

Pesticide Residues in Horse Feedstocks: A Regulatory Proxy Framework Using Human Food and Feed Standards

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Abstract

There appears to be little equine-specific research addressing the cumulative effects of long-term exposure to residual pesticides in horse feedstocks such as straw. In the absence of an equine-specific chronic exposure framework, the existing European and UK regulatory framework for pesticide maximum residue levels (MRLs) in food and feed provides a pragmatic proxy benchmark. This report sets out that rationale, summarises the relevant regulatory wording, and places straw in context by comparing pesticide use intensity in cereal systems versus forage/grassland systems. The evidence reviewed suggests that cereal crops, from which feed straw is derived, are treated far more extensively and with a broader range of pesticide classes than forage grassland, supporting the view that straw may represent a systematically higher pesticide-exposure feedstock than hay or grass forage.

1 Introduction

Horse diets may include substantial amounts of straw, particularly where straw is used as a forage extender or partial forage substitute. However, despite the likely relevance of residual agricultural pesticides, there does not appear to be an established equine-specific regulatory framework for chronic dietary pesticide exposure in straw. In contrast, there is a mature legal framework governing pesticide residues in food and feed intended for human consumption and the human food chain.

The present report does not assume that human food/feed MRLs are direct equine toxicological thresholds. Rather, it uses them as an established regulatory benchmark for contextualising pesticide residues in horse feed materials, especially straw, where equine-specific chronic exposure data appear sparse.

2 Regulatory Framework

The core legal instrument is Regulation (EC) No 396/2005, retained in UK law. Article 3 defines a maximum residue level as:

“the upper legal level of a concentration for a pesticide residue in or on food or feed set in accordance with this Regulation, based on good agricultural practice and the lowest consumer exposure necessary to protect vulnerable consumers.”

This definition is useful for the present purpose for two reasons. First, it confirms that pesticide residues in *feed* are explicitly within scope. Second, it shows that MRLs are not arbitrary numbers; they exist because regulators regard pesticide residues in food and feed as requiring legal control.

A careful interpretation is therefore as follows: MRLs should not be treated here as proof of safety or harm in horses, but as evidence that regulators consider pesticide residues in feed materials sufficiently important to warrant legally defined upper limits. In a data-poor equine context, this makes the human food/feed MRL framework a rational proxy benchmark.

3 Why Straw Merits Particular Attention

The argument for using straw as a special case is not merely theoretical. UK pesticide usage data indicate that arable cereal systems are treated much more intensively than forage systems. Since feed straw is a by-product of cereal production, it is reasonable to infer that straw is exposed to a different pesticide environment from hay or grass forage.

The UK Pesticides National Action Plan explainer states that arable farming accounts for around 85–90% of total pesticide use in UK agriculture and horticulture. This is an important contextual point, because cereals dominate the arable sector. The Scottish Government’s 2022 survey of arable crops reported that pesticides overall were applied to 97% of arable crop area, with fungicides applied to 94%, herbicides/desiccants to 93%, and growth regulators to 56% of crop area. By contrast, the AFBI 2021 survey of grassland and fodder crops reported herbicide treatment on 50% of first-cut grass silage and 45% of enclosed grazing area.

4 Headline Comparison: Cereal Versus Forage Systems

Table 1 summarises the practical contrast most relevant to horse feeding.

This gives a simple comparison that can be stated plainly:

Table 1: Indicative comparison of pesticide treatment intensity in cereal and forage systems

Parameter	Cereal / arable crops (straw source)	Forage / grassland systems
Overall significance in UK pesticide use	Arable farming accounts for about 85–90% of total pesticide use in UK agriculture and horticulture	Lower overall contribution than arable systems
Typical treatment prevalence	In Scotland 2022, pesticides were applied to 97% of arable crop area	Herbicide treatment reported on 50% of first-cut grass silage and 45% of enclosed grazing in AFBI 2021
Major pesticide classes	Herbicides/desiccants, fungicides, growth regulators, some insecticides	Predominantly herbicides
Treatment pattern	Often multiple applications across the season	More limited, often herbicide-led rather than broad multi-class programmes
Implication for feed exposure	Straw likely to arise from a more heavily treated crop system	Hay/forage likely to arise from a less intensively treated system

Cereal crops are treated much more extensively than forage/grassland systems, and straw therefore likely represents a systematically higher and more complex pesticide exposure source than hay or grass forage.

5 Regulatory Proxy Argument for Horses

The core argument of this report is intentionally modest. It is not that human MRLs establish equine safety thresholds. Rather, the argument is that:

1. There is an established legal framework for controlling pesticide residues in food and feed.
2. Straw is a feed material arising from cereal systems that are treated intensively with pesticides.
3. There appears to be no equivalent equine-specific chronic residue framework for straw.
4. Therefore, the existing food/feed MRL framework is a reasonable proxy benchmark for interpreting pesticide residues in horse feedstocks.

This can be stated as follows:

In the absence of equine-specific regulatory thresholds for chronic dietary pesticide exposure, the EU/UK maximum residue level framework for food and feed provides a useful proxy benchmark for horse feed materials such as straw. These MRLs are established legal limits intended to control pesticide residues in food and feed under good agricultural practice and consumer protection principles. They are not, however, equine toxicological thresholds. Accordingly, they are used here as a contextual and regulatory reference point rather than as direct evidence of safety or harm in horses.

6 A Usage-Based Straw Watchlist

Usage data do not prove residue persistence in straw, but they do identify which pesticide classes and active substances are most relevant as first-pass markers of likely exposure. Based on the Scottish arable survey and related UK data, the most relevant groups for straw appear to be herbicides/desiccants, fungicides, and growth regulators.

Table 2: Usage-based candidate pesticide markers for cereal straw

Active substance	Crop-use rationale	Likely relevance to straw
Glyphosate	Important herbicide/desiccant in cereal systems	Relevant where used late or pre-harvest
Fluroxypyr	Widely used cereal herbicide	Plausible marker of cereal herbicide exposure
MCPA / Mecoprop-P	Common broadleaf weed herbicides	Relevant as cereal field-use markers
Aminopyralid / Triclopyr	Herbicides also relevant in grassland systems	Useful for comparing straw and forage exposure profiles
Prothioconazole	Major cereal fungicide	Marker of intensive cereal disease-control programmes
Folpet	Important cereal fungicide in survey summaries	Marker of fungicide-treated cereal systems
Chlormequat	Classic cereal growth regulator	Particularly useful as a straw-relevant cereal agronomy marker

Active substance	Crop-use rationale	Likely relevance to straw
Trinexapac-ethyl	Widely used cereal growth regulator	Further marker distinguishing cereals from ordinary forage
Lambda-cyhalothrin	Common cereal pyrethroid insecticide	Secondary marker of broad-spectrum crop protection

These actives are included here as *usage-based proxy markers of exposure*, not as confirmed straw residues. That distinction is important.

7 Discussion

The regulatory and survey evidence reviewed here supports three practical conclusions.

First, pesticide residues in feed are not a fringe issue. They are already recognised within a formal legal framework through Regulation (EC) No 396/2005.

Second, cereal systems are not comparable to forage systems in pesticide intensity. Straw is not simply another fibre source; it is a by-product of a crop production system characterised by extensive herbicide, fungicide and growth-regulator use.

Third, because equine-specific chronic residue frameworks appear lacking, it is reasonable to use the existing human food/feed residue framework as a benchmark. This does not allow direct claims such as “below MRL means safe for horses” or “above MRL means harmful to horses.” What it does allow is a more disciplined and evidence-based interpretation than would be possible in the complete absence of any benchmark.

8 Limitations

Several limitations should be stated explicitly.

1. Pesticide usage data are not the same as measured residue data.
2. Residue presence in grain is not necessarily identical to residue presence in straw.
3. Human food/feed MRLs are legal regulatory limits, not equine toxicological thresholds.

4. Extrapolation from a human regulatory framework to horses is therefore heuristic and contextual, not definitive.

These limitations do not invalidate the approach. Rather, they define the appropriate strength of the conclusions.

9 Conclusion

In the absence of equine-specific chronic dietary exposure thresholds for pesticide residues in straw, the existing EU/UK food and feed MRL framework offers a rational regulatory proxy. This is strengthened by UK pesticide usage survey data showing that cereal systems are treated much more extensively than forage systems. Straw therefore likely represents a higher and more complex source of pesticide exposure than hay or grass forage. The human food/feed MRL system should not be interpreted as a direct equine safety standard, but it provides a defensible benchmark for contextualising pesticide residues in horse feedstocks where equine-specific data are limited.

References

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