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Glyphosate in the media: the battle for public information

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Abstract

Glyphosate (GLF), one of the most widely used herbicides worldwide, has been the subject of controversy in Mexico due to its potential impact on human health, the environment and agricultural production. The objective of this study was to describe and analyze the information published in the Federal Public Administration (APF) press releases and in the main digital newspapers in Mexico regarding GLF, with the purpose of identifying predominant positions, their evolution, and competing interests. A content analysis assisted by artificial intelligence (AI) and web taxonomy tools was conducted on more than 150 information sources published between February 2023 and April 2025. The information was systematized into six categories: political-ideological, legal, commercial, academic, environmental, and public health. The results showed that the government's position went from a decrease in imports to aa ban, and then to the repeal of the decrees due to the lack of viable substitutes, which generated disputes within the framework of the Free Trade Agreement between Mexico, United States and Canada Free (T-MEC). While academia proposes alternatives, the agrochemical industry warns of negative impacts on production and prices. Public positions reflect contradictions both between and within sectors. The debate over GLF in Mexico is marked by political, scientific and economic tensions, which hinders informed and consensual decision-making.

Keywords: decree, digital newspapers, herbicides, journalism, agroecological transition.

Introduction

In Mexico, the use of pesticides and fertilizers is considered essential to mantain agricultural productivity and to ensure food supplies for both the domestic and export markets. However, there are no accurate official statistics on their use, which represents a public problem (Silveira-Gramont et al., 2018). The available information is based on sales estimates from companies, which report an annual volume of close to 31 thousand tons (Arellano-Aguilar & Rendón-von Osten, 2016), used in approximately 72 % of the cultivated area in the country (around 32 million hectares) (Hernández, 2024a; Instituto Nacional de Estadística y Geografía [INEGI], 2023). Annual sales of these inputs are estimated at 18 billion pesos (mmdp), distributed equally between agrochemicals and pesticides. Among the most widely used are insecticides (4 billion pesos), herbicides (3 billion pesos) and fungicides (2 billion pesos), as well as inorganic fertilizers, which are key to increasing agricultural yields (INEGI, 2019).

Globally, the most widely used herbicide is glyphosate (GLF). Its global use exceeds 747 million tons (mt) annually, and it is the basis for approximately 750 commercial formulations (González-Díaz, 2025). The application of this herbicide is used primarily on genetically modified (GM) crops such as corn, cotton and soybean, as well as citrus fruits, grasslands,

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sorghum and sugarcane (Mordor Intelligence, 2024). In Mexico, GLF is estimated to be used in more than 31,000 farms, with an approximate annual consumption of 2 million liters. The states that use it most frequently are Veracruz, Chiapas, Campeche, Guerrero and Tabasco, mainly for corn cultivation (CONACYT, 2019; Encino, 2024; Agrarian Prosecutor's Office, 2021, 2024). Its popularity has grown due to its efficiency in pre and post emergence applications, both for land preparation and for accelerating crop drying prior to harvest (González-Ortega & Fuentes-Ponce, 2022). This growth has been driven by the introduction of GM crops and the reduction of their price (Bonny, 2016; General Coordination of Pollution and Environmental Health [CGCSA], 2018).

For decades, GLF was considered safe for human health and ecosystems (Torres-Cruz, 2024), even less toxic (at normal doses) than alcohol or certain greenhouse gases (Joaquín, 2024). However, the International Agency for Research on Cancer (IARC) warned of its possible link to cancinogenic diseases in humans and in laboratory animals, which was confirmed by the World Health Organization (WHO). The European Food Safety Authority later argued that the research conducted lacked scientific rigor (National Geographic, 2017).

At the institutional level, the Intersecretarial Commission on Biosafety of Genetically Modified Organisms (Comisión Intersecretarial de Bioseguridad de los Organismos Genéticamente Modificados CIBIOGEM, by its Spanish abbreviation) of the National Council for the Humanities, Science and Technology (Consejo Nacional de Humanidades, Ciencia y Tecnología CONAHCYT, now the Secretariat of Science, Humanities, Technology, and Innovation [Secretaría de Ciencia, Humanidades, Tecnología e Innovación SECIHTI, by its Spanish abbreviation]) has documented more than 600 research papers on the effects of GLF on health, the environment and food (CIBIOGEM, 2024). In this context, GLF has become a topic of political, academic, commercial, environmental and public health discussion. On one hand, the productive-commercial benefits of its use are mentioned; on the other, the possible negative implications on ecosystems, food and public health are questioned. Therefore, the objective of this work was to analyze the public information disseminated about GLF in Mexico between February 2023 and April 2025, with the aim of describing the main positions generated by the presidential decree proposing its restriction and subsequent repeal.

Methodology

The review was based on the methodologies proposed by Campoverde et al. (2022) and Pérez-Vázquez et al. (2024) and the web taxonomy technique. The research focused on the analysis of official and media information related to GLF in Mexico. The main sources considered were the Official Journal of the Federation (Diario Oficial de la Federación [DOF, by its Spanish abbreviation]) and press releases issued by different federal government agencies, including: the Ministry of Environment and Natural Resources (Secretaría de Medio Ambiente y Recursos Naturales SEMARNAT by its Spanish abbrevaition), the Ministry of Health (Secretaría de Salud SS by its Spanish abbreviation), the Ministry of Agriculture and Rural Development (Secretaría de Agricultura y Desarrollo Rural SADER by its Spanish abbreviation), the Federal Commission for the Protection of Sanitary Risks (Comisión Federal para la Protección de Riesgos Sanitarios COFEPRIS by its Spanish abbreviation) and CONAHCYT (now SECIHTI). Likewise, journalistic information from the main national newspapers was included: *El Financiero*, *El Universal*, *La Jornada*, *Milenio*, *El Economista*, *El Heraldo de México*, *El Sol de México*, *Reforma*, *Excelsior* and *Forbes México* (SCimago Media Rankings, 2024). Relevant complementary sources were also consulted.

Data collection was based on Google search alerts, with keywords related to GLF in the political, legal, commercial, academic, environmental and public health fields. The information search was conducted from February 2023 to April 2025, considering the enactment of the current decree on glyphosate restriction (February 2023) until the announcement of the new decree banning certain herbicides in 2025. In a first analysis, 193 sources of information were obtained; subsequently, the most relevant information was then filtered for the presentation of the results. The data were analyzed with the support of artificial intelligence (AI) to identify trend analysis, sentiment, impact, source comparison and media coverage (Table 1).

Table 1. Types of analysis and characteristics of information.

Type of analysis	Description
Trend	Most cited and mentioned topics
Sentiment	General tone of the news (positive, negative or neutral)
Impact	Consequence or effect of the news found
Comparison of sources	How different media outlets have covered the issue
Media coverage	Frequency of appearance in different media

Source: Authors'self-made with artificial intelligence support.

The information was also grouped into six categories: political-ideological, legal, commercial, academic, environmental and public health.

Results and discussion

The trend analysis indicated that public information about GLF in Mexico is mainly related to political-ideological, legal and public health aspects. This suggests that the government has set the agenda, followed by the academic sector. The sentiment analysis showed an average polarity of −−0.10; that is, most public information addresses the negative effects of the herbicide. However, conflicting views were identified within the same sector. Regarding the impact analysis, the environment and health issues presented the highest degree of resonance in the sources consulted, demonstrating social concern. Meanwhile, the political and legal categories reflect the existence of conflict surrounding government decisions.

The comparison of information sources and the analysis of coverage revealed that three media outlets concentrated the highest proportion of publications on GLF: *La Jornad*a (26 %), *El Universal* (23 %), and *Milenio* (21 %) (Table 2).

Table 3 shows the categories in which the different positions on GLF in Mexico were classified. These categories made it possible to identifiy the tensions between different agents, whose positions oscillate between the defense of the use of the herbicide for productive and economic reasons, and its rejection due to environmental and health risks.

Political-ideological category

In 2020, the Mexican government issued a first presidential decree for the gradual substitution of GLF use, as well as to regulate its acquisition, distribution, and importation. This decree also prohibited the use of GM corn and entrusted the interministerial coordination (SEMARNAT, SS, SADER, CONAHCYT, and COFEPRIS) to create the legal mechanisms for its prohibition in 2023 (DOF, 2020). In February 2023, a second decree was published, repealing the previous one and establishing new strategies for the use of GLF and GM maize. The new instrument detailed measures to restrict the distribution and importation of the herbicide, and set March 31, 2024 as the transition deadline (DOF, 2023).

Under this strategy framework, two types of GLF were differentiated: technical and formulated. The first is the concentrated active ingredient, while the second is the mixture of technical GLF plus adjuvants (such as diluents, surfactants and solvents), where 1 L of formulation contains 360 g of the concentrated ingredient (CONACYT, 2021). According to official records, in 2021 the import of 16,500 t of formulated and 1,200 t of technical was authorized; in 2022, these figures were reduced to 8,263.09 and 628.62 t, respectively (DOF, 2024); while in 2023 only 4,131 t of formulated and 314 t of technical were imported (COFEPRIS, 2023; CONAHCYT, 2024a). This is with the aim of a gradual reduction until its prohibition in 2024 (COFEPRIS, 2023; SEMARNAT, 2020b).

Given the lack of viable alternatives, the government postponed the herbicide ban from March 2024 (Secretaría de Economía [SE], 2024). This decision was supported by the National Agricultural Council (Consejo Nacional Agropecuario CNA, by its Spanish abbreviation), which represents the main agricultural companies in the country, considering that any substitute for GLF must be widely distributed, competitively priced and proven efficiency (Hernández, 2024b). For its part, the Mexican Union of Agrochemical Manufacturers and Formulators (Unión Mexicana de Fabricantes y Formuladores de Agroquímicos UMFFAAC, by its Spanish abbreviation) stated that the use of agrochemicals is necessary to maintain and increase production volumes, as they help to avoid losses of up to

Table 2. Position of each media outlet on glyphosate in Mexico (February 2023 to April 2025).

Source	General position	Polarity of sentiment
La Jornada	Critical	-0.20
El Universal	Critical	-0.10
Milenio	Neutral	0.00
El Financiero	Pro-economic	0.10
El Economista	Pro-economic	0.15
Forbes México	Neutral	0.00
Excelsior	Neutral	0.05
Reforma	Pro-industry	0.20
El Heraldo de México	Pro-industry	0.20
EL Sol de México	Critical	-0.10

Source: Authors' self-made with artificial intelligence support.

Table 3. Classification of positions in public information on glyphosate (GLF) in Mexico (February 2023 to April 2025).

Categories	Main positions
Political-ideological	• The government, through decrees, went from reducing, prohibiting, postponing, and even repealing the use of GLF. • It is considered that GLF regulation is based on a political-ideological conception, rather than on scientific, technical or productive criteria. • It is expected that the Constitution will be amended to regulate the use of GLF, and avoid further litigation and trade disputes under the framework of the T-MEC.
Legal	• From 2016 to 2023 there are lawsuits and legal disputes in national and international courts. • Mexico lost a T-MEC litigation on the restriction of GLF and GM corn. • Monsanto faced and dismissed lawsuits against the Mexican government regarding GLF.
Commercial	• The industry maintains that there are no viable alternatives that match GLF in terms of effectiveness, availability and price. • Globally, the glyphosate market is worth at over $9 billion annually, and $3 billion pesos in Mexico. • Eliminating GLF without a real alternative will negatively impact food production and prices.
Academic	• It presents opposing positions for and against the herbicide. • The scientific veracity is argued, but the safety for the environment, soil, food and human health is not proven. • Bio-herbicides have been developed (Contronat: argues 90 % effectiveness) and alternatives for an agroecological transition to reduce and replaces glyphosate.
Environmental	• There is concern about the negative impact of GLF on biodiversity, soil, water, and food. • Reducing and banning herbicides is necessary to protect ecosystems and native species. • The effects on the environment would have future economic implications for various agricultural subsectors; however, the economic aspect takes precedence over environmental considerations.
Public health	• International organizations have linked GLF to cancer, as well as kidney, reproductive, liver and brain diseases. • Prolonged exposure, as well as improper dosage, application and clothing can cause the presence of GLF in the human body. • Presence of GLF in food, water bodies and people has been documented, but it is argued that there is no medical or scientific evidence.

Source: Authors' self-made with artificial intelligence support.

40 % due to drought, 28 % due to pests, 27 % due to diseases and 42 % due to weeds (Hernández, 2024c). Other positions consider that the decrees were driven more by a political ideological issue than by the preservation or protection of health and the environment (Mota, 2024).

Legal category

Internationally, Bayer's acquisition of Monsanto generated approximately 100,000 lawsuits, with a total amount estimated at $10 billion dollars, for damages allegedly caused by the use of GLF (Nava, 2024; Reuters, 2024). Although Bayer agreed to cover these amounts, it clarified that this did not imply an admission of guilt, but rather a strategy to close the litigation (Barragán, 2024). The company argues that there is no scientific evidence to support harm to health or the environment (Petovel, 2024; Salazar-López & Aldana-Madrid, 2011).

In Mexico, the restrictive GLF import policy reached the Supreme Court of Justice of the Nation (Suprema Corte de Justica de la Nación SCJN, by its Spanish abbreviation) (Aguirre, 2024). After the judicial process, Monsanto stopped legal action against the 2020 decree, which represented a triumph for the federal government (Agencia Reforma, 2024a; CONAHCYT, 2024b).

In November 2023, the governments of Mexico and the United States initiated a trade dispute within the framework of the T-MEC, related to import restrictions on GM maize and the use of GLF (Amador, 2023; Ordaz, 2024). In late 2024, it was announced that Mexico had lost the legal dispute, which was considered by various sectors as a triumph for commercial agricultural biotechnology (Matamoros, 2024). The main argument of the ruling was that Mexico did not present sufficient scientific evidence on the negative effects of the herbicide on human health and the environment (Balderas, 2024; Morales, 2024). On the other hand, CONAHCYT argued that there is scientific evidence and that the US government did not prove the safety of the herbicide (Poy, 2024; Wise, 2024).

After the ruling, Mexico had until February 2025 to challenge it (Balderas, 2024; Cosío, 2024), as the government considered that public health and Indigenous rights were not taken into account (Ribeiro, 2024a). In this sense, the defense would raise the issue from a scientific and cultural perspective (Aguirre, 2024; Junta de Coordinación Política

[JUCOPO], 2024), with the objective of strengthening national agricultural and food sovereignty (Monreal, 2024). If Mexico loses this lawsuit, the dispute that both countries have been maintaining since 2020 would come to an end (Radio Fórmula, 2024). It should be noted that in México the planting of GM maize is prohibited, but not its importation, which means that the decree of February 2023 lacks support (Villalobos, 2025).

Commercial category

GLF is a water-soluble organic acid derived from the phosphonomethyl derivative of the amino acid glycine, whose active ingredient is N-(phosphonomethyl) glycine (Davoren & Schiestl, 2018). It was developed by Monsanto company in 1974 under the brand name Roundup, which held the patent until 2000 (Nava, 2024). Currently, the main companies dominating the market are Bayer CropScience AG, BASF Corporation, Syngenta AG, Adama Agriculture Solutions Ltd., and UPL Limited. In 2023, the value of the global GLF market was estimated at 8500 million dollars, and by 2024 it increased to 9000 million dollars, reaffirming itself as a stable market due to the lack of viable alternatives for both GM and conventional crops (Mordor Intelligence, 2024). However, it faces challenges such as oversupply, regulatory pressure in several countries and falling prices (Katsaris, 2024).

According to the Action Network on Pesticides and Alternatives in Mexico (RAPAM by its Spanish abbreviation), more than 9,500 types of pesticides are used (Animal Político, 2024), and 85 % of the market is concentrated in Bayer and Corteva (merger of DuPont/Pioneer and Dow) (Mordor Intelligence, 2023; Ribeiro, 2024a). There are around 36 commercial brands of GLF in the country and more than 400 products that use it as a base ingredient, including Faena, Cacique 480, Nobel 62 %, Lafam, and Eurosato. The available presentations are: soluble, soluble granules, soluble powder, concentrated solution, and aqueous solution (Arellano-Aguilar & Montero-Montoya, 2017). Considering the above, it is thought that the GLF remains in the market due to economic pressure through the generation of doubts about the veracity of scientific studies (Pomar, 2024).

Academic category

Internationally, there are three bioherbicides approved by the European Union (EU) and the United States: Beloukha, Burn Out Formula 2 and Weed Zap (Procuraduría Agraria, 2024). In Mexico, at the end of the 2019-2024 six-year term, CONAHCYT, together with Promotora Técnica Industrial, SA de CV, announced the product "Contronat" as the first Mexican bioherbicide registered with COFEPRIS. In addition, the development of other formulations with 90 % effectiveness were reported to be in some phase of registration: Herbi-O, Kill Herbs, Herbitech, Zekatryn and Sec Natural, developed by Agroplanet, Agribest, Biotech, Megainsumos and Seragram, respectively (CONAHCYT, 2024c; Villaseñor, 2024).

In view of these advances, the Chamber of Deputies requested that COFEPRIS expedite the corresponding procedures (Martínez, 2024). Likewise, state congresses were urged to inform producers about herbicidesin the proces of being banned (AC Noticias, 2024). However, the SE, SEMARNAT, SADER, and COFEPRIS acknowledged that no substitute with equivalent characteristics to GLF has been found (Barragán, 2024; Ribeiro, 2024b).

In addition to the development of bioherbicides, agroecological strategies for weed management have been promoted, including cultural and mechanical practices (Ramírez, 2024; SADER, 2024), extension work through field schools (Domínguez, 2024), and the use of geographic information systems and drones (AVC Noticias, 2024; Domínguez, 2024). Meanwhile, education and research institutions have developed projects to identify active ingredients that would allow the formulation of bioherbicides (Salinas, 2024) and to generate lines of research aimed at GLF free agriculture (Digital Roadmap, 2024).

On the other hand, there are positions that question the viability and effectiveness of these alternatives, and highlight the possibility of generating adverse economic impacts (Yuste, 2024). The UMFFAAC argues that the GLF ban would not improve the health of the population, but would increase the price of grains due to the drop in production (Hernández, 2024b). Moreover, the Protection of Crops, Science and Technology (PROCCYT, by its Spanish abbreviation) assures that GLF has been used for more than 40 years without adverse effects on health or the environment (Miranda, 2024), while the National Union of Agricultural Workers (UNTA, by its Spanish abbreviation) approved the measures taken by the federal government (Soriano, 2025b).

Environmental category

In 2020, the fifth edition of the *Antología toxicológica del glifosato* was published, which contains nearly 1,000 scientific and academic papers on the herbicide effects on the environment and human health (Mejía-Haro, 2025). In India, the promotion of the use of GM and GLF cotton has affected the agricultural industry (Sánchez, 2024), while the EU banned the import of Brazilian coffee due to the herbicide's toxicity, which represents significant economic losses for the sector (Afane, 2024). In Spain, the presence of nearly 106 pesticides was detected in fruits and vegetables (Rejón, 2024), so environmental associations consider that the suspension of the use of GLF in non agricultural activities would be an important step to reduce their environmental

impact (BioEco, 2025). For its part, Great Britain has been more flexible regarding tea regulations.

Some countries such as Argentina and Bolivia have documented GLF resistance of up to 90 % in at least 24 weed species (Pavot, 2024). In Mexico, GLF has been reported in maize from the United States (García, 2024a, 2024c; Valencia, 2025), as well as in water sources and aquatic species in several states (Cervantes, 2024). Some reports indicate that companies operating in these regions have exerted pressure to stop research into the use of agrochemicals (Valencia, 2024).

Recurrent criticisms point to the fact that governments favor the economic aspect, since they lack the political will to enforce existing laws regarding the use of GLF (del Valle, 2024; Pomar, 2024). This scenario benefits transnational corporations, which maintain oligopolistic practices, promote the privatization of genetic resources (Contreras, 2024; Díaz-Guillén, 2024) and create technological dependence (Mejía-Haro, 2025; Ortega, 2025) through consolidation governance structures parallel to constitutional powers (González-Díaz, 2025). Therefore, a reconversion of production models is necessary, as well as new legal instruments to regulate the use of GLF (Pérez-Vázquez et al., 2024).

Public health category

At the international level, negative effects of GLF on human health have been reported. Among the associated conditions are brain inflammation, acceleration of Alzheimer's disease (Infosalus, 2024), neurodegenerative diseases (Welle, 2024) and immunotoxic effects (de la Chica, 2024), as well as liver, kidney, reproductive (Wise & Malkan, 2024) and immune system damage. In Mexico, at least 146 cases of GLF and 2,4-D have been reported in urine samples from residents of Jalisco and Yucatán (García, 2024b; Ucán, 2024); in addition, low birth weight has been documented in rural communities in Monterrey (Martínez, 2025) and intoxication in children in the state of Veracruz (Guardian, 2024).

SEMARNAT has linked GLF to various diseases, such as encephalopathies, autism, parkinsonism, malformations and different types of cancer. Impacts on the endocrine, reproductive, immune, digestive, hepatic, renal, nervous and cardiovascular systems have also been reported (SEMARNAT, 2020a). Other effects reported include allergic reactions, antibiotic resistance, immunosuppression and nutrient loss from food (Rejón, 2024; Reuters, 2024), which coincides with international data.

A relevant aspect is the degradation time of the GLF molecule in the organism, which ranges between 50 to 300 days (González-Díaz, 2025). This persistence is related to inadequate dosing practices, application and use of protective equipment (Benbrook, 2016; CONACYT, 2019; Ribeiro, 2024b). Therefore, several studies highlight the importance of addressing these factors (Andreotti et al., 2018; Gandhi et al., 2021).

Position of the new government (2024-2030)

Policy regarding glyphosate and GM maize has been a central issue during the last two APFs, although there have been differences among its members. In the document *100 Steps to transformation*, the current government (2024-2030) established as a central axis the rescue of national sovereignty, particularly in the agricultural sector, under the concept of a "Just and Sovereign Rural Republic" (Aguirre, 2024; Sheinbaum, 2024).

The *National Development Plan* (PND by its Spanish abbreviation) (2025-2030), which gives continuity to the agricultural policies of the previous administration (Antúnez, 2024; Flores, 2024), establishes three axes: 1) promotion of food self-sufficiency through support for producers and the development of sustainable agriculture, 2) promotion of technological innovation to improve productive efficiency, and 3) strengthening of small producers through financing and technical assistance (Fajardo, 2025). Along with the PND, *Plan Mexico* aims to position the country among the top 10 global economies, produce 50 % of national consumption and be one of the top five tourist destinations worldwide (BBC News Mundo, 2025). However, opposition sectors argue the concentration of power and authoritarianism, and consider these plans to be unrealistic (Cámara de Diputados, 2025).

With respect to GLF, the government proposes to continue with the policy of reducing imports and use, in addition to reviewing another 200 products that are prohibited in other countries (Agencia Reforma, 2024b; Benítez, 2024; Miranda, 2024; Salgado, 2024). After the deadline to comply with the T-MEC trade dispute expired (Barragán, 2025; Romero, 2025), in early February 2023 decree, previously postponed by the previous APF, was published (DOF, 2025; Soriano, 2025a). Nevertheless, the government has publicly stated its commitment to maintain such policy, regardless of the T-MEC panel, and has even announced its intention to elevate it to constitutional status. To this end, it is proposed to modify articles 4th (right to a healthy and sustainable environment) and 27th (land ownership) of the Constitución Política de los Estados Unidos Mexicanos (Alegría, 2024; González, 2024; Méndez, 2024), in order to avoid future trade disputes (Vela, 2025). This strategy is legally viable, as the panel's ruling does not prevent Mexico from amending its constitution (Forbes, 2025; George, 2025).

In March 2025, the constitutional reform on the conservation of native maize was published (DOF, 2025), and in April a new decree was announced aimed at banning various

pesticides classified as highly toxic, already banned in other countries (del Ángel, 2025; Olivares & Urrutia, 2025).

Conclusions

In Mexico, current public information about glyphosate considers it to be a herbicide that is harmful to health and the environment, but its use is justified from a productive and commercial perspective. The federal government lost the trade litigation and repealed its decrees, but the policy on its use will be raised to constitutional rank, so the discussion and controversy will go on both public and scientific-academic spheres.

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