

Tensions and Transformations in Institutional Scientific Production: Editorial Dynamics, Costs, and Open Access Challenges in a National Agricultural Research Organization

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Abstract

Over the past two decades, the scientific publishing ecosystem has undergone profound transformations driven by the expansion of open access, the strengthening of open science policies, and the consolidation of the global publishing oligopoly. Within this context, public research and development centers and institutions face growing challenges related to the economic sustainability of publishing, visibility in indexing systems, and the effectiveness of their internal scientific evaluation policies. This study aims to analyze how these tensions emerge within the dynamics of scientific production at the Colombian Corporation for Agricultural Research, AGROSAVIA, as a national agricultural research institute.

The study followed a mixed-methods research design that included bibliometric analysis methods based on Scopus, Web of Science, SciELO, and The lens databases information; a review of institutional data on productivity and publication costs from 2019 to 2023; and a structured survey administered to all researchers affiliated with the organization (589). A prior sample size calculation, stratified by position, established the minimum threshold for representativeness; 156 voluntary responses were obtained. The survey examined perceptions, experiences, and barriers within the editorial process.

The findings reveal an increasing dependence on pay-to-publish models, particularly article processing charges (APCs), with a cumulative 273% increase in the average cost per article and an estimated USD 911,938 paid to publishers between 2021 and 2023. These trends converge with internal and external operational constraints, including overlaps between project timelines

and publishers' editorial workflows, funder restrictions, and specific features of the institutional ranking system, particularly those related to recognition and incentives for knowledge generation. The study concludes that, to address current challenges, institutions urgently need to redesign policy instruments governing scientific publication, prioritize sustainable funding mechanisms, and promote governance models aligned with the principles of open science.

Keywords: scientific production, open access, publication costs, research evaluation, open science

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Introduction

In recent decades, scientific publishing has shifted from a subscription-centered model toward progressively open schemes, thereby creating new forms of knowledge circulation. Open access (OA), promoted through initiatives such as the Budapest Declaration, DORA, the Berlin Declaration, the Leiden Manifesto, and Plan S, has become a dominant trend in contemporary scientific systems. This model advances principles of equity, transparency, quality, and knowledge reuse, while redefining the ways in which scientific output circulates. However, this transition toward open science has brought new tensions, particularly those related to the economic models that sustain publishing and to the role played by large publishing conglomerates in mediating scientific knowledge (Larivière et al., 2015).

The article processing charge (APC) model has progressively replaced the subscription-based system, shifting publication costs to authors or their institutions. Recent studies have shown that APCs have steadily increased and now represent a source of revenue exceeding one billion dollars annually for the leading academic publishers (van Norden, 2013; Wexler, 2015). So-called transformative agreements have further reinforced this trend. These agreements involve negotiations between large library consortia and commercial publishers to enable open access to articles through combined reading-and-publishing payments. Although such agreements promise to democratize access, establish more homogeneous negotiation mechanisms, and facilitate the dissemination of research outputs from the Global South, several analyses warn that they tend to perpetuate editorial concentration and dependence on the oligopoly of the “big five” publishers: Elsevier, Springer Nature, Wiley, Taylor & Francis, and Sage (Butler et al., 2023; Larivière et al., 2015). This pattern appears in the sustained increase in the average cost per article and in the relative exclusion of alternative models, such as Latin American open access journals that operate under the diamond model and charge neither readers nor authors (Borrego, 2023; Pinfield & Johnson, 2018).

Alongside the commercial model, a more diverse and distributed ecosystem of academic publishing has emerged, supported by open-source platforms such as Open Journal Systems (OJS) and by inclusive databases such as OpenAlex, The Lens, and Dimensions, which have broadened the participation of independent publishers and journals from the Global South. Nevertheless, selective databases such as Web of Science and Scopus continue to privilege journals published by large commercial publishers, reinforcing their symbolic centrality and shaping institutional perceptions regarding where and how researchers should publish in order to achieve “visibility,” “positioning,” “impact,” and “quality” (Álvarez, 2015; Martínez Galindo et al., 2023).

In Latin America, initiatives such as SciELO and Redalyc have developed an alternative model of scientific sustainability by promoting publication models without APCs and with universal access, commonly referred to as the diamond route. These models rely primarily on public and university funding. However, gaps persist in their recognition by international scientific evaluation systems, creating tensions for local institutions between the need for visibility and the demands imposed by global indicators (Aguado-López et al., 2019; Bojo-Canales et al., 2021; Packer et al., 2001).

Within this context, public research institutions face multiple challenges in sustaining their scientific output, ensuring its visibility, and aligning it with open science principles without compromising their economic sustainability. The Colombian Corporation for Agricultural Research (AGROSAVIA) does not remain immune to these tensions. In recent years, the institution has significantly increased its visibility in international databases and has strengthened its internal evaluation system through its researcher career-ranking scheme. However, this progress has also brought growing challenges, mainly due to rising publication costs and dependence on external resources—primarily associated with research projects funded by national, international, or hybrid sources—to cover article processing charges. This situation generates structural vulnerabilities by linking the sustainability of institutional scientific production to variable funding cycles and to conditions imposed by external entities.

These vulnerabilities raise a central question: how does the increase in open access publication costs affect the dynamics through which scientific knowledge emerges and transforms into visible and accessible research articles? This question guides the analysis of how global transformations in the publishing ecosystem permeate AGROSAVIA’s scientific production dynamics. To address this research question, three critical analytical dimensions were defined:

- The tensions between institutional guidelines aimed at strengthening the visibility and positioning of scientific productivity and the restrictions imposed by the global publishing context regarding the cost dynamics of open access publishing. These tensions appear in studies that examine the interrelationships between metrics used to validate journal quality and ranking and undesirable phenomena associated with the pressure to publish, such as salami-slicing overproduction, self-citation practices, and gift authorship (Talbot, 2016; Zedda, 2025). They also relate to restrictive factors embedded in the open access business model, including geographic diversity (Berger, 2021), and to the effects of APC-based payment models on institutional co-authorship metrics, particularly in terms of international collaboration between the Global North and the Global South (Collyer, 2018; Smith et al., 2022).

- The internal and external factors that limit the scientific publication process. The main external factors relate to the diversification of funding sources for R&D&I activities and to financial management practices that allow APC payments to be included throughout the project life cycle (Halevi et al., 2024). They also include related editorial services, considering both time and cost, such as intellectual property review, copyediting, and translation (Beigel, 2025).
- The possible guidelines for strengthening institutional governance of scientific publishing in a context marked by increasing editorial concentration and growing demands for openness. This tension encompasses the convergence of variables associated with scientific research, including the complexity of each field of knowledge and the phenomena under observation; variables related to the transformation of research findings from fieldwork, laboratory work, and modeling into new knowledge outputs; and variables linked to the supply-and-demand dynamics of scientific publication modes and channels, including open access, hybrid access, restricted access, and diamond access (Budzinski et al., 2020; Greussing et al., 2020).

To this end, the study adopted a mixed-methods approach integrating bibliometric analysis, a review of administrative databases, and a structured survey of researchers. This approach makes it possible not only to diagnose the current situation, but also to formulate strategic recommendations for institutional open science policies grounded in the specific realities and needs of an institute dedicated to agricultural research.

Methodology

This study adopts a mixed-methods approach, combining quantitative and qualitative analytical techniques to characterize the recent dynamics of scientific production at AGROSAVIA, identify its main constraints, and understand the factors that shape it. This methodology allows the evidence to be contrasted across multiple sources and perspectives. The methodology was organized into five main components:

Analysis of the international context: a scientific scan was conducted using the QTIP method proposed by Porter (2005) to examine recent transformations in the global academic publishing system. To this end, a structured search equation was implemented in Scopus.

```
TITLE-ABS-KEY ( ( "article processing charg*" OR "APC publish*" OR "open  
access cost*" ) AND ( "impact*" OR "trade_off*" OR "driver*" OR "scientific  
product*" OR "global south" OR "change" OR "transformative agreement*" OR  
"enabler*" OR "barrier*" OR "predatory" OR "gap" OR "financial issue*" ) ) AND  
PUBYEAR > 2010 AND PUBYEAR < 2026 AND ( LIMIT-TO ( DOCTYPE , "ar" )  
OR LIMIT-TO ( DOCTYPE , "re" ) )
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This search equation enabled the retrieval of 312 publications, of which 204 corresponded to full open access publications. Using the scientometric analysis software VOSviewer v1.6.20 (van Eck & Waltman, 2010), the main research trends related to the research question were identified. In addition, the bibliometric analysis software Bibliometrix v5.3.0 supported the baseline characterization of the knowledge core and the prioritization of trends. Based on these trends, studies related to the growth of open access, the evolution of the APC model, transformative agreements, and the role of the publishing oligopoly in knowledge circulation were selected and analyzed. This review made it possible to establish the global reference framework against which the institutional findings were analyzed.

Bibliometric analysis: institutional scientific publications from 2019 to 2023 were collected and analyzed across four databases: Scopus, Web of Science (WoS), SciELO, and The Lens. The Bibliometrix package, v5.3.0, in RStudio was used to generate productivity, visibility, and citation indicators (Aria & Cuccurullo, 2017). The aim was to compare the institutional scientific production metrics recorded in different sources and to identify divergent visibility patterns among them.

Review of administrative data: AGROSAVIA's internal institutional productivity records from 2019 to 2023 were systematized, consolidating information on reported scientific articles. In addition, a Microsoft Excel database was built with the APC values associated with these articles, according to the amounts reported by each publisher. Averages, annual trends, and cumulative estimates were calculated. This analysis made it possible to identify the costs associated with scientific production.

The data parametrization considered the APC payment value at the time when the article was published. Publications that benefited from transformative agreements were not included. APC payment values were reconciled between the annualized cost report by publisher and the institutional financial management system. Finally, USD values for fees charged in other currencies were calculated using the exchange rate in force on the payment date.

Structured survey of researchers: an online survey was designed and administered in September 2024 to researchers affiliated with the institution, including those holding the positions of research support professional, master, associate master, senior master, PhD, associate PhD, and senior PhD. Positions that, because of their functions, do not generate scientific publications, such as administrative and operational staff, were excluded.

The instrument comprised 13 questions, 11 closed-ended and 2 open-ended, addressing issues such as the time required to produce an article, funding sources, journal selection processes, structural constraints, and institutional perceptions of open access. The survey was administered through Microsoft Forms, with all questions set as mandatory, in order to ensure that all responses received could be included in the analysis without further data cleaning.

As a reference for establishing a minimum threshold of representativeness, a stratified sample size with proportional allocation was calculated in advance, with position used as the stratum. An estimation error of 0.1, a significance level of 0.05, and a proportion of 0.5 were set to obtain the largest possible sample size (Di Zio et al., 2024; Kish, 1965), resulting in a minimum of 87 responses. Given the low operational cost of administering the instrument electronically and the aim of ensuring equal opportunity for participation, the invitation was sent to all 589 eligible researchers. Consequently, the effective design corresponded to a census with voluntary participation rather than to stratified probability sampling. The previously calculated sample threshold was used solely as a criterion for verifying response sufficiency, not as a mechanism for selecting participants.

Survey data analysis: two complementary approaches were implemented to process the information. The first consisted of traditional statistical analysis aimed at identifying trends and relationships among variables. The results were presented as absolute frequencies and percentages. Chi-square tests of independence were applied to assess the association between sociodemographic variables, namely gender and position, and variables related to the scientific publication process, including process duration, submission dynamics, perceived constraints, funder conditions, preferences regarding journal types, and proposed improvements. A significance level of $\alpha = 0.05$ was considered. The analyses were conducted using R software, version 4.5.2.

Given that the effective design corresponded to a census with voluntary participation, the inferential statistics, namely chi-square tests of independence, are reported as exploratory tools to describe associations between variables within the respondent group, without any claim of generalization to the total population of eligible researchers. This option was preferred over the application of post-stratification weights, considering that the objective of the quantitative component was to characterize the experiences of those who effectively participate in editorial processes and to provide descriptive inputs for the institutional diagnosis, rather than to estimate population parameters.

The second approach consisted of an exploratory qualitative analysis of the open-ended questions. The content of the open-ended survey responses was analyzed in order to identify perceptions, recommendations, and emerging tensions. As a complementary visualization technique, VOSviewer was used to generate co-occurrence networks of key texts, drawing on the adaptation of its use to text segments other than titles and abstracts proposed by Martínez-Saldarriaga et al. (2025).

This procedure allowed recurrent themes expressed by researchers to be represented, particularly those related to difficulties in the publication process, perspectives on open access, and suggestions for institutional improvement. This qualitative component made it possible to interpret the subjective and contextual dimension of the publication process from the perspective of the actors themselves through a semantic construction method.

This methodological triangulation strengthened the comprehensive analysis of the information by cross-referencing institutional empirical evidence with global trends in open access, editorial concentration, and science evaluation.

Results

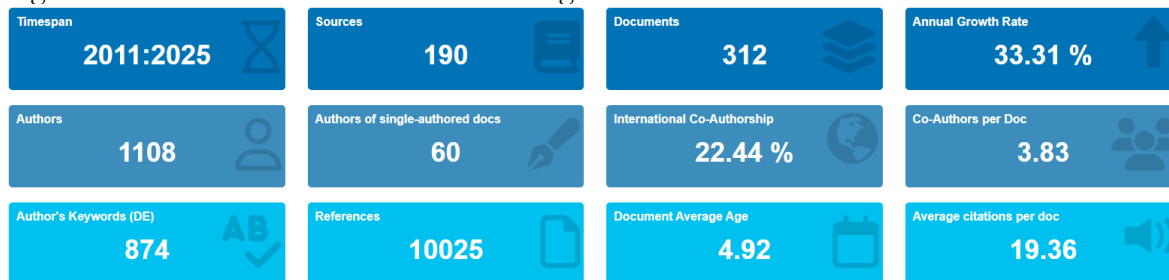
Based on the methodological design described above, the results obtained in each phase are presented below.

Analysis of the International Context

The knowledge core delimited for this study through the retrieval of 312 publications indexed in Scopus allows the identification, through the analysis of relevant metadata, of key trends concerning the impact of open access publication costs on scientific productivity. The baseline indicators of this core are presented in Figure 1.

Among the indicators, the annual growth rate of scientific publications stands out at 33.31%, reflecting increasing interest in the relationship between scientific publication costs and the generation and transfer of scientific knowledge through indexed articles. Similarly, the share of international co-authorship, at 22.44%—equivalent to approximately one in every four articles—reflects the impact of this topic on transnational collaboration for the generation of new knowledge. Finally, in terms of the scientific impact of the knowledge core, the average number of citations reaches 19.36 per document.

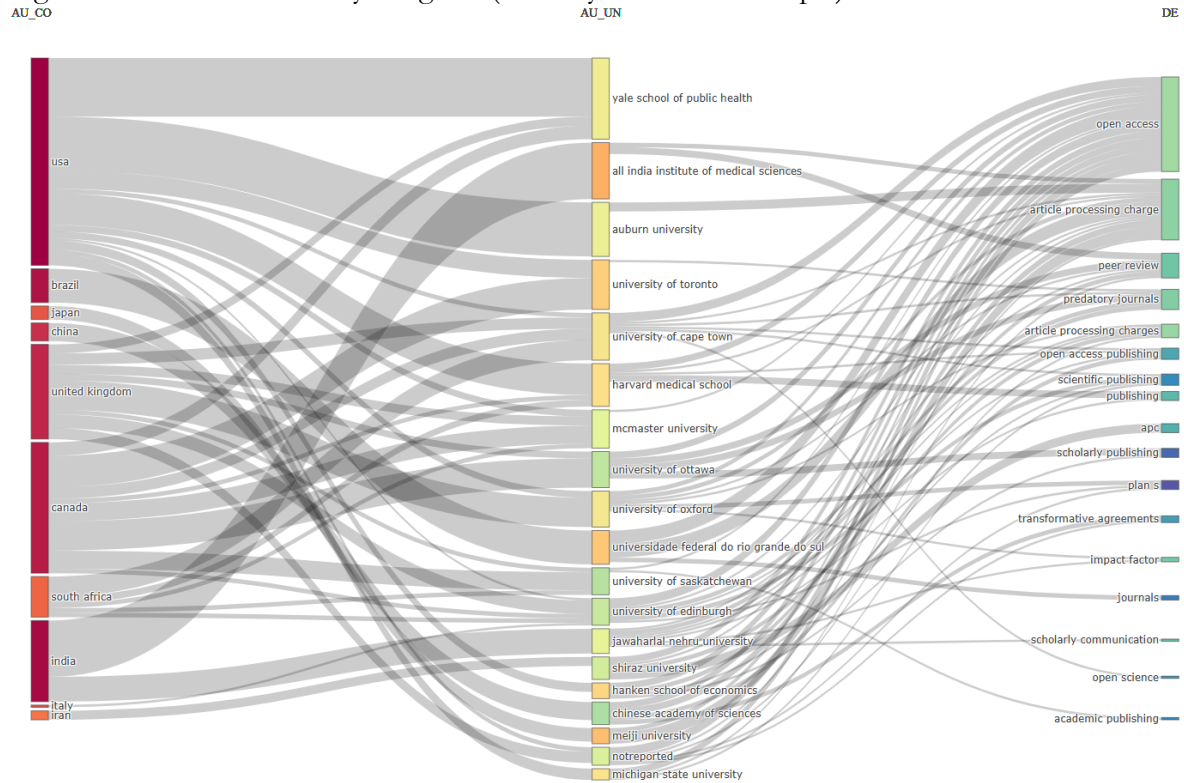
Figure 1. General Indicators of the Knowledge Core



Source: Prepared by the authors based on Scopus data. Bibliometrix v5.3.0 analysis software.

The relevance of the knowledge core from the perspective of geographic coverage and institutional representation appears in Figure 2. The main geographic reference points, understood as the countries leading the generation of new knowledge, reveal diversified leadership. Countries from the Global North, such as the United States, Canada, and the United Kingdom, lead research on topics such as thematic scientific production and open access, whereas countries from the Global South, including Brazil, India, and South Africa, contribute prominently to topics such as transformative agreements, publication costs, and predatory journals.

Figure 2. Three-Field Sankey Diagram (Country–Institution–Topic)



Source: Prepared by the authors based on Scopus data. Bibliometrix v5.3.0 analysis software.

The characterization of the knowledge core, based on the analysis of metadata categorized through publication keywords, enables the construction of research trends through the semantic analysis of textual groupings and interactions, understood as descriptive co-occurrence, and the linking of trend-specific features to related articles within the core, understood as inferential analysis.

The co-occurrence network, or trend map, comprises 72 keywords distributed across eight thematic clusters. Each cluster reflects a research trend, and each keyword represents a specific topic.

Red cluster – open access publishing, costs, and mechanisms: This cluster, comprising 30 topics, constitutes the main axis of the knowledge core. Specifically, it highlights the analysis of publication modes from the perspective of editorial business models, including open access, hybrid, and subscription-based models, as well as the generation of economic value in the dissemination of specialized knowledge (Delgado-López-Cozar & Martín-Martín, 2024). It also addresses the perceived relationship between publication cost and the overall quality of publication, integrating research quality, peer-review quality, and quality in academic editorial processes, through impact indicators and journal categorization (Ruggiero, 2023). A key dimension associated with the development of scientific knowledge concerns ethics, which, from

bibliometric mapping of knowledge areas, the transition toward open access, and the function of open access as an enabler of bibliodiversity (Bardiau & Dony, 2024; Berger, 2021). Elements used to assess the quality/APC relationship also appear, including journal indexing rankings such as Scimago and Journal Citation Reports (Abbasi et al., 2019; SCImago, 2016).

Blue cluster – influence of metrics on the business model: This cluster, comprising 11 topics, presents the relationship between impact and quality metrics designed for the analysis of knowledge dissemination sources and their use as criteria for charging open access publication fees (Abdel-Razig et al., 2024).

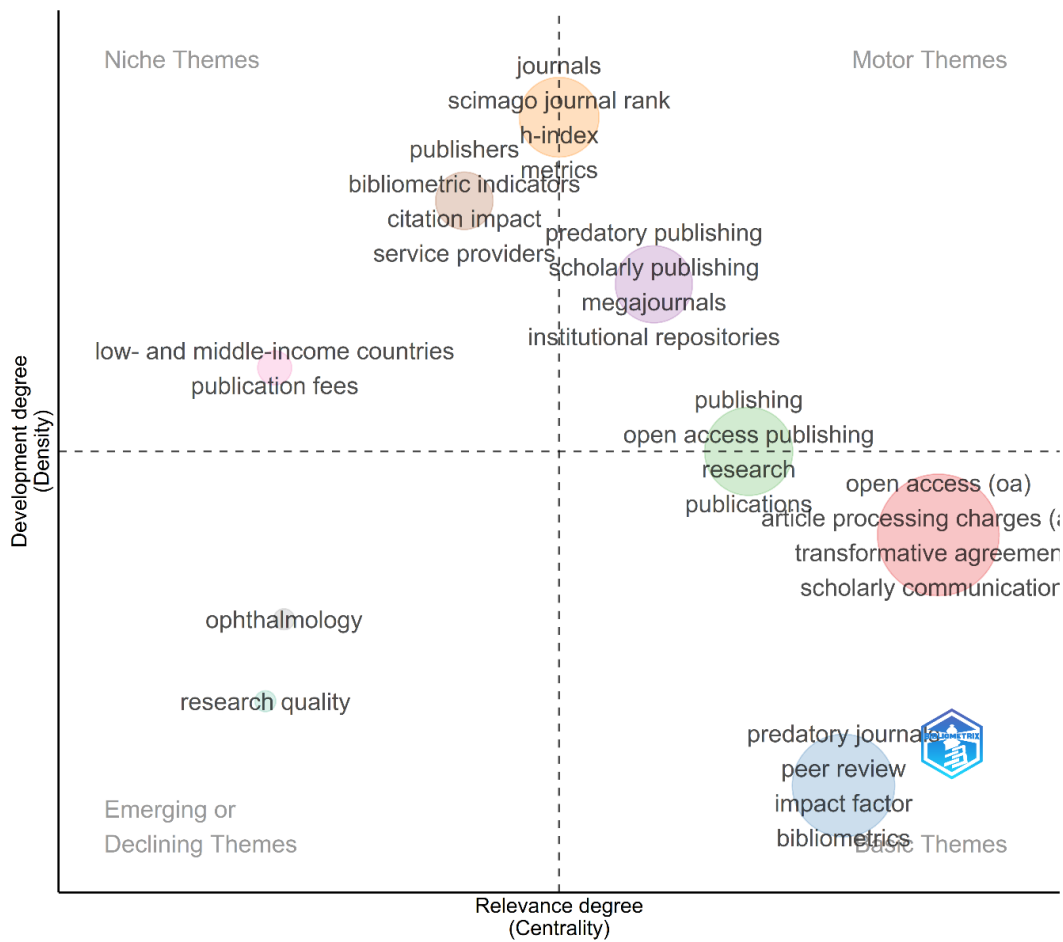
Yellow Cluster – open access metrics and their use in research evaluation: This cluster, comprising 6 topics, interrelates open access impact metrics with research evaluation and, by extension, with the challenges associated with publishing in high-impact journals beyond those inherent to each field of research, namely access barriers not directly linked to the research process itself (Nicholas et al., 2024).

Purple cluster – parameterization of open access risks: This cluster, comprising five topics, represents the construction of evaluation parameters for open access journals aimed at minimizing the impact on quality throughout the life cycle of a scientific article. This process relies on controlled lists of high-risk journals (Beallist, 2018; Nejadghanbar & Hu, 2022).

Cyan cluster – consensual parameterization for open access and open access publishing: This cluster, comprising five topics, presents the current mechanism with the widest dissemination and acceptance for balancing the access–publication relationship and the quality–cost relationship within the business model of global publishers (Borrego et al., 2021). Specifically, this trend has gained traction in the Global South through articulation schemes that connect the supply of knowledge, represented by universities and research centers, with the supply of dissemination routes, in order to consolidate a response model for the demand for accessible, reproducible, and high-quality knowledge (Muñoz-Vélez et al., 2024).

The identified trends can be interpreted as drivers of change that affect the processes through which scientific knowledge is generated and transformed into dissemination products such as scientific articles. Through the method of thematic parameterization by dimensions of relevance, associated with the centrality of the theme as a measure of the strength of the relationship between each theme and the other themes in the knowledge core, and development, associated with thematic density as a measure of the strength of the internal relationships among the topics that make up the theme, the trends are strategically categorized (Callon et al., 1991). Figure 4 presents the categorization into four specific groups.

Figure 4. Thematic Prioritization Map



Source: Prepared by the authors based on Scopus data. Bibliometrix v5.3.0 analysis software.

- Motor themes – Upper-right quadrant (high relevance/high development): These themes comprise the guiding axes of the knowledge core in its current research agenda. They include the analysis of the dynamics of the open access publishing business model and diversification strategies for knowledge dissemination associated with this dynamic, such as academic publishing through journals edited by universities and research centers, megajournals such as MDPI and Frontiers, predatory journals and publishers, and the role of institutional repositories in green, bronze, and gold open access modalities.

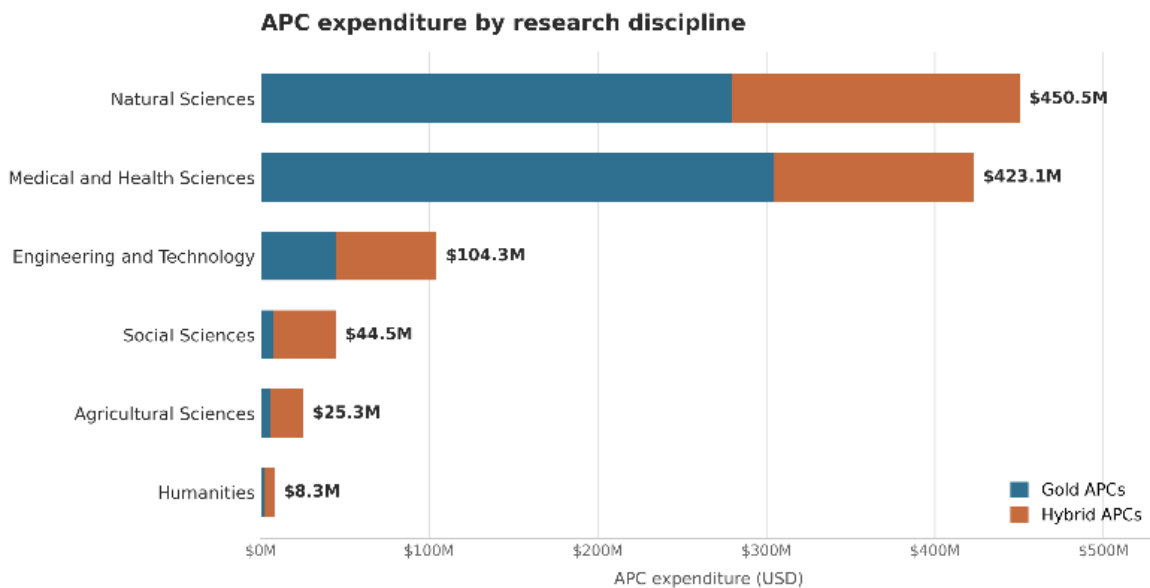
- Basic or transversal themes – Lower-right quadrant (high relevance/low development): These themes are important for the knowledge core, although their degree of development varies, since they cut across topics throughout the entire knowledge core. They include the analysis of the impact of open access costs on scientific productivity dynamics, research performance evaluation, resource allocation for dissemination and outreach activities, and perceived/offered quality through the use of impact metrics.

- Niche themes – Upper-left quadrant (low relevance/high development): These themes show a degree of research advancement that classifies them as research fronts or research frontiers; that is, specialized topics. They include the analysis of the influence of open access on research career evaluation metrics, such as the h-index; the assessment of journals in which articles are published according to categorization rankings such as Scimago and JCR; and the analysis of differential impacts on knowledge-generation systems in developing countries.
- Emerging and declining themes – Lower-left quadrant (low relevance/low development): These themes constitute new approaches within the knowledge core, some specific to contexts of interest, as well as topics that have lost research interest or remain latent. They include specific studies on quality impacts throughout the life cycle of scientific publication and on research niches in critical areas such as health sciences.

The landscape of the knowledge core described above makes it possible to identify, as key analytical elements, the evolution of open access publishing models, changes in pay-to-publish fees, and their impact on the accessibility and visibility of scientific knowledge, from the perspective of editorial production as an ecosystem connected to the research ecosystem.

Over the last decade, the academic publishing ecosystem has undergone profound transformations associated with the expansion of open access (OA), transformative agreements, and the consolidation of a publishing oligopoly (Cox, 2023). These dynamics have redefined financial flows and visibility mechanisms in global science, generating new tensions among equity, sustainability, and control over knowledge (Larivière et al., 2015; Williams et al., 2023).

Figure 5. Total Distribution of APCs by Field of Knowledge According to the OECD Classification

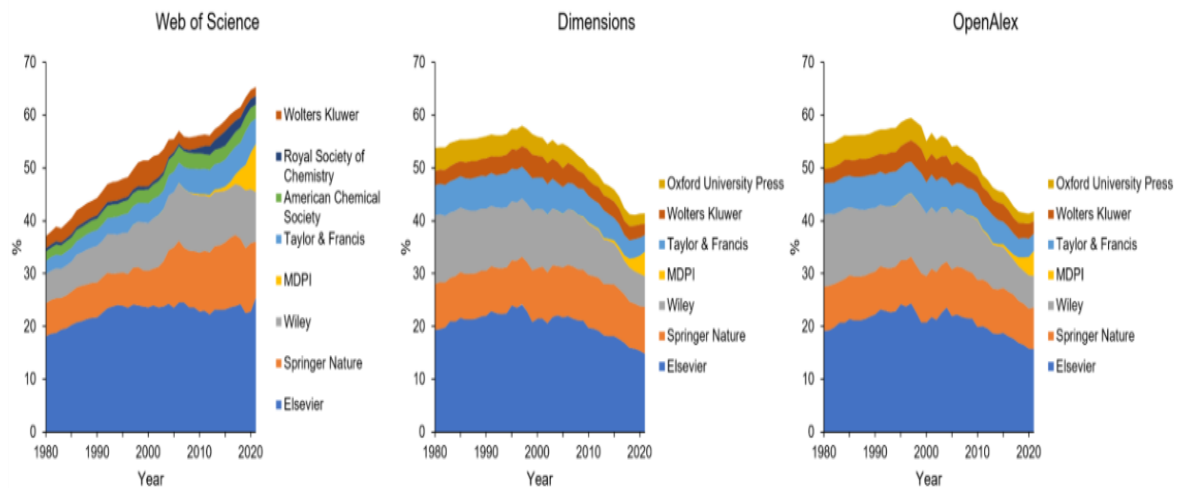


Source: Taken from Butler et al. (2023).

One of the most notable trends involves the sustained growth of the article processing charge (APC) market. According to Butler et al. (2023), the five leading publishing conglomerates—Elsevier, Springer Nature, Wiley, Taylor & Francis, and Sage—generated more than USD 1.06 billion in APC revenue between 2015 and 2018 alone. Figure 5 illustrates the disproportionate distribution of APC payments across disciplines, with natural sciences, health sciences, and engineering showing higher levels of payment than agricultural sciences, humanities, and social sciences.

Likewise, Figure 6 shows that, between 1980 and 2021, the proportion of articles published by these five major publishers increased steadily across all major bibliometric databases. This phenomenon, described as the “capture of openness,” raises a dilemma: although OA was originally conceived to democratize access, it currently remains shaped by actors that maximize economic rents through pay-to-publish models (Asai, 2020; Grossmann & Brembs, 2021; Zarif, 2023).

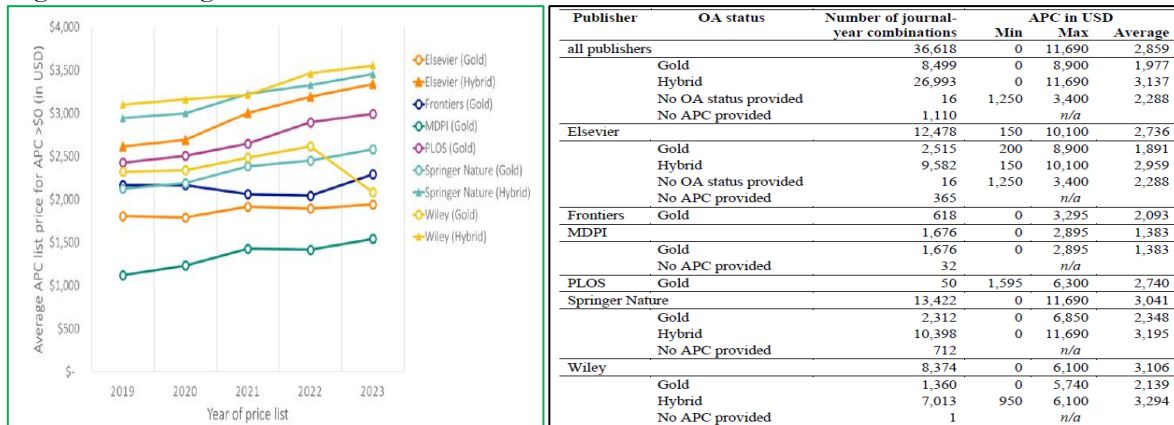
Figure 6. Proportion of Articles Published by the Five Dominant Publishers



Source: Taken from van Bellen et al. (2025).

The analysis of average APCs by publisher reveals that hybrid journals tend to cost more than Gold Open Access journals. Figure 7 shows that, on average, between 2019 and 2023, APCs for hybrid articles exceeded USD 3,000, whereas those for Gold Open Access articles stood at around USD 2,000.

Figure 7. Average APC Costs, 2019–2023



Source: Taken from Butler et al. (2024).

In addition, a significant geographic disparity exists in APC payments. Countries in the Global North—especially the United States, the United Kingdom, and Germany—concentrate the highest expenditure on hybrid publications, whereas countries in the Global South face financial barriers to participating in these dynamics. This situation has been described as a new form of scientific exclusion (Cox, 2023; Ikokoh & Ikokoh, 2026).

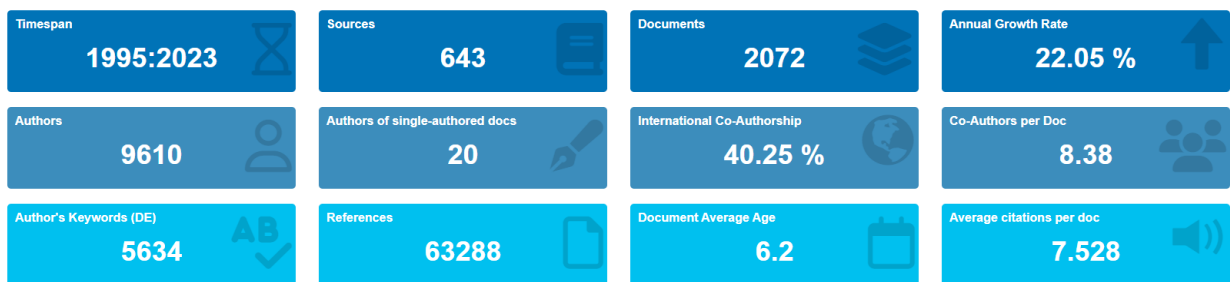
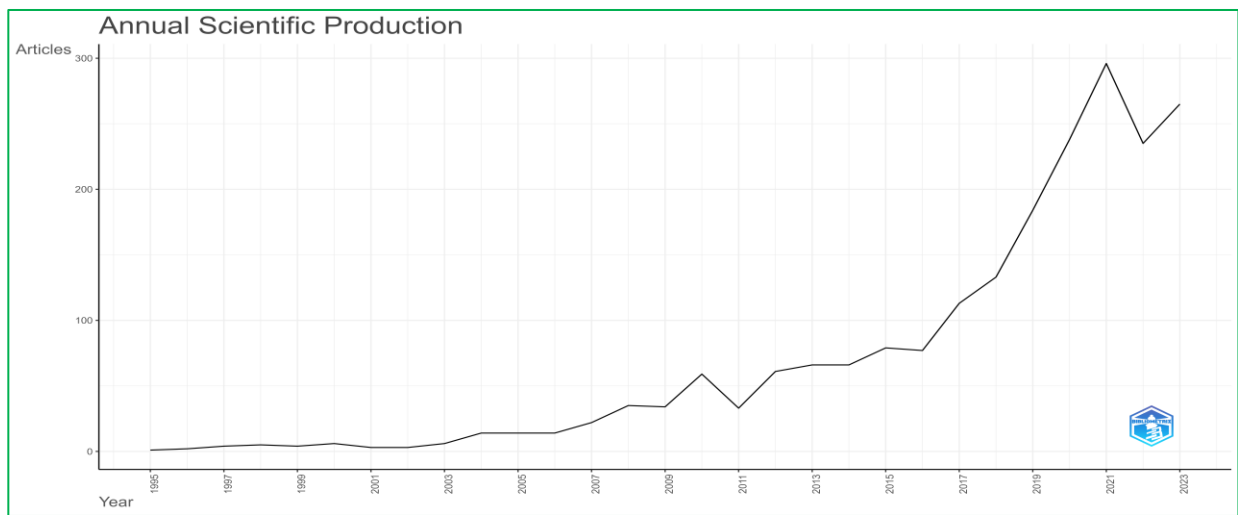
Finally, the need to diversify indexing databases and strengthen initiatives such as DOAJ, Redalyc, and SciELO should be emphasized, as these platforms offer open access models for full-text online publications, in line with the foundational principles of the Budapest Open Access Initiative (BOAI, 2002; Da Costa & Leite, 2016).

Institutional Scientific Visibility

One of the key aspects for the strategic positioning of a scientific institution lies in its capacity to ensure the visibility of its research outputs in internationally recognized databases or journal indexing systems that guarantee access to and availability of its publications, in addition to the institutional management of its own repository. In the case of AGROSAVIA, the visibility of scientific production was assessed through a comparative analysis of four sources: Scopus, Web of Science (WoS), SciELO, and The Lens.

Figure 8 shows the total number of scientific outputs consolidated by database between 1995 and 2023. Scopus shows the broadest coverage of institutional publications, with 1,531 records, followed by WoS with 1,328, The Lens with 1,079, and SciELO with 929. This difference highlights the effect that the inclusion criteria of each database exert on institutional representation and confirms that more open databases, such as The Lens, provide an alternative for mapping institutional scientific production, including publications in national and open access journals. In addition to these metrics, the analysis identified that selective databases such as WoS and Scopus continue to privilege publications in English and journals owned by commercial publishers, thereby generating a structural bias in the visibility of research developed in the Global South (Jama, 2025; Kwon, 2022). This situation may limit the circulation of relevant local knowledge, particularly when it appears in regional journals or in Spanish.

Figure 8. AGROSAVIA Scientific Production in SIREs*



Base of Data	Available indexing window	No. of records retrieved 1993–2024	No. of records retrieved 1993–2023	No. of records retrieved 2024
Scopus	1995–2024	1,647	1,531	116
Web of Science	2001–2024	1,433	1,340	93
SciELO	2003–2024	929	919	10
The Lens	1995–2024	1,079	1,020	59
Total	1995–2024	5,088	4,810	278

Source: Authors' own elaboration based on data retrieved from The Lens, Web of Science, Scopus, and SciELO. Date of consultation: September 2024. Bibliometrix v.5.3.0 analysis software.

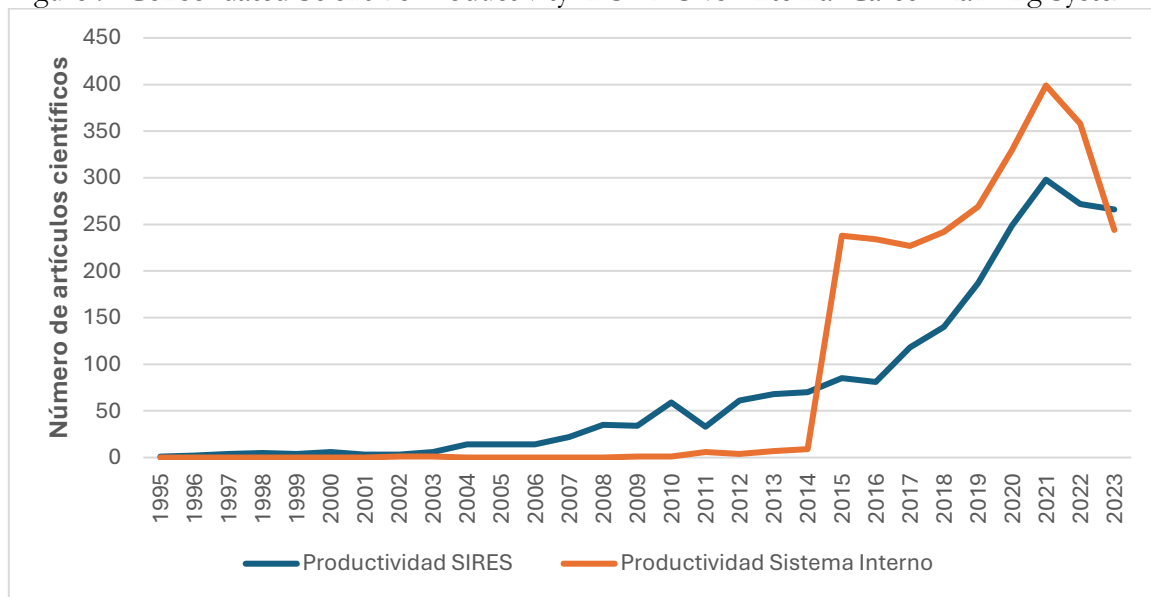
*Duplicate records were removed through title and DOI comparison for the 1993–2023 period. Documents that could not be attributed to AGROSAVIA's mission-oriented role were also removed for the 1993–2023 period.

In this regard, the inclusion of databases such as SciELO and The Lens in visibility analyses offers a more comprehensive and inclusive perspective on institutional scientific impact. By expanding the scope of analysis beyond traditional databases, this approach supports a more contextualized reading of academic production and aligns evaluation efforts with the principles of open science and epistemic justice (Alperin et al., 2019). Therefore, institutional policies for evaluating and recognizing scientific production need to consider multiple sources and value the diversity of languages, audiences, and editorial circuits, thereby avoiding bibliometric reductionism focused exclusively on WoS or Scopus impact metrics, such as JCR or Scimago.

Institutional Scientific Productivity

The analysis of AGROSAVIA's scientific productivity reveals both progress in the consolidation of the internal evaluation system and challenges arising from heterogeneity across reporting sources; that is, a contrast between the scientific production reported by researchers through the institutional career-ranking system and the production linked to and indexed in the main international databases.

Figure 9. Consolidated Scientific Productivity in SIRES vs. Internal Career-Ranking System



Source: Authors' own elaboration based on data retrieved from The Lens, Web of Science, Scopus, SciELO, and the Internal Institutional Career-Ranking System. Date of consultation: September 2024. Bibliometrix v.5.3.0 and MS Excel 365 analysis software.

Figure 9 presents a timeline comparing the total number of articles reported in the career-ranking system with those indexed in Scopus, WoS, SciELO, and The Lens. A significant difference between both sources can be identified, particularly in 2021 and 2022, suggesting an underrepresentation of institutional productivity in international systems. This discrepancy may result from several factors: the lack of indexation of certain journals in selective databases, delays

in registration, researchers’ historical productivity prior to their affiliation with AGROSAVIA, or publication in local outlets with limited international visibility.

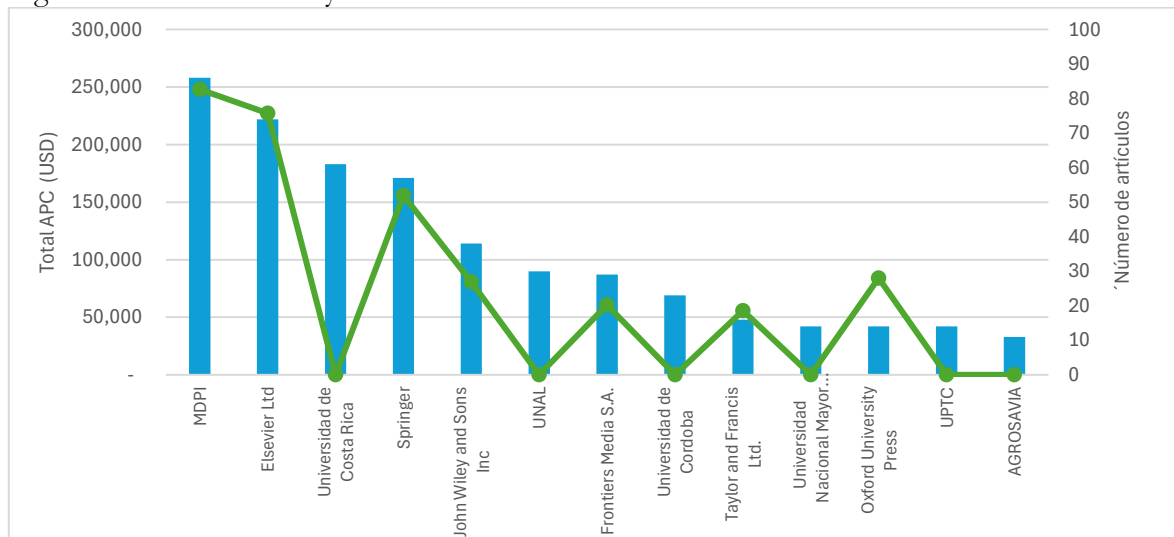
From a science policy perspective, these findings reinforce the need to adopt a multilevel evaluation approach that combines bibliometric criteria with qualitative criteria and recognizes the diversity of scientific publication channels used by researchers, including national outlets, dissemination-oriented media, and channels focused on technological development (Hicks et al., 2015).

Scientific Publication Costs at AGROSAVIA

One of the most significant findings of the institutional analysis concerns the sustained increase in the costs associated with scientific publication, particularly article processing charges (APCs). This trend reflects the historical evolution of the amounts paid, their distribution by type of funding source, and the behavior of average prices per article.

The evolution of the average APC value between 2009 and 2023 shows an increase of 273%, rising from USD 750 to USD 2,800 per article. This increase reflects both inflation in the prices charged by publishers and the growing institutional preference for publishing in journals indexed under open access models, many of which operate through hybrid or subscription-based schemes with APCs.

Figure 10. Institutional Dynamics of APC Costs



Source: Publishers’ information.

Figure 10 summarizes the estimated value of AGROSAVIA’s APC-based publications between 2021 and 2023, amounting to USD 911,938, funded through internal resources, project co-executors, and, in some cases, the researchers themselves. This figure not only underscores the institution’s economic effort, but also raises questions about the sustainability of this model in light of the projected growth of scientific output and the expectation of publishing in journals that tend to increase APC costs.

These results should be interpreted in light of the global context. Recent studies (Butler et al., 2024; Grossmann & Brembs, 2021) have documented a widespread increase in publication prices, especially in hybrid journals, as well as the concentration of APC revenue among a small number of publishers. This phenomenon has prompted international calls to regulate costs, strengthen academic publishing consortia, and promote APC-free models, such as diamond open access (Fuchs & Sandoval, 2013).

In AGROSAVIA's case, an institutional policy for APC funding and management needs to be defined to ensure equity, efficiency, and sustainability criteria. Such a policy could include the creation of internal competitive funds, the prioritization of publications in outlets that impose no costs on authors, and the integration of cost-benefit criteria into editorial planning and productivity evaluation processes. Likewise, it remains crucial to consider how Colombia's current categorization, derived from its membership in the Organisation for Economic Co-operation and Development (OECD), influences the possibility of accessing 25%, 50%, 75%, or 100% discounts on APC costs offered by some publishers.

Constraints in the Publication Process

Although the sample size calculation yielded an estimate of 87 participants and given the low implementation cost of the survey, the electronic form was sent to all researchers in the corporation, comprising 589 individuals under contract in September 2024, in order to maximize representativeness and ensure equal opportunity for participation. As a result, 156 valid responses were obtained, representing a participation rate of 26.5% and exceeding the minimum calculated sample size.

The distribution of respondents by position showed statistically significant differences compared with the initial population distribution ($\chi^2 = 33.78$, $df = 6$, p -value < 0.001 , Cohen's $w = 0.465$). The most marked extremes were: 1. the overrepresentation of researchers holding PhD-level positions across all categories (PhD: 14.7% vs. 8.2% expected; Associate PhD: 15.4% vs. 11.0%; Senior PhD: 3.8% vs. 3.6%), a group naturally expected to have greater experience in the editorial process and in managing potential bottlenecks; and 2. the underrepresentation of research support professionals, who, despite constituting the largest stratum, accounted for only 17.3% of total participation.

This difference reveals a self-selection bias inherent to a voluntary participation design and should be considered when interpreting the results. The greater participation of researchers in PhD categories implies that the findings more strongly reflect the editorial experience of profiles with a consolidated track record in scientific publishing, whereas the underrepresentation of research support professionals limits the capture of potential structural barriers experienced by those who participate less frequently in publication processes. Consequently, the analyses presented below are interpreted as a descriptive characterization of the respondent group rather than as an inference to the entire research staff of the institution.

In order to characterize the self-selection bias, a comparison was conducted between respondents (R) and non-respondents (NR). The results show that the two groups did not differ in age ($M_R = 43.2$ years; $M_{NR} = 43.6$ years; Welch's $t = -0.56$; $p\text{-value} = 0.578$; Cohen's $d = -0.05$) or gender (43.0% women among R vs. 43.2% women among NR; $\chi^2 = 0.000$; $df = 1$; $p\text{-value} = 1.000$; Cramer's $V = 0.000$). Differences were observed by position ($\chi^2 = 40.77$; $df = 6$; $p\text{-value} < 0.001$; Cramer's $V = 0.263$) and work site ($\chi^2 = 23.02$; $df = 13$; $p\text{-value} = 0.041$; Cramer's $V = 0.198$). Among respondents, the highest concentration occurred among PhD researchers and at sites with greater scientific critical mass, namely Tibaitatá and the Central Office. This pattern confirms the interpretive caution stated above: the findings reflect, to a greater extent, institutional experience in scientific publishing.

Of the total survey participants, the majority held the position of master's-level researcher (30.1%). In addition, 49.4% of participants were older than 45 years, and 59.6% were men. All results are provided in Supplementary Material 1.

Scientific Publication Process Timelines

The results show that the complete cycle from knowledge generation to publication requires a considerable amount of time:

- **Generation of research data:** The researchers reported that, on average, 23.6 months are required to generate the data needed to prepare a scientific article ($SD = 12.5$; $Mdn = 24$; $IQR = 12\text{--}36$). This variable showed no statistically significant associations with either gender ($\chi^2 = 3.583$; $df = 2$; $p\text{-value} = 0.1668$; Cramer's $V = 0.152$) or researchers' position ($\chi^2 = 6.561$; $df = 12$; $p\text{-value} = 0.8852$; Cramer's $V = 0.145$), suggesting that the time required for data generation remains relatively homogeneous across the different profiles within the research team.
- **Manuscript development:** The structuring and writing of a manuscript, from conception to submission, require approximately 8.5 months on average ($SD = 5.3$; $Mdn = 6.0$; $IQR = 5.8\text{--}12.0$). This variable showed a significant association with researchers' gender ($\chi^2 = 6.685$; $df = 2$; $p\text{-value} = 0.0354$; Cramer's $V = 0.207$): women reported requiring between 7 and 12 months to complete the manuscript, whereas men reported requiring up to 6 months. By contrast, no significant association emerged with respondents' position ($\chi^2 = 15.035$; $df = 12$; $p\text{-value} = 0.2395$; Cramer's $V = 0.220$).
- **External editorial process:** The time elapsed from manuscript submission to final article publication averages 13.2 months ($SD = 7.4$; $Mdn = 12$; $IQR = 8.0\text{--}16.0$), including editorial screening, peer review, revisions, copyediting, and layout. This variable showed no statistically significant associations with either gender ($\chi^2 = 2.038$; $df = 2$; $p\text{-value} = 0.3609$; Cramer's $V = 0.114$) or researchers' position ($\chi^2 = 10.964$; $df = 12$; $p\text{-value} = 0.5320$; Cramer's $V = 0.187$), indicating that external editorial timelines are perceived similarly regardless of the researcher's profile.

Submission and Acceptance Dynamics

On average, a researcher submits a manuscript to two journals before acceptance (SD = 1.0; Mdn = 2.0; IQR = 2.0–3.0). Overall, 45.5% reported submitting to at least two journals, 25.6% to three journals, and 9.0% to four or more journals before receiving a favorable response. When testing the association between gender and position, on the one hand, and the number of journals, on the other, a statistically significant association emerged with researchers' gender ($\chi^2 = 10.457$; df = 3; p-value = 0.0151; Cramer's V = 0.259). Whereas 55.6% of women reported submitting their manuscript to two journals and only 7.9% achieved acceptance at the first journal, among men, 38.7% submitted to two journals and a considerable proportion, 28.0%, obtained acceptance after a single submission. No significant association was observed with position ($\chi^2 = 12.301$; df = 18; p-value = 0.8313; Cramer's V = 0.162).

Regarding constraints in the process, the main bottleneck identified was the “overlap between the project schedule and the time required for manuscript development” (39.1%), followed by “available resources for publishing in open access” (28.8%).

With respect to funder conditions, the main constraints involved the requirement that the manuscript be submitted, accepted, and published within the project period (35.9%) and, in some cases, restrictions on publishing or disseminating the results (32.1%).

Preferences and Experiences Regarding Journal Types and Associated Costs

According to the researchers, paid open access journals (47.4% of responses) are more efficient and effective in providing a response, followed by non-fee open access journals (24.4%). In the case of hybrid or open access journals, the resources used to cover processing costs come from externally funded projects (34.0%) or from the authors' own resources (30.8%).

Proposals for Improvement

In terms of resource management, researchers would prefer to “enable resources for open access publication within projects financed through the corporation's variable transfer” (41.0% of mentions) and to design “a differentiated common fund for covering APC costs” (31.4%).

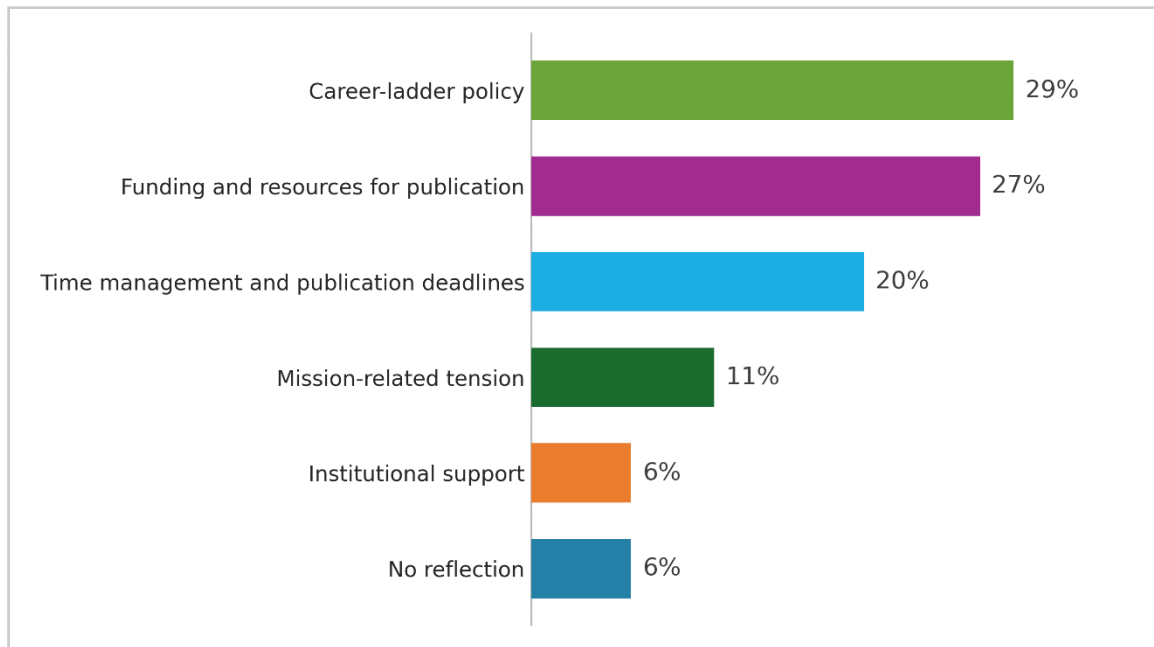
Regarding the evaluation and recognition system, 84.6% of researchers consider it necessary to review the minimum scores for the three-year period described in the career-ranking policy. In addition, they suggest adjusting “both category scores and three-year targets in accordance with current dynamics” (40.4%) and revising “the timing of targets according to the current dynamics of publication” (31.4%).

The associations among process constraints, funder conditions, preferences and experiences regarding journal types and associated costs, and proposals for improvement showed no relationship with the sociodemographic variables of gender and position (p-value > 0.0500).

Reflections and Challenges Regarding Scientific Publishing

The inductive thematic analysis of the open-ended responses made it possible to identify five categories of reflections on the challenges faced by researchers within the corporation. The career-ranking policy implemented by the corporation emerged as the most frequently mentioned category, followed by funding and resources for publishing (Figure 11).

Figure 11. Reflections on the Publication of Scientific Articles



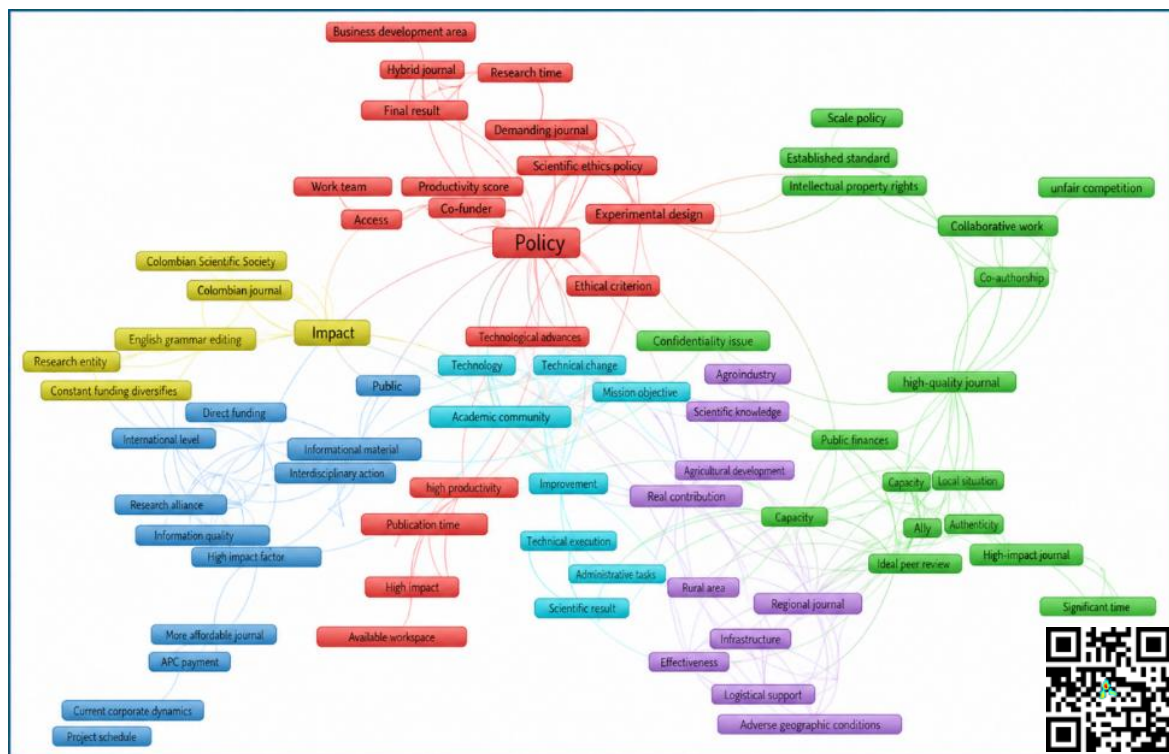
Source: Own elaboration

This is consistent with the most frequent terms identified in the co-occurrence network, which clearly reflects researchers' key concerns regarding scientific publishing. The semantic network comprises six thematic clusters and integrates 100 topics of interest that are interrelated through 284 connecting links (Figure 12). The main reflections and concerns focus on three dimensions:

- Institutional aspects: The need for greater institutional support, improved agreements, and strategic alliances for publication, particularly in relation to support for participation in scientific events, the management of agreements or partnerships, and the career-ranking policy for measuring productivity. These elements appear in the red cluster, comprising 28 topics, which highlights the need for an institutional policy for research and productivity evaluation that integrates specific features related not only to open access modalities—gold, bronze, green, or diamond—but also to quality-related aspects such as transdisciplinarity, the correspondence between research timelines and publication timelines, the diversification of project teams through multivariable analysis of co-authorship, and qualitative impact contributions based on elements such as experimental designs and the contribution of knowledge to current and future technological developments. The purple cluster encompasses institutional aspects specific to the institution's fields of knowledge and target population. It emphasizes the perception of

publication quality in relation to real contributions to rural development, not only through the results reported, but also through their dissemination in local and regional outlets, including national journals and Latin American publication circuits, and through the formation of value chains for knowledge dissemination and outreach by articulating trade associations, regional universities, and private companies.

Figure 12. Co-occurrence Network of Key Texts on Reflections and Challenges in the Publication of Scientific Articles



Source: Own elaboration. VOSviewer 1.6.20 analysis software.
<https://tinyurl.com/27vgd9zl>

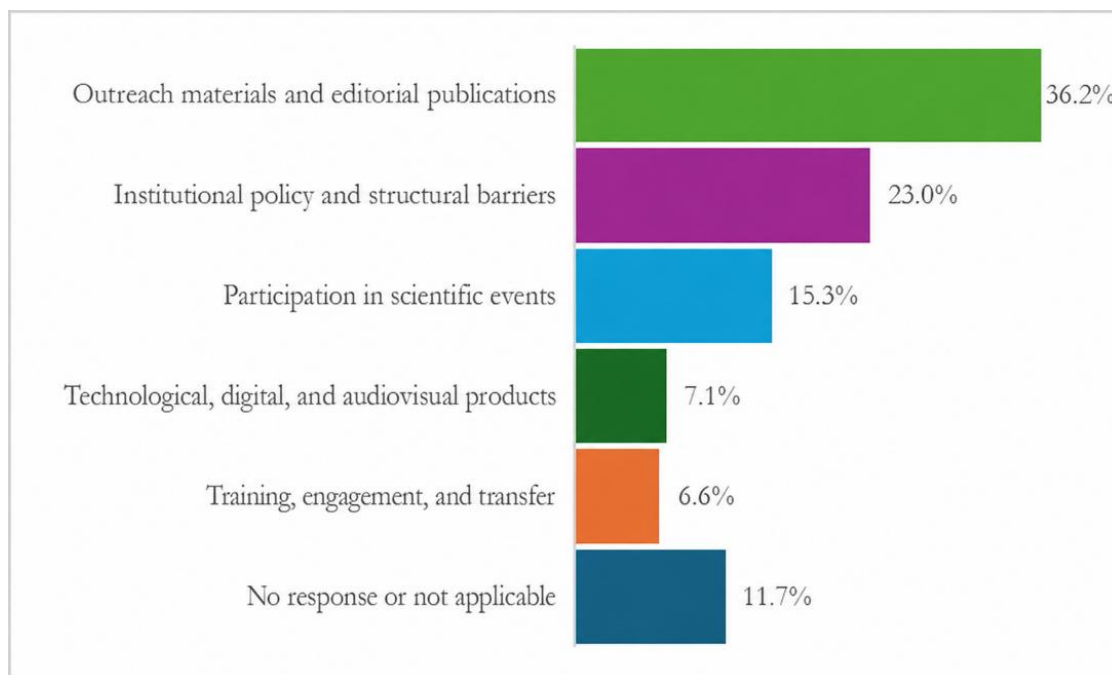
- Editorial processes: Concerns regarding time management for writing and publication deadlines, journal response times, requirements, funding, and resources for open access publication, as well as how these aspects relate to productivity measurement within the corporation. These elements appear in the yellow cluster, which highlights the impact on time and quality of having diversified channels and resources not only for APC payments, but also for related editorial services such as translation and copyediting, as well as the need for financial management services for budgetary reservations and payments.
- Research–publication balance: Mission-related tension arises from the need to generate high-quality scientific articles while also leading, participating in, and carrying out operational and collaborative work in projects implemented across different regions, some involving different disciplines or productive systems about which researchers may not have sufficient knowledge. The blue and cyan clusters integrate the elements that influence the responsible integration of R&D&I process life cycles and scientific publication. Within this integration, administrative

management and knowledge management activities emerge as critical factors that help produce outputs of scientific quality, real impact, and appropriate dissemination mechanisms that facilitate access not only for academics and researchers, but also for other actors within institutional value chains.

Main Constraints Associated with Other Research Outputs

In addition to scientific articles, survey participants considered that other research outputs face constraints within the corporation's scientific production model. The analysis of responses to the open-ended question, "In addition to scientific articles, what other research output do you consider to have faced constraints related to internal and external aspects?", made it possible to identify five thematic categories (Figure 13). The most frequent category was outreach materials and editorial publications, followed by institutional policies and structural barriers, such as inequities in the career-ranking system, the undervaluation of non-conventional outputs, long-term germplasm improvement, and differences among research centers.

Figure 13. Other Outputs Facing Constraints



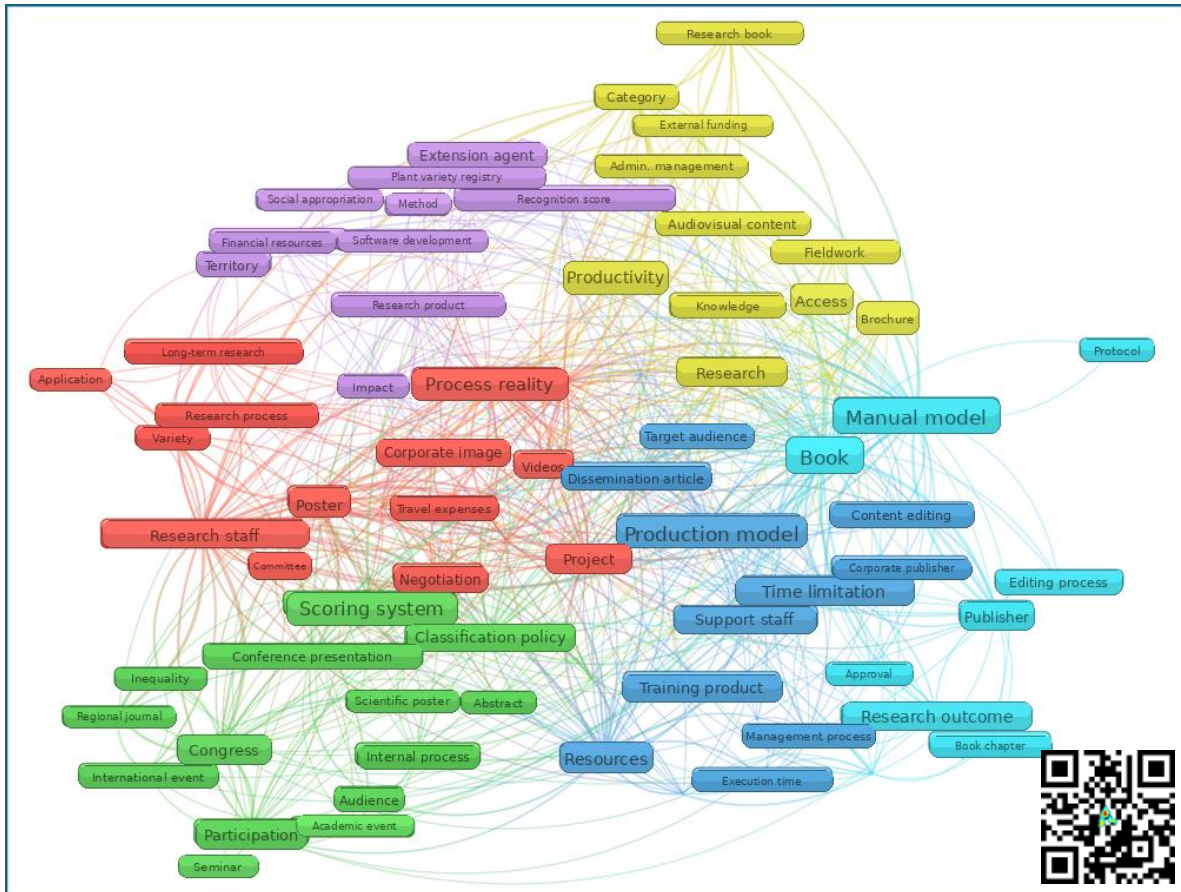
Source: Own elaboration.

The constraints are mainly related to the following dimensions:

The semantic word co-occurrence network (Figure 14) identified six thematic clusters that reflect, from the perspective of the scientific community, other outputs affected by the related tensions between the research process and the publication process. These six clusters comprise

86 topics of interest that interact through 713 links, thereby revealing specific features of the constraint–research output relationship.

Figure 14. Co-occurrence Network of Key Texts Associated with Constraints Related to Other Research Outputs



Source: Authors. VOSviewer 1.6.20 analysis software. <https://tinyurl.com/28qq3ehl>

The constraints relate mainly to the following dimensions:

- Insufficient recognition within the career-ranking system, which does not adequately acknowledge outputs such as booklets, manuals, videos, and software, thereby generating inequities among researchers with different mission-oriented profiles. In the semantic network, the yellow cluster reflects how, from the researchers' perspective, audiovisual content facilitates the systematization of field experiences, promotes the social appropriation of knowledge, and can operate as a complementary mechanism for disseminating outputs such as research books, theses, and brochures. The blue and cyan clusters show how new knowledge outputs, such as books, manuals, booklets, productive models, and public science communication outputs such as conference presentations, also depend on critical administrative parameters, including resources, timelines, and scientific editing processes.

- Development and publication processes that compete for time with article production and the execution of research projects, in addition to delays in the corporation's editorial processes. The green cluster makes it possible to identify detailed aspects of researchers' perceptions, in which time-related factors and editorial response capacity arise mainly from editorial planning during project formulation and from a concentration of outputs intended for transformation into books, given the differential reward assigned to these products within the research career evaluation model when compared with conference presentations, videos, and outreach materials. This points to the need to rethink the system used to assess research outputs.
- Funding restrictions for participation in scientific events, which face limitations due to the non-approval of requests by internal committees and the insufficiency of available resources. Specifically, in the red cluster, this involves a complex interaction among budget availability, the specific features of each project life cycle, the relevance, alignment, and quality of knowledge-sharing and exchange spaces, and the research–product–co-product relationship over time.
- Lower valuation of these outputs compared with indexed articles, despite their relevance for knowledge transfer. The purple cluster describes perception-related aspects associated with the productivity assessment mechanism, including valuation scales parameterized by type of research output. The analysis highlights the need to incorporate impact-related variables such as target audience, development time, and articulation with other outputs.

The analysis of these results suggests the need to balance institutional recognition across different types of scientific production, especially those aimed at dissemination and knowledge transfer. These outputs play an important role in the institutional mission, yet they face specific barriers that deserve attention in policies for evaluating and supporting scientific production.

These findings reflect tensions commonly faced by researchers in public R&D&I institutions worldwide, especially in countries of the Global South. Constraints on the time available to generate research outputs, economic barriers to covering APCs, and heterogeneity in institutional support constitute factors documented in contexts such as Latin America, Africa, and Asia (Buitrago-Ciro, 2022; Macdonald, 2025; Martinino et al., 2024; Memon, 2019). Globally, more than 60% of researchers in non-English-speaking institutions report difficulties in publishing in high-impact journals for economic or language-related reasons (Collyer, 2018; Demeter & Istratii, 2020). In addition, the APC model continues to show structural inequity, whereby researchers with more limited access to funding remain excluded from circuits of international visibility (Cantrell et al., 2025; Ellers et al., 2017). In this regard, the AGROSAVIA survey results are consistent with the most recent international concerns and reinforce the need for policies that promote the democratization of open access through equitable funding models, strengthened internal editorial capacities, and greater institutional recognition of the diversity of scientific outputs.

This analysis reveals the tensions, barriers, and expectations that researchers face in their relationship with the scientific publishing system, providing key inputs for the redesign of institutional policies aimed at fostering a sustainable, inclusive, and high-quality editorial culture.

Conclusions and Future Work

Empirical Findings

The results presented allow us to conclude that the dynamics of scientific production at AGROSAVIA are influenced by profound global transformations in the academic publishing ecosystem. The growth of open access based on APC payments, editorial concentration, and transformative agreements have generated a more costly, competitive, and restrictive publishing environment, especially for institutions in the Global South. These externalities influence institutional aspects related to securing resources for the development of R&D&I activities through competitive funding sources; designing operational budgets that include specific items for the publication of new knowledge outputs, such as scientific articles, without competing with other outputs, including participation in knowledge-sharing and exchange events and technology-development products such as prototypes, machinery, biological varieties, among others; and formalizing local, national, and international alliances with different actors in the STI ecosystem to optimize resources and enable differential access to scientific dissemination mechanisms.

In this scenario, AGROSAVIA has achieved significant progress in terms of visibility and publication volume, as evidenced by its coverage in databases such as Scopus, WoS, The Lens, and SciELO. However, a structural divergence persists between what is reported in the internal evaluation system—the career-ranking system—and international bibliometric platforms, along with a growing trend in publication costs that compromises the financial sustainability of the current publishing model. Together, these elements configure a scenario of increasing tension between the progress achieved and the conditions required to sustain it. Therefore, establishing a multivariable and multilevel evaluation mechanism that promotes knowledge generation and its materialization into different outputs aimed at different target audiences, through diverse dissemination and outreach mechanisms, would help maintain desired productivity rates in line with the available funding resources.

Institutional Implications

Researchers identify common structural constraints: operational overload, lack of time, difficulties in accessing resources for publication, and dynamics inherent to the local research context. When interpreted together with the detailed analysis of APC costs and visibility, these findings suggest that AGROSAVIA should move toward a more comprehensive and adaptive editorial governance approach, including: i) redefining APC funding and management mechanisms; ii) strengthening the internal ecosystem for editorial support; iii) updating the career-ranking system and triennial productivity measurement framework to include criteria of diversity, relevance, and social impact; and iv) adopting responsible metrics and open science principles. These implications are formulated for the specific context of AGROSAVIA, based

on the diagnosis conducted, and are not intended to be automatically extrapolated to other institutions.

In line with the transformation signals identified and detailed in this study, the results themselves are not directly extensible, transferable, or binding for any actor within STI ecosystems. However, they do become an analytical input for institutions such as research and technological development centers specialized in economic sectors, as well as for a characteristic type of actors that generate and transfer knowledge for the agri-food sector, namely national agricultural research institutes (NARIs).

Contribution to the Discussion on Science Policy

Beyond the case analyzed, this study provides empirical evidence on how global tensions within the publishing ecosystem—related to the sustained growth of APCs, the concentration of the publishing oligopoly, and the expansion of transformative agreements—materialize within a national agricultural research institute in the Global South. The evidence reinforces warnings already raised in the literature regarding the capture of open access by commercial actors and contributes a documented case in which aggregate costs, editorial-cycle timelines, and researchers' perceptions converge to signal sustainability limits. The study's contribution to the discussion on science policy lies in articulating, through integrated institutional data, three dimensions that are usually analyzed separately: publication costs, bibliometric visibility, and researchers' perceptions. This articulation offers a reference analytical framework for institutions with comparable mission-oriented profiles.

Consequently, this case study generates baseline signals that may be considered at three different levels: institutional knowledge management policy; sectoral policy for the creation, transfer, and access to knowledge, technologies, and services by producers, technical assistants, and agricultural extension agents; and national open science policy.

Scope, Limitations, and Conditions for Transferability

This study follows a single-case design focused on AGROSAVIA as a national agricultural research institute. No systematic comparison was conducted with other public agricultural R&D&I institutions in Colombia or Latin America, nor with universities or research centers with analogous profiles. Consequently, the institutional implications presented in Section 4.2 should be interpreted as contextualized guidelines rather than generalizable recommendations. The transferability of the findings to other institutions will depend, among other factors, on the following conditions: i) the existence of an internal career-ranking or research categorization system with incentives associated with publication in indexed journals; ii) a structural dependence on project-based funding to cover APC costs, without differentiated institutional funds; iii) location in a country whose status within APC waiver or discount schemes offered by major publishers conditions access to preferential fees; iv) a mission-oriented profile focused on applied research, with diverse transfer outputs, such as booklets, manuals, and productive models, whose valuation in global bibliometric systems remains limited; and v) a geographically distributed organizational structure across multiple research centers. Institutions that share these conditions may find the findings relevant as a point of reference, although validation would

require specific comparative studies and the development of pilot exercises based on the methodological design of this study.

Future Work

The results open lines of work that would allow the findings identified in this study to be extended and contrasted: i) deepening the comparative analysis among public R&D&I institutions in Colombia and Latin America, especially national agricultural research institutes; ii) studying the impacts of the APC model on inter-institutional scientific equity by clusters of actors, such as private universities versus public universities; iii) designing an internal system for monitoring costs and visibility by discipline, taking into account differences in the dynamics of knowledge cycles in basic, applied, adaptive, and transformative research; and iv) evaluating the effectiveness of collaborative publishing strategies and editorial infrastructure through public-private partnerships in the medium and long term.

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Declarations

The authors declare that they have no conflict of interest in relation to the publication of this article.

The authors declare that the data and information presented in this publication underwent an institutional verification process concerning the dissemination and disclosure of sensitive information, conducted by the internal Office of Intellectual Property and Copyright. This office endorsed the submission process to indexed journals, as the manuscript complies with the following requirements: (1) a similarity index below 20%, defined as the corporate threshold; (2) an authorship declaration based on the CRediT taxonomy; (3) the absence of sensitive institutional information that could compromise future knowledge outputs or technological developments, or require review by the ethics committee; and (4) verification of institutional data by the responsible offices and the author team.

The data obtained through the data collection instrument, namely the survey, were gathered under the institutional policies on intellectual property and copyright and included informed consent, as the study analyzes knowledge management within the institution from the perspective of scientific publishing.

The data supporting the results of this publication are available from the corresponding author upon reasonable request and subject to approval under institutional procedures.

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