

Question:

What are the main sources of ammonia (NH₃) emissions in UK agriculture ?

Source: clean-air-strategy-2019.pdf

Expected answer: The main agricultural sources of ammonia emissions in the UK include livestock manures, particularly from cattle and pigs, slurry storage, and the application of inorganic fertilizers. The strategy also highlights poor spreading techniques as a major contributor.

Source:

Expected answer:

GPT-3.5, text, TF-IDF + Cosine

The main sources of ammonia (NH₃) emissions in UK agriculture include the storage and spreading of manures, slurries, and fertilizers. Additionally, a portion of ammonia emissions in the UK comes from the waste sector, vehicles, human waste, and industry. Agriculture accounts for the majority (88%) of NH₃ emissions in the UK, with a smaller percentage coming from the waste sector and other miscellaneous sources.

[1] clean-air-strategy-2019.pdf | Score: 0.323

[2] Revised_National_Air_Pollution_Control_Programme__NAPCP_.pdf | Score: 0.242

[3] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.241

GPT-3.5, text, BM25

The main sources of ammonia (NH₃) emissions in UK agriculture are from the storage and spreading of manures, slurries, and fertilizers. Additionally, a small percentage of ammonia emissions in the UK come from the waste sector and a diffuse mix of sources including vehicles, human waste, and industry.

[1] clean-air-strategy-2019.pdf | Score: 19.290

[2] Air quality_ policies, proposals and concerns.pdf | Score: 19.070

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 19.062

GPT-3.5, text, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture include the spreading of slurries and inorganic fertilizers. These activities contribute to around 96% of ammonia emissions in the UK from the agricultural sector. Additionally, emissions from the waste sector industry also contribute to a smaller percentage of ammonia emissions in the UK.

[1] Guide to UK Air Pollution Information .pdf | Score: 0.470

[2] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.443

[3] Air quality - GOV.UK.pdf | Score: 0.439

GPT-3.5, text, No-RAG

The main sources of ammonia emissions in UK agriculture include:

1. Livestock manure: Ammonia is released from livestock manure through the decomposition of urea and other nitrogen-containing compounds.
2. Fertilizer application: Ammonia is released into the atmosphere when nitrogen-based fertilizers are applied to crops.
3. Animal housing: Ammonia emissions can occur in animal housing facilities, particularly in intensive livestock operations where animals are kept in confined spaces.
4. Slurry spreading: Ammonia can be released during the spreading of slurry on fields as a fertilizer.
5. Grazing animals: Ammonia emissions can occur from urine and feces deposited by grazing animals on pasture land.

6. Anaerobic digestion: Ammonia can be released during the anaerobic digestion process used to produce biogas from organic waste.

7. Agricultural burning: Ammonia emissions can occur during the burning of agricultural residues such as crop stubble.

Overall, livestock farming is the largest contributor to ammonia emissions in UK agriculture, accounting for around 80% of total emissions.

GPT-3.5, text, Hybrid-RAG

The main sources of ammonia emissions in UK agriculture include:

1. Livestock manure: Ammonia is released from livestock manure through the decomposition of urea and other nitrogen-containing compounds [1].

2. Fertilizer application: Ammonia is released into the atmosphere when nitrogen-based fertilizers are applied to crops [1].

3. Animal housing: Ammonia emissions can occur in animal housing facilities, particularly in intensive livestock farming systems [1].

4. Slurry spreading: Ammonia can be released during the spreading of slurry on fields as a fertilizer [1].

5. Grazing animals: Ammonia emissions can occur from urine and dung deposited by grazing animals on pasture land [1].

6. Anaerobic digestion: Ammonia can be released during the anaerobic digestion process used to produce biogas from organic waste [1].

7. Agricultural burning: Ammonia emissions can occur during the burning of agricultural residues or crop stubble [1].

Overall, livestock farming and the use of nitrogen-based fertilizers are the primary sources of ammonia emissions in UK agriculture. It is important for policymakers to address these sources to reduce ammonia pollution and its environmental impacts [2].

[1] clean-air-strategy-2019.pdf | Score: 19.290

[2] Air quality policies, proposals and concerns.pdf | Score: 19.070

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 19.062

[4] Guide to UK Air Pollution Information .pdf | Score: 0.470

[5] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.443

[6] Air quality - GOV.UK.pdf | Score: 0.439

GPT-3.5, paragraph, TF-IDF + Cosine

The main sources of ammonia (NH₃) emissions in UK agriculture are the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. Agriculture accounts for the majority of ammonia emissions in the UK, with the sector responsible for 87% to 88% of total emissions in recent years.

[1] clean-air-strategy-2019.pdf | Score: 0.407

[2] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.385

[3] Air quality policies, proposals and concerns.pdf | Score: 0.357

GPT-3.5, paragraph, BM25

The main sources of ammonia emissions in UK agriculture are cattle farming, particularly dairy farming, livestock housing, and manure application. Cattle farming, especially dairy cattle, accounts for a significant proportion of ammonia emissions, while livestock housing and manure application also contribute significantly to ammonia emissions in the agricultural sector.

- [1] clean-air-strategy-2019.pdf | Score: 23.857
[2] clean-air-strategy-2019.pdf | Score: 23.200
[3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 22.888

GPT-3.5, paragraph, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture are the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. Agriculture is the dominant sector contributing to ammonia emissions in the UK, accounting for a significant percentage of total emissions.

- [1] Air quality policies, proposals and concerns.pdf | Score: 0.849
[2] clean-air-strategy-2019.pdf | Score: 0.816
[3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.803

GPT-3.5, paragraph, No-RAG

The main sources of ammonia emissions in UK agriculture include:

1. Livestock manure: Ammonia is released from livestock manure through the decomposition of urea and other nitrogen-containing compounds.
2. Fertilizer application: Ammonia is released into the atmosphere when nitrogen-based fertilizers are applied to crops.
3. Animal housing: Ammonia is emitted from animal housing facilities, such as barns and stables, where animals are kept in confined spaces.
4. Slurry spreading: Ammonia is released when slurry, a mixture of animal waste and water, is spread on fields as a fertilizer.
5. Grazing animals: Ammonia is emitted from grazing animals as they excrete urine and feces on pasture land.
6. Anaerobic digestion: Ammonia is released during the anaerobic digestion process, which is used to break down organic waste to produce biogas.
7. Agricultural burning: Ammonia can be emitted during the burning of agricultural residues, such as crop stubble and straw.

Overall, livestock farming and the use of nitrogen-based fertilizers are the primary sources of ammonia emissions in UK agriculture.

GPT-3.5, paragraph, Hybrid-RAG

The main sources of ammonia emissions in UK agriculture include:

1. Livestock manure: Ammonia is released from livestock manure through the decomposition of urea and other nitrogen-containing compounds [1].

2. Fertilizer application: Ammonia can be emitted from synthetic fertilizers containing ammonium nitrate or urea when they are applied to fields [1].
3. Animal housing: Ammonia can be released from animal housing facilities, such as barns and stables, where animals are kept in confined spaces [1].
4. Slurry spreading: Ammonia can be emitted when slurry, a mixture of animal manure and water, is spread on fields as a fertilizer [1].
5. Grazing animals: Ammonia can be emitted from urine and feces of grazing animals, particularly in areas with high livestock densities [1].
6. Anaerobic digestion: Ammonia can be released during the anaerobic digestion process, which is used to break down organic waste to produce biogas [1].
7. Agricultural burning: Ammonia can be emitted from burning agricultural residues, such as crop residues and straw, which are commonly used as a method of waste disposal in agriculture [1].

The agriculture sector is the main source of ammonia emissions in the UK, accounting for 88% of emissions in 2016 [1]. Cattle farming, especially dairy farming, contributes significantly to ammonia emissions, while extensively grazed livestock make a smaller contribution [2].

To address these emissions, existing frameworks and policies are in place to limit ammonia emissions from agriculture. Intensive pig and poultry farms are regulated under the Environmental Permitting Regulations in England, with operators required to adopt Best Available Techniques to reduce emissions by around 30% [2]. Additionally, policies such as Farming Rules for Water, the Nitrates Regulations, and existing agri-environment and farm advice schemes help reduce ammonia emissions [2].

Ammonia emissions from agriculture impact biodiversity and contribute to the formation of particulate matter, affecting both local and transboundary environments [4]. It is crucial to continue implementing measures to reduce these emissions and mitigate their environmental impacts [5].

[1] [clean-air-strategy-2019.pdf](#) | Score: 23.857

[2] [clean-air-strategy-2019.pdf](#) | Score: 23.200

[3] [Air Quality Strategy_framework for local authority delivery.pdf](#) | Score: 22.888

[4] [Air quality policies, proposals and concerns.pdf](#) | Score: 0.849

[5] [Air Quality Strategy_framework for local authority delivery.pdf](#) | Score: 0.803

DeepSeek, text, TF-IDF + Cosine

The primary sources of ammonia (NH₃) emissions in UK agriculture arise from livestock production and fertilizer application. Specifically, these emissions occur during:

1. ****Storage and spreading of manure and slurries****: Decomposition of organic nitrogen in animal waste releases ammonia during handling and field application.
2. ****Application of inorganic fertilizers****: Synthetic nitrogen fertilizers (e.g., urea) volatilize into ammonia when applied to soils, particularly under warm or windy conditions.

Agriculture accounts for approximately 88% of total UK ammonia emissions, making it the dominant sector. Key contributors include dairy, beef, and poultry operations, where manure management practices significantly influence emission rates. The UK government has identified reducing agricultural ammonia as a priority, proposing measures such as improved storage systems, low-emission spreading techniques, and regulatory controls for intensive farming sectors.

(Note: The response synthesizes data from the policy documents without attributing specific phrasing to any single section.)

[1] clean-air-strategy-2019.pdf | Score: 0.323

[2] Revised_National_Air_Pollution_Control_Programme__NAPCP_.pdf | Score: 0.242

[3] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.241

DeepSeek, text, BM25

The primary sources of ammonia (NH₃) emissions in UK agriculture arise from livestock production and fertilizer application. Specifically, these emissions occur during:

1. ****Manure management****: Storage and spreading of animal manures and slurries from livestock operations.
2. ****Fertilizer use****: Application of both organic (e.g., manure) and inorganic nitrogen-based fertilizers to soils.

Agriculture accounts for approximately 88% of total UK ammonia emissions, making it the dominant sector. Key contributors include dairy, beef, and poultry farming, where ammonia volatilizes during housing, manure storage, and field application. The strategy highlights the need for improved practices, such as covered manure storage and precision fertilizer application, to mitigate these emissions.

(Note: The response synthesizes data from the policy excerpts without direct attribution to specific sections.)

[1] clean-air-strategy-2019.pdf | Score: 19.290

[2] Air quality policies, proposals and concerns.pdf | Score: 19.070

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 19.062

DeepSeek, text, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture stem primarily from livestock manure management and fertilizer application. Key contributors include:

1. ****Manure management****: Emissions arise from livestock housing, slurry storage, and manure spreading, accounting for a significant proportion of agricultural NH₃.
2. ****Fertilizer use****: Both organic (e.g., slurries) and inorganic nitrogen-based fertilizers release NH₃ during and after application, particularly when not incorporated into soils promptly.

These activities dominate agricultural NH₃ emissions, with manure-related processes being the largest source. Mitigation strategies often focus on improving application techniques (e.g., low-emission spreading), enhancing storage covers, and adopting precision farming to reduce excess nitrogen use.

(Note: The response synthesizes data from the UK government's air quality and agricultural policy documents

without direct attribution to specific sources.)

[1] Guide to UK Air Pollution Information .pdf | Score: 0.470

[2] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.443

[3] Air quality - GOV.UK.pdf | Score: 0.439

DeepSeek, text, No-RAG

In the UK, agriculture is the dominant source of ammonia (NH₃) emissions, accounting for around **88%** of total emissions (as of recent government reports). The main sources within the sector include:

1. Livestock Manure Management (≈50-60% of agricultural NH₃ emissions)

- **Cattle (Dairy & Beef)**: The largest contributor due to urine and dung, especially in housing, slurry storage, and grazing.
- **Poultry**: Mainly from manure in poultry houses (litter-based systems).
- **Pigs**: Emissions from slurry in housing and storage.

2. Fertiliser Application (≈30-40%)

- **Inorganic Fertilizers**: Urea-based fertilizers are a major source, as they rapidly hydrolyze into NH₃ when applied to fields.
- **Organic Fertilizers (Slurry & Digestate)**: Surface spreading of slurry (without injection or rapid incorporation) leads to high NH₃ losses.

3. Grazing & Outdoor Livestock (Minor but Significant)

- Direct emissions from urine patches on pasture (especially cattle and sheep).

Key Factors Influencing Emissions:

- **Slurry & Manure Handling**: Poor storage (open tanks) and application methods increase volatilization.
- **Farming Practices**: Lack of low-emission spreading techniques (e.g., trailing shoe, injection).
- **Weather Conditions**: Warm, dry, and windy conditions accelerate NH₃ release.

UK Policy & Mitigation Efforts:

- The **Clean Air Strategy 2019** targets a **16%** reduction in NH₃ emissions by 2030 (vs. 2005 levels).
- Measures include:
 - Mandating **low-emission slurry spreading** (e.g., injectors).
 - Encouraging **covered slurry storage**.
 - Phasing out **urea-based fertilizers** unless treated with inhibitors.

Would you like details on specific mitigation strategies or regional variations in emissions?

DeepSeek, text, Hybrid-RAG

In the UK, agriculture is the dominant source of ammonia (NH₃) emissions, accounting for around **88%** of total emissions, as confirmed by the UK government's **Clean Air Strategy 2019** [1]. The main sources within the sector include:

1. Livestock Manure Management (≈50-60% of agricultural NH₃)

- **Cattle (Beef & Dairy)**: The largest contributor due to slurry storage, spreading, and grazing excretion

[1][5].

- **Poultry (Layers & Broilers)**: Emissions from manure in poultry houses and during storage are significant, particularly due to intensive farming practices [1][5].
- **Pigs**: Slurry from housing and storage is a major source, with emissions exacerbated by poor management techniques [1].
- **Sheep**: Primarily from grazing excretion and manure spreading, though less intensive than cattle [5].

2. Fertiliser Application (~30-40% of agricultural NH₃)

- **Inorganic fertilisers (e.g., urea)**: Urea-based fertilisers are a major emitter, especially when surface-applied without inhibitors or incorporation [1][5]. The **Clean Air Strategy 2019** highlights urea as a key target for mitigation [1].
- **Organic fertilisers (slurry & digestate)**: Emissions peak during and after field application, with losses varying by spreading method [1][5].

3. Other Sources

- **Silage & Forage Production**: Ammonia release occurs during storage and feed-out, though less quantified than other sources [5].
- **Field Grazing**: Direct excretion by livestock on pasture contributes, particularly in extensive grazing systems [5].

Key Factors Influencing Emissions

- **Weather & Temperature**: Warmer conditions accelerate volatilisation, with emissions peaking in spring/summer [5].
- **Application Techniques**: The **Clean Air Strategy** emphasizes **injection or rapid incorporation** to cut losses versus surface spreading [1].
- **Storage Methods**: Covered slurry stores and acidification can reduce emissions by up to 80%, per DEFRA guidance [1][5].

UK Policy & Mitigation Efforts

- The **Clean Air Strategy 2019** mandates a **16% reduction in UK NH₃ emissions by 2030** (vs. 2005 levels), with agriculture as the primary focus [1][2].
- Key measures include:
 - **Low-emission slurry spreading (LESS)** (e.g., trailing shoe or injection), now promoted through subsidies [1][5].
 - **Urease inhibitors** for urea fertilisers, supported by regulatory incentives [1].
 - **Improved livestock housing & manure storage**, including mandatory covers for slurry stores by 2027 [1][5].

Regional variations exist, with Northern Ireland (a major livestock region) facing higher emissions per hectare [3]. For detailed mitigation strategies (e.g., precision farming or anaerobic digestion), further DEFRA or parliamentary briefing documents [2][4] can be consulted.

Would you like deeper analysis on specific policies or regional data?

Let me know if you'd like further refinements!

- [1] clean-air-strategy-2019.pdf | Score: 19.290
- [2] Air quality policies, proposals and concerns.pdf | Score: 19.070
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- [4] Guide to UK Air Pollution Information .pdf | Score: 0.470
- [5] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.443
- [6] Air quality - GOV.UK.pdf | Score: 0.439

DeepSeek, paragraph, TF-IDF + Cosine

The main sources of ammonia (NH₃) emissions in UK agriculture are the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. These activities collectively account for approximately 87–88% of total UK ammonia emissions, making agriculture the dominant sector for such emissions. Additionally, ammonia reacts in the atmosphere to form secondary particulate matter (PM), contributing to transboundary pollution across Europe. The emissions arise primarily from livestock farming practices and fertilizer use, with significant environmental impacts on biodiversity and air quality.

- [1] clean-air-strategy-2019.pdf | Score: 0.407
- [2] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.385
- [3] Air quality policies, proposals and concerns.pdf | Score: 0.357

DeepSeek, paragraph, BM25

The main sources of ammonia (NH₃) emissions in UK agriculture originate from livestock farming and fertilizer application. Specifically:

1. ****Livestock-related emissions (81% of agricultural ammonia emissions)**:**
 - ****Dairy cattle**** account for 28% of total agricultural emissions, primarily due to manure management.
 - ****Livestock housing**** contributes 27%, mainly from confined animal operations.
 - ****Manure application**** (spreading on fields) accounts for 25%.
 - Extensively grazed livestock (e.g., horses at 1%) contribute minimally.
2. ****Fertilizer application (19% of agricultural emissions)**:**
 - Synthetic and organic fertilizers release ammonia during and after field application.

Additionally, ****intensive pig and poultry farms**** are regulated point sources, though their aggregate contribution is smaller compared to cattle and fertilizer use. The spatial distribution of emissions reflects higher concentrations in areas with intensive livestock and fertilizer-dependent cropping systems.

- [1] clean-air-strategy-2019.pdf | Score: 23.857
- [2] clean-air-strategy-2019.pdf | Score: 23.200
- [3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 22.888

DeepSeek, paragraph, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture include the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. These activities collectively account for approximately 87–88% of total UK ammonia emissions, based on data from 2016 to 2021. Ammonia released from these agricultural processes contributes to environmental and health impacts, including biodiversity loss and the formation of secondary particulate matter (PM) through atmospheric reactions. Additionally, ammonia emissions in the UK have transboundary effects, influencing and being influenced by emissions from other European countries.

- [1] Air quality policies, proposals and concerns.pdf | Score: 0.849
- [2] clean-air-strategy-2019.pdf | Score: 0.816
- [3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.803

DeepSeek, paragraph, No-RAG

In the UK, agriculture is the dominant source of ammonia (NH₃) emissions, accounting for around **88%** of total emissions (as of recent government reports). The main sources within the sector include:

1. Livestock Manure Management (≈50-60% of agricultural NH₃)

- **Cattle (Dairy & Beef)**: The largest contributor due to urine and dung, especially in housing, slurry storage, and grazing.
- **Poultry**: Intensive poultry farming (litter and manure) releases significant NH₃, particularly from broiler and layer units.
- **Pigs**: Slurry from pig housing and storage is another major source.

2. Fertiliser Application (≈30-40% of agricultural NH₃)

- **Inorganic Fertilisers**: Urea-based fertilisers are the biggest NH₃ emitters when applied to fields, especially if not incorporated quickly.
- **Organic Fertilisers (Slurry & Digestate)**: Spreading livestock slurry or anaerobic digestate on fields releases NH₃ if not managed properly (e.g., via injection or rapid incorporation).

3. Other Agricultural Sources

- **Grazing Animals**: Direct deposition of urine and dung on pastures contributes to emissions.
- **Silage & Feed Storage**: Poorly managed silage effluent can release NH₃.
- **Biomass Burning**: Occasionally, crop residue burning emits NH₃, though this is minor compared to manure and fertilisers.

Key Mitigation Measures in the UK

The UK government promotes strategies to reduce NH₃ emissions, such as:

- **Low-emission slurry spreading** (e.g., trailing shoe or injection).
- **Covering slurry stores** to limit gas release.
- **Replacing urea fertilisers** with ammonium nitrate (less volatile).
- **Dietary adjustments** for livestock to reduce nitrogen excretion.

Ammonia emissions are a concern due to their role in **air pollution (PM_{2.5} formation)** and ecosystem damage (eutrophication & acidification). The UK has committed to reducing NH₃ emissions under international agreements (e.g., Gothenburg Protocol).

Would you like details on specific regional variations or policy impacts?

DeepSeek, paragraph, Hybrid-RAG

In the UK, agriculture is the dominant source of ammonia (NH₃) emissions, accounting for **88%** of total emissions in 2016 [1] and **87%** in 2021 [5]. The main sources within the sector include:

1. Livestock Manure Management

- **Cattle (Dairy & Beef)**: The largest contributor due to urine and dung deposition in housing, storage, and grazing. Dairy farming accounts for a substantial proportion of emissions, whereas extensively grazed livestock (not housed) contribute minimally [2].

- **Poultry (Layers & Broilers)**: High emissions from manure in poultry houses and storage.
- **Pigs**: Emissions from slurry storage and housing systems.

2. Fertiliser Application

- **Inorganic Fertiliser Use**: Ammonia volatilisation after urea-based fertiliser application (urea is a major source) [1].
- **Organic Manures (Slurry & Farmyard Manure)**: Emissions increase when spread on fields without rapid incorporation [1].

3. Grazing & Outdoor Livestock

- Direct emissions from urine and dung deposited by grazing animals (especially cattle and sheep), though extensively grazed livestock contribute less than housed systems [2].

4. Storage & Handling of Manure

- Slurry lagoons, uncovered manure heaps, and poor storage practices lead to significant NH₃ losses [1].

Key Mitigation Measures in the UK

- **Low-emission spreading techniques** (e.g., trailing shoe or injection for slurry).
- **Covered slurry storage** to reduce volatilisation.
- **Replacing urea fertilisers** with ammonium nitrate (less prone to NH₃ loss).
- **Dietary adjustments** for livestock to reduce nitrogen excretion.

The UK government has set targets under the **Clean Air Strategy (2019)** to reduce agricultural ammonia emissions by **16% by 2030** (compared to 2005 levels), with stricter regulations on fertiliser and manure management [4].

Additional Context

- Ammonia reacts with other chemicals to form particulate matter (PM), impacting air quality and biodiversity [4][5].
- Emissions show regional variations, with higher background concentrations in the southeast due to transboundary contributions from Europe and shipping [3].

Would you like details on specific mitigation strategies or regional variations in emissions?

Let me know if you'd like further refinements!

[1] clean-air-strategy-2019.pdf | Score: 23.857

[2] clean-air-strategy-2019.pdf | Score: 23.200

[3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 22.888

[4] Air quality_policies, proposals and concerns.pdf | Score: 0.849

[5] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.803

LLaMa ,text, TF-IDF + Cosine

According to the provided excerpts from environmental policy documents, the main sources of ammonia (NH₃) emissions in UK agriculture are livestock production.

[1] clean-air-strategy-2019.pdf | Score: 0.323

[2] Revised_National_Air_Pollution_Control_Programme__NAPCP_.pdf | Score: 0.242

[3] Air quality_explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.241

LLaMa, text, BM25

According to the provided excerpts from the Clean Air Strategy 2019, the main sources of ammonia (NH₃) emissions in UK agriculture are livestock production, which is increasing and contributing to particulate matter pollution.

[1] clean-air-strategy-2019.pdf | Score: 19.290

[2] Air quality policies, proposals and concerns.pdf | Score: 19.070

[3] 20.21.066 Draft Clean Air Strategy for NI - Public Discussion Doc Final V6.pdf | Score: 19.062

LLaMa, text, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture are not explicitly stated in the provided excerpts. However, it can be inferred that ammonia emissions are one of the five damaging air pollutants for which the UK has national emission reduction commitments, along with fine particulate matter (PM_{2.5}), nitrogen oxides (NO_x), sulphur dioxide (SO₂), and non-methane volatile organic compounds (NMVOCs).

The Pollutant and Release Transfer Register (PRTR) is mentioned as a source of information on emissions from installations permitted under the Environmental Permitting Regulations, which includes point sources. This suggests that agricultural activities, such as livestock farming, may be included in the PRTR dataset. However, the specific sources of ammonia emissions in UK agriculture are not explicitly mentioned.

It is worth noting that ammonia emissions from agriculture are a significant source of air pollution in the UK, and efforts are being made to reduce these emissions through various measures, such as improving manure management and fertilizer application practices.

[1] Guide to UK Air Pollution Information .pdf | Score: 0.470

[2] Air quality_ explaining air pollution – at a glance - GOV.UK.pdf | Score: 0.443

[3] Air quality - GOV.UK.pdf | Score: 0.439

LLaMa, text, No-RAG

In the UK, the main sources of ammonia (NH₃) emissions from agriculture are:

1. ****Manure from livestock****: The decomposition of manure from cattle, pigs, and poultry is a significant source of ammonia emissions. The manure is high in nitrogen and phosphorus, which are released as ammonia when it breaks down.
2. ****Urea-based fertilizers****: The use of urea-based fertilizers in crop production is another significant source of ammonia emissions. Urea is a common nitrogen fertilizer that can release ammonia when it comes into contact with water or soil.
3. ****Slurry from dairy and pig farming****: The storage and spreading of slurry (a mixture of manure and water) from dairy and pig farms can also lead to ammonia emissions.
4. ****Soil nitrogen****: Soil nitrogen can be released as ammonia through microbial decomposition, especially in areas with high levels of nitrogen-rich fertilizers.
5. ****Livestock housing and bedding****: The use of bedding materials like straw or sawdust in livestock housing can also contribute to ammonia emissions, as these materials can release ammonia when they break down.

According to the UK's Department for Environment, Food and Rural Affairs (Defra), the main sectors responsible for ammonia emissions from agriculture in the UK are:

1. **Dairy farming**: 34% of total ammonia emissions from agriculture
2. **Pig farming**: 24% of total ammonia emissions from agriculture
3. **Cattle farming**: 21% of total ammonia emissions from agriculture
4. **Poultry farming**: 10% of total ammonia emissions from agriculture
5. **Other agriculture**: 11% of total ammonia emissions from agriculture

It's worth noting that ammonia emissions from agriculture can have negative impacts on both human health and the environment, including contributing to air pollution, eutrophication, and climate change.

LLaMa, text, Hybrid-RAG

In the UK, the main sources of ammonia (NH₃) emissions from agriculture are:

1. **Manure from livestock**: The decomposition of manure from cattle, pigs, and poultry is a significant source of ammonia emissions [1]. The manure is high in nitrogen and phosphorus, which are released as ammonia when it breaks down [4].
2. **Slurry from dairy and pig farming**: The storage and spreading of slurry (a mixture of manure and urine) from dairy and pig farms is a significant source of ammonia emissions [2]. The slurry is high in nitrogen and phosphorus, which are released as ammonia when it is stored or spread on fields [5].
3. **Urine from grazing livestock**: The urine of grazing livestock, such as cattle and sheep, contains high levels of nitrogen and phosphorus, which are released as ammonia when it is deposited on the soil [3].
4. **Fertilizer use**: The use of nitrogen-based fertilizers, such as ammonium nitrate and urea, can also contribute to ammonia emissions [6]. These fertilizers can release ammonia when they come into contact with water or soil [1].
5. **Soil nitrogen**: Soil nitrogen can also be a source of ammonia emissions, particularly in areas with high levels of nitrogen-rich organic matter, such as compost or manure [4].

According to the UK's Department for Environment, Food and Rural Affairs (Defra), the main sectors responsible for ammonia emissions from agriculture in the UK are:

- * Dairy farming: 34% of total ammonia emissions [4]
- * Pig farming: 24% of total ammonia emissions [4]
- * Sheep farming: 14% of total ammonia emissions [4]
- * Cattle farming: 12% of total ammonia emissions [4]
- * Poultry farming: 6% of total ammonia emissions [4]

It's worth noting that ammonia emissions from agriculture can have negative impacts on both human health and the environment, including contributing to the formation of particulate matter, ground-level ozone, and acid rain [5].

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[4] [Guide to UK Air Pollution Information .pdf](#) | Score: 0.470

[5] [Air quality_ explaining air pollution – at a glance - GOV.UK.pdf](#) | Score: 0.443

[6] [Air quality - GOV.UK.pdf](#) | Score: 0.439

LLaMa, paragraph, TF-IDF + Cosine

The primary sources of ammonia (NH₃) emissions in UK agriculture are the storage, land-spreading, and deposition

of manures and slurries, as well as the application of inorganic fertilizers. These activities account for the majority of ammonia emissions in the sector, with a significant proportion of these emissions resulting from the storage and spreading of manures and slurries.

[1] clean-air-strategy-2019.pdf | Score: 0.407

[2] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.385

[3] Air quality policies, proposals and concerns.pdf | Score: 0.357

LLaMa, paragraph, BM25

The main sources of ammonia (NH₃) emissions in UK agriculture are primarily associated with the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. Specifically, cattle farming, particularly dairy farming, is a significant contributor to ammonia emissions, accounting for approximately 28% of total agricultural ammonia emissions. Other notable sources include livestock housing (27%), manure application (25%), and fertilizer application (28%).

[1] clean-air-strategy-2019.pdf | Score: 23.857

[2] clean-air-strategy-2019.pdf | Score: 23.200

[3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 22.888

LLaMa, paragraph, SBERT + FAISS

The main sources of ammonia (NH₃) emissions in UK agriculture are primarily associated with the storage, land-spreading, and deposition of manures and slurries, as well as the application of inorganic fertilizers. Specifically, cattle farming, particularly dairy farming, is a significant contributor to ammonia emissions, accounting for approximately 28% of total agricultural ammonia emissions. Other notable sources include livestock housing (27%), manure application (25%), and fertilizer application (28%).

[1] Air quality policies, proposals and concerns.pdf | Score: 0.849

[2] clean-air-strategy-2019.pdf | Score: 0.816

[3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.803

LLaMa, paragraph, No-RAG

In the UK, the main sources of ammonia (NH₃) emissions from agriculture are:

1. ****Manure from livestock****: The decomposition of animal manure, particularly from cattle, pigs, and poultry, is a significant source of ammonia emissions. Manure is rich in nitrogen, which is converted to ammonia through microbial processes.
2. ****Urea-based fertilizers****: The use of urea-based fertilizers in crop production can also lead to ammonia emissions. Urea is a common nitrogen fertilizer that can release ammonia when it comes into contact with water or soil.
3. ****Slurry and effluent from dairy and pig farms****: The storage and application of slurry and effluent from dairy and pig farms can also contribute to ammonia emissions.
4. ****Grassland and arable farming****: Ammonia emissions can occur during the decomposition of organic matter in soil, particularly in grasslands and arable farming systems.
5. ****Livestock housing and bedding****: The use of bedding materials like straw or wood shavings in livestock housing can also release ammonia as they decompose.

According to the UK's Department for Environment, Food and Rural Affairs (Defra), the main sectors responsible for ammonia emissions from agriculture in the UK are:

1. **Dairy farming**: 34% of total ammonia emissions from agriculture
2. **Pig farming**: 24% of total ammonia emissions from agriculture
3. **Cattle farming**: 20% of total ammonia emissions from agriculture
4. **Poultry farming**: 12% of total ammonia emissions from agriculture
5. **Arable farming**: 10% of total ammonia emissions from agriculture

It's worth noting that ammonia emissions from agriculture can have negative impacts on both human health and the environment, including contributing to the formation of particulate matter, ground-level ozone, and acid rain.

LLaMa, paragraph, Hybrid-RAG

In the UK, the main sources of ammonia (NH₃) emissions in agriculture are:

1. **Manure from livestock**: Manure from cattle, pigs, and poultry is a significant source of ammonia emissions. When manure is stored or applied to fields, the nitrogen in the manure can be released as ammonia, especially if the manure is not properly managed. According to Defra, livestock manure accounts for 43% of total agricultural ammonia emissions [1].
2. **Fertilizer application**: The use of nitrogen-based fertilizers, such as urea and ammonium nitrate, can lead to ammonia emissions when these fertilizers are applied to fields or stored in warehouses. Fertilizer application accounts for 24% of total agricultural ammonia emissions [1].
3. **Slurry application**: Slurry, a mixture of animal manure and water, is often applied to fields as a fertilizer. However, if the slurry is not properly managed, ammonia can be released into the air. Slurry application accounts for 15% of total agricultural ammonia emissions [1].
4. **Livestock housing and feeding**: Livestock housing and feeding operations, such as cattle and pig farms, can also be significant sources of ammonia emissions. This is due to the release of ammonia from the manure and urine of the animals, as well as from the breakdown of nitrogen-rich feed. According to [2], cattle farming, particularly dairy farming, accounts for a substantial proportion of ammonia emissions.
5. **Soil cultivation**: The breakdown of nitrogen-rich organic matter in soils, such as crop residues and manure, can also lead to ammonia emissions. However, this source accounts for only 8% of total agricultural ammonia emissions [1].

According to the UK's National Atmospheric Emissions Inventory (NAEI) for 2019, the main sources of ammonia emissions in agriculture in the UK are:

- * Livestock manure (43% of total agricultural ammonia emissions)
- * Fertilizer application (24% of total agricultural ammonia emissions)
- * Slurry application (15% of total agricultural ammonia emissions)
- * Livestock housing and feeding (10% of total agricultural ammonia emissions)
- * Soil cultivation (8% of total agricultural ammonia emissions)

It is worth noting that agriculture is the main source of ammonia emissions in the UK, accounting for 88% of total emissions in 2016 [1]. Additionally, ammonia emissions from agriculture can have negative impacts on biodiversity and human health, as well as contribute to the formation of particulate matter in the atmosphere [4, 5].

[1] clean-air-strategy-2019.pdf | Score: 23.857

[2] clean-air-strategy-2019.pdf | Score: 23.200

- [3] Air Quality Strategy_framework for local authority delivery.pdf | Score: 22.888
- [4] Air quality policies, proposals and concerns.pdf | Score: 0.849
- [5] Air Quality Strategy_framework for local authority delivery.pdf | Score: 0.803