

Commentary

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PESTICIDE REGULATION AND THE OMNIBUS PROCESS A systems-based regional management approach: operational framework, fair access, and market incentives

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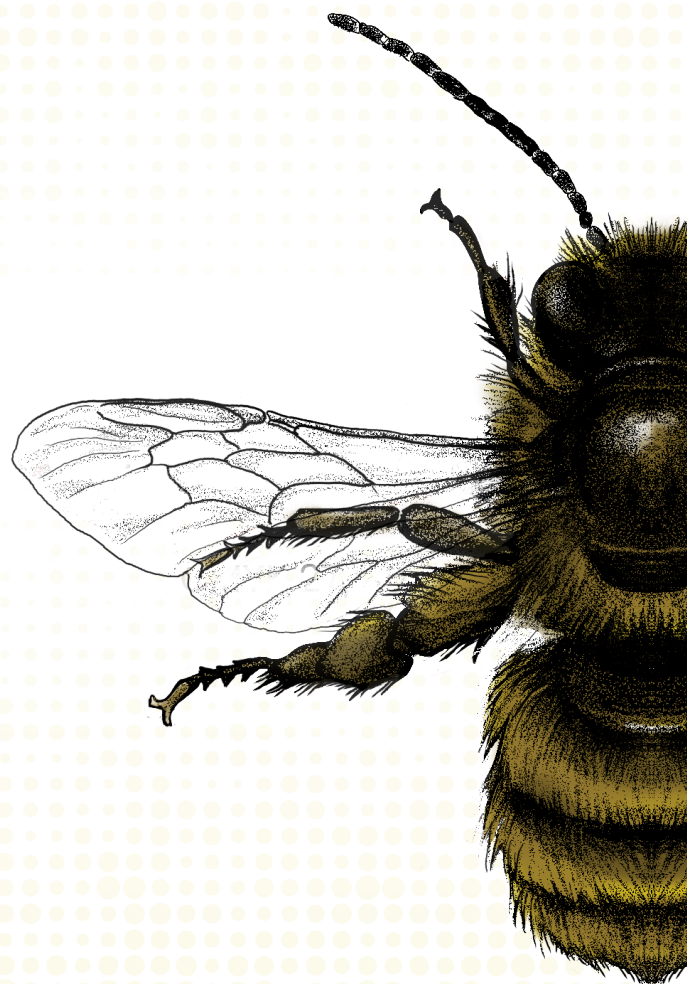
PESTICIDE REGULATION AND THE OMNIBUS PROCESS

A systems-based regional management approach: operational framework, fair access, and market incentives

Christopher John Topping, Johan Axelman, James Henty Williams

Key message

Current EU pesticide regulation assesses substances individually, but environmental impacts arise cumulatively across landscapes. A regional budget system, assigning each ecological region an annual capacity of permitted pesticide pressure, can align regulation with EU environmental law, simplify approvals, incentivise lower-impact products, and support resistance management. A well-designed access framework ensures that budget capacity is distributed equitably, with no operator able to monopolise a shared regional resource.



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1. The Structural Problem

EU pesticide regulation under Regulation (EC) No 1107/2009 evaluates active substances individually. Each product is assessed in isolation against standardised ecotoxicological endpoints. This approach has delivered harmonised authorisation procedures, but it was not designed to manage the cumulative chemical pressure that determines real-world ecological outcomes.

Groundwater contamination, pollinator decline, and farmland biodiversity loss arise from the combined effect of multiple substances applied across entire landscapes over time, not from individual product applications assessed independently. The Water Framework Directive, Nature Restoration Law, and Natura 2000 obligations all set outcome-based targets that operate at landscape scale. The result is a structural mismatch: a product-based regulatory method trying to deliver landscape-scale ecological outcomes.

The core problem is not insufficient data on individual substances. It is that individual-substance assessment cannot, by design, address cumulative pressures. Increasing the volume of product-level assessments does not resolve this.

A systems-first approach to environmental risk assessment addresses this directly. Rather than asking whether a substance is safe in isolation, it asks how much total chemical pressure an ecosystem can sustain while maintaining functional coherence, supporting productive agriculture, and meeting legal protection obligations over the long term. That question is answered once at the landscape or regional system scale, and individual product uses are then managed as allocations within defined ecologically resilient regional capacity.

2. How the Regional Budget System Works

The operational mechanism is a Regional Cumulative Assessment Group (RCAG) budget. Each defined ecological region, aligned with Water Framework Directive river basin districts, receives an annual allocation of toxic units (TU) for defined receptor groups: pollinators, aquatic invertebrates, non-target arthropods, and groundwater quality.

Active substances are assigned TU values derived from ecotoxicological endpoints already contained in

authorisation dossiers under Regulation 1107/2009, normalised for application rate and environmental persistence. A substance that degrades rapidly and has low acute toxicity carries a low TU cost per hectare. A persistent substance with high ecotoxicity carries a high TU cost. The values are not new assessments; they are a standardised re-expression of data that already exists.

2.1 Operational workflow

The system operates through a pre-application notification process linked to the CAP Land Parcel Identification System (LPIS):

- A farmer intending to apply a pesticide registers the intended application, covering product, rate, and parcel, through a digital notification system before spraying.
- The system calculates the TU impact of the intended application and checks it against the remaining regional TU allocation budget for the current season.
- If budget remains available, the application is confirmed. If the regional budget is exhausted, the application cannot be authorised for that season.
- Compliance monitoring is therefore largely automatic and occurs before pesticide use, rather than relying on retrospective inspection.

DENMARK AS PROOF OF CONCEPT

Denmark already operates the infrastructure on which this system would rely: mandatory digital pesticide use reporting under the Plant Protection Products Register, high-resolution LPIS parcel data, and groundwater monitoring under both national law and the Water Framework Directive. Denmark's Boringsnære Beskyttelsesområder (BNBO) system, established under the Environmental Protection Act (amended 2024), requires mandatory designation of protection zones around drinking water boreholes. Within these zones, plant protection products are not automatically prohibited; instead, continued use requires a formal application and is subject to negotiated agreements, with compensation available to farmers where use is restricted. This application-based permission model is closely analogous to the RCAG pre-notification approach. The RCAG framework would extend this existing architecture from point-source borehole protection to e.g. catchment-scale cumulative pressure management. No new data infrastructure is required; the regulatory logic is extended, not replaced

3. Fair Access: Preventing Monopolisation of the Regional Budget

A shared regional TU allocation budget functions as a common-pool resource. Without explicit allocation rules, it is subject to the same risks as other common resources: early or large-scale actors

could exhaust the budget before smaller or later operators have access. This section sets out a framework for fair access that prevents monopolisation while preserving operational flexibility.

3.1 Baseline entitlement allocation

Each farm holding registered under the CAP LPIS would receive a baseline TU entitlement proportional to its eligible agricultural area and declared crop types. Entitlements would be calculated from historic cropping patterns and standard crop protection profiles, analogous to the allocation of CAP payment entitlements. This ensures that all operators begin each season with a defined share of the regional budget, rather than competing on a first-come, first-served basis.

Entitlements would be differentiated by land use. Arable land in intensive production would carry a

higher baseline entitlement than permanent grassland or low-input systems, reflecting realistic pesticide demand. Organic holdings would retain nominal entitlements that can be banked or transferred, incentivising conversion without penalising existing organic operators. At the same time, the system can encourage coordination of pesticide and integrated pest management (IPM) with landscape resilience measures at farm and regional level, for example by linking allocation rules or top-ups to CAP eco-schemes, agri-environment-climate commitments and cooperation interventions

3.2 Use-it-or-lose-it provisions

Unused entitlement at the end of a season would not roll over automatically. A defined carry-forward threshold, for example, 20% of the annual entitlement, could be permitted to account for weath-

er-driven variation in spray windows. Beyond this threshold, unused entitlement returns to a regional reserve. This prevents strategic hoarding of budget capacity by large operators across seasons.

3.3 Regulated secondary market with holding caps

A limited secondary market in TU entitlements would be permitted to allow flexibility between holdings. Farmers facing unexpectedly severe disease or pest pressure could acquire additional entitlement from holdings with surplus capacity. To prevent consolidation:

- A per-holding maximum on total TU capacity, including purchased entitlement, would be set at a defined multiple of the baseline entitlement for that holding's area and crop type.
- Transfers would be registered through the same digital notification system, creating a transparent public record of entitlement holdings.

Entitlement purchased on the secondary market would expire at the end of the season and could not itself be re-transferred, preventing the emergence of entitlement brokers disconnected from active farming.

This structure is analogous to quota systems in fisheries management, where individual transferable quotas allow economic flexibility while total catch remains bounded (Arnason, 2012, Marine Policy), and CAP safeguards for active farmers should be used to prevent undesired market effects such as loss of the erosion of small and medium farm viability, barriers for new entrants and excessive concentration through accumulation by large holdings.

3.4 Reserved allocation for new entrants and small farms

A proportion of the regional budget, suggested at 5 to 10%, would be held in a managed reserve administered at Member State level. This reserve would provide baseline TU allocations for new entrants to farming, recently restructured holdings, and farms

below a defined area threshold. This prevents the baseline allocation system from inadvertently locking out smaller operators who lack the historic CAP records on which an entitlement calculation would be based.

3.5 Differential pricing and taxation

Baseline entitlements could be issued without charge as part of CAP conditionality. Use of higher-TU substances beyond a defined threshold within a holding's entitlement could attract a differential levy, applied at the point of product registration in the pre-application system. This levy would:

- Create an additional economic signal reinforcing the TU cost already embedded in the budget system.
- Generate revenue that could be recycled into IPM advisory services, resistance monitoring networks, and rural development funds at regional level.

- Avoid penalising necessary use: the levy would apply to high-TU products used at high rates, not to all pesticide applications. Essential and targeted uses within entitlement remain available to all operators.

Differential taxation of higher-hazard pesticides already has precedent in several Member States, including Denmark and Sweden, and is compatible with EU internal market rules where applied on objective environmental criteria (European Commission, 2022, Taxes on pesticides in EU member states).

4. Market Incentives: Rewarding Target-Specific, Lower-Impact Products

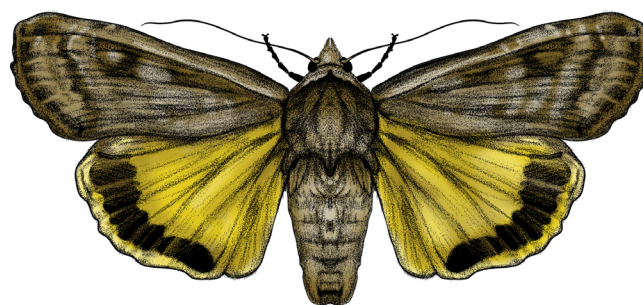
The TU burden cost structure creates a structural market incentive that the current product-by-product system does not provide. Under the current system, a highly selective, rapidly degrading product

and a broad-spectrum persistent product may both be approved with equivalent regulatory status. The farmer's choice between them is driven primarily by efficacy and financial pricing.

Under the RCAG budget system, a lower-TU product burden costs less from the farmer's seasonal entitlement. If a selective fungicide delivers equivalent disease control at half the TU burden of a broad-spectrum alternative, a farmer under pesticide budget pressure has a direct incentive to prefer it. This then creates an incentive for manufacturers to invest in the development of target-specific, environmentally more benign products: not because of regulatory mandate, but because lower TU burden is a commercial advantage.

The TU budget serves as an embedded indicator of cumulative burden within the regulatory architecture, influencing behaviour without prescribing which products farmers must use.

This incentive also benefits innovation in biological and semi-chemical crop protection products. Biopesticides and semi-chemicals typically carry very low ecotoxicological profiles and would therefore attract minimal TU burden costs, increasing their competitive attractiveness relative to synthetic alternatives without requiring specific subsidies.



5. Resistance Management and Farmer Access

5.1 Resistance management

One limitation of the current substance-by-substance approval system is that pre-emptive restrictions on individual active substances can remove tools from resistance management programmes. When a substance is banned or severely restricted, growers may be left with a reduced set of modes of action, accelerating the development of resistance in target organisms.

The RCAG budget system allows a different approach. A substance with a high TU profile, which would otherwise face restrictions based on individual-substance hazard assessment, can remain authorised for rare, targeted use within the regional budget. A grower facing confirmed resistance to the available low-TU options could access a higher-TU product within their entitlement, with the application registered through the pre-notification system.

- Rare use of higher-TU products for resistance control is accommodated within the budget

framework, without requiring substances to remain on general open-access authorisation.

- Pre-application notification records provide an audit trail linking specific applications to resistance management justifications, supporting enforcement of use restrictions.
- The budget framework incentivises rotation through diverse modes of action as a cost-efficient resistance management strategy, since maintaining chemical diversity within entitlement reduces the risk of exhausting the most cost-efficient options.

This approach is consistent with integrated pest management (IPM) principles under the Sustainable Use Directive, which already requires professional users to apply IPM and to use chemical control only where necessary after consideration of non-chemical alternatives.

5.2 Farmer access and economic implications

A common concern about environmental budget systems is that they restrict access and increase costs for farmers. The framework described here is designed to avoid this outcome:

- Baseline entitlements are allocated proportionally to farm area and crop type, ensuring that all registered holdings receive capacity sufficient for standard crop protection under typical conditions.

The secondary market allows farmers facing exceptional pest pressure to access additional capacity, preventing situations where a disease outbreak cannot be addressed within a fixed seasonal entitlement.

The system bans only extremely harmful substances and does not require farmers to use specific products. It constrains total chemical pressure at the regional scale while leaving product choice to the farmer within their entitlement.

Lower-TU products, including many currently underused selective chemistries and biolog-

icals, become relatively more cost-effective under the budget system. This may broaden the accessible product portfolio for farmers, particularly in high-pressure years, rather than narrowing it.

The system does not itself increase costs to farmers. Costs could arise if a farmer's entitlement is insufficient for their crop protection requirements and they must purchase additional capacity on the secondary market. However, this cost is bounded by the market price of surplus entitlement, which is itself determined by the regional budget level and aggregate demand. The regional budget is calibrated against ecological carrying capacity, not set arbitrarily.

6. Legislative Pathway

Implementation does not require a new legislative framework. Three targeted amendments within the current Omnibus process would be sufficient:

- 1 **Regulation (EC) No 1107/2009:** introduce a formal mechanism to link regional ecological monitoring outcomes to pesticide use conditions, and establish pre-application notification as a mandatory use condition for authorised products in defined ecological regions.
- 2 **Sustainable Use Directive (2009/128/EC):** replace or supplement national action plans with Regional Pesticide Management Plans aligned with WFD river basin districts, giving spatial ecological content to existing IPM obligations.

- 3 **Water Framework Directive (2000/60/EC) and Nature Restoration Law:** strengthen Programmes of Measures to include regional pesticide load management, and link RCAG budget calibration to restoration indicator targets under the Nature Restoration Law.



Summary comparison

Dimension	Current product-by-product system	Systems-first RCAG budget
Efficiency	Repeated per-substance assessments; duplication across Member States	System question answered once; substances allocated against regional ecological limit
Environmental protection	Cumulative landscape-scale pressures unaddressed	Cumulative pressure managed against legally binding ecological thresholds
Farmer flexibility	Binary: substance approved or banned	Portfolio choice within budget; lower-impact products cost less from the budget
Resistance management	Rare or damaging substances may be banned pre-emptively	Rare use permitted within budget for resistance control, with audit trail
Market incentives	No structural incentive for reduced-impact formulations	Lower TU cost per application incentivises development of target-specific products
Regulatory predictability	Prolonged re-evaluation uncertainty	Regional budget fixed annually; industry can plan product positioning accordingly

7. Conclusion

The EU's current pesticide regulatory architecture is structurally misaligned with the landscape-scale ecological outcome obligations established by EU environmental law. A systems-first regional budget approach resolves this misalignment by treating pesticide use as a managed cumulative variable within defined ecological regions, rather than a series of isolated product decisions.

The RCAG budget mechanism can be implemented through targeted amendments to existing legislation, using digital infrastructure already available through the CAP. A carefully designed access framework, combining proportional baseline entitlements, use-it-or-lose-it provisions, regulated secondary markets, reserved allocations for new entrants, and differential pricing, ensures that the shared regional resource is

distributed equitably and that no operator can monopolise regional pesticide capacity.

Beyond environmental protection, the system creates structural market incentives for investment in lower-impact and target-specific crop protection products, provides a coherent framework for resistance management, and preserves farmer access to the full range of authorised substances within an ecologically bounded system.

The Omnibus process is an opportunity to modernise pesticide regulation not only procedurally, but architecturally, aligning it with the ecological obligations that EU law already requires.

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This briefing was prepared to support legislative discussions within the Food and Feed Safety Omnibus process. It does not represent the position of any institution or political group. Contact: Prof. Christopher J. Topping, Department of Agroecology, Aarhus University. cjt@agro.au.dk