

3.1 - Agricultural: Other

Short description

| Category Code | Name of Category | Method | AD | EF |
|---|--|---|-------|---|
| 3.1 | Agriculture: other | | | |
| <i>consisting of / including source categories:</i> | | | | |
| 3.1 | Storage of digestate from energy crops | T2 (NH ₃ , NO _x) | Q, PS | CS (NH ₃ , NO _x) |
| Method(s) applied | | | | |
| D | Default | | | |
| T1 | Tier 1 / Simple Methodology * | | | |
| T2 | Tier 2* | | | |
| T3 | Tier 3 / Detailed Methodology * | | | |
| C | CORINAIR | | | |
| CS | Country Specific | | | |
| M | Model | | | |
| * as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in category chapters. | | | | |
| (source for) Activity Data | | | | |
| NS | National Statistics | | | |
| RS | Regional Statistics | | | |
| IS | International Statistics | | | |
| PS | Plant Specific | | | |
| As | Associations, business organisations | | | |
| Q | specific Questionnaires (or surveys) | | | |
| M | Model / Modelled | | | |
| C | Confidential | | | |
| (source for) Emission Factors | | | | |
| D | Default (EMEP Guidebook) | | | |
| CS | Country Specific | | | |
| PS | Plant Specific | | | |
| M | Model / Modelled | | | |
| C | Confidential | | | |

| NO _x | NM VOC | SO ₂ | NH ₃ | PM _{2.5} | PM ₁₀ | TSP | BC | CO | Heavy Metals | POPs |
|-----------------|--|-----------------|-----------------|-------------------|------------------|-----|----|----|--------------|------|
| -/- | NA | NA | -/- | NA | NA | NA | NA | NA | NA | NA |
| L/- | key source by L evel only | | | | | | | | | |
| -/T | key source by T rend only | | | | | | | | | |
| L/T | key source by both L evel and T rend | | | | | | | | | |
| -/- | no key source for this pollutant | | | | | | | | | |
| IE | emission of specific pollutant I ncluded E lsewhere (i.e. in another category) | | | | | | | | | |
| NE | emission of specific pollutant N ot E stimated (yet) | | | | | | | | | |
| NA | specific pollutant not emitted from this source or activity = N ot A pplicable | | | | | | | | | |
| * | no analysis done | | | | | | | | | |

Country specifics

In 2024, NH₃ emissions from category 3.1 (agriculture other) amounted to 0.26 % of total agricultural emissions, which is equal to ~ 1.3 kt NH₃. NO_x emissions from category 3.1 contribute 0.07 % (~ 0.07 kt) to the total agricultural emissions. All these emissions originate from the storage of digestate from energy crops (for details on anaerobic digestion of energy crops see Vos et al. (2026)¹⁾, Chapter 5.1. The emissions resulting from the application of energy crop digestates as organic fertilizer are dealt with under 3.D.a.2.c.

Activity Data

Time series of activity data have been provided by KTBL (Kuratorium für Technik und Bauwesen in der Landwirtschaft / Association for Technology and Structures in Agriculture). From these data the amount of N in energy crops fed into anaerobic digestion was calculated.

Table 1: N amount in energy crops fed into anaerobic digestion, in [kt N]

| 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.0 | 0.6 | 5.3 | 45.1 | 163.0 | 293.7 | 292.2 | 287.4 | 283.2 | 283.2 | 289.3 | 283.8 | 304.9 | 295.3 | 295.3 |

Table 2: Distribution of gastight storage and storage in open tank of energy crop digestates, in [%]

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|--------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| gastight | 0.0 | 4.7 | 9.4 | 15.8 | 42.2 | 65.2 | 67.1 | 69.1 | 71.0 | 74.9 | 78.7 | 82.6 | 82.0 | 85.8 | 85.8 |
| non-gastight | 100 | 95.3 | 90.6 | 84.2 | 57.8 | 34.8 | 32.9 | 30.9 | 29.0 | 25.1 | 21.3 | 17.4 | 18.0 | 14.2 | 14.2 |

Methodology

The calculation of emissions from storage of digestate from energy crops considers two different types of storage, i.e. gastight storage and open tank. The frequencies of these storage types are also provided by KTBL (see Table 2). There are no emissions of NH₃ and NO from gastight storage of digestate. Hence the total emissions from the storage of digestate are calculated by multiplying the amount of N in the digestate leaving the fermenter with the relative frequency of open tanks and the emission factor for open tank. The amount of N in the digestate leaving the fermenter is identical to the N amount in energy crops fed into anaerobic digestion (see Table 1) because N losses from pre-storage are negligible and there are no N losses from fermenter (see Vos et al. 2026, Chapter 5.1).

Emission factors

As no specific emission factor is known for the storage of digestion residues in open tanks, the NH₃ emission factor for storage of cattle slurry with crust in open tanks was adopted (0.045 kg NH₃ -N per kg TAN). This choice of emission factor is based on the fact that energy crops are, in general, co-fermented with animal manures (i. e. mostly slurry) and that a natural crust forms on the liquid digestates due to the relatively high dry matter content of the energy crops.

The TAN content after the digestion process is 0.56 kg TAN per kg N. The NO emission factor for storage of digestion residues in open tanks was set to 0.0005 kg NO-N per kg N.

The following table shows the resulting implied emission factors for NH₃ -N and NO-N. NO_x emissions are related to NO-N emissions by the ratio of 46/14. This relationship also holds for NO-N and NO_x emission factors.

Table 3: IEF for NH₃ -N and NO-N emissions from storage of digested energy crops

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|--------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| kg NH ₃ -N per kg N | 0.0252 | 0.0240 | 0.0228 | 0.0212 | 0.0146 | 0.0087 | 0.0082 | 0.0078 | 0.0073 | 0.0063 | 0.0054 | 0.0044 | 0.0045 | 0.0036 | 0.0036 |
| kg NO-N per kg N | 0.00050 | 0.00048 | 0.00045 | 0.00042 | 0.00029 | 0.00017 | 0.00016 | 0.00015 | 0.00014 | 0.00013 | 0.00011 | 0.00009 | 0.00009 | 0.00007 | 0.00007 |

Trend discussion for Key Sources

NH₃ and NO_x from storage of anaerobically digested energy crops are no key source.

Recalculations

There were no recalculations except the replacement of extrapolated activity data in 2023 with data from KTBL (see [main page of the agricultural sector](#), Chapter 5 - NFR 3 - Agriculture (OVERVIEW), **recalculation No. 18**). For further details on recalculations see Vos et al. (2026), Chapter 1.3.

Table 4: Comparison of NH₃ and NO_x emissions [kt] with previous submission

| | Submission | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Ammonia | current | 0.0015 | 0.0180 | 0.1482 | 1.1624 | 2.8842 | 3.1074 | 2.9181 | 2.7131 | 2.5068 | 2.1785 | 1.8901 | 1.5115 | 1.6749 | 1.2796 | 1.2796 |
| | previous | 0.0015 | 0.0180 | 0.1482 | 1.1624 | 2.8842 | 3.1074 | 2.9181 | 2.7131 | 2.5068 | 2.1785 | 1.8901 | 1.5115 | 1.6749 | 1.6749 | |
| | absolute change | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.40 | |
| | relative change [%] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -23.60 | |
| Nitrogen oxides | current | 0.0001 | 0.0010 | 0.0080 | 0.0624 | 0.1548 | 0.1668 | 0.1567 | 0.1457 | 0.1346 | 0.1170 | 0.1015 | 0.0811 | 0.0899 | 0.0687 | 0.0687 |
| | previous | 0.0001 | 0.0010 | 0.0080 | 0.0624 | 0.1548 | 0.1668 | 0.1567 | 0.1457 | 0.1346 | 0.1170 | 0.1015 | 0.0811 | 0.0899 | 0.0899 | |
| | absolute change | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.02 | |
| | relative change [%] | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -23.60 | |



For **pollutant-specific information on recalculated emission estimates for Base Year and 2023**, please see the tables following [chapter 9.1 - Recalculations](#).

Planned improvements



At the moment, no category-specific improvements are planned.

Uncertainty

Details are described in [chapter 1.7](#).

¹⁾
Vos, C., Rösemann, C., Haenel, H.-D., Dämmgen, U., Döring, U., Wulf, S., Eurich-Menden, B., Döhler, H., Steuer, B., Osterburg, B., Fuß, R. (2026) Calculations of gaseous and particulate emissions from German agriculture 1990 - 2024 : Report on methods and data (RMD) Submission 2026. www.eminv-agriculture.de