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Methodological Design for Strengthening the Digital Scientific Footprint in R&D&I Organizations: The Case of AGROSAVIA

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Abstract– Scientific visibility constitutes a strategic factor for positioning research institutions within the national and international science, technology, and innovation ecosystem. To consolidate the digital scientific footprint of its researchers, AGROSAVIA designed and implemented an institutional strategy based on digital tools, didactic support, and an equity-oriented approach. The methodology was structured into three sequential phases: initial diagnosis, design and implementation, and evaluation of visibility indicators on platforms such as CvLAC, ORCID, and Google Scholar. The results demonstrate a substantial increase in institutional records, international interoperability, and academic citations, along with qualitative outputs that strengthen the institutional culture of open science. These findings provide a replicable model for institutions seeking to enhance their scientific visibility and align with sustainability and equity objectives.

Keywords-- digital scientific footprint, academic visibility, science and technology indicators, public communication of science, didactic accessibility, open science.

I. Introduction

The visibility of scientific production has become a strategic factor for strengthening national and international science, technology, and innovation (STI) systems [1]. Currently, researchers face the challenge not only of generating knowledge but also of ensuring that their contributions are accessible, recognized, and used across diverse contexts [2]. In this context, the concept of a digital scientific footprint emerges as a key notion referring to the set of evidence of academic output, professional profiles, and impact metrics available on digital platforms. A strong digital footprint contributes to research traceability, facilitates scientific collaboration, and enhances institutional reputation [3].

In Colombia, the registration and classification of researchers and research groups within the National Science, Technology, and Innovation System (SNSTI), led by the Ministry of Science, Technology, and Innovation (Minciencias), largely depend on the accurate and updated use of platforms such as ScienTI–CvLAC. At the international level, persistent identifiers such as ORCID and the linkage of scientific productivity data through academic visibility engines such as Google Scholar are required [4]. However, many institutions face barriers related to digital literacy, profile fragmentation, and the lack of systematic strategies to consolidate and monitor researchers' presence across these platforms [5].

Aware of this need, the Colombian Agricultural Research Corporation (AGROSAVIA), as a national entity dedicated to agricultural research, designed and implemented an institutional strategy aimed at consolidating the digital scientific footprint of its researchers. This initiative is based on the integration of digital tools, continuous support, and an approach grounded in didactic accessibility, gender inclusion, and the use of emerging technologies such as artificial intelligence. The strategy seeks not only to enhance individual profile visibility but also to strengthen the institution's collective positioning within the scientific ecosystem, particularly through its knowledge management structures: (a) research groups, (b) innovation networks, and (c) regional research centers.

A digital scientific footprint refers to the set of visible and accessible online evidence that reflects the academic production, collaboration, and impact of researchers and institutions [6]. In a context where open science and international visibility are essential, building a robust digital footprint becomes a strategic indicator of research relevance and influence [7]. It encompasses published articles, conference presentations, code repositories, collaborations, social media activity, online course participation, and research data and analyses [8]. Moreover, it reflects professional experience, reputation, and institutional impact potential, allowing researchers to actively shape their presence to promote their work and strengthen professional connections [9]. Maintaining an active, updated, and coherent digital footprint not only increases citations and international recognition but also enhances institutional credibility and expands opportunities for interdisciplinary and transnational collaboration [10].

Researcher curriculum systems such as CvLAC, along with platforms such as ORCID, Google Scholar, and ResearchGate, play a fundamental role in the systematization and dissemination of academic information. CvLAC, administered by Minciencias, supports the registration and classification of researchers in Colombia and constitutes a key input for national evaluations of scientific capacity. ORCID ensures interoperability and standardization through persistent identifiers, while Google Scholar facilitates article and citation visibility, albeit with challenges related to data quality and standardization [11]. ResearchGate has emerged as a major academic social network, fostering scientific communication, alternative impact assessment, and global visibility through publication sharing and collaboration networks [12].

Strengthening scientific visibility through these platforms not only enhances individual and institutional reputation but also contributes to scientific impact understood as the capacity of research outputs to be recognized, cited, and applied across social, technological, and productive contexts [13]. In the agricultural sector, this impact is particularly relevant due to the need to transfer research results to extension agents, technical assistants, producers, and rural communities, thereby linking academic production to sustainability and social innovation in rural territories [14].

Additionally, didactic accessibility emerges as a key component for knowledge appropriation [15]. Initiatives integrating visual resources, practical guides, and emerging technologies such as artificial intelligence have demonstrated improvements in comprehension, equity, and stakeholder participation in scientific communication processes [16]. Therefore, strengthening the digital scientific footprint should not be limited to a technical practice but rather conceived as a cultural strategy that articulates visibility indicators with pedagogical, inclusive, and sustainable approaches.

This study aims to present the design, implementation, and lessons learned from a strategy to consolidate AGROSAVIA researchers' digital scientific footprint through digital tools and active visibility actions. Specifically, the objectives were to: (i) diagnose researchers' digital presence across three key platforms (CvLAC, ORCID, and Google Scholar); (ii) implement accessible and up-to-date digital tools to promote platform use; and (iii) assess the effects of the strategy using visibility indicators.

The relevance of this experience extends beyond AGROSAVIA, providing a replicable model for other research institutions seeking to strengthen their digital scientific footprint, improve positioning, and promote a responsible open science culture.

II. Methodological design

This study adopted a mixed-methods, descriptive, and evaluative approach aimed at the design, implementation, and analysis of an institutional strategy to strengthen AGROSAVIA researchers' digital scientific footprint. The methodology was structured into three sequential phases: diagnosis, tool implementation, and results evaluation and experience systematization [17]. The collection and analysis of these digital traces are essential for assessing highly sensitive personal attributes [18]. Consequently, for a scientist, the digital scientific footprint constitutes the core of their personal brand.

The strategy was implemented at the institutional level across the entire population of AGROSAVIA researchers, including those at the professional, master's, and PhD levels, in each evaluation period: baseline assessment in December 2023 and evaluation in June 2025. Considering fluctuations in the total number of researchers, the analysis in this study was conducted in proportional terms.

The main instruments for data collection and monitoring included three key platforms: CvLAC as the official registry of the national system (Minciencias), ORCID as a global interoperability standard, and Google Scholar for tracking citation metrics. Additionally, institutional tools such as the CRIS system were used for incentive management, along with Power BI dashboards for the visualization of gender-related indicators by research area.

The intervention was structured through eight institutional lines of action designed to mitigate digital literacy barriers and promote an open science culture. These lines included the use of internal and external communication channels, the design of simplified visual guidelines, and personalized support for researchers.

Innovative components were integrated, such as the use of generative Artificial Intelligence for the creation of inclusive scientific narratives, as well as a gender equity approach through the "Violet Section" and the character "Doña Violeta." As a reinforcement mechanism, a system of symbolic incentives was implemented, including the recognition of profiles in the "*Agrometrics*" and "*Panorama Científico*" bulletins, as well as the assignment of public digital badges for advancements in national categorization.

The analytical pipeline adopted a mixed-methods, descriptive, and evaluative approach, organized into three sequential phases. In Phase I (Diagnosis), a baseline was established in December 2023 by assessing registration indicators, citation averages, and institutional categorization levels. Following the execution of Phase II (Intervention), Phase III (Evaluation) was conducted in June 2025, performing a comparative measurement of the initial indicators to identify quantitative variations and emerging trends.

Qualitative analysis was carried out through the systematization of experiences using coding processes analogous to grounded theory, enabling the identification of patterns, barriers, and enabling factors that ensure the transferability of the model to other R&D&I organizations.

A. Phase I – initial diagnostic

A baseline assessment was conducted as of December 2023 based on the direct review of researcher profiles across three key platforms: CvLAC, ORCID, and Google Scholar.

These platforms were selected due to their role in consolidating researchers' digital identity and academic visibility: CvLAC as the official registry within Colombia's National Science, Technology, and Innovation System (SNCTI); ORCID as a globally adopted persistent identifier, supported by initiatives such as Consorcio Colombia under Transformative Agreements; and Google Scholar as a widely used academic search engine and citation tracking tool.

To characterize the initial situation, the following key visibility indicators were defined:

- Percentage of researchers with active profiles in CvLAC, ORCID, and Google Scholar.
- Total number of citations recorded in Google Scholar.
- Average number of citations per article and per researcher.
- Number of citations of the most cited article per researcher.
- Number of researchers categorized in CvLAC (Senior, Associate, Junior).
- Number of research groups officially recognized and categorized by Minciencias.

These indicators were constructed following recent recommendations on the use of digital footprints for research impact and visibility analysis. The diagnostic phase enhances effectiveness by facilitating teaching and learning processes [17].

B. Phase II – Design and Implementation of Tools

Based on the diagnostic assessment, eight institutional lines of action were implemented to promote the consolidation of the scientific digital footprint:

- Internal and external communication channels.
- Design and dissemination of visual instructions and guidance materials.
- Continuous and personalized support for researchers.
- Institutional incentives like branding strategies for profile updating.
- Inclusion of a gender perspective to ensure equity in scientific visibility.
- Didactic accessibility through graphical materials and content adapted to different levels of digital literacy.
- Use of emerging technologies, such as artificial intelligence, to support the creation of outreach materials and the monitoring of researcher profiles [19].
- Analysis of the potential contribution to the institutional digital memory, related to data management and open science practices. This aspect aligns with the importance of efficiently archiving and accessing large datasets, as observed in the implementation of interoperability standards in genomics [20].

The strategy was grounded in previous experiences highlighting the need to combine technological infrastructure with pedagogical actions and sustained support to achieve institutional appropriation and long-term sustainability [21].

C. Phase III – Assessment

The final phase consisted of the re-evaluation of the indicators established in Phase 1, using June 2025 as the cutoff date. The analysis focused on identifying quantitative variations, emerging trends, and persistent gaps. In addition, best practices and barriers identified during the process were systematized in order to provide institutional recommendations that are transferable to other scientific organizations in the region. The steps of this phase included:

- Measurement of visibility and usability indicators.
- Identification of trends observed between the initial diagnostic assessment (December 2023) and the final cutoff.
- Systematization of best practices and barriers encountered during implementation. This systematization involved a qualitative analysis, similar to the coding processes used in grounded theory methodologies to identify patterns and emerging categories [22].

The main objective of this evaluation was to determine the impact of the strategy on strengthening the institutional scientific digital footprint, aiming for a substantial improvement in academic visibility and the consolidation of an open science and responsible metrics culture.

III. Results

The results of the institutional strategy implemented to consolidate the scientific digital footprint of AGROSAVIA researchers are presented below. These results are organized into Phase 2 (Design and implementation of tools) and the articulation of Phases 1 and 3, corresponding to the diagnostic and evaluation stages, covering the evaluation period from December 2023 to June 2025.

A. Results Phase II

The implementation of the eight lines of action produced several qualitative outcomes focused on communication, continuous support, and didactic accessibility:

- **Communication strategy and continuous support.** Institutional communication channels, both internal and external, were used to the purpose of the designed outreach materials. Visual and easy-to-understand guidelines were developed to facilitate researchers' use and appropriation of the ORCID, Google Scholar, and

CvLAC platforms. In addition, personalized support was provided throughout the process of creating and strengthening researchers' digital profiles. As a recognition strategy, outstanding scientific profiles were highlighted in key institutional newsletters, including *Panorama Científico* and *Agrometrics*, in their 2023 and 2024 editions.

- **Didactic accessibility and gender-focused approach.** Innovative materials and approaches were developed to improve the adoption of digital tools among researchers. Among the implemented strategies, those incorporating a gender-differentiated approach stand out, such as the creation of the "Violet Section" in the *Agrometrics* newsletter and the inclusion of illustrated characters such as "Doña Violeta," which promoted women's participation and representation in science, to reduce gender bias by promoting differential inclusion and gender equity. Didactic accessibility was further strengthened through the intensive use of visual content. In addition, generative Artificial Intelligence (AI) was incorporated into the design of outreach materials, particularly in the *Knowledge Generation 2024* report, in sections such as the "Curiosity Corner," and across several special editions of institutional newsletters. This approach enhanced scientific communication through engaging and inclusive visual narratives. Furthermore, a dashboard was developed to visualize gender-related indicators by research area and management domain[1].
- **Communication products for promoting the scientific digital footprint.** *Agrometrics* is an annual bulletin that compiles key indicators related to AGROSAVIA's scientific output. It has also become a visibility platform showcasing the work of research teams, their most highly cited publications, as well as strategic foresight and intelligence activities for R&D&I, together with consultation platforms and information systems. These tools were implemented as institutional communication channels and as systems for monitoring impact metrics, thereby enabling the systematic visualization, consolidation, and interpretation of scientific impact through quantitative indicators. The 2024 edition incorporated a *Violet Section* to highlight the contributions of women at AGROSAVIA in science and technology, as well as a section entitled *Curious Corner*, designed to engage readers through a lighter and more accessible narrative style. The *Agrometrics* content is available at the following link[2].

Fig. 1. Mosaic of sections from the *Agrometrics* bulletin.
Source: Prepared by the Department of Scientific and Technological Intelligence and Dissemination based on the *Agrometrics* bulletin. Available at the following link. https://repository.agrosavia.co/items/68850b6e-1fa6-4f1a-9729-845547f94f43

- *Panorama Científico: Milestones and Perspectives* is an institutional bulletin of AGROSAVIA that emerged as a creative response to strengthen the Corporation's scientific and technological visibility. Published three times per month by the Department of Scientific and Technological Intelligence and Dissemination, it communicates research progress, indicators, and achievements through an accessible and visually engaging format. The bulletin integrates data from institutional sources, applies scientometric approaches, and combines didactic narratives with special sections that humanize science, positioning AGROSAVIA as a benchmark in knowledge-based agricultural innovation. Access the content here.[3]

B. *Results Phase I and Phase III*

The quantitative data obtained revealed a substantial improvement in institutional scientific visibility, particularly across the selected national and interoperable platforms.

Regarding platform registration and adoption, a significant increase was observed in the proportion of

[1] A dashboard of gender-related indicators by research area and management domain is available at the following link: https://app.powerbi.com/view?r=eyJrIjoiZDY4NjE2ODctOTlkYi00ZmQwLWE1YmMtOGU1ZTE3NmIzYWY2IiwidCI6IjdhYTU0MDg1LTBmMjMtNDk0YS1hZTBhLThkMzYzYTc3YzExYiIsImMiOjR9

[2] Agrometrics 2024, available at: https://repository.agrosavia.co/items/68850b6e-1fa6-4f1a-9729-845547f94f43

[3] Panorama científico: Milestones and Perspectives. Available at https://www.agrosavia.co/ciencia-para-todos#30789

researchers registered on key platforms between 2023 and 2025, as follows:

Fig. 2. Mosaic of editions of the *Panorama Científico: Milestones and Perspectives* bulletin, illustrating the institutional strategy for scientific communication and visibility.
Source: https://www.agrosavia.co/ciencia-para-todos#30789

- The proportion of researchers registered in CvLAC increased from 82% to 98%.
- ORCID registration increased from 66% to 89%.
- Registration in Google Scholar increased from 48% to 55%.

With respect to scientific visibility and impact, the metrics showed considerable growth, reflecting increased academic visibility according to Google Scholar indicators:

- The average number of citations per researcher increased from 67.75 to 124.18.
- The average number of citations per article increased by 84%.
- The institution's most cited article increased from 184 to 993 citations.

Additionally, regarding institutional consolidation, the national research assessment model based on CvLAC management documented a strengthening in the categorization of researchers and research groups:

- An increase was recorded in the number of researchers categorized by Minciencias as Junior (+103) and Associate (+26).
- Research groups consolidated in the A1 category (+4).
- The redistribution of groups across categories B and C suggests a process focused on strengthening research quality.
- The emergence of newly recognized groups indicates a renewal of institutional research lines.
- The implementation of the strategy facilitated the update of the institutional guideline for the creation and management of research groups.

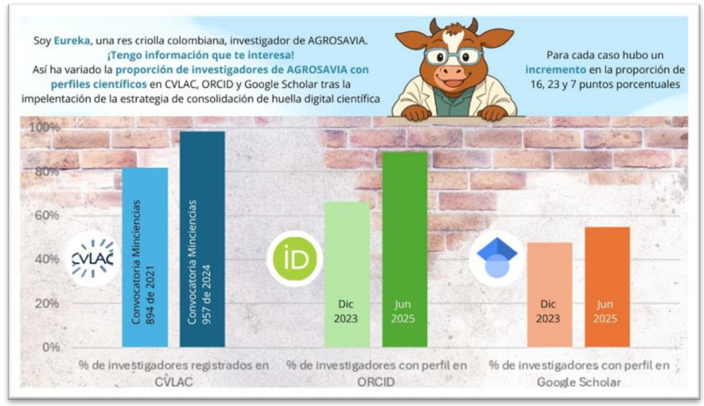

Fig. 3. Variation in the proportion of AGROSAVIA researchers with scientific profiles in CvLAC, ORCID, and Google Scholar between 2021 and 2025, following the implementation of a scientific digital footprint consolidation strategy.
Source: Prepared by the Department of Scientific and Technological Intelligence and Dissemination. Available at: https://app.powerbi.com/onedrive/open?pbi_source=ODSPViewer&driveId=b!nPCasnkBlk6u-ybuTOeLkChQAbhjf7dEpgALFjtW6uzpz-fwsrGJQoUtipX9G9Fh&itemId=015JAYQJBF6OGNF4U7UNA3BYIYGIOFECQL

The evolution of institutional scientific visibility is evidenced by comparing historical benchmarks (2021), the baseline established during the initial diagnosis (December 2023), and the final results obtained after the intervention (June 2025). In the initial stage, registration in platforms such as CvLAC and ORCID stood at 82% and 66%, respectively, revealing a significant gap in Google Scholar, with only 48% adoption.

As the strategy progressed, intermediate data reflected in the 2024 national call demonstrated a strengthening of human capital, with an increase of 103 researchers in the Junior category and 26 in the Associate category compared to 2021 levels.

Finally, the June 2025 evaluation consolidated this upward trend, achieving 98% coverage in CvLAC and 89% in ORCID, along with an 84% increase in the average number of citations per article and a rise in the average number of citations per researcher, from 67.75 at baseline to 124.18 in the final measurement.

IV. Discussion

AGROSAVIA's institutional strategy primarily aimed to consolidate the scientific digital footprint of its researchers to enhance visibility, research impact, and alignment with open science practices. The quantitative results, which show significant increases in platform registration (CvLAC, ORCID, and Google Scholar) as well as in citation metrics, validate the research approach.

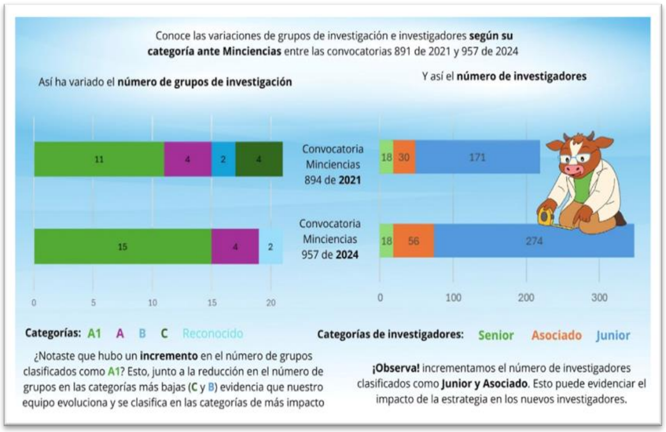

Fig. 4. Changes in the classification of AGROSAVIA research groups and researchers between Calls 894 (2021) and 957 (2024), according to categories recognized by Minciencias. An increase is observed in A1-classified research groups and in researchers categorized as Junior and Associate.
Source: Prepared by the Department of Scientific and Technological Intelligence and Dissemination
https://app.powerbi.com/onedrive/open?pbi_source=ODSPViewer&driveId=b!nPCasnkBlk6u-ybuTOeLkChQAbhjf7dEpgALFjtW6uzpz-fwsrGJQoUtipX9G9Fh&itemId=015JAYQJBF6OGNF4U7UNA3BYIYGIOFECQL

While previous studies present descriptive and retrospective bibliometric analyses of researchers' footprints based on metrics such as the h-index and RCR [23], the AGROSAVIA study proposes a proactive and systemic approach with dynamic effects on both the instruments and the indicators achieved over the course of the strategy's implementation.

Likewise, while previous studies have introduced concepts such as ideometry [24]. as an emerging field for generating, evaluating, and prioritizing ideas, the AGROSAVIA study applies these principles in a practical manner to the lifecycle of scientific visibility. It does not merely report data; rather, it designs a sequential methodology (diagnosis, implementation, and evaluation) to "cultivate" the digital footprint. This shift from a theoretical ideation framework to an organizational intervention strategy constitutes a methodological novelty within the field of R&D&I organizations.

A. *Impact of the Strategy on the Scientific Digital Footprint*

This strategy is relevant in the context of modern research, where the scientific digital footprint is fundamental for predicting and monitoring highly sensitive personal attributes. Digital footprint analysis represents a promising innovation in research, as it provides a more efficient and cost-effective approach to identifying scientific influence and opinion leadership compared with traditional survey-based methods, which are costly and limited in sample size [25]. Moreover, the strategy's capacity to increase registration and citation metrics is directly associated with key attributes of influence observed in digital environments [26]. Studies on opinion leadership in social networks have identified that "what one knows" and "how active one is" are the strongest predictors for identifying opinion leaders [27]. In the context of AGROSAVIA, the strengthening of the scientific digital footprint was achieved through actions that explicitly promoted these attributes:

- "What one knows" (content and knowledge): Opinion leaders are generally those who are better informed, which is reflected in the volume of publications they produce. AGROSAVIA's strategy addressed this dimension through the implementation of user-friendly visual guidelines for platforms such as CvLAC, ORCID, and Google Scholar, as well as the use of generative artificial intelligence (AI) to enhance the design of outreach materials. This approach aligns with the notion that effective digital communication—often mediate through visual content—is essential for branding and scientific promotion [28].

- "How active one is" (engagement and presence): Opinion leaders are more actively involved in social and professional activities and must maintain a consistent online presence to engage in discussions and disseminate new content [27]. The increase in platform registration and consolidation within Minciencias categories reflects a growth in active digital presence. To reinforce this outcome, the recognition of outstanding profiles in institutional newsletters and the provision of personalized support functioned as incentives to sustain such activity as a scientific branding strategy that strengthens the institution's virtual showcase, shaping the perception of the academic audience and enhancing institutional reputation. The improvement in institutional classification—evidenced by a higher number of researchers in Junior and Associate categories and the consolidation of groups in category A1—highlights the importance of interoperable platforms such as ORCID and CvLAC, which capture online activity and contribute to the formal evaluation of academic visibility [29]. Additionally, to provide a symbolic incentive for research groups and researchers who achieved an upward reclassification within the national evaluation model, a public digital badge was assigned through the AGROSAVIA CRIS system, as a symbolic incentive for the adoption of open science practices, which can be replicated across researchers' professional profiles.

Despite the positive results obtained, this study presents several limitations that should be considered when interpreting the findings. First, reliance on platforms such as Google Scholar introduces challenges related to data standardization; the use of automated metrics entails the risk of incorporating bibliometric "noise," such as author disambiguation errors or the overrepresentation of self-citations, which may influence the reported impact figures.

Additionally, a coverage bias arises from the focus on systems such as CvLAC and ORCID; although these are essential for regional monitoring, extending the strategy to international indexing databases with more stringent inclusion criteria, such as Scopus or Web of Science, remains a challenge.

On the other hand, despite the observed correlation between institutional actions and the improvement of indicators, it is essential to consider exogenous variables that may have influenced this behavior. First, the increase in visibility and citation volume may reflect global trends in Open Science and the widespread adoption of persistent identifiers—dynamics that extend beyond the local intervention.

Additionally, the technical maturation of large-scale projects initiated in earlier periods may help explain the citation peak observed between 2023 and 2025, in line with the natural lifecycle of high-impact scientific production.

B. *Impact of the Strategy on Content Diversification and Accessibility Pathways*

The inclusion of a gender-sensitive approach in AGROSAVIA's strategy—materialized through the "Violet Section" of the *AGROMETRICS* bulletin and the incorporation of illustrated characters such as "Doña Violeta"—is essential to addressing structural disparities inherent to academic and digital environments [30].

There is well-documented concern that gender bias in peer review and academic publishing can generate publication bias and perpetuate gender inequality in science, potentially silencing women's contributions to research [31]. By implementing targeted actions, the institution seeks to mitigate these biases by enhancing the visibility of authorship and contribution profiles, which is critical for promoting equal opportunities in downstream outcomes such as career advancement and leadership positions [23].

Furthermore, differentiated communication strategies are justified by documented differences in digital behavior between men and women. Consequently, the use of visual content and a didactic accessibility approach within AGROSAVIA's strategy not only aligns with these trends but also provides social support and motivation—factors identified as critical for women's transition into scientific expertise, historically constrained in many domains [32].

With 681 active ORCID profiles (366 men and 315 women), AGROSAVIA strengthened its scientific digital footprint through an equity-oriented approach. The institutional normalization of 127 profiles in 2023 represented a key step toward global interoperability and responsible scientific footprint management. This effect is reinforced by evidence showing that ORCID profiles with verified DOIs are 25% more likely to be correctly cited in international databases. Moreover, each normalized ORCID profile prevents data duplication across national and international platforms, reducing academic information update time by up to 40%.

This highlights the need for sustained institutional intervention to reduce persistent gender gaps in visibility and representation of women's scientific profiles in international search engines and academic platforms [33].

Additionally, the incorporation of didactic accessibility as a core action line—formalized through the implementation of user-friendly visual guidelines—was essential to ensure effective adoption and use of digital platforms and measurement systems such as ORCID and CvLAC. In the context of scientific digital footprint management, this approach addresses the need to transform complex data into comprehensible and actionable information [15].

In this same vein, innovative didactic approaches aim to improve content assimilation and foster collaborative skill development [34], with collaboration recognized as a key learning strategy across scientific domains [35]. Ensuring accurate interpretation of technical information, particularly in diagnostic evaluations, requires transforming sophisticated data in ways that align user understanding with developer intent [17].

By making platform management information accessible and visually clear, the institution not only facilitates learning and user engagement [36] but also strengthens its "virtual storefront," a critical first impression shaping academic audience perception and institutional reputation [37]. This emphasis on visual content aligns with research on information diffusion, which identifies knowledge transmission—an important predictor of opinion leadership—as more effective when delivered through diverse publication formats [23].

Finally, the use of generative artificial intelligence to enhance the design of dissemination materials exemplifies the integration of emerging technologies to improve readability, inclusiveness, and scientific communication effectiveness [36].

C. Impact on Institutional Evaluation Strategy

The mixed-methods approach (qualitative and quantitative) adopted in the strategy enabled not only the quantification of impact (Phase 3, cut-off June 2025) but also the systematic documentation of best practices and identified barriers. This qualitative systematization process is critical to the robustness of the results and is analogous to the use of grounded theory in systematic reviews, where emergent theories are developed through data analysis by identifying patterns and categories [22].

The active digital visibility achieved by AGROSAVIA—reflected in its positioning within national and international science, technology, and innovation (STI) ecosystems—highlights a key trend: the use of scientific digital footprints for institutional management and evaluation. This data-driven approach, which leverages information from digital platforms and networks, is significantly more efficient than traditional influence-identification methodologies that are manual and time-intensive [23].

Furthermore, there is a direct connection between AGROSAVIA's scientific digital footprint management, and the criteria used by Scimago to classify academic and research organizations, as these rankings rely on a composite indicator combining three main metric dimensions: research performance, innovation output, and social impact measured through web visibility.

AGROSAVIA's strategy promoted strategic alignment with visibility and impact dimensions, directly targeting the third component of the Scimago composite indicator: social impact and web visibility. In this context, a core element of scientific rankings is research performance, commonly measured through citation metrics. Accordingly, the strategy focused on increasing researchers' digital presence in interoperable and high-visibility platforms such as ORCID and Google Scholar.

The observed increase in citation metrics constitutes a direct indicator of enhanced research impact and reach, which can translate into improved research performance indicators within the Scimago ranking through direct effects on open-access visibility and scientific leadership criteria. This result is aligned with the institutional strategy through the understanding and management of composite indicators of web visibility and social impact. The experience demonstrates the feasibility of integrating visibility indicators with pedagogical actions. The proposed scientific digital footprint management model extends beyond the institutional scope, offering a transferable methodology for organizations (fig.5) seeking to optimize their position in global rankings such as SCImago by enhancing their social impact and web visibility.

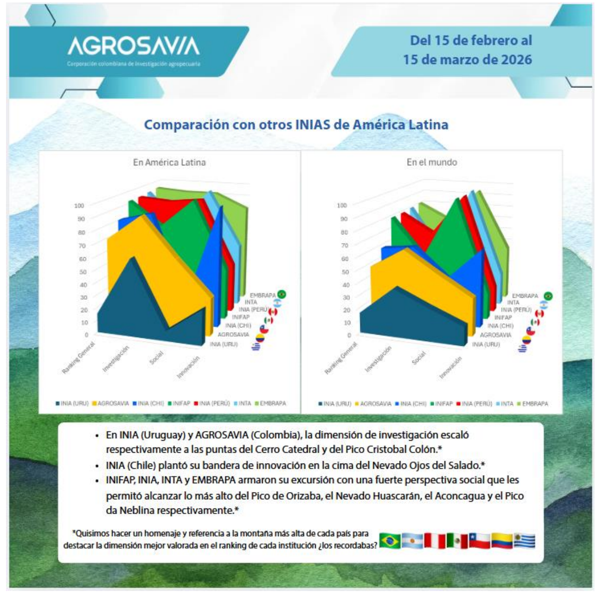

Fig. 5. Comparative graphs of the results in the SCImago Institutions Rankings 2026.
Source: *Panorama Científico Semanal*, February–March 2026 edition. Prepared by the Department of Intelligence and Scientific and Technological Outreach. Available at: https://www.agrosavia.co/media/ex4pgnaj/_panorama-febrero-2026-scimago-1.pdf

On another way, the long-term viability of the proposed model is contingent upon financial and cultural sustainability factors that require careful examination. While monitoring the digital footprint is argued to be more cost-effective than traditional survey-based methods, the strategy entails a considerable level of human resource intensity; continuous, personalized support requires a significant investment in staff time from administrative and communication teams, which must be quantified to ensure scalability.

From a technological perspective, reliance on generative artificial intelligence tools and the maintenance of dynamic dashboards demand a robust technical infrastructure and ongoing updates of digital competencies—elements that may be compromised by potential fluctuations in institutional budgets.

Ultimately, sustainability depends on a profound cultural transformation: the challenge lies in moving from an externally driven intervention based on symbolic incentives—such as digital badges—toward an intrinsic open science culture, preventing a decline in researchers' engagement once the novelty phase of the strategy has passed.

Finally, the success of this strategy has important implications for large-scale data management and open science. Efforts to consolidate scientific digital footprints—particularly through the use of interoperable standards such as ORCID—are essential for the development of federated data networks and for the efficient management of large volumes of scientific information [20].

V. CONCLUSIONS

By focusing on active visibility and the production of outreach materials, AGROSAVIA's strategy primarily sought to increase its digital influence and reach, which is essential for strengthening societal impact. This approach addresses themes aligned with inclusion criteria, alternative metrics, and website size, particularly through actions such as the use of internal and external communication channels to disseminate visual guidelines and the implementation of tools to enhance the visibility of women in science [37].

AGROSAVIA's experience in designing and implementing an institutional strategy to consolidate scientific digital footprints demonstrates that visibility indicators can be effectively articulated with pedagogical, inclusive, and technologically innovative actions. Quantitative results show significant progress in researcher registration on key platforms such as CvLAC and ORCID, as well as increases in citations and the positioning of scientific output. In parallel, qualitative results reflect a cultural transformation within the institution, in which open science, gender equity, and didactic accessibility have become guiding principles of academic visibility.

These achievements position AGROSAVIA as a regional benchmark, demonstrating that digital footprints are not merely measurement mechanisms but strategic instruments for knowledge management. The implemented strategy not only strengthens institutional reputation but also contributes to sustainability and equity objectives promoted within the framework of the XII Ibero-American Conference on Science and Technology Indicators.

Nevertheless, the results also reveal remaining challenges, including the need to increase presence in international indexing engines and to more actively promote open access, particularly through Google Scholar. These challenges represent opportunities to further consolidate scientific digital footprints in an increasingly competitive and globalized environment.

In conclusion, AGROSAVIA's experience provides a transferable methodology for consolidating scientific digital footprints in other Ibero-American institutions seeking to strengthen their scientific visibility. It shows how indicators, when integrated with accessibility- and equity-oriented approaches, can become true catalysts of institutional and social transformation.

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