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Editorial

WASTE MANAGEMENT IS PIVOTAL IN THE CROSSROAD BETWEEN FOOD AND HEALTH, LEGAL, ECONOMIC, FINANCIAL AND ETHICAL INTERESTS ARE MODULATORY

Introduction

Ensuring access to food is one of the main pillars of the global sustainability goals. The challenge of feeding an expanding global population is complicated by the dual demands for both quantity and quality. Consumer expectations are for clean, spotless, uniform, and herbicide-free products. This has led to widespread reliance on agrochemical interventions to provide quantity and desired quality.

This editorial aims to explore the paradox in contemporary food systems: the use of chemicals, particularly herbicides, to satisfy consumer demands on one hand, and the potential consequences for human health on the other. The core message is that waste management plays a crucial role in resolving this paradox. Legal issues, economics/finance, and ethics influence the presence of chemicals in food, but do not determine it. Glyphosate will be used as a case study because of its significant role in modern agriculture and its controversial toxicological and regulatory history.

Glyphosate as a Model Chemical

Since its introduction in the 1970s and the subsequent release of glyphosate-resistant genetically modified (GM) soybean crops in 1996, glyphosate has become the most widely used herbicide worldwide, best known commercially as Roundup, The main advantage of glyphosate over other herbicides is its selective biological target in plants: an enzyme called EPSPS. This enzyme is absent in human cells, which explains glyphosate's low acute toxicity and accounts for its widespread use worldwide.

However, there is a consensus that glyphosate shows toxic properties, and its potential to cause cancer is the most debated issue. Data from in vivo studies support comparisons of this carcinogenic potential with levels found in processed meat, diesel exhaust, and nitroso compounds. The available human epidemiological studies complicate this issue because of the lack of individual exposure assessments, thereby limiting causal conclusions. This methodological gap is often cited by glyphosate supporters to dismiss concerns, despite the increasing accumulation of toxicological evidence and public calls for stricter regulation.

Human exposure to glyphosate is widespread, and numerous studies have detected glyphosate in the urine of up to 90% of tested individuals across various populations. Although these concentrations are below toxic thresholds, available data on glyphosate levels in biological fluids (blood and urine) suggest they are within the same concentration range as endogenous signalling molecules (hormones, neurotransmitters…), raising a valid concern and warranting closer scrutiny.

The toxicological profile of glyphosate has expanded over the past decade, revealing its interactions with microorganisms in the mammalian gut and in insects, amphibians, and other organisms. However, the precise scientific details are still under investigation. Potential effects on neurological and endocrine systems have been identified. I have recently outlined the current toxicological profile of glyphosate in some detail (Fraeyman, 2025). While suggestive evidence exists, a conclusive mechanistic understanding remains elusive, maintaining a policy impasse.

Regulatory Decisions

Glyphosate has undergone several regulatory reviews in Europe – in 2002, 2012, 2017, and most recently in 2019-2023 – with the European Commission renewing its approval until 2033. This decision was based on the European Food Safety Authority's (EFSA) assessment, despite political and public opposition and two unsuccessful committee votes due to disagreement among the European Member States. EFSA concluded that there was insufficient evidence to justify a ban but implemented restrictions, such as prohibiting the use of glyphosate in public spaces and playgrounds. The approval for continued use also involves strict limits on the amount of glyphosate permitted in various food products, known as Maximum Residue Levels (MRLs). These levels are established as safe thresholds to prevent toxic effects from consumption.

All this creates the impression of a strict and well-regulated control system. However, despite claims of safe levels for each type of food (fruit, meat, drinks...), daily consumption results in cumulative exposure to glyphosate, potentially exceeding the allowable daily intake (ADI). Even more concerning is the nearly constant—and involuntary—exposure to these low concentrations, raising essential questions about their long-term effects on human health and sustainability. This is a crucial factor to consider in risk assessment and management.

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Economic and/or financial interests

There is no doubt: glyphosate is the most successful herbicide ever produced The glyphosate market is estimated to be between 600.000 and 800.000 tonnes/year globally. The market value of glyphosate is estimated at 10-15 billion dollars in 2030. Useless to say that this is a firm financial and economic argument in the hands of those who are in favour of retaining and intensifying the use of glyphosate as the herbicide of choice.

Illustrative of the economic and financial significance are the intensive lobbying efforts by companies producing glyphosate across various decision-making bodies. Data from lobbyFacts.EU for 2022 reveals that Bayer spends over 6 million euros at the European level, with a significant portion likely allocated to supporting the approval for the continued use of glyphosate.

A complete and immediate ban on glyphosate would entail a substantial increase in food costs. Consumers' demand for quality food will remain, and other methods of controlling herbs will be needed, among them costly hand labour. derations. Hence, the balance between economic and financial considerations/financial and health considerations, on the other hand, dictates a gradual, well-controlled phasing out of glyphosate over sufficient time to allow agriculture to adopt alternative methods. This should also prompt producers of agrochemicals to seek alternatives to glyphosate.

Ethical Considerations and the Involuntary Nature of Exposure

The modest carcinogenicity of glyphosate is often cited as a sufficient argument not to discontinue its use. However, this argument is flawed for two reasons. Unlike voluntary exposures such as tobacco, alcohol, or red and/or processed meat, exposure to glyphosate is primarily involuntary. People have limited options to avoid dietary and environmental exposure to glyphosate and similar substances, making it essential for regulatory bodies to apply the precautionary principle when uncertainties persist. Unfortunately, this ethical perspective is largely absent from EFSA's public communications and scientific evaluations.

This ethical component is further emphasized when considering glyphosate as part of the exposome —the totality of (chemical) exposures an individual encounters throughout life. The ubiquitous use of glyphosate makes it highly likely that glyphosate is, and probably an important component of, the exposome. The concept of the exposome further strengthens the notion of chemical interactions, although this is scientifically underexplored.

Food Waste, Waste Management, and Chemical Redistribution

Waste – broadly defined as any human-made material requiring disposal or repurposing – has become more complex since the start of industrialisation, especially with the rise of synthetic chemicals, some of which are found in everyday food. Although some food waste is destroyed during household waste management, practices such as redistributing surplus food and using food as animal feed do not eliminate chemical residues in food. Notably, the Environmental Protection Agency (EPA – USA) identifies "Donate or Upcycle" and "Animal Feed" as valuable methods for reducing the environmental impact of food waste (EPA, 2025). An estimated 30% of our food waste is repurposed as animal feed, much of which is then reintroduced into the human food chain. This is not a call for the destruction of more food waste, but rather an appeal to reduce glyphosate levels in food, thereby preventing continued human exposure.

Taken together, a substantial portion of chemically contaminated food waste is incorporated into circular economy models, such as the reuse of human food waste for animal feed. This practice is problematic unless it is accompanied by rigorous chemical monitoring and comprehensive regulatory reform.

Conclusios

The 2023 reauthorization decision by the European Commission illustrates the broader tensions between regulatory standards, scientific uncertainty, and precautionary principles. The widespread use of glyphosate epitomizes a broader systemic challenge at the intersection of food production, public health, environmental ethics, and economic interests. While regulatory bodies continue to emphasize insufficient evidence for restricting glyphosate, the growing body of toxicological data suggests the need for a more precautionary and ethically attuned approach.

Ultimately, addressing this issue demands an integrated response: advancing our understanding of chemical exposures through scientific innovation, reassessing regulatory frameworks in light of ethical considerations, and reforming waste management systems to prevent the continuous spread of chemical contaminants. The recently launched International Research Association on Circular Economy (IRACE) exemplifies the kind of initiative required (IRACE, 2025). Only through such interdisciplinary efforts can we begin to reconcile the competing demands of feeding the global population while safeguarding human and environmental health.

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REFERENCES

EPA (2025). https://www.epa.gov/sustainable-management-food/prevent-wasted-food-through-source-reduction.
Fraeyman N. (2025). Glyphosate 2023-2033. Springer Nature, Switzerland. https://doi.org/10.1007/978-3-031-97540-0.
IRACE (2025). https://irace.eco/