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Methodological procedure for implementing reducing effects on ammonia emissions resulting from urea application into the national ammonia emission balance

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Directive (EU) 2016/2284 of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants (Emission Ceilings Directive) sets out commitments for

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individual Member States of the European Union to reduce emissions in relative values in % compared to 2005. One of the pollutants listed is ammonia emissions. Agriculture contributes to the total ammonia emissions in the Czechia by approximately 93–94%. According to the said directive, the Czechia has a commitment to reduce ammonia emissions by 7% compared to the value in 2005 for any year between 2020 and 2029, and a commitment to reduce emissions by 22% for any year from 2030 compared to 2005.

The purpose of the prepared document is to describe in a transparent manner the method of implementing reduction measures resulting from the application of mineral fertilizers into the national emission balance of ammonia emissions of the Czech Republic. The document is intended to serve as a basis for the preparation of an update of the Informative Inventory Report of the Czechia (IIR 2026) from Agriculture. The document is also intended as a basis for international review and assessment of national pollutant emission inventories within the framework of the activities of Technical Expert Review Teams (TERTs).

To ensure the fulfillment of the obligations arising from the Emission Ceilings Directive, the following obligation was established, among other measures, as part of the amendment to the Decree of the Ministry of Agriculture No. 377/2013 Coll. on the storage and method of use of fertilizers, from 1 July 2022, in paragraph 7, letter 4). "Urea as a fertilizer may only be applied if a urease inhibitor is added to it in the manner and in the dose specified in its label. This does not apply if it is immediately incorporated into the soil or applied in solution". This implemented into Czech legislation a measure for reducing ammonia emissions from the application of mineral fertilizers, specifically from the application of urea, defined in the Options for Ammonia Mitigation Guidance principles from the UNECE Task Force on Reactive Nitrogen. According to the document, this involves the application of urea-based fertilizers with urease inhibitors with a 70% effect on reducing ammonia emissions and the immediate incorporation of urea-based fertilizers with a 50-80% effect on reducing ammonia emissions compared to the reference technology, which is the broad application of urea-based fertilizers to the soil surface.

As part of the amendment to the Decree of the Ministry of Agriculture No. 377/2013 Coll., Section 9 also introduced the obligation to keep records of fertilization in the following wording. "Agricultural entrepreneurs who are obliged to keep records pursuant to Section 9, Paragraphs 7 and 8 of the Fertilizers Act in electronic form shall submit them to the Central Institute for Supervising and Testing in Agriculture (ÚKZUS) electronically in the form of an automated data output via an electronic application accessible on the Ministry's website". Data outputs of electronic records are submitted to the Unified Repository of Fertilization and Yield Records (JUDEH). The mandatory data specified in Annex No. 2 to this Decree shall be recorded in the fertilization records, which are the following data:

Mandatory data:

a) identification data of the agricultural entrepreneur

1. name, or names, surname, or an addition distinguishing the person of the agricultural entrepreneur or type of business, date of birth, personal identification number, if assigned, and address of the place of business, if it is a natural person, and
2. name or business name, personal identification number and address of the registered office, if it is a legal person,

b) identification data of the owner of the forest land,
c) identification data of the natural or legal person carrying out forest production,
d) number of the cadastral area1) in the event that it is not parts of land blocks kept in the register of land use according to user relations under the Act on Agriculture,
e) number of the plot1), forest plot (for forest plot, the department, stand, stand group shall be indicated),
f) area of the plot, forest plot (for forest plot, the department, stand, stand group shall be indicated) in ha,
g) name of the crop species,
h) date sowing or planting date,
i) date of harvest or incorporation,
j) area of the cultivated crop in ha,
k) average yield of the crop – main product in t/ha, if the crop is cultivated on arable land,
l) type of main product (especially grain, green matter), if it is a crop grown on arable land,
m) average yield of the crop – by-product in t/ha, if it is a crop grown on arable land,
n) date of application of fertiliser, soil conditioner, plant biostimulant, substrate or treated sludge (date of commencement of grazing or stay of animals on agricultural land),
o) date of application of fertiliser, soil conditioner, plant biostimulant, substrate or treated sludge (date of termination of grazing or stay of animals on agricultural land),
p) area of fertilised area, grazing or stay of animals on agricultural land in ha,
q) type or name of fertiliser or treated sludge,
r) type of animals, if it is grazing of livestock4),
s) total dose of fertiliser or treated sludge (t, kg, l), for treated sludge calculated as 100% dry matter,
t) average dose of fertilizer or treated sludge (t/ha, kg/ha or l/ha), for treated sludge converted to 100% dry matter, for grazing or stay of animals on agricultural land the number of DJ/ha5),
u) average nutrient supply in the used fertilizer or treated sludge in kg/ha - N, P2O5, K2O, MgO, CaO, S,
v) name of used soil additives, plant biostimulants, substrates, fertilizers with trace nutrients and
w) average dose of used soil additives, plant biostimulants, substrates and fertilizers with trace nutrients (t/ha, kg/ha or l/ha).

Annex 1 of this document provides an anonymized illustrative extract from the Unified Repository of Fertilization and Yield Records (JUDEH). The database structure allows, based on the name of the fertilizer and **its identification number**, to accurately determine the type and consumption of the selected fertilizer, in this case urea-based fertilizer, and

urea-based fertilizer containing urease inhibitors. The database structure also allows, based on the specified date of fertilizer application and the date of its incorporation, to demonstrably determine the amount of fertilizer immediately incorporated into the soil (or within 24 hours of application). Since accurate fertilization records are one of the main conditions for receiving subsidies for agricultural entities, the maintenance of these documents can be considered trustworthy, in accordance with applicable legislation. In the event of deficiencies identified during inspections by state authorities (The State Agricultural Intervention Fund (SZIF/Fund), Central Institute for Supervising and Testing in Agriculture (ÚKZUS), Czech Environmental Inspectorate (ČIŽP)), agricultural entities are exposed to the risk of sanctions with significant financial impacts.

The state institution Central Control and Testing Institute of Agriculture was entrusted with the collection, validation and basic evaluation of data from the Unified Repository of Fertilization and Yield Records (JUDEH). According to Act No. 156/1998 Coll. on fertilizers, all agricultural entities operating on an area larger than 20 ha were obliged to provide the required data for 2022. Very small agricultural enterprises were thus exempted from this obligation. Table 1 evaluates the fulfillment of the legal obligation by agricultural entities when submitting data to JUDEH for 2022, divided into enterprises according to the size of the land they manage.

Table 1 Evaluation of the share of individual groups of agricultural entities submitting data to JUDEH for 2022 (source: Department of Registers of the Ministry of Agriculture)

User categories by size of farmed land (ha)	Users without submitted records			Users with valid submitted records			Total	
	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Share of total quantity in a given category:
20 až 30 ha	1 304	31 683,78	52,21%	1 168	28 997,47	47,79%	2 472	60 681,25
30,01 až 40 ha	676	23 399,68	42,99%	896	31 030,93	57,01%	1 572	54 430,61
40,01 až 50 ha	414	18 454,43	35,97%	730	32 844,85	64,03%	1 144	51 299,28
50,01 až 60 ha	346	18 884,64	35,57%	624	34 204,71	64,43%	970	53 089,35
60,01 až 80 ha	423	29 044,20	31,69%	905	62 598,34	68,31%	1 328	91 642,54
80,01 až 100 ha	246	22 098,21	24,98%	738	66 363,52	75,02%	984	88 461,73
100,01 až 150 ha	358	43 920,29	23,73%	1 139	141 188,01	76,27%	1 497	185 108,30
150,01 až 200 ha	145	25 113,38	21,59%	531	91 184,27	78,41%	676	116 297,65
200,01 až 300 ha	131	32 340,83	18,29%	585	144 454,88	81,71%	716	176 795,71
300,01 až 400 ha	69	23 700,88	15,43%	373	129 908,31	84,57%	442	153 609,19
400,01 až 500 ha	53	23 832,71	16,09%	276	124 252,55	83,91%	329	148 085,26
500,01 až 750 ha	56	34 571,64	11,20%	442	274 146,66	88,80%	498	308 718,30
750,01 až 1 000 ha	43	38 208,91	12,88%	299	258 492,55	87,12%	342	296 701,46
1 000,01 až 1 500 ha	41	50 013,50	10,54%	347	424 635,35	89,46%	388	474 648,85
1 500,01 až 2 000 ha	19	33 208,59	9,43%	182	318 843,82	90,57%	201	352 052,41
2 000,01 až 5 000 ha	17	40 354,03	5,82%	232	653 015,45	94,18%	249	693 369,48
5 000 ha and more	1	10 037,34	8,80%	16	103 989,72	91,20%	17	114 027,06
Total:	**4 342**	**498 867,04**	**14,59%**	**9 483**	**2 920 151,39**	**85,41%**	**13 825**	**3 419 018,43**
Share of total (%):	**31,41%**			**68,59%**				

The total area of agricultural land in the Czechia is on the level of 4,200,000 ha. The area of arable land in the Czechia represents an area of approximately 2,900,000 ha. Table 1 shows that from this total area of agricultural land in the Czechia, the legislative obligation to provide data from the fertilization record by reporting data to JUDEH applied to agricultural

entities managing a total area of 3,419,306 ha. This represents approximately 81% of the total agricultural land in the Czech Republic. From this area, data on fertilization of crops from 2,920,151 ha were reported, which represents the fulfillment of the reporting obligation from approximately 70% of the total agricultural land in the Czechia. Thus, this value can be considered a representative sample describing the actual state of mineral fertilizer application in the Czechia. Out of a total of 13,825 agricultural land users, a total of 9,483 agricultural entities sent data to the JUDEH database.

Based on the data collected in this way, the Czech Agrifood Research Centre (CARC), within the framework of the national projects NAZV QK21020121 "Determination and balance of specific greenhouse gas emissions from cultivation and post-harvest processing of agricultural crops" and NAZV QL25020046 "Quantification of the reduction of agricultural greenhouse gas emissions (methane, nitrous oxide) and quantification of long-term carbon absorption in agricultural soil due to carbon and regenerative agriculture", subsequently carried out an evaluation of the total nitrogen consumption originating from urea-based fertilizers and from this amount the shares of these fertilizers containing urease inhibitors were determined, including the share of the amount of these fertilizers incorporated into the soil immediately after their application. The evaluation was carried out according to the regional breakdown according to NUTS 3, see. Table. 2.

Table 2 Share of urea with urease inhibitors and share of immediately incorporated urea in total urea-based fertilizer consumption in 2022 (source: CARC)

Region of the Czechia (NUTS 3)	N from urea consumption	Urea with inhibitors consumption	Penetration rate of urea with inhibitors	Urea - incorporation immediately	Penetration rate of urea incorporated immediately
Year of data collection 2022	kg N	kg N	%	kg N	%
CZ010 Hl. město Praha	166 378	32 145	19,32	1 062	0,64
CZ020 Středočeský kraj	4 788 908	1 224 048	25,56	264 113	5,52
CZ031 Jihočeský kraj	3 598 229	278 965	7,75	142 428	3,96
CZ032 Plzeňský kraj	1 520 703	261 129	17,17	120 005	7,89
CZ041 Karlovarský kraj	810 187	425 043	52,46	519	0,06
CZ042 Ústecký kraj	2 234 344	923 412	41,33	130 698	5,85
CZ051 Liberecký kraj	755 520	458 213	60,65	3 927	0,52
CZ052 Královehradecký kraj	1 969 819	262 543	13,33	67 485	3,43
CZ053 Pardubický kraj	1 922 611	175 978	9,15	123 952	6,45
CZ063 Kraj Vysočina	4 427 430	375 550	8,48	244 212	5,52
CZ064 Jihomoravský kraj	8 112 175	436 735	5,38	684 935	8,44
CZ071 Olomoucký kraj	3 787 475	1 003 104	26,48	207 127	5,47
CZ072 Zlínský kraj	2 474 385	777 757	31,43	39 342	1,59
CZ080 Moravskoslezský kraj	2 044 852	750 301	36,69	151 219	7,40
Total	**38 613 017**	**7 384 923**	**19,13**	**2 181 024**	**5,65**

Table 2 shows that in 2022, when the obligation to apply urea with urease inhibitors or to incorporate it immediately after application was first established by law, the share of fertilizers with urease inhibitors in the total consumption of urea-based fertilizers was approximately 19%. Furthermore, of the total amount of urea-based fertilizers applied, approximately 5.5% was demonstrably incorporated immediately after their application to

agricultural land. It should be emphasized that the application of urea-based fertilizers to already grown crops during, for example, spring fertilization is not subject to the obligation to incorporate it.

Due to the high administrative burden on agricultural entities and the overload of the system in the first year of data collection, legislative amendments were made. Effective from 1.1. 2024, only agricultural entities with an area registered in the land register greater than 200 ha are obliged to keep records of fertilization in electronic form and subsequently provide it. Tables 3 show an evaluation of the data submitted for 2023.

Table 3 Evaluation of the share of individual groups of agricultural entities submitting data to JUDEH for 2023 (source: Department of Registers of the Ministry of Agriculture)

User categories by size of farmed land (ha)	Users without submitted records			Users with valid submitted records			Total	
	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Share of total quantity in a given category:
20 až 30 ha	2 177	53 587,65	91,43%	201	5 021,91	8,57%	2 378	58 609,56
30,01 až 40 ha	1 404	48 624,86	89,28%	167	5 839,14	10,72%	1 571	54 464,00
40,01 až 50 ha	971	43 488,02	87,39%	139	6 273,26	12,61%	1 110	49 761,28
50,01 až 60 ha	806	44 184,86	87,31%	116	6 419,48	12,69%	922	50 604,34
60,01 až 80 ha	1 138	78 394,04	86,95%	167	11 763,64	13,05%	1 305	90 157,68
80,01 až 100 ha	852	76 468,59	82,89%	176	15 785,02	17,11%	1 028	92 253,61
100,01 až 150 ha	1 514	191 338,92	84,08%	286	36 215,86	15,92%	1 800	227 554,78
150,01 až 200 ha	661	113 274,37	81,98%	145	24 907,11	18,02%	806	138 181,48
200,01 až 300 ha	511	126 580,66	72,49%	196	48 025,61	27,51%	707	174 606,27
300,01 až 400 ha	330	114 900,32	72,47%	125	43 646,78	27,53%	455	158 547,10
400,01 až 500 ha	194	87 477,93	68,45%	90	40 320,51	31,55%	284	127 798,44
500,01 až 750 ha	349	216 658,75	72,92%	131	80 473,84	27,08%	480	297 132,59
750,01 až 1 000 ha	245	212 695,79	72,48%	93	80 739,27	27,52%	338	293 435,06
1 000,01 až 1 500 ha	263	321 617,34	69,85%	113	138 818,25	30,15%	376	460 435,59
1 500,01 až 2 000 ha	136	237 228,32	67,25%	66	115 519,46	32,75%	202	352 747,78
2 000,01 až 5 000 ha	172	478 328,83	70,20%	73	203 018,34	29,80%	245	681 347,17
5 000 ha and more	11	73 829,57	69,37%	5	32 596,11	30,63%	16	106 425,68
Total:	**11 734**	**2 518 678,82**	**73,77%**	**2 289**	**895 383,59**	**26,23%**	**14 023**	**3 414 062,41**
Share of total (%):	**83,68%**			**16,32%**				

As a result of the change in legislation, the number of reports sent to JUDEH decreased in 2024. The area of monitored cultivated agricultural land, where fertilizers were applied in 2023 and for which data from the fertilization record was provided, decreased from the original value of 2,902,111 ha to 887,672 ha. However, the new lower value still represents approximately 21% of the total area of agricultural land in the Czech Republic and 26% of the original value of the cultivated area of land to which the reporting obligation applied in 2022. Table 4 shows share of urea with urease inhibitors and share of immediately incorporated urea in total urea-based fertilizer consumption in 2023.

Table 4 Share of urea with urease inhibitors and share of immediately incorporated urea in total urea-based fertilizer consumption in 2023 (source: CARC)

Region of the Czechia (NUTS 3)	N from urea consumption	Urea with inhibitors consumption	Penetration rate of urea with inhibitors	Urea - incorporation immediately	Penetration rate of urea incorporated immediately
Year of data collection 2023	kg N	kg N	%	kg N	%
CZ010 Hl. město Praha	9 454	1 209	12,79	-	0,00
CZ020 Středočeský kraj	3 162 920	1 579 423	49,94	91 179	2,88
CZ031 Jihočeský kraj	868 347	304 022	35,01	198 543	22,86
CZ032 Plzeňský kraj	643 008	170 419	26,50	61 899	9,63
CZ041 Karlovarský kraj	223 338	84 623	37,89	108 186	48,44
CZ042 Ústecký kraj	671 525	389 648	58,02	56 420	8,40
CZ051 Liberecký kraj	349 430	306 822	87,81	-	0,00
CZ052 Královehradecký kraj	660 112	378 420	57,33	11 110	1,68
CZ053 Pardubický kraj	322 546	62 141	19,27	20 136	6,24
CZ063 Kraj Vysočina	1 537 373	342 584	22,28	71 305	4,64
CZ064 Jihomoravský kraj	2 009 943	509 576	25,35	192 025	9,55
CZ071 Olomoucký kraj	1 596 107	449 928	28,19	27 333	1,71
CZ072 Zlínský kraj	249 131	62 155	24,95	4 283	1,72
CZ080 Moravskoslezský kraj	495 732	271 211	54,71	258 727	52,19
Total	**12 798 965**	**4 912 182**	**38,38**	**1 101 147**	**8,60**

In the third year of data collection, there was a renewed increase in the number of agricultural entities that submitted their data on fertilization of cultivated crops to the JUDEH database. Table 5 shows the increase in the monitored cultivated area in 2024 compared to 2023. The increase in the area for which verifiable data is available in JUDEH from 887,672 ha in 2023 to 1,168,354 ha in 2024 represents a slight increase in the monitored total area of agricultural land in the Czechia from approximately 21% to 28%. Compared to 2022, when reporting by agricultural entities was mandatory, data on fertilization of agricultural crops for 2024 was voluntarily reported to JUDEH by agricultural entities farming approximately 34% of the original value of the cultivated area of land to which the reporting obligation applied in 2022. Table 5 shows an evaluation of the share of individual groups of agricultural entities submitting data to JUDEH for 2024. Table 6 shows share of urea with urease inhibitors and share of immediately incorporated urea in total urea-based fertilizer consumption in 2024.

Table 5 Evaluation of the share of individual groups of agricultural entities submitting data to JUDEH for 2024 (source: Department of Registers of the Ministry of Agriculture)

User categories by size of farmed land (ha)	Users without submitted records			Users with valid submitted records			Total	
	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Area of agricultural land (ha):	Share of total quantity in a given category:	Number of users:	Share of total quantity in a given category:
20 až 30 ha	2 244	55 300,27	95,88%	97	2 376,14	4,12%	2 341	57 676,41
30,01 až 40 ha	1 438	49 925,60	94,68%	81	2 806,12	5,32%	1 519	52 731,72
40,01 až 50 ha	1 060	47 505,57	94,54%	61	2 745,85	5,46%	1 121	50 251,42
50,01 až 60 ha	835	45 804,70	93,12%	62	3 386,76	6,88%	897	49 191,46
60,01 až 80 ha	1 242	85 741,26	91,78%	110	7 676,99	8,22%	1 352	93 418,25
80,01 až 100 ha	957	85 927,71	91,73%	86	7 742,74	8,27%	1 043	93 670,45
100,01 až 150 ha	1 779	226 436,17	90,88%	179	22 730,13	9,12%	1 958	249 166,30
150,01 až 200 ha	703	120 126,15	86,86%	106	18 172,52	13,14%	809	138 298,67
200,01 až 300 ha	419	103 891,33	60,54%	275	67 708,78	39,46%	694	171 600,11
300,01 až 400 ha	272	94 938,10	61,47%	171	59 507,09	38,53%	443	154 445,19
400,01 až 500 ha	158	70 929,72	52,85%	141	63 271,81	47,15%	299	134 201,53
500,01 až 750 ha	277	171 020,51	60,31%	185	112 538,46	39,69%	462	283 558,97
750,01 až 1 000 ha	189	163 780,84	54,04%	160	139 268,41	45,96%	349	303 049,25
1 000,01 až 1 500 ha	209	256 640,61	56,49%	161	197 640,58	43,51%	370	454 281,19
1 500,01 až 2 000 ha	110	193 877,16	55,31%	90	156 682,28	44,69%	200	350 559,44
2 000,01 až 5 000 ha	140	384 518,04	56,87%	102	291 557,84	43,13%	242	676 075,88
5 000 ha and more	10	66 713,54	68,79%	5	30 270,38	31,21%	15	96 983,92
Total:	**12 042**	**2 223 077,28**	**65,21%**	**2 072**	**1 186 082,88**	**34,79%**	**14 114**	**3 409 160,16**
Share of total (%):	**85,32%**			**14,68%**				

Table 6 Share of urea with urease inhibitors and share of immediately incorporated urea in total urea-based fertilizer consumption in 2024 (source: CARC)

Region of the Czechia (NUTS 3)	N from urea consumption	Urea with inhibitors consumption	Penetration rate of urea with inhibitors	Urea - incorporation immediately	Penetration rate of urea incorporated immediately
Year of data collection 2024	kg N	kg N	%	kg N	%
CZ010 Hl. město Praha	139 467	131 640	94,39	-	0,00
CZ020 Středočeský kraj	4 155 855	1 937 742	46,63	236 271	5,69
CZ031 Jihočeský kraj	1 761 249	613 069	34,81	144 126	8,18
CZ032 Plzeňský kraj	1 391 914	558 220	40,10	340 743	24,48
CZ041 Karlovarský kraj	538 703	388 368	72,09	-	0,00
CZ042 Ústecký kraj	1 958 804	1 025 574	52,36	581 231	29,67
CZ051 Liberecký kraj	84 824	63 793	75,21	-	0,00
CZ052 Královehradecký kraj	735 478	64 548	8,78	15 064	2,05
CZ053 Pardubický kraj	730 700	151 704	20,76	59 832	8,19
CZ063 Kraj Vysočina	1 934 911	478 748	24,74	270 708	13,99
CZ064 Jihomoravský kraj	2 699 378	714 274	26,46	911 896	33,78
CZ071 Olomoucký kraj	1 538 956	582 662	37,86	302 183	19,64
CZ072 Zlínský kraj	505 928	159 088	31,44	75 299	14,88
CZ080 Moravskoslezský kraj	927 021	542 467	58,52	33 950	3,66
Total	**19 103 188**	**7 411 897**	**38,80**	**2 971 304**	**15,55**

Fig. 1 shows the development of the share of the use of urea-based fertilizers with urease inhibitors and the share of urea-based fertilizers incorporated immediately into the soil in the total nitrogen consumption from these fertilizers between 2022 and 2024. Compared to 2022, there is a noticeable increase in the use of urea-based fertilizers with urease inhibitors

from the original approx. 19% to the current approx. 39%. Measures related to the immediate incorporation of these fertilizers into the soil from the original approx. 6% to the current approx. 16% also show a gradual increase.

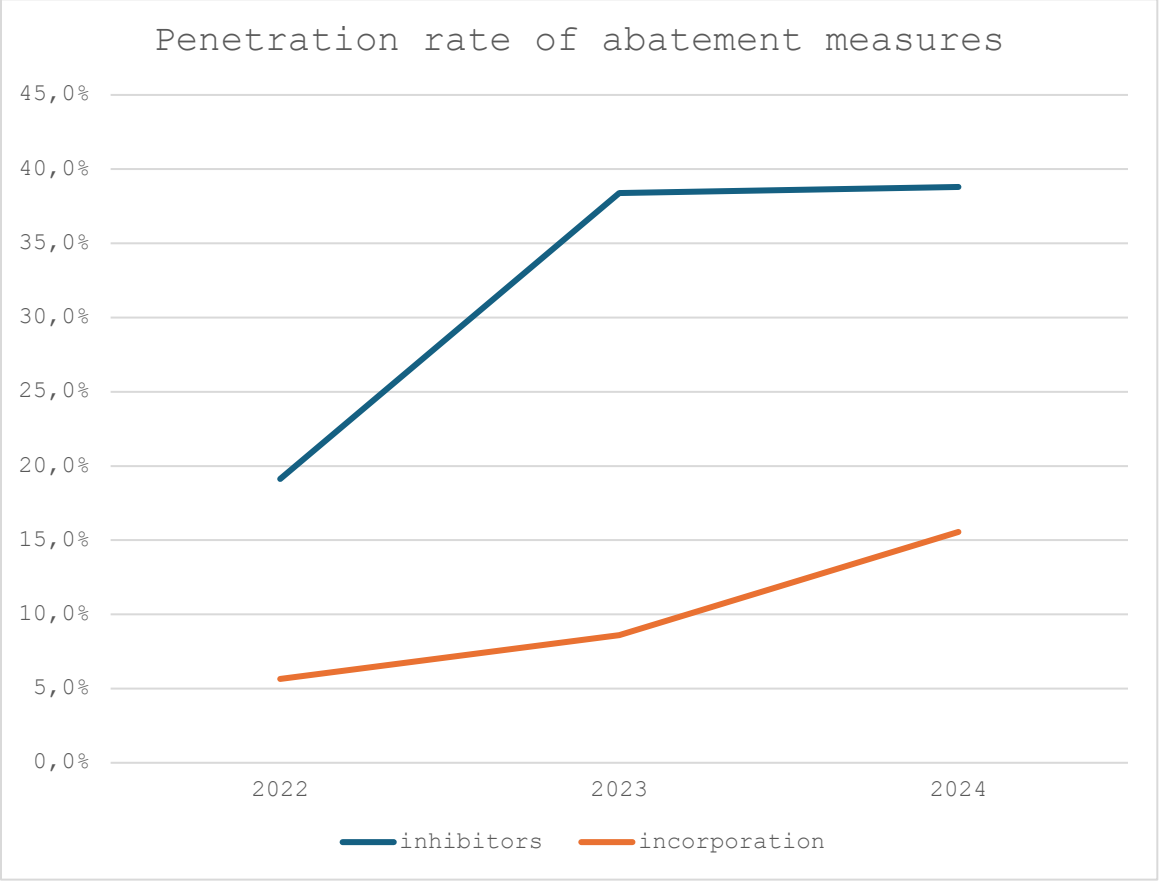

Fig. 1 Development of the share of urea-based fertilizers with urease inhibitors and the share of urea-based fertilizers applied directly to the soil in the total consumption of urea-based fertilizers between 2022 and 2024

To include the reducing effects on ammonia emissions into the national emission balance from the application of urea-based fertilizers with urease inhibitors, **only and exclusively industrially produced fertilizers** are included, where their manufacturer also guarantees the appropriate amount and type of urease inhibitor. These fertilizers are identified by their identification number assigned by Central Institute for Supervising and Testing in Agriculture (ÚKZUS). Annex 2 provides an illustrative list of fertilizers with urease inhibitors, included according to their respective identification numbers in the national ammonia emission inventory, as a measure for reducing ammonia emissions from NFR category 3Da1 - Inorganic N-fertilizers (including urea application).

No other urea-based mineral fertilizers that are treated with urease inhibitors, e.g. by mixing urea directly with the inhibitor on the farm, are included in the national emission balance. The reason is the impossibility of demonstrating the use of these inhibitors in practice. Other methods of treating fertilizers with urease inhibitors, such as adding the inhibitor directly to the slurry applicator, etc., are also not included in the national ammonia emission balance.

Proof of immediate incorporation of urea-based fertilizers directly into the soil immediately after application is based on a record in the JUDEH database in the columns titled "date of application and date of incorporation" see Appendix 1. If there is a match in the reported dates, the condition of immediate incorporation can be considered fulfilled.

The analytical procedures described above are then reflected in the national ammonia emission inventory. Table 7 shows the penetration rate values used to reduce the basic emission factor for urea, as determined by EMEP/EEA 2023, 3D Crop Production, Table 3.2.

Table 7 Penetration rate of utilisation of urease inhibitors (solid urea) and incorporation urea-based fertilisers immediately for 2023,2024 and 2025

Application - urea-based fertilisers									
data source:									
fertiliser typ	Parameter code	BaseEF / mitigation measure / abated EF	Penetration% / AE%	2020	2021	2022	2023	2024	2025
Urea-based	EF_NH3_applic_	BaseEF / cool temperature / normal pH	N/A	195	195	195	195	195	195
Urea-based	EF_NH3_applic_	Reference case (broadcast, no incorporation	Penetration rate	1,00	1,00	1,00	0,75	0,53	0,46
Urea-based	EF_NH3_applic_	Urease inhibitor (solid urea)	Penetration rate	0,00	0,00	0,00	0,19	0,38	0,39
Urea-based	EF_NH3_applic_	Urease inhibitor (liquid urea, ammonium nitrate)		0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	Slow-release fert. (polymer coatings)	Penetration rate	0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	closed-slot injection	Penetration rate	0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	Incorporation immediately	Penetration rate	0,00	0,00	0,00	0,06	0,09	0,16
Urea-based	EF_NH3_applic_	Irrigation	Penetration rate	0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	Substitution with ammonium nitrate	Penetration rate	0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	Reference case (broadcast, no incorporation	Abatement efficiency rate	0,00	0,00	0,00	0,00	0,00	0,00
Urea-based	EF_NH3_applic_	Urease inhibitor (solid urea)	Abatement efficiency rate	0,70	0,70	0,70	0,70	0,70	0,70
Urea-based	EF_NH3_applic_	Urease inhibitor (liquid urea, ammonium nit	Abatement efficiency rate	0,40	0,40	0,40	0,40	0,40	0,40
Urea-based	EF_NH3_applic_	Slow-release fert. (polymer coatings)	Abatement efficiency rate	0,30	0,30	0,30	0,30	0,30	0,30
Urea-based	EF_NH3_applic_	closed-slot injection	Abatement efficiency rate	0,85	0,85	0,85	0,85	0,85	0,85
Urea-based	EF_NH3_applic_	Incorporation immediately	Abatement efficiency rate	0,65	0,65	0,65	0,65	0,65	0,65
Urea-based	EF_NH3_applic_	Irrigation	Abatement efficiency rate	0,55	0,55	0,55	0,55	0,55	0,55
Urea-based	EF_NH3_applic_	Substitution with ammonium nitrate	Abatement efficiency rate	0,90	0,90	0,90	0,90	0,90	0,90
Urea-based	**EF_NH3_applic_**	**Abated EF**		195	195	195	161,73	131,707	122,3

The processed data on the use of individual types of mineral fertilizers, their doses, etc. coming from the national database JUDEH database was also used for calculations of greenhouse gas emissions from the production of selected crops in the NUTS 2 breakdown within the framework of Directive (EU) 2018/2001 of the European Parliament and Council of 11 December 2018 on the promotion of the use of energy from renewable sources (RED Directive), see the chapter 3.6 of the Czech national report (https://circabc.europa.eu/ui/group/8f5f9424-a7ef-4dbf-b914-1af1d12ff5d2/library/0aba8c46-2e3e-4146-8b57-5076b910b762/details). The method of calculations, including the use of the JUDEH database, was assessed by DG Energy as transparent. The result was Commission Implementing Decision (EU) 2025/473. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202500473 .

Appendix 1 Illustrative extract from the JUDEH database

Time period: 01.01.2022 - 31.12.2022, Area NUTS 3: Královéhradecký kraj																										
Record ID	ID of subject	Name of subject	Quater ID	Plot code	Plot ID	Date of application	Date of incorporation	Cultivated crop	Crop area (ha)	Application area (ha)	Ammount of applied fertilisers	Applied fertilisers (unit of quantity per ha)	Unit	Ferlizers id	The name of the fertilizer	Category of N - id	Category of N - name	Type - id	Type - name	Nutrient supply - oxide form (kg/ha)						
																				N	N (adjus	P2O5	K2O	MgO	CaO	S
XXXX	XXXXX	XXXXX	480-114	9001/1	125948	30.04.2024		Corn	10,84	10,40	1 040,00	100,00	kg	2009587	Močovina 46 % N	2	Mineral nitrogenous	102	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	480-114	9101	125953	15.04.2024		Corn	6,07	5,70	570,00	100,00	kg	2009587	Močovina 46 % N	2	Mineral nitrogenous	102	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	480-114	9102	125953	15.04.2024		Corn	6,08	5,70	570,00	100,00	kg	2009587	Močovina 46 % N	2	Mineral nitrogenous	102	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	490-113	5401	397131	26.03.2024		Wheat	6,05	6,04	851,64	141,00	kg	99001100	UREAstabil	2	Mineral nitrogenous	117	Mineral fertiliser	64,86	64,86					
XXXX	XXXXX	XXXXX	490-113	5410/3	394090	26.03.2024		Wheat	10,44	10,44	1 472,04	141,00	kg	99001100	UREAstabil	2	Mineral nitrogenous	117	Mineral fertiliser	64,86	64,86					
XXXX	XXXXX	XXXXX	490-113	5705/1	397146	26.03.2024		Wheat	15,43	15,43	2 191,06	142,00	kg	99001100	UREAstabil	2	Mineral nitrogenous	117	Mineral fertiliser	65,32	65,32					
XXXX	XXXXX	XXXXX	490-113	5705/2	397154	18.04.2024		Wheat	5,28	5,28	1 267,20	240,00	kg	99004603	Močovina	2	Mineral nitrogenous	102	Mineral fertiliser	110,40	110,40					
XXXX	XXXXX	XXXXX	490-113	6308/3	391260	26.03.2024		Wheat	3,56	3,56	501,96	141,00	kg	99001100	UREAstabil	2	Mineral nitrogenous	117	Mineral fertiliser	64,86	64,86					
XXXX	XXXXX	XXXXX	490-113	6401/1	397189	26.03.2024		Wheat	16,61	16,61	2 347,19	141,31	kg	99001100	UREAstabil	2	Mineral nitrogenous	117	Mineral fertiliser	65,00	65,00					
XXXX	XXXXX	XXXXX	510-114	8413/3	125745	01.10.2024	01.10.2024	Wheat	0,91	0,91	91,00	100,00	kg	99001827	Močovina N 46 gr	2	Mineral nitrogenous	102	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	510-114	8502	900139	01.10.2024	01.10.2024	Wheat	6,17	6,17	617,00	100,00	kg	99001827	Močovina N 46 gr	2	Mineral nitrogenous	102	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	510-114	9407	119368	20.04.2024	20.04.2024	Corn	3,57	3,00	900,00	300,00	kg	99008186	Močovina stabil	2	Mineral nitrogenous	102	Mineral fertiliser	138,00	138,00					
XXXX	XXXXX	XXXXX	510-114	9407	119368	27.05.2024		Corn	3,57	3,00	300,00	100,00	kg	99004707	Urea Safe	2	Mineral nitrogenous	117	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	510-114	9410	119368	20.04.2024	20.04.2024	Corn	11,29	11,00	3 300,00	300,00	kg	99008186	Močovina stabil	2	Mineral nitrogenous	102	Mineral fertiliser	138,00	138,00					
XXXX	XXXXX	XXXXX	510-114	9410	119368	27.05.2024		Corn	11,29	11,00	1 100,00	100,00	kg	99004707	Urea Safe	2	Mineral nitrogenous	117	Mineral fertiliser	46,00	46,00					
XXXX	XXXXX	XXXXX	510-116	2105/2	118651	09.04.2024	10.04.2024	Corn	19,66	19,66	4 915,00	250,00	kg	99000976	Močovina prilova	2	Mineral nitrogenous	102	Mineral fertiliser	115,00	115,00					
XXXX	XXXXX	XXXXX	510-116	2105/2	118651	09.04.2024	10.04.2024	Corn	13,31	13,31	3 327,50	250,00	kg	99000976	Močovina prilova	2	Mineral nitrogenous	102	Mineral fertiliser	115,00	115,00					
XXXX	XXXXX	XXXXX	510-116	7003/1	121925	09.04.2024	09.04.2024	Corn	5,99	5,99	575,04	96,00	kg	99000976	Močovina prilova	2	Mineral nitrogenous	102	Mineral fertiliser	44,16	44,16					
XXXX	XXXXX	XXXXX	520-118	1902	190288	17.03.2024		Wheat	27,55	27,55	2 755,00	100,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	40,00	40,00					5,60
XXXX	XXXXX	XXXXX	520-118	1902	190288	11.04.2024		Wheat	27,55	27,55	4 132,50	150,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	60,00	60,00					8,40
XXXX	XXXXX	XXXXX	520-118	2002/3	110500	03.05.2024		Corn	17,97	17,97	5,57	0,31	t	2010677	YaraVera Amidas	2	Mineral nitrogenous		Mineral fertiliser	124,00	124,00					
XXXX	XXXXX	XXXXX	520-118	2903/3	136684	03.05.2024	03.05.2024	Corn	3,20	3,20	225,00	70,31	kg	99000976	Močovina prilova	2	Mineral nitrogenous	102	Mineral fertiliser	32,34	32,34					
XXXX	XXXXX	XXXXX	520-118	6703/6	136685	15.04.2024	15.04.2024	Sugar beet	25,09	25,09	6 272,50	250,00	kg	99001766	Močovina granul	2	Mineral nitrogenous	102	Mineral fertiliser	115,00	115,00					
XXXX	XXXXX	XXXXX	520-118	6703/6	136685	03.05.2024	03.05.2024	Corn	3,51	3,51	250,00	71,23	kg	99000976	Močovina prilova	2	Mineral nitrogenous	102	Mineral fertiliser	32,76	32,76					
XXXX	XXXXX	XXXXX	520-118	7701/1	353723	17.03.2024		Wheat	11,80	11,80	1 180,00	100,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	40,00	40,00					5,60
XXXX	XXXXX	XXXXX	520-118	7701/1	353723	11.04.2024		Wheat	11,80	11,80	1 770,00	150,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	60,00	60,00					8,40
XXXX	XXXXX	XXXXX	520-118	7802/1	136686	15.04.2024	15.04.2024	Sugar beet	5,66	5,66	1 415,00	250,00	kg	99001766	Močovina granul	2	Mineral nitrogenous	102	Mineral fertiliser	115,00	115,00					
XXXX	XXXXX	XXXXX	520-118	7901/4	122487	20.03.2024		Wheat	12,18	12,18	1 218,00	100,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	40,00	40,00					5,60
XXXX	XXXXX	XXXXX	520-118	7901/4	122487	16.04.2024		Wheat	12,18	12,18	1 827,00	150,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	60,00	60,00					8,40
XXXX	XXXXX	XXXXX	520-119	0507	190286	17.03.2024		Wheat	18,86	18,86	1 886,00	100,00	kg	2010677	YaraVera AMIDAS	2	Mineral nitrogenous	102	Mineral fertiliser	40,00	40,00					5,60

Annex 2 Illustrative extract from the fertilizer database

Identifikátor hnojiva	Reg. číslo dle ÚKZÚZ	Evidenční číslo hnojiva	Název hnojiva	Subjekt žadatel	Subjekt výrobce	Výkaly	Organické hnojivo	Typ číselníku	Kategorie N	Druh hnojiva	Typ obvyklé MJ	Platnost od	Platnost do	N	P2O5	K2O	CaO	MgO	Na2O	S	Cl	Zn	Cu	Fe	B	Mn
							ne			× Minerální hnojivo s inhibitorem				>= 10												
99007605		C341	Močovina N 46 stabilizovaná	ACHP Slavkov, a.s.	ACHP Slavkov, a.s.	Ne	Ne	Hnojiva ES	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	13.03.2024		46												
99004707		C203	Urea Safe	MJM agro, a. s.	MJM agro, a. s.	Ne	Ne	Hnojiva ES	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	17.05.2023		46												
99011785		C467	Entec perfect	FERTISTAV CZ a.s.	EuroChem Agro GmbH	Ne	Ne	Hnojiva ES	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	10.07.2025		14	7	17		2		9		0,01			0,02	
99000843		V802	Urea prilled with urease inhibitor	Witt Handel GmbH	Witt Handel GmbH	Ne	Ne	Vzájemně uznaná	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	21.06.2022		46												
2008879		V451	ALZON neo-N	AGROFERT, a.s.	SKW Stickstoffwerkw Piesteritz GmbH	Ne	Ne	Vzájemně uznaná	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	19.07.2017		46,3												
99000842		V801	STABUR	Witt Handel GmbH	Witt Handel GmbH	Ne	Ne	Vzájemně uznaná	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	21.06.2022		46												
99006663			Močovina s inhibitorem ureázy 46%			Ne	Ne	Hlavní hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	15.11.2023		46												
99012999		C520	Močovina N 46 stabilizovaná VOLIT	ACHP Slavkov, a.s.	ADW AGRO, a.s.	Ne	Ne	Hnojiva ES	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	23.02.2026		46												
99006842		V982	SULFAMMO 18 N-PROCESS	TIMAC AGRO CZECH s.r.o.	TIMAC AGRO, Dungemittelproduktions - und HandelsgmbH	Ne	Ne	Vzájemně uznaná	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	01.12.2023	08.11.2031	18				4		12		0,1	0,1			
99009508		O1880	Močovina granulovaná STABIL	Stavsale s.r.o.	Stavsale s.r.o.	Ne	Ne	Ohlášená hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	30.10.2024	30.10.2029	46												
99009509		O1881	Močovina granulovaná STABIL	Stavsale s.r.o.	Polish Agro Sp. z o.o.	Ne	Ne	Ohlášená hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	30.10.2024	30.10.2029	46												
99009506		O1878	Močovina granulovaná STABIL	RB ChemGroup a.s.	LLC TECHNOSPETSTRADING	Ne	Ne	Ohlášená hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	26.10.2024	26.10.2029	46												
99009507		O1879	Močovina granulovaná STABIL	RB ChemGroup a.s.	Polish Agro Sp. z o.o.	Ne	Ne	Ohlášená hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	H	26.10.2024	26.10.2029	46												
2009845		O1033	NUTRINO	Agrinova Consulting s.r.o.	IntraCrop Limited	Ne	Ne	Ohlášená hnojiva	Minerální hnojivo	Minerální hnojivo s inhibitorem	O	07.01.2024	07.01.2029	28												

https://mze.gov.cz/ssl/nosso-app/DataKeStazeni/Hnojiva?page=1&sortBy=-PLADO&pageSize=500&collapsed=False&opIDHN=%3D&opREC=%3D&opEVIDENCNICISLO=~C&opNAZ=~C&opZAD=~C&opVYR=~C&opORG=_%21%3D&opID1=%40&opID2=%40&opDRUH=%40&opTYPMJ=~C&opPLAOD=%3D&opPLADO=%3D&opCHN=%3E%3D&opCHP=%3D&opCHK=%3D&opCHCA=%3D&opCHMG=%3D&opCHNA=%3D&opCHS=%3D&opCHCL=%3D&opCHZN=%3D&opCHCU=%3D&opCHFE=%3D&opCHB=%3D&opCHMN=%3D&opCHMO=%3D&opCHSE=%3D&opCHSL=%3D&opCHSP=~C&opKOEFPREP=%3D&fcDRUH=117&fcCHN=10