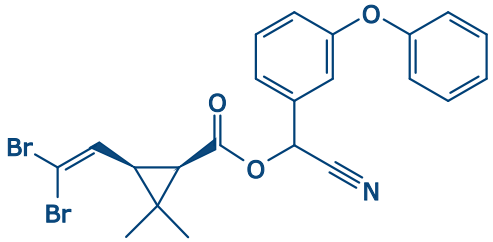
Deltamethrin, an essential substance in the PPP toolbox for stored grain protection

EXECUTIVE SUMMARY OF THE AGRONOMIC SOCIO-ECONOMIC ANALYSIS OF DELTAMETHRIN AS AN INSECTICIDE ON STORED GRAINS

GRAIN STORAGE AND DELTAMETHRIN AS AN INSECTICIDE

Insect infestations pose a major threat to the quality and quantity of grain during storage and transportation. **Pest numbers and pressure are increasing with climate change**, reinforcing the need to **preserve stored grains from deterioration caused by pests**, particularly at a time of increasing geopolitical pressure. These **food security and safety stakes** are widely supported through **European policies**, notably in the One Health approach and the "Farm to Fork" strategy.

The grain industry relies heavily on effective grain protection products, which is reflected in the Common Agricultural Policy's objectives and EFSA's Good Agricultural Practices. In particular, **Deltamethrin, a synthetic pyrethroid, has become well-known for effectively targeting a wide range of agricultural pests in stored grains**. In 2016, **around 78% of the total volume of cereals stored in silos were treated with Deltamethrin**.



Compared to other plant protection products, **Deltamethrin stands out for its broad efficacy against both crawling and flying insects**, making it **suitable for various grains like corn, rice, and rye**. It can be directly applied to grains with a low application rate, requiring only 4,2 to 10 litres of formulated products, depending on the formations and on the conditions, to treat 100 tons. **The product offers easy use in all types of silos**, has no withholding period, and is effective for both disinfecting storage facilities and treating commodity crops. It can be applied to different surface types and is easily handled by professionals, with no hazardous reactions when stored and used properly.

REGULATORY CONTEXT AND METHODOLOGY

Deltamethrin is an approved insecticidal active substance under the EU Plant Protection Products Regulation (PPPR). Currently, Deltamethrin is in the renewal process under the PPPR. **This Agronomic Socio-Economic Analysis (ASEA) assesses the order of magnitude of potential socio-economic impacts resulting from the hypothetical non-approval of Deltamethrin for grain storage applications. The analysis also assesses the availability of feasible and economically viable alternatives to Deltamethrin.**

This ASEA follows:

- the methodology recommended by the European Chemicals Agency (ECHA) for the SEA, which is commonly used for REACH authorizations and restrictions.
- the methodology for the Assessment of Alternatives (AoA) was adapted from the Biocidal Products Regulation (BPR) in alignment with the European Food Safety Authority (EFSA) guidance for Article 4(7).

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CHEMICAL ALTERNATIVES

Our assessment **identified initially 14 potential chemical alternatives to Deltamethrin**, but only four —**Spinosad, Cypermethrin, Malathion, and Pirimiphos -methyl** — met the technical requirements criteria (defined in **section 3.2.4**) for further in-depth analysis. Despite their interesting profiles, all four analyzed substances presented various issues. For instance:

SPINOSAD

Spinosad has limitations in terms of its effectiveness against certain pest species. Additionally, its regulatory profile raises concerns. The EFSA conclusions confirm a classification as a CMR substance (Reprotoxic) Category 2. These toxicological and regulatory concerns could impact its acceptability and long-term viability in pest control applications. Spinosad could be a complement to Deltamethrin to prevent potential resistance issues but only with a clean label.

CYPERMETHRIN

Cypermethrin shows high resistance and the same initial issues as Deltamethrin, with less efficacy. Additionally, its use on stored grains has been significantly restricted due to new Maximum Residue Level (MRLs) regulations. As a result, Cypermethrin is no longer approved for application directly onto grains and is only permitted for use in treating empty silos, as biocidal compound, limiting its practicality as an alternative.

MALATHION

Malathion, while effective, **raises concerns about human health risks** and environmental impact. In addition, the substance was not developed in Europe, so there are no approved formulations for the protection of stored grains on the market.

PIRIMIPHOS-METHYL

Pirimiphos-methyl, too, has faced scrutiny due to its toxicity and **potential to disrupt ecosystems**, while its renewal in 2025 is very hypothetical.

The main challenge associated with Deltamethrin is the development of resistance among target pest populations. However, this issue is **effectively addressed with the unique combination of Deltamethrin and the synergist Piperonyl butoxide (PBO)s**. This combination enhances the efficacy of Deltamethrin, significantly reducing resistance issues, ensuring Deltamethrin remains below MRLs and maintaining its effectiveness as a highly efficient insecticide for stored grains.

NON-CHEMICAL ALTERNATIVES

In our exploration of non-chemical alternatives to Deltamethrin, various methods and strategies to control pest populations in stored grains have been identified. However, despite the potential benefits, several challenges hinder their feasibility and widespread adoption:

Physical methods

Physical methods such as temperature manipulation, aeration, moisture control, triage and mechanical barriers have been suggested as alternatives to chemical pesticides. **These methods often require significant economic investments, energy input and can be logistically challenging**, particularly in large-scale storage facilities as they often require significantly more time to be effective and properly implemented. **Physical methods are usually more considered as monitoring tools or as complementary to chemical treatment**. Particularly, moisture levels and temperature are continuously increasing due to climate change, leading to the ineffectiveness of various methods in such conditions, such as aeration.

Biological control methods

Biological control methods, including the use of natural predators or parasites of stored grain pests, have also been considered. While this approach can be seen as environmentally friendly and sustainable, it has significant limitations. These methods are not effective enough because they target specific pest hosts and require very specific conditions to work. Furthermore, if these biological agents die in the silo, they contribute to contamination, leading to dirtier grains and additional challenges in maintaining grain quality.

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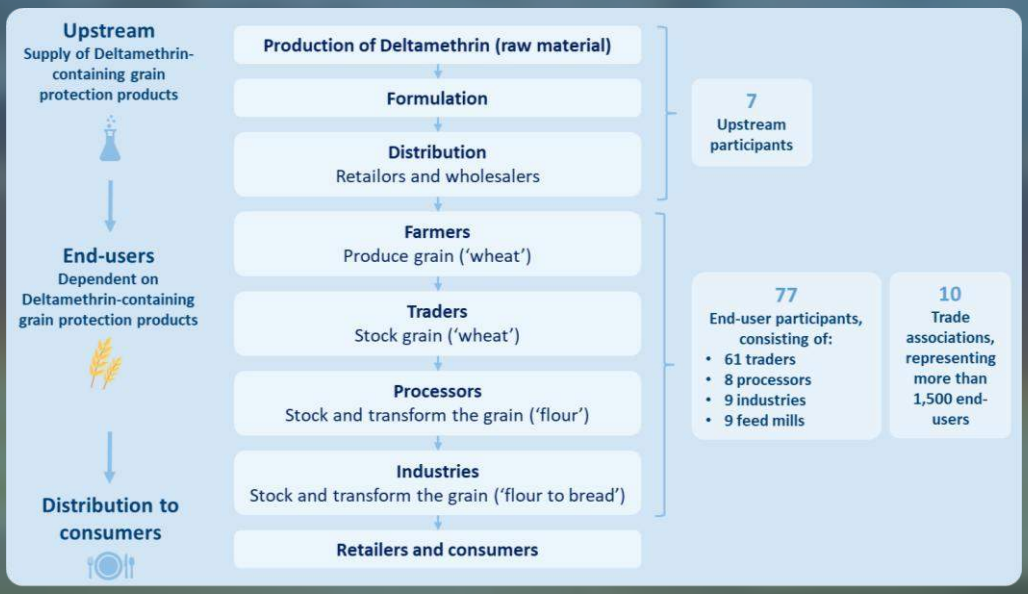
OVERVIEW OF THE PARTICIPANTS



SOCIO-ECONOMIC IMPACTS

Monetised impacts	**Upstream:** **> 27.4 million EUR** over a 4-year period	9.3 million EUR **economic impacts** (i.e., EBIT losses)
		18.1 million EUR **social impacts** (i.e., unemployment)
	Downstream: **> 2.7 billion EUR** over a 4-year period	2.7 billion EUR **economic impacts** (i.e., sales losses)
		130 FTE employees facing layoff
Non-monetised impacts	**Adverse impacts** related to grain waste, quality of stored grains, sustainability, and competitiveness	Concerns about **increased grain spoilage** and **waste**
		Due to **higher operational costs**, concerns about a **reduced competitiveness** of the EEA
		Concerns about the **quality** of stored grains, driven by physical damage, contamination, and mycotoxin
		Increasing environmental pressure is already contributing to an **increased pest pressure**
		Increased contamination of insects and compromised system efficiency

Economic impacts

Upstream companies have projected net EBIT losses of approximately **9.3 million EUR** over four years. Downstream end-users have reported sales losses of more than **2.7 billion EUR** over the same four-year-period.

Social impacts

The analysis also assessed the social costs of unemployment, estimating these costs at about **18.1 million EUR** across the EEA at the upstream level. Participating end-users project varying employment impacts, but the overall net effect reported indicates employment loss.

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WIDER IMPACTS

GRAIN QUALITY

Without access to Deltamethrin, grain storage facilities face increased challenges in controlling pest infestations. Deltamethrin is used to protect against common grain storage pests such as beetles, weevils, and moths. These pests can cause physical damage, contamination, and can result in mycotoxins – which are harmful to both human and animal health.

SPOILAGE, WASTE, AND SUSTAINABILITY

Without access to Deltamethrin, grain storage facilities face increased challenges in controlling pest infestations. Deltamethrin is used for protecting against common grain storage pests such as beetles, weevils, and moths. These pests can cause physical damage, contamination, and can result in mycotoxins – which are harmful to both human and animal health.

COMPETITIVENESS

Without access to Deltamethrin, EEA grain producers and storage operators would incur higher operational costs to manage insect pressure in their grain storage practices. 62 out of 77 participating end-users indicated they anticipated an increase in operational costs. Non-EEA grain storage operators who retain access to Deltamethrin would have a distinct advantage. This disparity will make it difficult for EEA producers to compete in regions where Deltamethrin remains approved.

Conclusions of the Agronomic Socio-economic analysis of Deltamethrin

ON ALTERNATIVES & SUBSTITUTION

After evaluating 14 alternative substances and non-chemical options, no suitable or effective alternatives are currently available. Chemical alternatives do not meet the technical requirements of Deltamethrin-based products for stored grain and are often more expensive. While non-chemical methods hold potential, they tend to be more costly and less effective than Deltamethrin, especially in cases of severe infestations and challenging conditions. Most non-chemical alternatives are better suited as complementary tools rather than full substitutes.

Furthermore, **developing alternatives plant protection products to Deltamethrin typically takes 12 to 18 years**, with high costs and regulatory hurdles, making it **unlikely that a viable replacement for stored grain uses will emerge anytime soon**.

ON SOCIO-ECONOMIC IMPACTS

The non-approval of Deltamethrin for stored grains would result in total losses of 27.4 million EUR upstream and 2.7 billion EUR downstream, causing a disproportionate negative impact on society. This includes the **potential layoff of 130 full-time employees**, reduced competitiveness in the EEA, increased grain spoilage and waste, and heightened pest pressure.

Given the lack of a technically feasible, economically viable, and safer alternative to Deltamethrin, this assessment concludes that non-approval of Deltamethrin for grain storage under the PPPR would have major socio-economic implications for grain storage operators, for the cereal sector and the EEA society. The analysis indicates substantial economic losses, potential job layoffs, and significant challenges related to grain quality, grain value and competitiveness.