid biopreparations.

"When applying solid compost to the grasslands of the southern zone, the extreme cold severely slows microbiological activity. No immediate edaphic result is observed; it can take the soil up to three seasons for the microorganisms to survive the winter and decompose the organic material, which is why the livestock sector opts for liquid solutions."

Source: Agronomic experts, Magallanes Region

3.4 Strategic Modeling and Dynamic Demand Projection

The evaluation of future compost demand is subject to variations inherent to agricultural conversion, changes in land use, policies for the recovery of degraded areas, and agro-climatic oscillations. Consequently, establishing static projections anchored to fixed temporal milestones, such as the years 2030 or 2040, introduces a margin of uncertainty that reduces the study's analytical precision.

To mitigate this variability, a dynamic projection model was structured based on the configuration of parametric scenarios. This approach allows for the simulation of territorial requirements through the modulation of application rates, providing the flexibility to adjust the evaluation according to the actual evolution of surface area and operational practices.

Considering the results of the secondary source diagnosis and the bibliographic review, compost application rates were defined for three intensity scenarios, structured according to the land-use categories established in the methodology. The parameters integrated into the spatial model are as follows:

Figure 5: Compost Application Rates by Sector (tonnes/ha)

AGRICULTURE AND LIVESTOCK	PUBLIC PARKS, PLAZAS, AND GARDENS	CONSERVATION AND RESTORATION
High: 23 tonnes/ha	High: 450 tonnes/ha	High: 70 tonnes/ha
Medium: 15 tonnes/ha	Medium: 300 tonnes/ha	Medium: 50 tonnes/ha
Low: 7 tonnes/ha	Low: 150 tonnes/ha	Low: 30 tonnes/ha

The consolidation of territorial data and the execution of the calculation model are materialized in an interactive dashboard, which constitutes the primary deliverable for results visualization. This tool was designed to operate autonomously, allowing for the direct exploration of the various projections.

The dashboard features a parametric filter module that facilitates the selection of the intensity level for each soil category. Upon entering these variables, the system instantaneously recalculates the national macro-indicators, displaying the total compost demand expressed in tonnes, the effective usable surface area in hectares, and the weighted average application rate.

The geospatial distribution of demand is represented through a range-based thematic map, whose color gradient adjusts automatically to the scenario configuration, facilitating

the identification of territorial hubs with the highest requirements. This cartography is linked to a bar chart that classifies regional demand ordered from north to south, and to a data matrix detailing the total area, effective area, and specific compost demand at a district scale.

As a reference for the model's operability, the figures shown below illustrate the results interface under different parametric demand configurations.

Figure 6: Projection of total demand under a Low parametric scenario

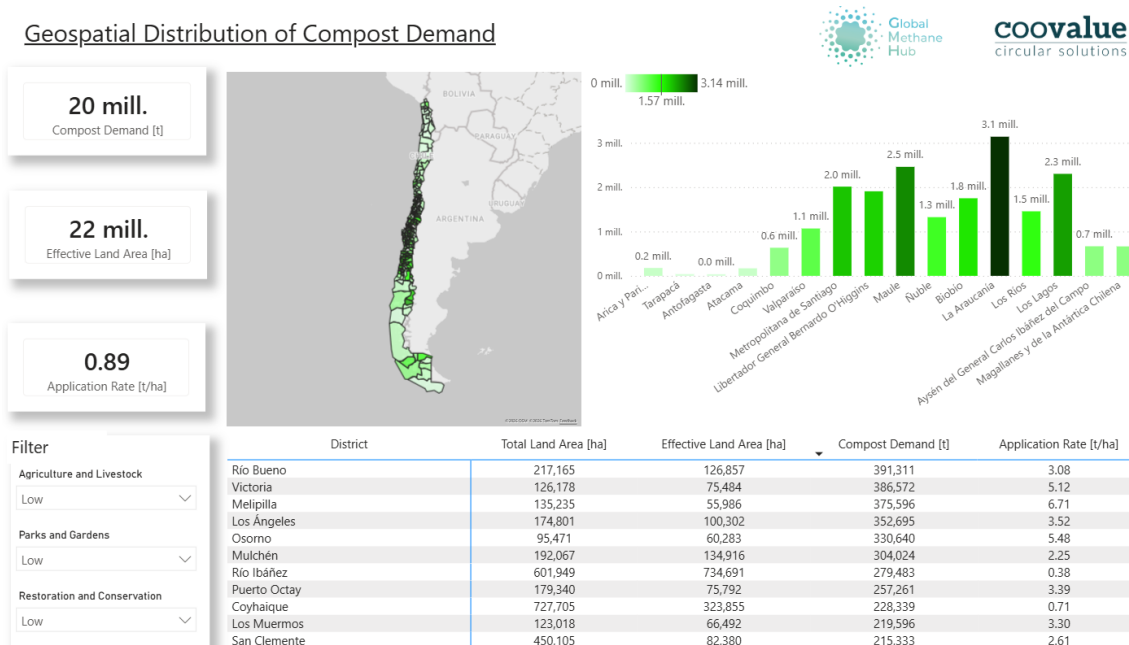


Figure 7: Projection of total demand under a Medium parametric scenario

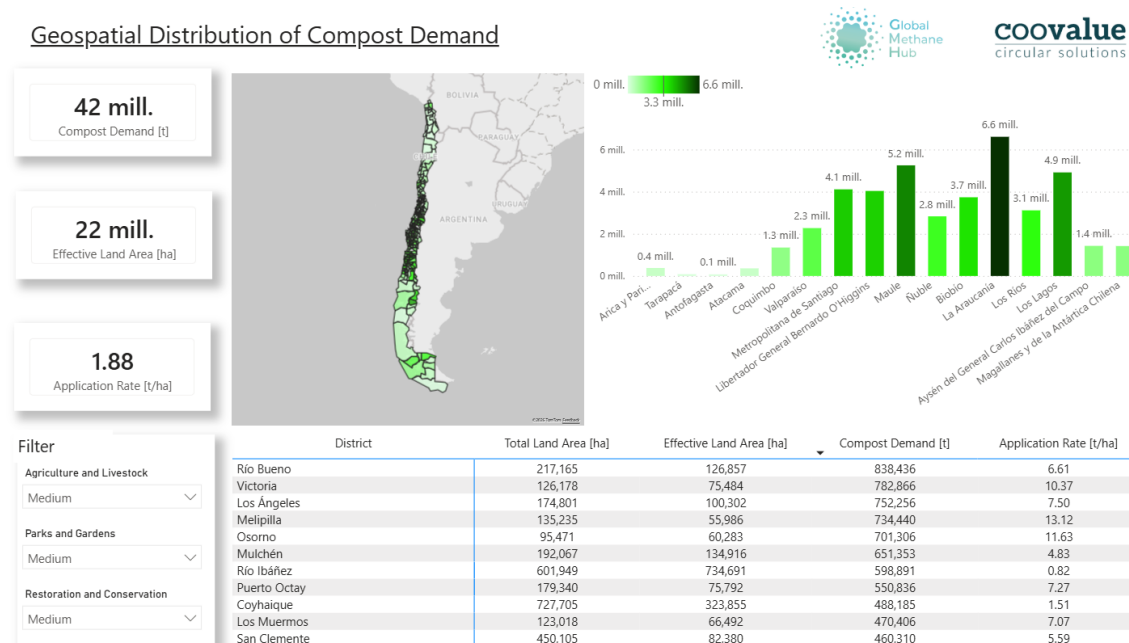
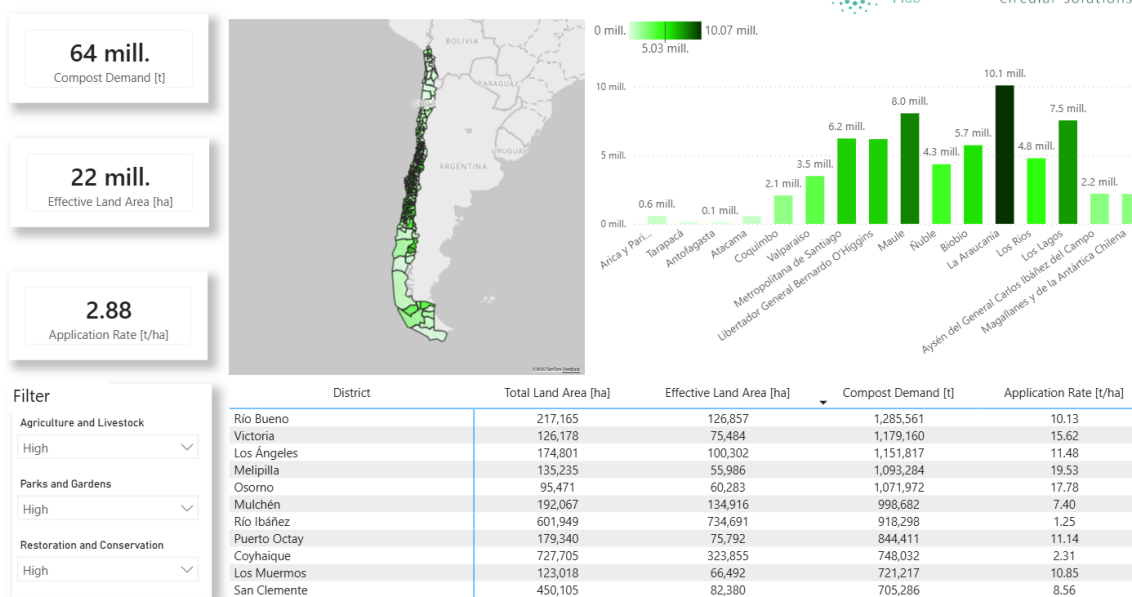


Figure 8: Projection of total demand under a High parametric scenario

Geospatial Distribution of Compost Demand



Interpretive note on sectoral demand distribution: A counter-intuitive finding in the demand projections is that the Agriculture and Livestock sector displays the largest demand volumes despite having lower compost application rates per hectare compared to Conservation and Restoration. This apparent paradox is explained by the difference in effective surface area scale: agricultural land in Chile encompasses tens of millions of hectares, whereas the burned or degraded areas targeted for restoration represent a fraction of that extent. Consequently, even a modest application rate (e.g., 2–5 tonnes/ha in agriculture) applied over a vast territorial base generates a significantly larger total volume than a high application rate (e.g., 50–100 tonnes/ha for soil stabilization) applied to a comparatively small degraded area. This dynamic underscores the strategic importance of the Agriculture and Livestock sector as the primary volumetric absorber of compost at a national scale, despite the lower per-hectare dose, and justifies the policy focus on agricultural adoption even though it is a structurally more complex sector to penetrate.

4.0 ANALYSIS OF STRATEGIC GAPS AND OPPORTUNITIES

4.1 Systemic Market Barriers (Supply and Demand)

The deployment of solutions for methane mitigation and organic valorization in Chile faces systemic obstacles that stifle both supply and demand at a national level. The analysis of interviews and surveys reveals that, beyond the specific challenges of each industry, there are structural bottlenecks that dictate the sector's stagnation.

The four major macroeconomic, regulatory, and cultural barriers hindering the consolidation of this market are detailed below.

4.1.1 The Logistical Cost: The Challenge of "Moving Air and Water"

The most critical and frequently cited gap by ecosystem stakeholders is the geographic disconnection between generation zones, treatment plants, and end-users. The valorization supply is heavily centralized in the Metropolitan Region, leaving the northern and far southern zones without viable alternatives.

- **Disproportionate freight costs:** Compost is a bulky and heavy product. Data indicate that transporting it to distant demand zones results in freight costs that can exceed the commercial value of the product by up to seven times. In extreme regions, the high initial CAPEX required to install local plants and the impossibility of absorbing transport costs render operations unviable.
- **Lack of regional supply:** The scarcity of decentralized infrastructure necessitates illogical transfers that negate environmental and economic benefits.

"In 2022, for the first time, there was a clear instruction to purchase organic fertilizers, and there was no availability. People who purchased in La Araucanía brought it from the Metropolitan Region... It is unacceptable that La Araucanía does not have a SAG-certified compost."

Source: INDAP Interviewee

"The geographic reach we have is quite limited [...] The price of compost is largely dictated by the freight."

Source: Agricultural Consultant

4.1.2 Economic Distortion and Unfair Competition from Sanitary Landfills

The current financing model lacks incentives that reward circularity. The business model of valorization plants cannot be sustained solely through the sale of the final product (compost or digestate); it depends critically on the reception fee (gate fee). However, the market competes against an artificially inexpensive final disposal system.

- **The cost of disposal:** In Chile, it is legally and economically much more profitable to discard waste in sanitary landfills than to manage it. In the absence of

regulations or taxes that penalize the failure to valorize or the methane emissions in landfills, the organics market remains underfunded from its inception.

"Billions of pesos are literally being buried in the management of the waste generated daily. These funds should instead be available for education, healthcare, and public safety."

Source: NGO and Foundations Sector Interviewee

- **Business model weakness:** The absence of systematic buyers forces projects to leverage themselves almost exclusively on waste reception income, which cannot compete with landfill rates.

"Why would I, as a company, pay double if I can legally take it—complying with all laws—to a landfill? You cannot compete against a solution that is too cheap."

Source: Circular Economy, Management, and Valorization Experts

4.1.3 Regulatory Rigidity

Building and operating infrastructure for organic waste treatment is a highly bureaucratic process. The current regulatory framework applies a risk standard that penalizes investment and blocks the creation of new supply.

- **Requirements:** The Ministry of Health and the Environmental Impact Assessment System (SEIA) evaluate industrial composting plants with the same rigor as sanitary landfills or hazardous waste facilities (requiring **concrete slabs**, high-standard geomembranes, etc.).
- **Regulations disconnected from reality:** Regulations often import international standards that do not align with territorial diversity or the need to promote smaller-scale plants. This is compounded by public opposition ("NIMBY Syndrome"), stemming from misinformation regarding modern plants, which makes finding viable land extremely difficult.

"One must be an expert in 'permisología' (permitting processes) and design a [complex] permit strategy just to set up a recycling plant."

Source: Management and Valorization Sector Interviewee

4.1.4 Sociocultural Gap: Mistrust and Short-termism

There is a structural disconnection between waste generation, its correct separation, and the agronomic value of the resulting product. This gap affects the entire chain, from the citizen to the end-user of the soil.

- **Contamination at the source:** Improper use of containers and a lack of public habits cause feedstock to arrive contaminated (plastics, bulky items, PLU stickers). This degrades the quality of the final product and increases the operating costs of the plants.

"What complicates things most for us at times is contamination from bags that claim to be compostable but ultimately are not (...) When plastic occasionally passes into the compost, the client notices it, and it generates mistrust."

Source: International Ecosystem Interviewee

"We have found up to 300,000 microplastics per kilogram in the organic waste stream from supermarkets (...) which directly impact compost quality, with produce stickers (PLUs) being one of the most persistent sources."

Source: International Ecosystem Interviewee

- **Short-termism and lack of guarantees:** The end-user perceives compost as a short-term expense rather than an investment in soil life. Furthermore, there is strong mistrust regarding product standardization. Current regulations fail to ensure a homogeneous quality free of negative externalities for the buyer.

"There is a profound disconnection between food waste and soil health [...] The greatest challenge is for people to believe in this system and see the negative impacts of throwing the organic fraction into the trash."

Source: Management and Valorization / NGO Interviewees

"The lack of reliability regarding the technical data sheet or the analysis is critical... We spend so much money on this, and the primary pain point is whether it is truly a compost that provides value."

Source: Agriculture and Green Areas Experts

4.1.5 Reactive Demand: Crisis as the Primary Adoption Driver

A structural pattern identified across the qualitative data is that compost adoption in Chile has been driven predominantly by crisis response rather than by proactive environmental or agronomic planning. This reactive dynamic represents a systemic market barrier: demand activation is episodic and event-dependent rather than structural and continuous, limiting the development of a stable and predictable market.

The following cases, drawn from primary interviews conducted as part of this study, illustrate this pattern across different sectors and scales:

- **Municipal fiscal crisis — La Pintana (2005):** The most established municipal composting model in Chile did not originate from an environmental policy decision. Faced with the loss of property tax revenue due to the characteristics of its housing stock, the municipality could no longer finance conventional waste collection and disposal. Confronted with the fact that over 50% of its waste stream was organic matter, the municipality initiated a door-to-door organic separation campaign as a cost-reduction measure. Two decades later, this fiscally-driven intervention has produced multiple generations of residents who have

separated organic waste throughout their lives and who actively demand the return of the resulting compost to their community.

- **Sanitary crisis – Ancud, Chiloé:** Following the closure of the local landfill, organic waste from Ancud was transported hundreds of kilometers to Los Ángeles. When collection services were suspended for two consecutive weeks, households were forced to manage their own waste on-site. This direct exposure to waste volume generated a behavioral shift that was qualitatively distinct from conventional awareness campaigns: when the municipality subsequently offered composting units, Ancud was the only case in the study where residents stated their primary motivation was waste volume reduction, rather than obtaining a soil amendment. The crisis converted a sanitary problem into community composting practice and food garden development.
- **Wildfire events – Jardín Botánico de Viña del Mar and Santa Juana:** Post-fire soil degradation has emerged as a crisis-driven demand trigger for compost in ecological restoration contexts. Following the fire affecting the Jardín Botánico de Viña del Mar, civil society organizations mobilized six truckloads of donated compost within days of the event for emergency soil treatment. In Santa Juana – identified in this study as the most complete current municipal composting model – the experience of successive wildfires led the municipality to establish a weekly organic waste collection system, the output of which is applied directly to urban reforestation and food production for affected farming communities.
- **Agricultural input crisis – Synthetic fertilizer price shock (2022):** In the agricultural sector, the price spike in synthetic fertilizers triggered by the war in Ukraine in 2022 produced the most significant State-level response documented in this study. The "Siembra por Chile" program issued an explicit directive to purchase organic amendments, generating an immediate demand signal. This episode exposed a critical structural gap: despite the directive, certified compost was not available in sufficient volumes or geographic distribution to meet the demand, revealing that reactive policy responses cannot be absorbed by a supply base that had not been developed under stable demand conditions.

As confirmed by multiple agricultural stakeholders, the conventional producer typically considers organic amendments only when facing compound operational failures: declining yields from degraded soils, reduced efficacy of synthetic pesticides, or synthetic fertilizer prices that exceed operational cash flow. Adoption driven by these conditions is structurally fragile, as it is contingent on crisis recurrence rather than grounded in a sustained agronomic or economic rationale.

This pattern of reactive adoption has a direct implication for market development strategy: interventions designed to build stable compost demand must address the underlying conditions, agronomic risk perception, cost structure, and supply availability, that currently position compost as a last resort rather than a baseline input.

4.2 Overarching Levers and Opportunities for Scaling

While Section 4.1.5 documents that crisis events have historically been the primary trigger for compost adoption in Chile, this pattern also reveals a strategic opportunity: each of the crises documented – fiscal, sanitary, climatic, and agronomic – generated

measurable behavioral change within a short timeframe and without requiring prior market development. The levers described in this chapter are designed to replicate that activation effect under non-crisis conditions, embedding the drivers of adoption into institutional structures, financial instruments, and infrastructure models that do not depend on emergency circumstances to function.

The analysis confirms that the bottlenecks for the mass adoption of organic valorization are not exclusive to any particular industry but respond to systemic national failures. To achieve the targets established for 2030 and 2040, aligned with the objectives of the Global Methane Hub, four strategic pillars for macro-action emerge from the data, operating as fundamental enablers for any subsequent sectoral effort:

4.2.1 Integrated Governance and Regulatory Modernization

The administrative barrier is one of the most acute operational constraints detected in the data collection. The current disconnection between regulations stalls investment and complicates operations. The national solution requires a redesign of the institutional architecture.

- **Creation of a national waste authority:** The ecosystem demands a centralized entity to articulate efforts currently dispersed among the Ministries of Environment, Health, Agriculture, Education, and Public Works. This authority would allow for the unification of criteria and the acceleration of decision-making.
- **Legislative harmonization:** It is urgent to establish a "dialogue" between regulatory frameworks. Macro-solutions aim to organically link the National Organic Waste Strategy (ENRO) with the Extended Producer Responsibility (REP) Law, the Single-Use Plastics (PUSU) Law, and future initiatives such as the Soil Law.
- **Simplification of sanitary permits:** Regulations concerning safety and health sector requirements generate asymmetric hurdles for composting projects. A regulation adjusted to the biological reality of the process is required, without compromising safety.
- **Mandatory requirements as market drivers:** Beyond voluntary targets, a progressive and definitive prohibition (a "Zero Organic Waste to Landfills" policy) is viewed as the "golden rule" that will force infrastructure creation and capital mobilization.

"We should move toward the prohibition of organic waste in sanitary landfills. It is the fastest and most effective way to reduce our carbon footprint in the waste sector and to provide value to something we are simply burying today."

Source: Circularity Economics Expert

"We need the laws to speak to each other; currently, ministries do not engage in dialogue. The great opportunity is to articulate all of them around this challenge, ideally under the figure of a single national waste authority."

Source: Synthesis of key stakeholders, qualitative interviews

4.2.2 *Financial Reengineering and Demand Stimulation*

The economic viability of organic valorization cannot depend exclusively on the waste reception fee (gate fee). Quantitative and qualitative analysis demonstrates that supply will grow naturally only if the State and global markets drive and subsidize demand.

- **Direct demand subsidy (SIRSD-S):** The public policy with the highest consensus for immediate impact is the reorientation of state instruments (such as soil recovery programs). This involves transitioning from subsidizing synthetic fertilizers to providing incentives for the purchase and application of compost on a national scale.
- **Leveraging carbon markets and ESG financing:** Connecting methane reduction (landfill diversion) with international climate financing. The "Zero Waste" targets of the corporate sector and the issuance of carbon credits or water footprint certificates are key to making composting plants profitable at a national level.
- **Valorization of water resilience:** In the face of the climate crisis, compost must stop being traded as a simple "fertilizer" and instead be financially valorized as a "water retainer." Subsidizing the application of organic matter is, at a macro level, a direct investment in water security.
- **Economic competitiveness of compost versus synthetic fertilizers:** While a full cost-benefit analysis falls outside the primary scope of this study, qualitative and survey data consistently highlight the cost gap between compost and synthetic alternatives as a critical adoption barrier. Urea, the most widely used nitrogen source in Chilean agriculture, reached CLP \$1,012,849 per tonne at its 2022 peak following supply disruptions linked to the Russia-Ukraine conflict (Agrocompra, cited in ANPROS, 2023), and as of May 2026 trades at approximately USD 616 per tonne internationally — 25% above year-prior levels — sustained by natural gas cost increases and ongoing geopolitical supply pressures (Trading Economics, 2026; ODEPA, 2026). In Chile specifically, ODEPA's "Chile Produce Seguro" action plan documents a 16.3% increase in urea CIF import prices year-on-year, with the FAO projecting further increases of 15–20% for the first half of 2026 (ODEPA, April 2026). Despite this escalating cost context, compost at a WTP of CLP \$10,000–\$18,000/m³ continues to be perceived by most producers as expensive when evaluated solely on a nutrient-equivalent basis. This comparison systematically ignores the multi-year agronomic co-benefits of compost: improved water retention, increased soil organic matter, and compliance with international sustainability certifications that carry export premium potential. The progressive narrowing of the cost gap between synthetic fertilizers and organic amendments — driven by structural supply volatility rather than temporary market fluctuations — represents a near-term window for compost market penetration. A formal cost-benefit analysis integrating these co-benefits at a per-hectare level for representative Chilean crop systems is identified as a high-priority area for follow-up research, and is identified as a recommended area for deepening in subsequent phases of this research program.

4.2.3 *Decentralized Infrastructure and Territorial Ecosystems*

Freight costs were consistently identified across surveys as the most critical primary financial viability constraint. The national strategy must abandon the paradigm of centralized, massive installations.

- **Decentralized valorization nodes:** Transition toward a distributed network of local, municipal, or on-farm plants. Processing waste in the same territory where it is generated and applying it within a short radius collapses the logistical barrier and significantly reduces the transport carbon footprint.
- **Industrial symbiosis and spatial associativity:** Encourage, through state incentives, the direct connection between industries located in the same territorial hub (e.g., residues from an agro-industry feeding the demand of adjacent ecological restoration), generating a "zero-kilometer" circular economy.
- **Utilization of installed local logistics:** Operational viability for organic capture lies in articulating the capacity that already exists in each municipality. Instead of designing routes from scratch or tendering large-scale transport to distant landfills, the opportunity is to leverage the territorial infrastructure of private managers, composting startups, and formalized recycler cooperatives. Diverting the organic fraction toward smaller-scale pretreatment plants using these pre-existing actors significantly reduces municipal freight costs.

4.2.4 *Cultural Resignification and Communication of Urgency*

The cultural barrier (odors, vectors, perception of waste) remains a systemic brake. Positioning the circular economy requires a profound intervention in public and corporate perception.

- **National communication strategy:** Implement a structured two-stage awareness plan to modify the population's waste management habits. The first stage must evidence the sanitary and operational impact of waste accumulation, using local contingencies as a reference (e.g., the halt of collection services in Aysén). The second stage must focus on demonstrating the technical utility of the organic matter cycle, based on municipal operating models such as that of La Pintana. This approach allows for a modification of the public perception of waste, transitioning from an environmental liability to a valorized input.
- **Environmental education and local participation:** Promote the transition toward circularity through the use of community infrastructure, such as schools and urban gardens. These spaces operate as practical education centers, facilitating the technical understanding of the biological degradation cycle. Direct citizen interaction with their waste processing reduces the information gap, encourages correct separation at the source, and improves territorial management capacity.
- **Alignment of the agro-export sector with international standards:** Link the application of compost with the traceability and sustainability requirements demanded by destination markets. The incorporation of compost into production systems improves the physical properties of the soil and increases moisture retention, operating as a technical adaptation measure against water deficits. The standardization of these agricultural practices facilitates compliance with

international regulations, safeguarding the operability and competitiveness of exports.

5.0 STRATEGIC RECOMMENDATIONS

5.1 Regional Scaling in LATAM

Implement the transfer of the systemic collection model and methodological triangulation to priority markets in the region, such as Peru, Mexico, and Colombia, by securing cooperation funds from entities like the Global Methane Hub. The results of the quantitative collection demonstrate that 73% of the logistical and territorial frictions detected in Chile operate transversally across neighboring emerging markets. The standardization of this methodology allows for the collection of comparable continental metrics regarding infrastructure gaps and regulatory frameworks associated with methane mitigation, unifying multilateral financing policies for the development of the organic industry at a South American level.

5.2 Positioning and In-Situ Valorization at Events

Deploy a citizen intervention strategy through projected participation in at least three or four mass events during the second half of the year, with the purpose of executing active dissemination and making circularity visible to civil society through the in-situ management of organic waste logistics. This methodological directive aims to educate through operational demonstration, managing the organic fraction in public view to exhibit the practical viability of recovery models.

5.3 Transformation of Tenders and Public Procurement

Design and propose the drafting of standardized bidding terms to the Chilean Association of Municipalities (AChM) and relevant undersecretariats to require the application of a minimum percentage of certified compost in concession and maintenance contracts for public green areas. Data from the 30 surveys confirm that 60% of municipal officials and planners consider it operationally viable to integrate this circularity clause without altering the annual budgets assigned to the sanitation and landscaping portfolios. This regulatory intervention transforms the State into a captive market, generating automatic institutional demand that makes the processing of local pruning waste profitable within the same territory without requiring additional legislative processing.

5.4 Reformulation of Technical Data Sheets and INDAP Subsidies (SIRSD-S/SIGES)

Execute technical advocacy efforts to update the cost tables and technical data sheets associated with the promotion and credit programs of the Ministry of Agriculture and INDAP, transferring funds from synthetic fertilizers toward subsidies for organic amendments. Currently, these structural tools are outdated and operate with generic values that do not absorb geographic particularities or real logistical costs; in fact, the surveys identify freight cost as the primary variable of unviability for 73% of farmers. This modification is of critical importance, as the technical data sheet not only determines the allocated capital but is also the binding instrument that conditions agricultural insurance coverage, requiring the subsidy to directly cover the purchase, transport, and on-farm application of compost to level the commercial competitive conditions.

5.5 Technical Liaison with Agricultural Consultants

Enhance the integration of independent agronomic advisor networks through the execution of practical education modules, field visits, and direct technical transfer

demonstration days. The 60 interviews in the study reveal that agro-industrial producers delegate the entirety of their fertilization decisions to the guidelines recommended by these professionals, identifying them as the most critical node of influence in the market. Altering the recommendation matrix of this specific segment—by contrasting water retention metrics in land with "living soil" versus "dead soil" through on-site inspections—scales agricultural sector demand exponentially without the need for farm-by-farm persuasion campaigns.

5.6 Infrastructure Leveraging Through ESG Financing

Structure climate financing mechanisms that connect territorial landfill diversion volumes with the issuance of methane reduction bonds and water footprint certificates tradable in international markets. The economic analysis of the industry indicates that more than 85% of composting plants nationwide lack viability if they operate depending exclusively on the waste reception fee (gate fee). Linking greenhouse gas mitigation with ESG capital instruments allows for the profitable operation of decentralized pretreatment nodes, providing organic valorization infrastructure with the additional revenue necessary to guarantee operational continuity and scaling.

5.7 Integration of Technosols in Mining and Offsets

Push for the regulatory incorporation of composted substrate demand into the terms of Environmental Compensation Funds and Large-Scale Mining Closure Plans. The crossover of field reports and technical surveys demonstrates that the injection of these organic amendments significantly increases the survival rate of native species in arid zones, reducing replanting costs by 40% by stabilizing environmental liabilities through physical confinement and phytoremediation processes. Orienting the mitigation budgets of major operations—referencing empirical cases of tailings recovery in Andacollo—positions industrial compost not as a traditional fertilizer, but as a strategic input for structural recovery.

5.8 Implementation of Strategic Pilots

The implementation of strategic pilots constitutes the tactical axis for the transition toward an effective circular economy, operating as technical instruments designed to mitigate investment risk and gather hard data on operational performance under real conditions. These testing units allow for the validation of the financial and logistical viability of the proposed models before their national scaling, transforming theoretical projections into in-situ performance metrics that ensure efficiency in the use of public and private resources under international consultancy standards.

5.8.1 Strategic Recommendation: Pilot for Decentralization and Local Organic Valorization

This pilot proposes the structuring of a demonstrative model to validate the technical and financial efficiency of local organic waste management. The strategy consists of processing organic matter in controlled generation hubs, demonstrating that the system's viability lies in in-situ valorization and the redirection of municipal budgets currently destined for final disposal payments in sanitary landfills.

The funding for the pilot is not framed as an additional expense, but as a strategic redirection of municipal funds currently allocated to final disposal. The core of the

proposal is to capture the capital currently being "buried" in sanitary landfills to finance local operations; for example, it is identified that municipalities like Recoleta pay approximately 130 million pesos monthly to companies like KDM for this concept.

In addition to the Metropolitan Region, the municipalities of Puerto Varas (Los Lagos Region) and Río Bueno (Los Ríos Region) are identified as priority territories for the deployment of these pilots. These zones combine a high density of organic waste generation with unsatisfied agricultural demand and logistical gaps that this decentralized model would allow to resolve with high social profitability.

This base model is complemented and strengthened by two additional sources of revenue and optimization: the valorization of carbon credits for \$CO₂\$ equivalent—leveraged by avoiding methane generation in landfills—and direct operational savings for the municipality by reducing pruning waste transport costs and the purchase of external fertilizers for the maintenance of its green areas.

To overcome the sanitary and logistical barriers that have historically hindered organic valorization at the municipal level (such as odors and vectors), a decentralized circular economy model is proposed based on the following technical pillars:

- **Pre-processing via automated "compost" machines:** The first stage consists of using machinery that significantly reduces the moisture content of household organic waste (food scraps) in just 24 hours. This step neutralizes the organic matter, delivering a stabilized substrate that eliminates the root causes of odors and pest attraction, which are the primary drivers of community rejection.
- **Synergy with free markets and municipal pruning:** The material pre-processed by the "compost machine" is strategically combined with other sources of clean organic matter generated within the same municipality: rejects from free markets (*ferias libres*) and chipped pruning waste from green areas. This mixture balances nutrients and structures the material, transforming it into a high-value organic amendment.
- **Local processing of the final compost:** Instead of exporting waste to peripheral industrial plants, the maturation of this mixture is performed locally on land or in a facility available within the municipality (such as municipal operational sites or parks, e.g., Cerro Blanco in Recoleta). Processing the final compost in situ avoids the unnecessary transport of high-tonnage loads (composed mostly of water), reducing the logistical carbon footprint.
- **Immediate availability for the municipality:** The final result remains at the direct disposal of the municipality, providing high-quality input for hillside reforestation and the maintenance of local parks and green areas.

5.9 Leveraging Survey Results for Policy Dialogue

The quantitative and qualitative data collected through the 30 technical surveys and 60 in-depth interviews serve not only as inputs for demand modeling, but as a structured evidence base to underpin conversations with key decision-makers. The following applications are recommended:

- **Parliamentary engagement:** Survey data demonstrating that 73% of farmers identify freight cost as the primary barrier to adoption, combined with the WTP ranges documented by sector, provides a concrete, numbers-based argument for reforming INDAP subsidy structures. This evidence is suitable for presentation before agriculture and environment committees.
- **Agricultural consultant alignment:** The identification of agro-industrial producers' near-total reliance on agronomic advisors for fertilization decisions (documented in qualitative interviews) positions these professionals as the highest-leverage communication channel. Survey data on ROI expectations and technical barriers should be packaged as a specific briefing for consultant networks to update their recommendation protocols.
- **Municipal authorities:** The finding that 60% of municipal officials consider the integration of compost circularity clauses into tender contracts feasible without budget impact provides a ready-made argument for local government advocacy.
- **International funders and multilateral bodies (UNEP, GMH, PNUMA):** The georeferenced demand model and scenario projections serve as a replicable diagnostic tool to justify regional climate financing for methane mitigation infrastructure, aligned with the study's replicability strategy (Section 6).

5.10 Crop-Specific Application Guidelines by Micro-Zone

To support the design of pilot projects and facilitate technical conversations with agricultural consultants and regional stakeholders, the following framework identifies the macro-zones and productive sectors with the highest potential for compost adoption in Chile. The characterization draws on official agricultural statistics from the VIII National Agricultural and Forestry Census 2021 (INE), ODEPA Regional Data Sheets (2024–2026), the CIREN-ODEPA Fruit Cadastre (2024), INE Livestock Market Bulletins (2024), and the ODEPA study Fertilización Sostenible y Gestión Integral de Nutrientes (Villena et al., 2022).

Table 1: Crop-Specific Application Guidelines by Micro-Zone

Macro-zone	Primary productive sectors	Compost demand potential	Key considerations
La Araucanía	Dryland cereals — wheat (116,547 ha nationally, with La Araucanía as the primary production zone) and oats (111,523 ha) (ODEPA, 2022); beef cattle (25.5% of national bovine livestock transactions — INE, 2024); sheep; dairy production	Very high	La Araucanía is the region with the highest fertilizer consumption in Chile (MMA, 2020, cited in Villena et al., 2022). For wheat, fertilization represents approximately 39% of total production costs (2018–2021 average), a structural pressure that creates a clear economic argument for partial substitution with organic amendments. Soils are derived from volcanic ash (trumaos and red clay), characterized by high phosphorus retention and progressive acidification from mineral fertilizer use — both conditions that organic matter applications directly address (Villena et al., 2022). A critical supply gap persists: no SAG-certified compost is currently produced within the region, requiring transport from the Metropolitan Region at prohibitive freight costs (INDAP interviewee, primary data).
Maule & O'Higgins	Cherries — 50% of national area (48,961 ha) concentrated in O'Higgins (ODEPA, 2022); wine grapes; walnuts; apples	High	Cherry production has the lowest fertilization cost as a share of total production costs among the crops analyzed in this study (approximately 4% — Villena et al., 2022), which means the adoption argument for compost in this sector must prioritize soil structure and export compliance rather than input cost substitution. Export-oriented producers face growing traceability requirements (GlobalG.A.P., EU sustainability standards) that favor documented use of certified organic amendments. For stone fruits with fine root systems (e.g., nectarines), surface application is recommended, avoiding root-zone placement during the active growing season, as compost can elevate soil temperature in a manner detrimental to fine roots (primary qualitative data, this study).

Macro-zone	Primary productive sectors	Compost demand potential	Key considerations
Los Lagos	Dairy cattle; beef cattle; improved pastures; potatoes	High for livestock sector	Field evidence from Chilean livestock operations transitioning to regenerative management documents a net income increase of approximately USD 278/ha with an average investment of USD 54/ha, representing a return-on-investment ratio that strengthens the economic case for organic amendment adoption in this sector (Villena et al., 2022, citing Chilean field data). The region hosts extensive bovine dairy operations with degraded pastureland presenting measurable recovery potential. Puerto Varas and Río Bueno have been pre-identified as priority pilot zones within this study, combining high organic waste generation density with unmet agricultural demand and logistical conditions suited to the decentralized valorization model.
Atacama & Coquimbo	Table grapes; avocados; olives; vegetables	Moderate – with conditioning factor	The CIREN-ODEPA Fruit Cadastre (2024) records a reduction in fruit-growing area in both regions, likely associated with the prolonged water crisis. Compost application in these arid zones must be conditioned on electrical conductivity (EC) verification: Class A compost with confirmed low EC levels is essential to avoid soil salinization, which is a primary agronomic risk in northern dryland contexts. The moisture retention capacity of compost (up to 20 times its weight in water) represents a technically relevant co-benefit in a context of structural water deficit, which constitutes the primary adoption argument in this zone.
Metropolitan Region	Vegetables (leads national area – ODEPA, 2024); minor fruits; legumes	Moderate	Between 85% of national horticultural surface area is concentrated in the Coquimbo-to-Maule corridor, with the Metropolitan Region as the primary production hub (ODEPA, 2022). Documented over-fertilization with nitrogen is a common practice in this zone, generating nitrate leaching risk and aquifer contamination (Villena et al., 2022). Compost application at rates documented in Chilean agroecological systems, approximately 35 t/ha for horticultural soils, produced an increase in soil organic matter from below 1% to 10% over a 20-year period (Infante, 2015, cited in Villena et al., 2022), providing a locally-validated evidence base for adoption advocacy. The strategic priority for this region remains the consolidation of in-situ municipal circular models (e.g., La Pintana) rather than expansion of long-distance distribution.

It is important to note that this framework is intended as a demand orientation guide based on regional productive structure, not as a prescriptive agronomic protocol. Crop-specific application rates, timing, and compost maturity requirements vary significantly by species, soil type, and climatic zone, and should be validated through field trials and agronomic advisory prior to large-scale deployment. The spatial model (Annex A) provides the quantitative demand estimates by commune (*comuna*) and region that complement this qualitative sectoral characterization.

6.0 REPLICABILITY STRATEGY

6.1 Strategic Justification for Scaling

The macroeconomic and operational gaps identified in the ecosystem analysis—such as the logistical unviability generated by disproportionate freight costs, the asymmetric competition from final disposal models in sanitary landfills, and the persistence of rigid environmental and sanitary permitting disconnected from territorial reality—are not isolated phenomena; rather, they constitute shared structural patterns across Latin America. This systemic recurrence justifies the transfer of the qualitative and quantitative diagnostic model to standardize solutions at a regional level. As an example of operational deployment, the scaling projects an initial intervention phase focused on three key markets: Brazil, Colombia, and Argentina—territories that require standardized data to align multilateral financing policy in the face of the climate crisis.

6.2 Methodological Architecture and Hybrid Operating Model

The replicability of the evaluation requires a structured execution architecture to mitigate implementation risks and optimize the capital of the funding agency. The deployment design is based on the following components:

- **Validated methodology (ready-to-deploy methodology):** The operational instrumental base has already been tested and consolidated. The mixed-method design, which integrates willingness-to-pay (WTP) surveys and semi-structured interview protocols, allows for the decoding of complex regulatory and logistical dynamics without requiring preliminary design phases. This availability enables a central consulting team to execute immediate deployment in new territories, guaranteeing the collection of standardized and comparable continental metrics.
- **Hybrid execution model (core + local partner):** The territorial penetration strategy operates through a dual structure. A central consulting team (Core) assumes technical governance, data modeling, and systemic analysis under standardized international parameters. This core is articulated with a local partner provided with institutional validation in each country. This territorial body is responsible for providing the contact network and the critical social capital necessary to ensure the engagement and participation of local decision-makers.

6.3 Strategic Deliverables per Country

Based on the structure of the diagnosis performed, the application of this model guarantees the generation of the following tangible and standardized products for each new evaluated market:

- **Quantification and georeferencing of potential demand:** Spatial modeling and volumetric estimation of the absorption capacity of organic substrates within the territories, projecting short- and medium-term scenarios for the agriculture, ecological restoration, and urban landscaping sectors.
- **Ecosystem mapping and diagnosis of structural gaps:** Qualitative and quantitative collection that identifies key stakeholders in the decision-making chain and isolates the specific regulatory, economic, and cultural barriers that stifle circularity in the local market.

- **Preliminary design of strategic pilots:** Formulation of technical guidelines and initial concepts for territorial validation units (e.g., models for decentralization and logistical articulation) intended to mitigate investment risk and demonstrate the financial efficiency of the system operating with local resources.

7.0 CONCLUSIONS

The systemic analysis of the collected data allows for the establishment of the following technical and operational conclusions for strategic decision-making:

Diagnosis of the Logistical and Operational Gap

The primary factor of financial unviability identified within the compost value chain is the cost of transport, technically referred to as the challenge of "**moving air and water**" due to the volume and moisture content of the substrate. Quantitative data confirm that freight costs significantly exceed the commercial value of the product itself when transported to distant demand zones. The centralization of the valorization supply in the Metropolitan Region generates a geographic asymmetry that prevents efficient supply and renders operations economically unviable toward the northern and far southern zones of the country.

Segmentation and Behavior of Demand

The market is fragmented and conditioned by asymmetric sectoral realities, evidencing dissimilar absorption dynamics:

- **Agriculture and Livestock:** Represents the greatest volumetric absorption potential, with a massive projected capacity capable of covering a vast effective area at a national level. However, accelerated adoption is stagnant due to a disadvantageous cost structure compared to synthetic fertilizers and a highly restrictive willingness to pay (WTP) by producers in the standard segment.
- **Public Parks, Plazas, and Gardens:** Exhibits the greatest operational momentum through the implementation of municipal circular economy models that neutralize logistical barriers by producing and consuming the substrate **in-situ** within the same urban circuits.
- **Conservation and Restoration:** There is a latent demand with high technical specificity, recording the highest and most premium willingness to pay in the entire study. However, its large-scale execution remains inactive due to a lack of structural financing for environmental liability recovery and post-fire restoration projects.

Market Distortions and Regulatory Bottlenecks

The economic viability of valorization plants is significantly constrained as they compete at a disadvantage against a final disposal system in sanitary landfills that is legally and artificially inexpensive. This asymmetric competition, exacerbated by the lack of regulations penalizing methane emissions in landfills, is compounded by rigid environmental permitting. Permits apply a disproportionate risk standard, evaluating composting plants with the same rigor as hazardous waste facilities, which penalizes and disincentivizes investment in new decentralized infrastructure.

Pillars for Scaling and Sustainability

The transition toward achieving the targets of the National Organic Waste Strategy (ENRO) requires the implementation of the following measures and strategic levers:

- **Financial reengineering:** Transition from synthetic fertilizer bonuses toward direct demand subsidies, reorienting state instruments such as INDAP's SIRSD-S to directly subsidize the purchase and application of **organic amendments** on a national scale.
- **Infrastructure decentralization:** Move away from the paradigm of centralized installations and promote the deployment of distributed networks and local pretreatment nodes operating within reduced transport radii to eliminate logistical impacts at the source.
- **ESG mechanisms and carbon credits:** Integrate methane reduction with international climate financing, given that the vast majority of composting plants nationwide lack viability if they operate depending exclusively on the reception fee (gate fee).
- **Modernization of tenders:** Operationally transform public procurement through the design of bidding terms that require the application of a minimum percentage of certified compost in concession and maintenance contracts for green areas, creating a captive market and stable institutional demand.

Methodological Replicability on a Latin American Scale

The operational, regulatory, and logistical gaps identified in this analysis are likely to constitute shared structural patterns across Latin America. The study model executed in Chile serves as a valid methodological baseline for the region. The architecture of this research is directly replicable for developing analogous assessments in other countries, allowing for the precise identification of local barriers limiting the circularity of organic matter.

The transfer of this standardized methodology to other Latin American markets allows for the unification of metrics and the collection of comparable data at a continental level. The availability of this information is a critical element for aligning multilateral financing policies aimed at methane emission mitigation, structuring viable strategies to increase compost demand and develop decentralized organic valorization across the region.

8.0 BIBLIOGRAPHY

- Agrocompra; Asociación Nacional de Proveedores de la Agricultura (ANPROS). (2023). *Caída de los fertilizantes alivia al agro*.
- Brown, S., & Alexander, R. (2023). *Compost & soil improvement: Tools for climate resilient landscapes*. United States Composting Council.
- Centro de Información de Recursos Naturales (CIREN); Oficina de Estudios y Políticas Agrarias (ODEPA). (2024). *Catastro Frutícola 2024: Principales Resultados*. Santiago: Ministerio de Agricultura.
- Damaschino, G. (2024). *Quantifying the mechanisms behind carbon sequestration and soil health following compost application in a rangeland chronosequence*. California Polytechnic State University.
- Department of Climate Change, Energy, the Environment and Water. (2024). *Recycled organics for soil health: A farmer and advisor guide*. Commonwealth of Australia.
- Díaz, N., Cortés, P., Álvarez, C., & Medina, J. (2023). *Bases para incorporar compost en la viverización de especies nativas en Chile: Pauta técnica*. Fundación para la Innovación Agraria (FIA).
- Gravuer, K. (2016). *Compost application rates for California croplands and rangelands for a CDFA Healthy Soils Incentives Program*. California Department of Food and Agriculture.
- Hernández Silva, C. (2011). *Efecto de la aplicación de cal y compost en un suelo afectado por depositación atmosférica*. Universidad de Chile.
- Instituto Nacional de Estadísticas (INE). (2022). *VIII Censo Nacional Agropecuario y Forestal 2021: Resultados*. Santiago: Instituto Nacional de Estadísticas.
- Instituto Nacional de Estadísticas (INE). (2024). *Boletín Regional de Ferias y Mataderos: Región de La Araucanía, Edición N°173*. Santiago: Instituto Nacional de Estadísticas.
- Luo, S., Chen, Y., Hinojoza, L., & Campbell, J. (2026). Geospatial optimization of compost distribution for cropland under California's organic waste diversion strategy. *Journal of Cleaner Production*, 148075.
- McGinnis, M., & Myers, J. (2018). *Compost use guidelines for gardens, landscapes, & small farms*. Agronomic Division, NCDA&CS.
- Oficina de Estudios y Políticas Agrarias (ODEPA). (2024). *Ficha Nacional 2024: Estadísticas Silvoagropecuarias*. Santiago: Ministerio de Agricultura.
- Oficina de Estudios y Políticas Agrarias (ODEPA). (2026). *Ficha Regional: Región de La Araucanía, actualización marzo 2026*. Santiago: Ministerio de Agricultura.

- Oficina de Estudios y Políticas Agrarias (ODEPA). (2026). *Informe de Indicadores de Precios de Alimentos, Materias Primas y Fertilizantes, Abril 2026*. Santiago: Ministerio de Agricultura.
- Oficina de Estudios y Políticas Agrarias (ODEPA). (2026). *Plan de Acción de Fertilizantes: Chile Produce Seguro*. Santiago: Ministerio de Agricultura.
- Román, P., Martínez, M., & Pantoja, A. (2013). *Manual de compostaje del agricultor: Experiencias en América Latina*. FAO.
- Taylor, M., Rollett, A., & Chambers, B. (2010). *Compost & anaerobic digestate quality for Welsh agriculture*. WRAP.
- Trading Economics. (2026). *Urea – Commodity Price Tracker*.
- Villena, M., Pabón, C., Mora, A., & López, H. (2022). *Fertilización sostenible y Gestión Integral de Nutrientes*. Santiago: Oficina de Estudios y Políticas Agrarias (ODEPA), Ministerio de Agricultura.
- Wilson, S., Lee, A., Sistla, S., & Decock, C. (2025). Soil development and compost application rate impacts short-term soil health outcomes. *Journal of Soil and Water Conservation*, 491-506.
- WRAP. (2016). *Digestate and compost use in agriculture: Good practice guidance*. WRAP.
- Xiong, J. (2015). *Recuperación y rehabilitación de suelos contaminados mediante la aplicación de enmiendas*. Universidad de Sevilla.

9.0 ANNEXES

Annex A: Technical Data Sheet of the Spatial Model (Dashboard)

General Description

The Spatial Demand Projection Model is an analytical tool designed to quantify and georeference compost requirements in Chile under different demand scenarios. The model enables the simulation of dynamic scenarios by adjusting application intensity parameters over effective territorial surface areas.

Software Architecture

- **Calculation engine:** Microsoft Excel. It is used to structure the "Demand Calculator," which processes raw databases, applies standardization macros, and executes the parametric calculation matrix.
- **Visualization platform:** Power BI Desktop / Service. An interactive interface that consumes processed data in CSV format to generate the control panel (Dashboard), which includes the map of Chile.

Integrated Databases

The model integrates four strategic information sources to ensure territorial precision:

- **Municipal territorial database:** Provides the political-administrative division (region, province, municipality/*comuna*) and total surface areas per unit.
- **Agricultural census:** The primary source for the classification of soil types, planted areas (cereals, fruit trees, forage crops), and improved pastures.
- **Urban green areas cadastre (MINVU):** A detailed registry of urban parks, plazas, and green areas, standardized from square meters to hectares for the model.
- **Record of burned areas:** A wildfire database used to identify degraded soils with potential for ecological restoration.

Modeling Logic and Functionalities

- **Segmentation:** The model divides the surface area into three sectors: Agriculture and Livestock, Public Parks, Plazas and Gardens, and Conservation and Restoration.
- **Scenarios:** Allows toggling between High, Medium, and Low compost demand intensity levels, which apply different tonnes/hectare rates based on the bibliographic review.
- **Dynamic Visualization:** Includes range-based thematic maps (choropleth maps) that adjust their color gradient automatically based on the selected scenario, as well as bar charts with a North-South distribution.

Instructions for Installation/Visualization

The spatial model is delivered packaged in the compressed file *GMH0001 - Dashboard.zip*. To ensure the correct reading of the databases via the absolute paths configured in the system, the following procedure must be followed:

- Extract the entire contents of the compressed file.
- Host the four files resulting from the extraction strictly in the following directory of the local storage unit: *C:\GMH0001 - Dashboard*.
- Execute the main file named *Dashboard Compost Demand.pbix* to initialize the interactive visualization platform.

To enable access to the control panel via a web environment and dispense with local execution at each workstation, the project file must be transferred to the Power BI Service cloud environment. This procedure ensures data integrity and facilitates centralized multi-platform visualization.

The technical phases for publishing the report are as follows:

- **Opening the project:** Execute the *Dashboard Compost Demand.pbix* file using the previously installed desktop software.
- **Credential validation:** Log in to the system using an institutional account with the required publishing privileges in the data services portal.
- **Execution of the publish command:** Within the top ribbon, under the Home tab, activate the function labeled Publish.
- **Defining location:** The system will request the selection of a destination Workspace within the organization where the dynamic report will be hosted.
- **Access distribution:** Upon successful data upload, the system will generate a unique web address. To allow external or public visualization, access the report settings in the web service and select the option to generate an embed code for web publication. This process provides a direct access link that allows full interaction with the compost demand model from any standard browser, maintaining the functionality of parametric filters and cartographic visualization.

Integrated Sources and Databases

The model integrates four information sources for territorial spatial modeling:

- **Municipal territorial database:** Provides the political-administrative division by region, province, and municipality, and total areas per unit. Source: *División Política Administrativa 2023, Infraestructura de Datos Espaciales de Chile* ([IDE Chile](#)).
- **Agricultural census:** Source for the classification of soil types, planted areas, and improved pastures corresponding to the agricultural and livestock sector. Source: *Instituto Nacional de Estadísticas* ([INE](#)).
- **Urban green areas cadastre:** Registry of urban parks and green areas, standardized from square meters to hectares. Source: *Ministerio de Vivienda y Urbanismo* ([MINVU](#)).
- **Record of burned areas:** Information for the restoration and conservation category, structured from the following sources:
 - **Corporación nacional forestal (CONAF):** Closing reports for the 2024-2025 operational season and preliminary progress memos for the first quarter of the 2025-2026 season.

- **Digital information system for operational control (SIDCO):** Attribute database for the registry of large polygons and propagation thresholds in Wildland-Urban Interface (WUI) zones.
- **Servicio nacional de prevención y respuesta ante desastres (SENAPRED):** Consolidated reports of forest incidents and emergencies issued during Red and Yellow Alert periods.

Annex B: Interviewee Database

Name	Institution / Organization / Company	Position
Alejandra Marín	Sociedad Agrícola del Norte	Manager of the Sociedad Agrícola del Norte
Alejandro Florenzano	Regenerativa	Partner
Alejandro Retamal	Municipalidad Vitacura	Head of the Organic Recycling System
Alfredo Caro	Municipalidad Pto. Varas	DIMAO Director
Amanda Leigh Urzúa	Bendito Residuo	Innovation and New Business Development
Antonio Kusanovic	ACHIGANAR	President and Legal Representative
Antonio Walker (SNA)	SNA - Sociedad Nacional de Agricultura	President
Aurora Espinoza	SAG	Expert at the Servicio Agrícola y Ganadero
Barbara Recabarren	SAG	Head of the Department of Regulation and Control of Forestry and Agricultural Inputs and Products
Barbara Zaavedra	WCS Chile Wildlife Conservation Society-Chile	Director
Carolina Rivera	Armony	Marketing and Corporate Affairs Manager
Cristobal Meriño Sarmiento	Consorcio Santa Marta Realim Chile	Head of Circular Economy and Sales
Daniela Acuña	ODEPA	National Director
Esteban Valenzuela	Universidad de Concepción (ex Ministro Agricultura)	Professor
Etienne Lefranc	Parque Cerros de Renca	Director of Infrastructure and Nature
Felipe Marchant	Municipalidad de La Pintana	Director of Environmental Management
Felipe Molinare	Chicureo Sustentable	Director
Francisca Lira	Ladera Sur	CEO of Ladera Sur
Francisco de Torre	Rilesur	Technical Manager
Francisco Moscoso Guerrero	Municipalidad Recoleta	Director of Environment, Sanitation, and Landscaping
Gerardo Canales	Implementa Sur	Director and Founder
Gerardo Soto	Universidad de Chile Ciencias Agrónomas	Professor, Faculty of Agricultural Sciences
Germán Jara	Compost Fertil Cooperativa de compostaje	Managing Manager
Guillermo Gonzalez	Ex miembro del Ministerio de Medio Ambiente	Consultant
Hans Hube	Municipalidad Recoleta	Head of the Environmental Management Department
Jaime Giacomozzi	ODEPA	Climate Change Mitigation Analyst
Jesús de la Riva	Aba Consulting	President
Jorge Carrion	El Manzano	Founding Partner

Name	Institution / Organization / Company	Position
Jorge Céspedes	CONAF	Manager of Forests and Climate Change
Jorge Gomez	MMA	External Advisor
José Miguel Riesco Pineda	CONAF	Santiago Provincial Head
José Pedro Guilisasti	Asociación Parques Cordillera	Executive Secretary
Juan Jose Donoso	TNC	Program Director
Juan Pablo Letelier	Ex Senador y Diputado	Former Senator and Deputy
Laura Bascuñan	Local Compost	Executive Director
Leonardo Curotto	Resiter	Mining Waste Valorization Manager
Leonardo Marquez	lansa	Environmental and Sustainability Assistant Manager
Leticia Rebolledo	Municipalidad Renca	Director of Environment, Sanitation, and Landscaping
Lucía San Pedro	Parque Met	Head of Sustainability and Outreach
Magali Adasme	Subsole	Head of Environment
María Emilia Undurraga Marimón	Universidad San Sebastián (ex ministra y ODEPA)	Dean of the Faculty of Nature Sciences
Maria Jose Irrarazaval	ChileCarnes A.G (ex ODEPA y PUC)	Director
Matías Herseg	Corporación Cultiva	Executive Director
Miguel Leal	INDAP Los Lagos	Head of Sustainability Programs for Los Lagos
Munir Wahab Rumie	Asociación de Municipios Provincia de Llanquihue	Technical Head of Waste Valorization
Patricio Camoglini	INDAP Araucanía	Agroecology Support Professional
Paula Guerra	Ambition Loop	Co-Founder, Circular Lead
Rafael Ascanio	AngloAmerican	Biodiversity Advisor
Ricardo Cofré Meza	Municipalidad Peñalolen	Director of Environment
Rodrigo Alarcón	Verde Corp	Agronomist
Rodrigo Goñi	Fundación Mi Parque	Head of Landscaping and Monitoring
Rodrigo O’Ryan	CORMA (Depto. de Medio Ambiente)	President
Rodrigo Sapiain	AIN Consultores	Board Member
Salvador Luco	Zero Corp	New Projects Manager
Sebastián Herceg	Kyklos	Director of Corporate Affairs
Sebastián Tramon	Emiliana	Sustainability Manager
Soledad Mella Vidal	ANARCH	President
Tamara Ortega	Fundación Basura	Executive Director
Verónica de la Cerda	CMPC	Corporate Sustainability Manager
Ximena Milicevic	Asociación de Agricultores Biológicos y Biodinámicos	Director

Annex C: Specific Gaps in Demand by Sector

Beyond the structural and regulatory gaps that condition the ecosystem at a macro level, the stagnation of the organic valorization market stems from highly specific frictions at the point of consumption. The adoption of soil amendments like compost clashes with operational, financial, and cultural realities that vary drastically depending on the end-user. Below is a breakdown of the specific challenges blocking demand across the three sectors with the highest potential.

Agriculture and Livestock

Despite being the sector with the highest theoretical volume absorption potential, commercial and traditional agriculture faces a matrix of risks that blocks the systematic adoption of organic amendments.

- **Outdated state incentives (SIRSD-S):** Public promotion instruments are disconnected from market reality. The official cost tables used by these programs are outdated in the face of inflation and freight costs. The state subsidy fails to cover the actual price of compost delivered to the field, forcing farmers to co-finance a difference that disincentivizes use from the start.
- **Narrow financial margins:** Beyond subsidies, the agricultural business operates with structurally vulnerable and very tight profitability. As validated by surveys and industry testimonies, the willingness to pay (WTP) is very low: if the farmer does not see a clear and rapid Return on Investment (ROI) or demonstrable savings compared to urea or other synthetic fertilizers, they reject the purchase of compost due to liquidity issues, categorizing it as a risk to their cash flow.

"I would tell you that the main limiting factor in this has been the cost. Agriculture has a super unstable profitability... So, if you tell me 'apply compost,' and I am convinced of the benefits it has, but I don't have the cash to do it, it doesn't happen. As we demonstrate to the farmer that it is also more profitable, they will become convinced."

Source: Agricultural Sector Stakeholder, Gremial representation

- **Hidden gaps:** Mistrust is not only agronomic; it is commercial. In export agriculture, international certifications (such as GlobalG.A.P. or the stringent phytosanitary requirements of the Chinese market) generate fear of cross-contamination (pathogens, heavy metals, or weed seeds). Faced with uncertainty regarding the traceability of industrial compost, the agro-exporter opts for the sterile "safety" of chemicals.
- **Machinery deficit and scale logic:** Unlike traditional fertilizers applied in kilograms, compost requires moving tonnes per hectare. The average farmer lacks specialized machinery. Application becomes a manual, inefficient, and costly process, highly dependent on an increasingly scarce rural labor force.
- **Regulatory uncertainty (NCh 2880):** The current Chilean standard (Class A and B) is perceived as a minimum and insufficient standard. Agronomists demand a stable "agronomic recipe" that guarantees biological richness, but in practice, they

receive immature batches with excessive electrical conductivity (lethal in the arid soils of the north) or excess woody material (lignin), making it impossible to standardize use from one truck to the next.

"The price of compost is largely determined by the freight... The low reliability the product has regarding the data sheet or the analysis is critical. We spend so much money on this only for it to fail to perform as expected."

Source: Agricultural Consultant

"The regulations in Chile are closely aligned with international realities and little with national reality (...) They try to regulate a product that is very different from one to another and between different zones. Today, it shouldn't be the case that La Araucanía doesn't have a SAG-certified compost and it has to be brought in from the Metropolitan Region."

Source: INDAP Representative

Conservation and Restoration

This sector presents the most urgent biological need to incorporate organic matter to recover degraded soils, burned areas, and inactive or abandoned mine tailings. However, its ability to drive demand is significantly constrained by the lack of an economic model that valorizes the ecosystem.

- **Valorization of ecosystem services:** In the current economic model, there is no accounting that rewards or internalizes long-term environmental benefits, such as water retention capacity, carbon sequestration, or biodiversity recovery. Lacking a direct financial return, restoration initiatives hit a structural barrier where compost application and ecosystem regeneration are perceived exclusively as a **sunk cost**, without the commercial pull to justify the investment.

"In the current model, nobody cares about nature in financial terms. There is no accounting that rewards water retention, carbon sequestration, or biodiversity recovery (...) Since there is no direct and short-term economic return, investment in restoration through compost is perceived as a sunk cost."

Source: Conservation Sector Stakeholder, Ecological expert

"We have disconnected products and basic needs from their origin; we believe compost is the farmer's problem and we don't understand that soil degradation is everyone's problem."

Source: Sustainability Consultant

- **Extreme logistics:** The topography of Chilean restoration (steep slopes, basins, hills) makes access for heavy machinery impossible. This forces the acquisition of

compost in 25 kg bags (infinitely more expensive than bulk) and its transport by human or animal traction.

- **Lack of state support and corporate short-termism:** The NGOs leading reforestation survive on philanthropy, without structural subsidies for purchasing organic substrates. On the other hand, large-scale mining, when executing environmental liability closure plans (tailings), lacks a quantitative environmental culture; they limit themselves to complying with basic physical stability standards without optimizing budgets to integrate compost on a large scale cost-effectively.

"There is a profound disconnection between food waste and soil health... The greatest challenge is for people to believe in this system and see the negative impacts of throwing the organic fraction into the trash."

Source: Conservation NGO Representative

Public Parks, Plazas, and Gardens

Urban landscaping should be the natural and circular buyer of municipal compost. However, local public management presents blockages that break this virtuous cycle.

- **Social perceptions and the NIMBY Effect:** Public ignorance regarding controlled biological processes generates deep-seated rejection toward the installation of urban composting plants. The community associates these plants with dumpsites, vectors, and bad odors. This social friction politically stalls mayors, who prefer to avoid territorial conflicts, perpetuating the shipping of organics to distant landfills.

"Nobody wants a plant near their house... you're going to have the community up in arms, and they won't let you because they don't know what it is. They assume you're going to install a landfill on the corner."

Source: Valorization Company

- **Inertia of public tendering:** Bidding terms for the maintenance of green areas suffer from an acute economic bias: they are awarded almost exclusively based on the "lowest price" criterion. Contractor companies attempting to innovate using certified compost find their costs elevated compared to competitors using leaf mold (often from illegal and predatory extraction) or cheap chemical fertilizers, leaving them out of the public market.
- **Municipal financial stifling (the double cost):** With an average of 38% of the municipal budget allocated to traditional waste management (representing a national sunk cost of 600 million dollars annually), municipalities operate with no room for maneuver. They are financially blocked by the "double cost" required for the transition: it is unviable for them to sustain the high operating costs of traditional waste removal while simultaneously financing the new infrastructure (CAPEX) and citizen education required for segregated organic collection.

"Municipalities would be delighted [to move forward], but they face the money problem. Today they spend about 600 million dollars a year on this, and honestly, they do it simply to throw the trash somewhere and bury it."

Source: Public Policy and Climate Change Sector Stakeholder

"Why would I, as a municipality or company, pay double for a valorization service if I can legally take it—complying with all laws—to a sanitary landfill? You cannot compete against a solution that is too cheap."

Source: Circular Economy Expert / Management Company

Annex D: Sector-Specific Demand Opportunities: Niche Levers and Operational Solutions

Having addressed the macro and systemic challenges, data analysis reveals that the mass adoption of composting requires targeted interventions adapted to the operational reality of each industry. The following opportunities emerge from stakeholders on the ground as the most viable paths to drive immediate demand.

Agricultural and Livestock Sector

This sector concentrates the greatest territorial volume potential but faces operational frictions linked to land scale and machinery availability. Technical and commercial opportunities are structured as follows:

- **"Turnkey" integrated application service model:** The bulk sale of compost presents logistical barriers for the producer. The structuring of contracting companies that offer the input, freight, and application machinery (**spreaders**) directly in crop fields and livestock pastures solves the operational hurdle. This is supported by the fact that 73% of surveyed farmers identify the lack of specialized machinery as the main brake on incorporating organic amendments.

"For 40 years, the entire machinery matrix has operated based on synthetic products. Go to a farm today. Who has a manure spreader? Who has a compost spreader? Nobody. [...] We need that kind of investment in mechanization, mechanization for sustainable agriculture."

General Manager of Agricultural Composting Cooperative

- **Alignment with export markets and water certifications:** Adoption is driven by the traceability requirements of international markets (Europe, Japan, Korea) and protocols such as GlobalG.A.P. Fruit and cereal producers use compost as a compliance tool to manage waste responsibly and reduce their water footprint, taking advantage of the fact that the substrate retains up to 20 times its weight in water. In the livestock sector, application to recover grazing lands allows access to organic meat and dairy certifications, improving commercial margins.
- **Substitution of agricultural burning and on-farm advisory:** The imminent prohibition of agricultural burning requires the urgent valorization of crop residues (stubble). There is a window to mobilize agronomists and independent advisors as key prescribers in the design of *in-situ* composting systems. By mixing this plant biomass with livestock waste (slurry and manure), the farmer transforms a disposal problem into an internal bio-input that reduces fertilization costs.
- **Development of bio-inputs and parameterized substrates:** To mitigate the logistical costs of volume transport, compost producers should formulate liquid biological inoculants and compost teas. These formats are injected directly into irrigation systems, delivering microbiological load with low freight costs. Parallel to this, creating tailored technical substrates for high-value crops (blueberries, cherries) and quality forage increases the willingness to pay.

"What we are indeed doing, for example, and what we highly recommend in soils with organic matter [...] is compost extract or compost tea... you take that compost, make an extract, and you apply that extract constantly... it is a very good method, since making biologically good compost at the scales we are operating is complicated."

Founding Partner of an Organic Farm

- **Technical recovery of saline soils:** In the northern and central-southern zones, the application of organic matter is the primary technical mechanism for salt leaching and increasing water retention in degraded soils. This generates constant demand aimed at maintaining agricultural productivity against desertification.
- **Human capital formation for agroecological transition:** Structurally intervening in the curricula of technical and higher education to respond to the imperatives of the new agro-export matrix and the soil crisis. It is critical that faculties of agronomy, engineering, and environmental sciences move away from linear production paradigms. The training of this new human capital must transversally integrate regenerative system design, the bio-economy, and the integral valorization of biomass.

Conservation and Restoration

In this sector, compost operates as ecological infrastructure for environmental regulatory compliance and the stabilization of liabilities. Technical and commercial opportunities are structured as follows:

- **Manufacturing of technosols for mining liabilities:** Large-scale mining represents the highest volume market. The intensive use of compost to formulate artificial soils allows for the physical confinement and phytoremediation of tailings. The viability of this logistical model is observed in operations such as Minera Collahuasi, which processes its organic waste for local cultivation, closing the cycle directly at the impact zone.

An interesting experience is taking place at the Collahuasi mine (Iquique), where an organic matter stabilizer-dehydrator is being installed so that the product does not go to a sanitary landfill... The resulting substrate from Collahuasi is being used in the Pica Valley to produce lettuce that returns to the mine through the food service provider."

Mining Waste Valorization Manager

- **Capture of environmental compensation funds:** Large-scale infrastructure projects (power transmission, solar plants, real estate) execute reforestation by legal requirement. Operationally directing these budgets to purchase compost ensures project success, as field reports indicate that its application increases the survival rate of native species in arid zones significantly, making the investment profitable by reducing replanting costs.
- **Supply contracts with the nursery network:** Forest propagation plans require constant volumes of substrate. The CONAF nursery network and private

operators constitute an institutional purchasing power that allows local composting plants to sign long-term supply contracts, ensuring a stable regional base demand.

- **Post-fire stabilization protocols:** There is a technical niche in applying compost and mulch (chipped local pruning waste) to treat burned soils. This intervention prevents immediate surface erosion by runoff and restructures the soil to accelerate the recovery of native biodiversity.

"In terms of ecological restoration, it is done. I think nobody does it, or very few people do it. I don't do it, because it is extremely expensive. [...] I would happily incorporate it [compost], it's good for the soil, it retains water, it improves the soil's organic matter... I mean, they are all positive things. But I am not going to pay for it because it is not within my priorities to pay for it... However, if there is a brand that wants to pay for it... we are happy to receive it"

Executive Secretary of a Mountain Parks Association

Public Parks, Plazas, and Gardens

In the urban and municipal environment, compost operates as a technical water resilience tool against water scarcity and as a means of optimizing public maintenance budgets. Technical and commercial opportunities are structured as follows:

- **Modification of technical bidding terms:** The most efficient administrative lever to trigger urban demand is the adjustment of concession contracts. Requiring green area maintenance companies to apply a mandatory minimum percentage of local compost creates an immediate captive market. The technical viability of this measure is confirmed by the 60% of surveyed municipal officials who consider it possible to integrate this clause without altering already assigned annual budgets.

"If it were required in the municipality's environmental ordinance that a certain percentage of the substrates used in nurseries and/or neighborhood associations come from compost"

Head of a Municipal Environment Department

- **Circular valorization of municipal pruning:** Urban administration generates critical volumes of biomass through the management of public trees. There is a logistical opportunity in processing these residues to formulate substrates to be reincorporated into the same municipality. This eliminates freight costs to landfills and ensures the supply of compost for local plazas, closing the municipality's operational cycle.
- **Formulation of substrates for water resilience:** Production plants (supply) must repackage and commercially adapt compost to highlight its main attribute in the city: moisture retention capacity. According to urban sector surveys, water retention has positioned itself as the most sought-after value characteristic for retail consumers (Sodimac, Easy) and low-consumption landscaping contractors, as it directly reduces irrigation frequency and volume.

- **Demonstrating of the circular model via community educational infrastructure:**
Operationally integrating municipal organic recycling programs with the network of neighborhood and school gardens represents a high-impact lever. This strategy makes the circular economy tangible in the territory, visually demonstrating the conversion of household waste into a valuable input for neighborhood greening and local food production. Using these spaces as platforms for technical demonstration and social cohesion acts as the primary catalyst for massifying source-separation habits.

"We have an environmental educational center called Ecopark. In this center, we manage the organic waste from five open-air markets [...] The substrate for plant regeneration... and the fertilization of the vegetable gardens are the compost sink of the eco-park... acting as a support for all our neighborhood education programs, the 'create your garden' or the community gardens programs."

Municipal Environmental Director

Annex E: Key Implementation Cases

- **Association of Municipalities of the Llanquihue Province.** Composed of nine municipalities, it manages the provincial landfill to extend its lifespan by reducing final waste disposal, especially the organic fraction (50% of the load). Its inter-municipal governance model acts as a technical coordinating committee, enabling smaller municipalities to access infrastructure, optimize logistical costs, and centralize negotiations. This framework demonstrates that associativity around shared infrastructure overcomes administrative fragmentation in regional waste management.

Munir Rumie, Planning and Strategic Management Lead.

<https://asociacionllanquihue.cl/>

- **Cooperativa FÉRTIL (Agricultural Valorization).** Operates the only plant with sanitary resolution in the Araucanía region, transforming industrial subproducts into inputs to close the local nutrient cycle. Its strategic model replaces industrial mega-plants with a decentralized network of agro-composting nodes on agricultural land, mitigating territorial impacts and highlighting the lack of specialized machinery for application as the primary barrier to scaling mass consumption.

Germán Jara, General Manager.

<https://www.compostfertil.cl/>

- **Municipality of La Pintana (Door-to-Door Segregated Collection)** Established in response to a 2005 budgetary crisis, this model's success is rooted in a **sustained door-to-door environmental education strategy**. Through direct one-on-one engagement, the municipality built a bond of trust that solidified the habit of separating vegetable waste without relying on fines, achieving high purity levels in the collected material. This material feeds municipal treatment plants that return the resource to local green areas, demonstrating that human engagement is the key to transforming a critical operating cost into a socio-environmental asset.

Felipe Marchant, Director of Environmental Management.

https://pintana.cl/?page_id=7740

<https://www.youtube.com/watch?v=bnlZFZn60i0>

- **Fundo El Manzano (Organic and Regenerative Agriculture)** Located in the Biobío Region, this small-scale family project (35 hectares) is dedicated to the agroecological production of cereals, legumes, and seeds. Its model completely bypasses synthetic fertilizers, using compost as its sole agricultural input to sustain crop yields in highly leached, sandy soils. Its differentiating factor is the focus on "biological compost," prioritizing the soil food web and functional microbiology over traditional chemical nutrient delivery (NPK). This case highlights a specialized demand niche within regenerative agriculture, while also revealing that high logistical costs for on-farm application and the lack of microbiological standards in current regulations are the main barriers to scaling this approach to other farmers.

Jorge Carrión, Agricultural Administrator.

<http://elmanzano.org/>

- **Consortio Santa Marta and Fundación Realim (Landfill Valorization)** This case illustrates the integration of valorization processes adjacent to final disposal at Chile's second-largest sanitary landfill. Through Fundación Realim, they divert source-separated clean organic waste, primarily from open-air markets and the Lo Valledor wholesale market. The operation includes an on-site composting plant with an initial authorized processing capacity of 29 tons, using a tiered pricing model that incentivizes the reception of pure biomass. The final product is projected for internal use as landfill cover material or for municipal distribution. This model highlights that, at an industrial scale, the major bottleneck is the lack of a consolidated market for finished compost, as current profitability relies on the initial waste reception fee rather than product commercialization.

Cristóbal Meriño, Head of Circular Economy at Consorcio Santa Marta and President of Fundación Realim.

<https://www.csmarta.cl/>

<https://www.instagram.com/realimchile/>

Annex F: Glossary of Terms and Abbreviations

Public Institutions and Agencies

- **AChM:** Asociación Chilena de Municipalidades - *Chilean Association of Municipalities.*
- **CONAF:** Corporación Nacional Forestal - *National Forestry Corporation.*
- **DIMAO:** Dirección de Medio Ambiente, Aseo y Ornato - *Directorate of Environment, Sanitation, and Landscaping (Municipal level).*
- **IDE Chile:** Infraestructura de Datos Espaciales de Chile - *Spatial Data Infrastructure of Chile.*
- **INDAP:** Instituto de Desarrollo Agropecuario - *Institute of Agricultural Development.*
- **INE:** Instituto Nacional de Estadísticas - *National Institute of Statistics.*
- **MINVU:** Ministerio de Vivienda y Urbanismo - *Ministry of Housing and Urban Planning.*
- **MMA:** Ministerio de Medio Ambiente - *Ministry of the Environment.*
- **ODEPA:** Oficina de Estudios y Políticas Agrarias - *Office of Agricultural Studies and Policies.*
- **PUC:** Pontificia Universidad Católica - *Pontifical Catholic University.*
- **SAG:** Servicio Agrícola y Ganadero - *Agriculture and Livestock Service.*
- **SENAPRED:** Servicio Nacional de Prevención y Respuesta ante Desastres - *National Disaster Prevention and Response Service.*

Policies, Regulations, and Systems

- **ENRO:** Estrategia Nacional de Residuos Orgánicos - *National Organic Waste Strategy.*
- **NCh 2880:** Norma Chilena 2880 (Norma de calidad y requisitos del compost) - *Chilean Standard 2880 (Compost quality and requirements standard).*
- **PUSU:** Ley de Plásticos de un Solo Uso - *Single-Use Plastics Law.*
- **REP:** Responsabilidad Extendida del Productor - *Extended Producer Responsibility.*
- **SEIA:** Sistema de Evaluación de Impacto Ambiental - *Environmental Impact Assessment System.*
- **SIDCO:** Sistema de Información Digital para Control de Operaciones (Utilizado para el registro de incendios forestales) - *Digital Information System for Operational Control (Used for wildfire logging).*
- **SIGES:** Sistema de Incentivos para la Gestión Sustentable de los Suelos Agropecuarios - *Incentive System for the Sustainable Management of Agricultural Soils.*
- **SIRSD-S:** Sistema de Incentivos para la Recuperación de Suelos Degradados - *Incentive System for the Recovery of Degraded Soils.*

International Organizations and Foreign References

- **AORA:** Asociación Australiana de Reciclaje de Orgánicos - *Australian Organics Recycling Association*.
- **CCAC:** Coalición Clima y Aire Limpio - *Climate and Clean Air Coalition*.
- **ECN:** Red Europea de Compost - *European Compost Network*.
- **FAO:** Organización de las Naciones Unidas para la Alimentación y la Agricultura - *Food and Agriculture Organization of the United Nations*.
- **GMH:** Hub Global del Metano - *Global Methane Hub*.
- **NCDA&CS:** Departamento de Agricultura y Servicios al Consumidor de Carolina del Norte - *North Carolina Department of Agriculture and Consumer Services*.
- **UNEP:** Programa de las Naciones Unidas para el Medio Ambiente - *United Nations Environment Programme*.
- **WRAP:** Programa de Acción de Residuos y Recursos - *Waste and Resources Action Programme*.

Guilds, Companies, and NGOs

- **ACHIGANAR:** Asociación Gremial de Ganaderos - *Livestock Farmers Trade Association*.
- **ANARCH:** Asociación Nacional de Recicladores de Chile - *National Association of Recyclers of Chile*.
- **CMPC:** Compañía Manufacturera de Papeles y Cartones - *Paper and Cardboard Manufacturing Company*.
- **CORMA:** Corporación Chilena de la Madera - *Chilean Wood Corporation*.
- **NGO / ONG:** Organización No Gubernamental - *Non-Governmental Organization*.
- **SNA:** Sociedad Nacional de Agricultura - *National Society of Agriculture*.
- **TNC:** The Nature Conservancy - *The Nature Conservancy*.
- **WCS:** Wildlife Conservation Society - *Wildlife Conservation Society*.

Technical and Methodological Terms

- **CAPEX:** Gasto en Capital (Inversión inicial) - *Capital Expenditure (Initial investment)*.
- **CO2:** Dióxido de Carbono - *Carbon Dioxide*.
- **CSV:** Valores Separados por Comas (formato de archivo) - *Comma-Separated Values (file format)*.
- **ESG:** Criterios Ambientales, Sociales y de Gobernanza - *Environmental, Social, and Governance criteria*.
- **GIS:** Sistema de Información Geográfica (para los mapas de demanda) - *Geographic Information System (for demand mapping)*.
- **GlobalG.A.P.:** Norma global de buenas prácticas agrícolas - *Global Good Agricultural Practices standard*.
- **LATAM:** Latinoamérica - *Latin America*.

- **OpEx:** Gasto Operativo - *Operating Expense*.
- **PLU:** Códigos de búsqueda de precio (etiquetas en frutas/verduras) - *Price Look-Up codes (stickers on produce)*.
- **ROI:** Retorno de la Inversión - *Return on Investment*.
- **VAT / IVA:** Impuesto al Valor Agregado - *Value Added Tax*.
- **WTP:** Disposición a pagar por el compost - *Willingness to pay for compost*.
- **WUI:** Interfaz Urbano-Forestal (zonas de propagación de incendios) - *Wildland-Urban Interface (wildfire propagation zones)*.