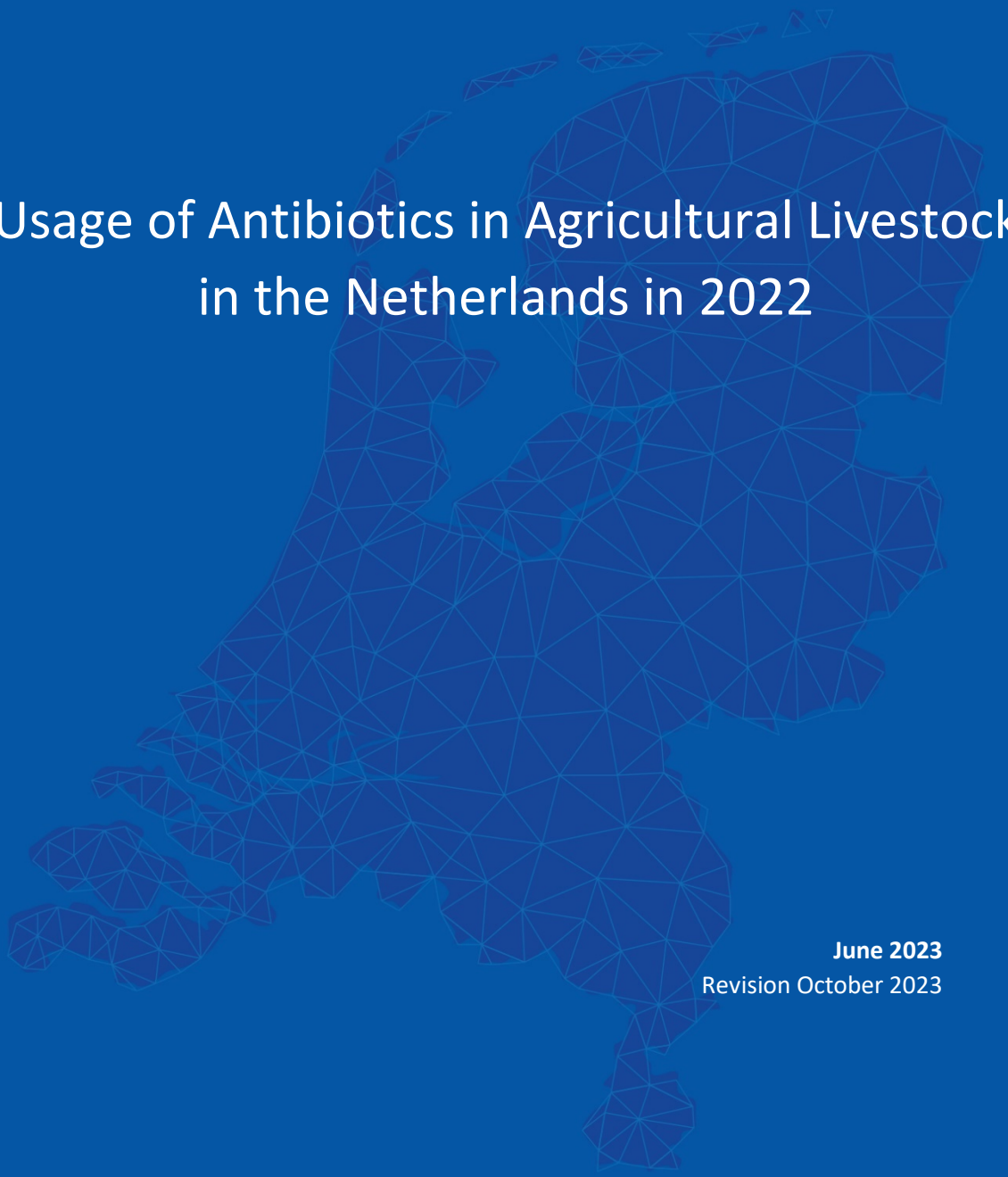
Autoriteit Diergeneesmiddelen

Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022



June 2023

Revision October 2023

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Reader's guide

This is a copy of the SDa report on the usage of antibiotics in agricultural livestock in the Netherlands in 2022, drawn up by the SDa expert panel.
The report and a cover letter by the SDa board have been combined in a single document, with the SDa board's cover letter preceding the SDa expert panel's report. The appendix to the report is available online.

Autoriteit Diergeneesmiddelen

Utrecht, June 2023

Re: SDa report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022*

Dear Sir or Madam,

It is with great pleasure that the Netherlands Veterinary Medicines Institute (SDa) presents its report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022*. In this publication, the SDa expert panel reports on the amounts of antibiotics used in the Dutch cattle, goat, pig, poultry, rabbit and veal farming sectors in 2022.

In 2022, overall antibiotic use in the rabbit, pig and broiler farming sectors continued to decline, by 32.4%, 23.8% and 7.6%, respectively. Overall antibiotic use in the cattle farming sector has been low and stable since 2014. In the turkey and veal farming sectors, however, overall antibiotic use rose by 4.0% and 5.6%, respectively, in 2022.

In 2022, the overall amount of antibiotics sold within the Dutch livestock sector declined by 22.9%, amounting to a 77.4% reduction from the government-specified reference year of 2009. The SDa compares antibiotic usage and sales data on an annual basis. Data on sales volumes are provided by FIDIN, the federation of the Dutch veterinary pharmaceutical industry. The number of kilograms of antibiotics sold in 2022 exceeded the number of kilograms used by 3.3%. Due to the implementation of a new EU regulation, veterinarians are able to purchase veterinary medicinal products in other member states when the product concerned is not available in the country in which the veterinarian is established. This could affect the accuracy of comparisons between the amounts of antibiotics sold and used in the Dutch livestock sector and might consequently affect the value of these comparisons as a monitoring tool. The SDa is aware of this and intends to estimate the extent of such purchases in consultation with other EU member states.

Sales of antibiotics classified as last-resort antibiotics for humans (i.e. fluoroquinolones and third- and fourth-generation cephalosporins) remained low in 2022. Sales of polymyxins (including colistin) showed a substantial decline in 2022, to the lowest level recorded since monitoring was initiated. This decline has cancelled out the rise in sales recorded over the 2017-2020 period.

The action plans implemented by the rabbit, pig and broiler farming sectors are proving to be effective, with lower overall antibiotic use and fewer livestock farms recording persistently high usage levels. In the veal and turkey farming sectors, overall antibiotic use did not decline in 2022. Mean antibiotic use at rosé veal fattening farms increased, and rosé veal starter, rosé veal combination and white veal farms are characterised by stagnating usage level reductions and high between-farm usage level differences. As of 2023 the measures already taken to reduce persistently high usage levels in rosé veal fattening farms were extended to the rosé veal starter and white veal farms. Future SDa reports will reveal how successful these measures are in reducing antibiotic usage levels. Several farms in the relatively small turkey farming sector recorded high usage levels for 2022. Measures taken by the turkey farming sector in response to individual farms with high usage levels will have to become more effective.

Since 1 April 2021, goat farmers are also required to record antibiotic usage data in a government-specified database. Similar to 2021, about 80% of all goat farms with over 25 animals and 85% of all dairy goat farms had their antibiotic usage data recorded. According to the 2022 data provided to the SDa, usage of antibiotics at dairy goat farms was low. The antibiotic usage data received by the SDa are not yet sufficient to enable reporting on the goat farming sector as a whole. Consequently, the SDa urges goat farmers and their veterinarians to identify and address any factors contributing to the goat farming sector's incomplete antibiotic usage data, and to make sure the data provided are of sufficient quality.

In 2022, almost all of the livestock sectors saw a decline in the amounts of antibiotics prescribed by veterinarians compared to the year before, which has resulted in the reductions in antibiotic use referred to above. Veterinarians' prescription patterns continued to show substantial variation, suggesting there is still room to further reduce the mean amounts of antibiotics prescribed.

[1]Types of farms or production categories benchmarked by means of benchmark thresholds representing acceptable use are characterised by low or very low antibiotic usage levels, limited variation in $DDDA_F$ values between individual livestock farms, and limited usage level fluctuations over time.The livestock farms concerned are benchmarked by means of a single benchmark threshold, referred to as their action threshold. Farms with $DDDA_F$ values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.

The 2022 monitoring results show a primarily positive picture. The SDa considers this to be the result of many livestock farmers and veterinarians being successful in their efforts to achieve sustained reductions in the amounts of antibiotics used in the Dutch livestock sector. In the cattle, pig and broiler farming sectors, a considerable number of farms have managed to reach antibiotic usage levels consistent with acceptable use. Over the next year, the SDa will examine whether the other livestock sectors also meet the requirements for implementation of benchmark thresholds representing acceptable use.

The SDa would like to note, perhaps unnecessarily, that what is considered to be acceptable use is subject to the way in which the Dutch livestock sector is organised. A transition to different animal husbandry practices may affect the amounts of antibiotics used and, as a result, could have an effect on benchmark thresholds representing acceptable use.

In light of the overall objective of preventing the emergence and spread of resistant bacteria, reducing the amounts of antibiotics used and prescribed at livestock farms with persistently high usage levels should remain the primary focus in the next few years.

On behalf of the SDa board,

Yours sincerely,

H.M. Meijdam, LLM
Chair

H.M.G. Schreurs, DVM, PhD
Director

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REPORT

Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022

Trends and benchmarking of livestock farms and veterinarians

SDa expert panel

June 2023

Preface

This is a copy of the SDa report *Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022*. With this year's report, the SDa expert panel provides insight into the usage of antibiotics at Dutch livestock farms for the twelfth consecutive year. The report consists of two separate parts: a main report summarising the most important findings regarding the usage of antibiotics in the Dutch livestock sector, and an online appendix containing all of the underlying data.

With its benchmarking activities and annual report, the SDa aims to promote prudent usage of antibiotics by offering livestock farmers and veterinarians insight into their performance in terms of antibiotic usage levels and prescription patterns, respectively.

Since several years, the report also includes information on livestock farms with persistently high antibiotic usage levels (i.e. $DDDA_F$ values that have exceeded the action threshold two years in a row), and this year's report describes livestock sectors' trends in the number of farms with persistently high usage levels.
Similar to last year, the report also includes detailed information on the amounts of colistin used in the various livestock sectors.

Colophon:
Members of the SDa expert panel:

Prof. M.J.M. Bonten, PhD, medical microbiologist
I.M. van Geijlswijk, PhD, hospital pharmacist - clinical pharmacologist
Prof. D.J.J. Heederik, PhD, epidemiologist and chair
A.J. van Hout-van Dijk, DVM, PhD, veterinarian/senior researcher
L. Mughini-Gras, DVM, PhD, epidemiologist

Research staff:
P. Sanders, ir., data analyst

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Summary

Sales data trends

The SDa expert panel publishes its annual report to provide information on the amounts of antibiotics sold and used within the Dutch livestock sector. In 2022, the overall number of kilograms of active substances sold declined by 22.9%. This amounts to a 77.4% reduction from the government-specified reference year of 2009, indicating how effective reduction efforts in the Netherlands have been.

Antibiotic use in the various livestock sectors

The **pig farming sector** continued the decline in overall antibiotic use recorded for 2021 with a prominent 23.8% additional reduction in 2022. This resulted in a $DDDA_{NAT}$ of 5.8, corresponding to a 71.9% reduction from the pig farming sector's 2009 $DDDA_{NAT}$ value. The proportion of farms with persistently high usage levels (i.e. farms whose $DDDA_F$ values had exceeded their SDa-defined action threshold two years in a row) continued to decline in 2022, to a level below 10% for all production categories in the pig farming sector. It should be noted, however, that antibiotic use in the weaner pigs production category is still benchmarked by means of a provisional benchmark threshold.

Overall antibiotic use in the **veal farming sector** increased by 5.6% in 2022, to 16.2 $DDDA_{NAT}$. Antibiotic use in terms of $DDDA_F$ has remained stable for all types of veal farms except rosé veal fattening farms, with the latter recording an increase in antibiotic use for 2022. The veal farming sector as a whole has not managed to resume the downward trend observed over the 2015-2020 period, and its $DDDA_{NAT}$ reduction from the 2009 reference year currently amounts to 52.0%. All types of veal farms still show considerable between-farm usage level differences, which indicates there is room for further usage level reductions. Persistently high usage levels turned out to be quite common in 2022, particularly at rosé veal starter, rosé veal fattening and rosé veal combination farms. In addition to addressing persistently high usage levels, the veal farming sector needs to make sure across-the-board usage level reductions are realised. In 2023, the veal farming sector will see the introduction of a new calculation method and an update of its provisional benchmark thresholds by the SDa expert panel.

Overall antibiotic use in the **broiler farming sector** decreased by 7.6% in 2022, to 5.8 $DDDA_{NAT}$. This was a continuation of the sector's downward trend in antibiotic use, which has amounted to an 84.1% reduction from the broiler farming sector's 2009 level. The decline observed between 2009 and 2016 was the result of reductions in the amounts of antibiotics used in conventional broiler breeds, whereas the continuation of

this trend from 2016 onwards was mainly driven by many broiler farmers switching to slower growing breeds and by reductions in the amounts of antibiotics used in those slower growing breeds. Antibiotic use in slower growing breeds is low, and has fallen by 66.4% between 2017 and 2022. At the moment, no distinct downward trend can be observed for the amounts of antibiotics used in conventional broiler breeds. Although 2022 saw a decline in the proportion of broiler farms with conventional breeds that had exceeded their SDa-defined action threshold for the second year in a row, it was still relatively high (30.5%). The SDa-defined action threshold should be regarded as a distant goal to work towards, which is why the broiler farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the application of transitional benchmark thresholds intended to help broiler farmers move towards their SDa-defined benchmark threshold over a period of several years. Broiler farmers' usage of antibiotics is currently benchmarked by means of their sector-negotiated, transitional benchmark thresholds. In 2022, 2.8% of broiler farms with conventional breeds exceeded their transitional action threshold for the second year in a row. Persistently high usage levels are rare at broiler farms with slower growing breeds.

Mean antibiotic use at **broiler parent/grandparent stock rearing farms** dropped to 6.4 $DDDA_F$ in 2022, but there were considerable usage level differences between individual rearing farms. Although the majority of **layer parent/grandparent stock rearing farms** did not use any antibiotics in 2022, several rearing farms recorded relatively high usage levels (>20 $DDDA_F$). Antibiotic use in **layers, layer pullets**, **layer parent/grandparent stock** and **broiler parent/grandparent stock** was low and remained relatively stable.

Overall antibiotic use in the **turkey farming sector** declined to 9.2 $DDDA_{NAT}$ in 2022. The sector has managed to reduce its overall antibiotic use by 68.5% since monitoring commenced in 2013. Since 2021, turkey farms are benchmarked by means of a new, more stringent action threshold. As a result, 2022 saw an increase in the proportion of turkey farms with persistently high usage levels. The SDa expert panel expects this proportion to decline over the next years if the turkey farming sector is able to continue its downward $DDDA_F$ trend.

Ever since 2014, overall antibiotic use in the **dairy cattle farming sector** has been at a stable level of about 3 $DDDA_{NAT}$. Antibiotic use in 2022 amounted to 3.2 $DDDA_{NAT}$, which represents a 45.4% reduction from the 2009 reference year. The **non-dairy cattle farming sector** (i.e. **suckler cow farms, rearing farms** and **beef farms**) was already characterised by very low $DDDA_{NAT}$ values, and 2022 saw an additional 43.6% reduction in the sector's overall antibiotic use, resulting in a $DDDA_{NAT}$ of 0.4. Most suckler cow, rearing and beef farms had $DDDA_F$ values equal or close to zero. The proportion of farms with persistently

high usage levels was below 5% for both dairy cattle farms and the various non-dairy cattle farms.
Since 1 April 2021, the **goat farming sector** is also required to record the amounts of antibiotics used. The antibiotic usage data provided by the sector turned out to be incomplete, and the SDa expert panel also has concerns about the quality of the received data. As the available data do not pertain to all goat farms, it is not yet possible to report on the amounts of antibiotics used in the goat farming sector as a whole. The issue of incomplete data was first encountered when the goat farming sector submitted its data for 2021, and there is no indication that substantial progress has been made in this respect since. It is not always clear why certain data are missing or of insufficient quality. This is something that requires further investigation. The SDa expert panel wants the goat farming sector and veterinarians active in this livestock sector to show initiative in finding out the root causes of these issues. Once the causes are identified, the sector should improve its data quality and data coverage.
Overall antibiotic use in the **rabbit farming sector** appears to be trending downwards significantly. The reduction recorded for 2021 was followed by an additional 32.4% decline in 2022, resulting in a $DDDA_{NAT}$ of 23.7. Benchmarking of rabbit farms' antibiotic usage levels was initiated in 2022, and 2022 also saw the implementation of the sector's action plan aimed at reducing the amounts of antibiotics used. As the rabbit farming sector's benchmark threshold was only introduced one year ago, no data on persistently high usage levels could be included in this year's report. The SDa expert panel believes its benchmarking activities and the sector's action plan will help prevent persistently high usage levels at rabbit farms.

Usage of critically important agents

In most livestock sectors, usage of fluoroquinolones, third- and fourth-generation cephalosporins and colistin is low and stable. Fluoroquinolones and third- and fourth-generation cephalosporins were used very sparingly, if at all, in the various monitored livestock sectors (with a maximum of 0.23 $DDDA_{NAT}$, recorded for the turkey farming sector). Colistin is the only critically important agent used more extensively in some of the livestock sectors over the last few years. In 2022, the number of kilograms of colistin used in all monitored livestock sectors combined dropped below the 2017 level, which up to 2022 had been the lowest level recorded for the livestock sectors combined. Over the 2017-2020 period, total colistin use had increased by 62.1%, followed by a 21.2% decline in 2021 and an additional 28.2% reduction in 2022. Total colistin use in 2022 amounted to 806 kilograms of active substance. The layer and pig farming sectors are the main contributors to the amount of colistin used in the Dutch livestock sector. In 2022, the pig

and layer farming sectors both managed to significantly reduce the number of kilograms of colistin used, by 24.5% and 45.4%, respectively.

Benchmarking of veterinarians

All types of farms and production categories had the majority of their veterinarians recording target zone prescription patterns for 2022. Considering there are still substantial prescription pattern differences between individual veterinarians, it should be possible for veterinarians to further reduce the mean amounts of antibiotics prescribed. Livestock farms with persistently high usage levels do not contribute to the Veterinary Benchmark Indicator (VBI) of their veterinarian, as these farms are not included in VBI calculations. Farms with persistently high usage levels require targeted measures aimed at reducing the amounts of antibiotics used. These measures are to be developed and implemented by the livestock sectors, in close consultation with veterinarians.

Terms and definitions

Benchmark threshold	For livestock farms: a value set by the SDa to which a livestock farm's usage of antibiotics (in Defined Daily Doses Animal, $DDDA_F$) is compared. Benchmark thresholds are assigned for each type of farm or production category within a particular livestock sector. There are two different types of benchmark thresholds: benchmark thresholds representing acceptable use, and provisional benchmark thresholds. For veterinarians: the value to which the amount of antibiotics prescribed by a particular veterinarian is compared. Benchmark thresholds for veterinarians correspond to the $DDDA_F$-based benchmark thresholds for the types of farms or production categories concerned.
Benchmark threshold representing acceptable use	This type of benchmark threshold reflects a usage level deemed to be acceptable for the type of farm or production category concerned. The types of farms and production categories that are benchmarked by means of benchmark thresholds representing acceptable use, are characterised by low or very low usage levels, limited variation in $DDDA_F$ values between individual livestock farms, and limited usage level fluctuations over time. They are only assigned a single benchmark threshold representing acceptable use: their action threshold. Livestock farms with $DDDA_F$ values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.
Cattle farming sector	In this report, the term "cattle farming sector" includes the dairy cattle farming sector (i.e. dairy cattle farms) and the non-dairy cattle farming sector (i.e. suckler cow farms, rearing farms, and beef farms). This term does not include the veal farming sector (i.e. white veal farms, rosé veal starter farms, rosé veal fattening farms, and rosé veal combination farms), unless stated otherwise.
$DDDA_F$	The Defined Daily Dose Animal at the farm level. The $DDDA_F$ is used to express the amount of antibiotics used at a particular livestock farm. The $DDDA_F$ is determined by first calculating the total number of treated kilograms for a particular livestock farm for a particular year (based on the antibiotics supplied to the farm concerned), and then dividing this number by the average number of kilograms of animal present on the farm concerned. The $DDDA_F$ is expressed in DDDA/animal-year. In the initial SDa reports, the ADDD/Y unit of measurement was used.

$DDDA_{NAT}$	The Defined Daily Dose Animal at the national level. The $DDDA_{NAT}$ is used to express the amount of antibiotics used within a particular livestock sector in the Netherlands. The $DDDA_{NAT}$ is determined by first calculating the total number of treated kilograms within a particular livestock sector for a particular year, and then dividing this number by the average number of kilograms of animal present within the livestock sector concerned. The $DDDA_{NAT}$ is expressed in DDDA/animal-year.
$DDDA_{VET}$	The Defined Daily Dose Animal at the veterinarian level. The $DDDA_{VET}$ is used to express a veterinarian's antibiotic prescription pattern for a particular type of farm or production category for a particular year. To determine the $DDDA_{VET}$, the first step is to calculate the total number of treated kilograms for which a particular veterinarian prescribed antibiotics during a specific year (the overall number of treated kilograms for all of the livestock farms that had a registered one-to-one relationship with this veterinarian in the year concerned). This number is then divided by the average number of kilograms of animal present based on all of the livestock farms that had a registered one-to-one relationship with the veterinarian concerned, including those with persistently high usage levels – which are not included when determining the new VBI. Due to its inclusion of livestock farms with persistently high usage levels, the $DDDA_{VET}$ is better suited for monitoring trends in veterinarians' overall prescription patterns.
DDD_{VET}	The active-substance-based Defined Daily Dose for veterinary medicinal products. The DDD_{VET} is the assumed average dose administered to a particular type of livestock in Europe, in mg/kg body weight.
EUROSTAT	The statistical office of the European Union.
Livestock farms with persistently high usage levels	Livestock farms whose $DDDA_F$ values have exceeded their action threshold two years in a row. Besides being useful for sector-based usage level monitoring, identification of livestock farms with persistently high usage levels is required when determining a veterinarian's VBI value, as those farms are excluded from the SDa's VBI calculations.
Mass balance	A comparison between the number of kilograms of active substances sold according to recorded sales data and the number of kilograms of the active substances used according to veterinarian-reported delivery data (delivery records).

PCU	The Population Correction Unit. The PCU is used by the European Medicines Agency as a unit of measurement for the number of kilograms of animal. The PCU is calculated using the number of animals slaughtered in a particular year (adjusted for imported and exported animals), unless the animals present within the livestock sector concerned are not kept for meat production (e.g. dairy cattle), in which case the number of live animals is used.
Poultry farming sector	In this report, the term “poultry farming sector” includes all of the monitored poultry farms (i.e. turkey farms, broiler farms, layer farms, pullet rearing farms, rearing farms for layer or broiler parent/grandparent stock, and production farms for layer or broiler parent/grandparent stock), unless specified otherwise.
Provisional benchmark threshold	This type of benchmark threshold reflects a usage level not yet consistent with acceptable use. As a result, assigned provisional benchmark thresholds will be adjusted on a regular basis over the next few years as the livestock farms concerned move towards more acceptable usage levels. Types of farms and production categories benchmarked by means of provisional benchmark thresholds are characterised by relatively high mean DDDAF values, wide DDDAF distributions and substantial usage level fluctuations over time. They are only assigned a single provisional benchmark threshold: their action threshold. Livestock farms with DDDAF values exceeding this threshold are required to take action in order to reduce their antibiotic usage levels.
Rabbit farming sector	In this report, the term “rabbit farming sector” refers to meat rabbit farms, and rabbit farming sector data pertain to all of the rabbits present on meat rabbit farms (i.e. breeding does with kits, weaned meat rabbits, and replacement breeding does). Collectively, these rabbits are referred to as “meat rabbits”.
Transitional benchmark thresholds	Some of the livestock sectors have negotiated transitional benchmark thresholds with the Ministry of Agriculture, Nature and Food Quality in order to help livestock farmers move towards their SDa-defined benchmark threshold in a more gradual fashion.
Treated kilograms	The number of kilograms of a particular type of livestock that can be treated with a single packaging unit of the antibiotic concerned.

VBI (implemented in 2021)	The Veterinary Benchmark Indicator (VBI) reflects a veterinarian's antibiotic prescription pattern with respect to a particular type of farm or production category in one of the livestock sectors. The VBI is calculated by first determining the total number of treated kilograms for which the veterinarian prescribed antibiotics during a particular year (the overall number of treated kilograms for all livestock farms that had a registered one-to-one relationship with this veterinarian in the year concerned) and then dividing this number by the average number of kilograms of animal present based on all of the livestock farms concerned. Livestock farms with persistently high usage levels are not included in VBI calculations.

Antibiotic usage trends

Antibiotic use in the main livestock sectors

Usage trends for monitored livestock sectors are visualised in Figure 1. The **pig farming sector** continued the decline in overall antibiotic use recorded for 2021 with a prominent 23.8% additional reduction in 2022, resulting in a $DDDA_{NAT}$ of 5.8. This represents a 71.9% reduction from the sector's $DDDA_{NAT}$ value for 2009.

Overall antibiotic use in the **veal farming sector** increased by 5.6% in 2022, to 16.2 $DDDA_{NAT}$. This livestock sector has not managed to resume the downward trend observed over the 2015-2020 period. There appears to be room for improvement, since all types of veal farms (white veal farms, rosé veal starter farms, rosé veal fattening farms and rosé veal combination farms) show substantial between-farm usage level differences. Persistently high usage levels are quite common in this livestock sector, particularly at rosé veal starter, rosé veal fattening and rosé veal combination farms.

In 2023, the veal farming sector has introduced new measures intended to lower the number of rosé veal starter and white veal farms with persistently high usage levels. These measures, which had already been in use for rosé veal fattening farms, mean that in the event of persistently high usage levels, the veal farmer is notified in writing by the Certifying Body for the sector's quality assurance scheme and will be required to work more closely with the farm's veterinarian and feed consultant. If following two written notifications no sufficient improvements are observed, an external consultant has to be added to the standard 3-person team comprising the farmer, veterinarian and feed consultant. This approach is currently being implemented for an initial selection of veal farms with the highest $DDDA_F$ values, but considering the generally high antibiotic usage levels in the veal farming sector, it would be preferable if all veal farms with persistently high usage levels were to be included. In addition to addressing persistently high usage levels, the veal farming sector needs to make sure across-the-board usage level reductions are realised.

In 2023, the veal farming sector will also see the introduction of a new calculation method and an update of its provisional (i.e. pragmatic) benchmark thresholds by the SDa expert panel. The new calculation method should offer veal farmers better insight into their antibiotic use, and thereby raise awareness on the matter. Another development of relevance to the veal and cattle farming sectors is that as of 2024, only calves free of Bovine Viral Diarrhoea (BVD) will be accepted on veal farms. As BVD leads to suppression of the animal's immune system, it makes affected cattle more susceptible to infections.

Consequently, by only accepting BVD-free calves veal farmers might be able to reduce their need for antibiotics.

Overall antibiotic use in the **broiler farming sector** continued to decline in 2022, to 5.8 $DDDA_{NAT}$. This represents a 7.6% reduction from the year before. The broiler farming sector's downward trend in antibiotic use has now amounted to an 84.1% reduction from the sector's 2009 $DDDA_{NAT}$ value. The decline observed between 2009 and 2016 was the result of reductions in the amounts of antibiotics used in conventional broiler breeds, whereas the continuation of this trend from 2016 onwards was mainly driven by many broiler farmers switching to slower growing breeds and by reductions in the amounts of antibiotics used in those slower growing breeds. Usage levels at broiler farms with slower growing breeds are very low, on average about 1 Defined Daily Dose Animal ($DDDA_F$) per year. At about 11 $DDDA_F$ per year, mean antibiotic use at broiler farms with conventional breeds is considerably higher. Broiler farms with conventional breeds also show a high degree of between-farm usage level variation, suggesting there is still room to reduce the amounts of antibiotics used at these farms. Antibiotic use in **layers, layer pullets**, **layer parent/grandparent stock** and **broiler parent/grandparent stock** remained low in 2022. Mean antibiotic use at **broiler parent/grandparent stock rearing farms** dropped to 6.4 $DDDA_F$, but usage level differences between individual rearing farms were considerable. Although the majority of **layer parent/grandparent stock rearing farms** did not use any antibiotics in 2022, several rearing farms recorded relatively high usage levels (>20 $DDDA_F$).

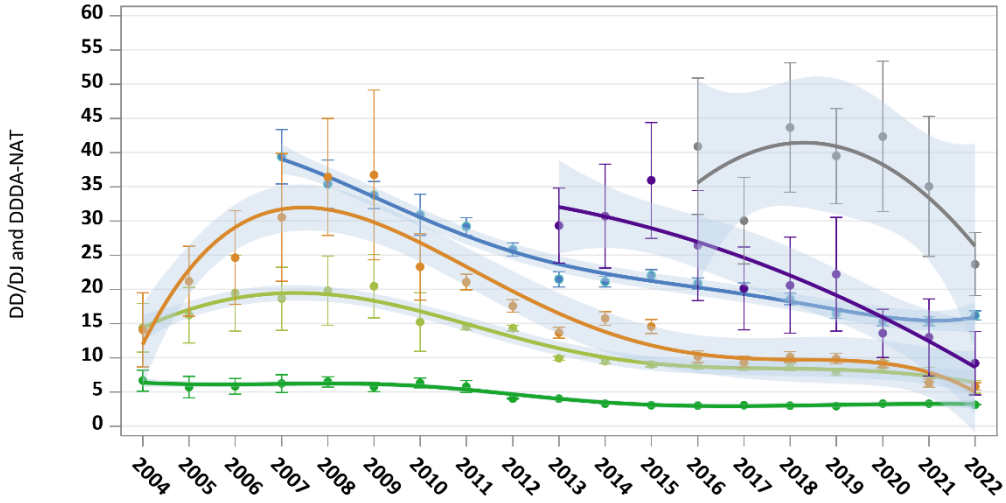
Overall antibiotic use in the **turkey farming sector** declined to 9.2 $DDDA_{NAT}$ in 2022, which represents a 68.5% reduction from the sector's $DDDA_{NAT}$ value for 2013. It should be noted, however, that there is some doubt regarding the reliability of the population size data (retrieved from the CBS) used to calculate the turkey farming sector's $DDDA_{NAT}$. For several years, there has been a discrepancy of over 10% between the number of turkeys according to CBS data and the number of turkeys according to data provided by the turkey farming sector. Given the reliability concerns regarding the turkey farming sector's $DDDA_{NAT}$ values, the SDa expert panel feels farm-level $DDDA_F$ values are better suited for monitoring antibiotic usage trends in this sector. The turkey farming sector's median $DDDA_F$ dropped by 29.6% in 2022 and has reached its lowest level in the sector's monitoring history. Although the SDa expert panel welcomes this downward trend, the sector's between-farm usage levels differences are still substantial. The high and extremely high $DDDA_F$ values recorded for a small number of turkey farms still require attention.

Ever since 2014, overall antibiotic use in the **dairy cattle farming sector** had been at a stable level of about 3 $DDDA_{NAT}$. The sector's 2022 $DDDA_{NAT}$ of 3.2 continued this trend, and represents a 45.3% reduction from the 2009 reference year.
The **non-dairy cattle farming sector** (suckler cow farms, rearing farms and beef farms), which was already characterised by very low $DDDA_{NAT}$ values, managed to reduce its overall antibiotic use by an additional 43.6% in 2022, resulting in a $DDDA_{NAT}$ of 0.4. The majority of farms within the non-dairy cattle farming sector had $DDDA_F$ values equal or close to zero.
This is the second SDa report with antibiotic usage data on the **goat farming sector**. The SDa expert panel has some concerns about the completeness and quality of the data it has received. Considering the total number of goat farms according to CBS records (CBS, 2022), the data provided to the SDa seem to cover only about 80% of all goat farms with 25 goats or more (Table 1). Anyone keeping fewer than 25 goats is not legally required to report the use of antibiotics in their animals. With regard to the antibiotic usage data that have been provided to the SDa, there are doubts as to whether they are of sufficient quality. Missing data on numbers of animals was the main concern in this respect, and has meant that for 7% of goat farms no $DDDA_F$ values could be calculated. Additionally, for a number of farms no or incorrect animal categories (i.e. dairy goats, fattening lambs, rearing goats or goats kept as a hobby) were provided.
Given that since 1 April 2021 there is a legal obligation to report usage of antibiotics in goats, the SDa expert panel had expected to include antibiotic usage data covering the entire goat farming sector in this year's report, but this turned out not to be possible. The available data suggest antibiotic usage levels at dairy goat farms are relatively low, with a mean $DDDA_F$ of 1.3. The SDa expert panel feels it cannot draw any definitive conclusions as long as the data provided are incomplete and contain numerous inaccuracies. Due to the insufficient quantity and quality of data on the goat farming sector's other animal categories, the SDa expert panel has decided not to report on the amounts of antibiotics used in fattening lambs, rearing goats and goats kept as a hobby in this year's report. It is not always clear why certain data are missing or of insufficient quality. This is something that requires further investigation. The SDa expert panel wants the goat farming sector and veterinarians active in this livestock sector to show initiative in finding out the root causes of these issues. Once the causes are identified, the sector should improve its data quality and data coverage.
Overall antibiotic use in the **rabbit farming sector** appears to be trending downwards significantly. The reduction recorded for 2021 was followed by an additional 32.4% decline in 2022, resulting in a $DDDA_{NAT}$ of 23.7. Benchmarking of rabbit farms' antibiotic usage levels was initiated in 2022, and 2022 also saw the implementation of the sector's

action plan aimed at reducing the amounts of antibiotics used. The SDa expert panel is pleased with the current development and feels the rabbit farming sector should be able to continue this downward trend in the next few years.

Please refer to the online appendix for detailed information on $DDDA_{NAT}$ developments within the various livestock sectors (Table A1) and to see livestock sectors' annual reductions from their 2009 $DDDA_{NAT}$ levels (Table A2). The appendix also includes multi-year data on livestock sectors' antibiotic use in terms of DDD_{VET}/animal-year (Table A53).

Figure 1. Long-term developments in antibiotic use according to LEI Wageningen UR data (in DD/AY, for 2004 to 2010) and SDa data (in $DDDA_{NAT}$, for 2011 to 2022), as spline curves with point estimates and 95% confidence intervals for each year. Tabulated sector-specific usage data are included underneath the graph, shown from high to low based on the sectors' overall antibiotic use in 2022. Underlying data can be found in the appendix



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Rabbits	.	.	.	.	.	.	.	.	.	.	.	.	40.9	30.1	43.7	39.5	42.4	35.1	23.7
Veal calves	.	.	.	39.4	35.4	33.8	30.9	29.2	25.9	21.5	21.2	22.1	20.9	20.1	18.6	16.5	15.3	15.4	16.2
Turkeys*	.	.	.	.	.	.	.	.	.	29.4	30.7	35.9	26.4	20.2	20.6	22.3	13.6	13.0	9.2
Broilers	14.1	21.2	24.7	30.5	36.5	36.8	23.3	21.1	17.6	13.7	15.8	14.6	10.2	9.4	10.1	9.9	9.3	6.3	5.8
Pigs	14.4	16.2	19.5	18.7	19.8	20.5	15.2	14.6	14.3	10.0	9.5	9.0	8.9	8.7	8.7	8.0	8.8	7.6	5.8
Dairy cattle	6.7	5.7	5.9	6.3	6.5	5.8	6.3	5.8	4.1	4.0	3.3	3.1	3.0	3.1	3.0	3.0	3.3	3.3	3.2

* There is some doubt regarding the reliability of the turkey farming sector's $DDDA_{NAT}$ values, as explained on page 16 above.

Table 1. Comparison of the number of goat farms according to CBS data and the number of goat farms for which antibiotic usage data have been provided, categorised by group and farm size (CBS, 2022)

Group	Farm size	Number of goat farms	
		CBS data	Sector-provided data
All goat farms	**Number of animals unknown**		27
	20-50 animals*	92	18
	50-100 animals	27	7
	100-200 animals	29	15
	200-500 animals	53	43
	500 animals or more	353	330
	Total number of farms	554	440
Dairy goat farms	**Number of animals unknown**		27
	20-50 animals*	21	3
	50-100 animals	7	3
	100-200 animals	23	8
	200-500 animals	49	32
	500 animals or more	330	302
	Total number of farms	430	375

* Anyone keeping 25 goats or more is legally required to report the use of antibiotics in their animals.

Developments in usage of first-, second- and third-choice antibiotics

The relative contributions of first-, second- and third-choice antibiotics differ from livestock sector to livestock sector. While relative contributions within individual livestock sectors initially varied from year to year, they are currently relatively stable for most of the sectors (see Table A1 in the online appendix). The 2022 $DDDA_{NAT}$ data show that in the dairy cattle, non-dairy cattle, veal and rabbit farming sectors, first-, second- and third-choice antibiotics accounted for approximately 80%, 15-20% and 0-1% of overall antibiotic use, respectively. The dairy cattle, non-dairy cattle and veal farming sectors have seen a steady increase in the relative contribution of first-choice antibiotics since the start of the monitoring process, even though usage of first-choice antibiotics in absolute terms has declined. Third-choice antibiotics accounted for less than one per cent (0.2-0.7%) of overall antibiotic use in the dairy cattle, non-dairy cattle and veal farming sectors, and the rabbit farming sector did not use any third-choice antibiotics at all.

In the pig farming sector, first-choice antibiotics accounted for 68.2% of overall antibiotic use in 2022, and second-choice antibiotics and polymyxins accounted for 27.4% and 4.4%, respectively. Third- and fourth-generation cephalosporins are not used in the pig farming sector, and usage of fluoroquinolones in this livestock sector is very low.
In the broiler and turkey farming sectors, first-choice antibiotics accounted for 26.7% and 52.6% of overall antibiotic use, respectively. Second-choice antibiotics were used relatively frequently in these livestock sectors, accounting for 72.4% of overall antibiotic use in the broiler farming sector and 45.0% of overall antibiotic use in the turkey farming sector. Although the relative contribution of second-choice antibiotics in the broiler farming sector was similar to the year before, usage of second-choice antibiotics in absolute terms did decline, from 4.6 $DDDA_{NAT}$ in 2021 to 4.2 $DDDA_{NAT}$ in 2022. Third-choice antibiotics accounted for only 0.9% and 2.4% of overall antibiotic use in the broiler and turkey farming sectors, respectively. Relative contributions, as mentioned above, are calculated using a livestock sector's $DDDA_{NAT}$ values. While $DDDA_{NAT}$ values are based on standardised body weights, broiler and turkey farms' $DDDA_F$ values are based on body weights at the time of treatment according to growth curves. The latter approach is more precise and results in different relative contributions of first-, second- and third-choice antibiotics (the difference between $DDDA_F$- and $DDDA_{NAT}$-based contributions is further explained on page 34). For data comparison purposes, the SDa expert panel has, however, decided to report $DDDA_{NAT}$-based results for the broiler and turkey farming sectors, given that all of the other livestock sectors' data are based on average body weights rather than body weights at the time of treatment, and data to be collected on a European level will also be based on average body weights.

Usage of critically important agents

In most livestock sectors, usage of critically important agents is low and stable. Colistin is the only critically important agent used more extensively in the last few years. In 2018, the World Health Organization decided to add colistin to its WHO List of Critically Important Antimicrobials for Human Medicine (the WHO CIA List), which was published in 2019 (WHO, 2019). This decision was made in light of associations between usage of colistin in particular and the presence of genes conferring transmissible resistance to colistin (*mrc-1*) being identified in animals and animal products (Liu, 2016). In light of these findings, the European Union also started reporting on colistin consumption, similar to its reporting on the consumption of fluoroquinolones and third- and fourth-generation cephalosporins.
Total colistin use (in kilograms of active substance) in the Dutch livestock sector dropped by 28.2% during the 2022 reporting year, continuing the decline initiated in 2021. The observed reduction in the amount of colistin used is confirmed by a 26.8% reduction in the amount of colistin sold. Colistin use has reached the lowest level in its monitoring history, cancelling out the rise recorded over the 2017-2020 period. The SDa is pleased to see this downward trend in colistin use. As colistin is critically important for human medicine, it should be used as little as possible in veterinary medicine.

The decline in total colistin use observed for 2022 was primarily driven by a 221.7 kg (24.5%) colistin use reduction in the pig farming sector (Figure 2). In 2021, the pig farming sector, veterinarians and the Ministry of Agriculture, Nature and Food Quality launched a project aimed at reducing the amount of colistin used at pig farms. The IKB quality assurance schemes (IKB stands for *Integrale Ketenbeheersing*, i.e. Integrated Chain Management) stipulate pig farms whose antibiotic usage levels have exceeded their action threshold two years in a row, are to address their use of colistin in an additional farm health plan (*Bedrijfsgezondheidsplan*) that has to be drawn up in response to their action zone usage levels. Colistin is used primarily in the treatment of enteropathogenic *E. coli* infections.
Close to 90% of the total amount of colistin used in the pig farming sector could be attributed to use in weaner pigs, with 27.5% of farms with weaner pigs having recorded colistin use in 2022. In the subgroup of farms that recorded colistin use in weaner pigs, mean colistin use amounted to 4.12 $DDDA_F$ (Table A49). The majority of colistin doses recorded for these farms (3.63 $DDDA_F$), were administered in the context of group treatment, given that oral administration was the main route of administration at farms with weaner pigs (Table A27). Colistin was also used quite regularly in sows and suckling piglets, with 406 farms with this production category (30.8%) recording colistin use for 2022. The mean $DDDA_F$ value recorded for these farms was low, however (Table A49).

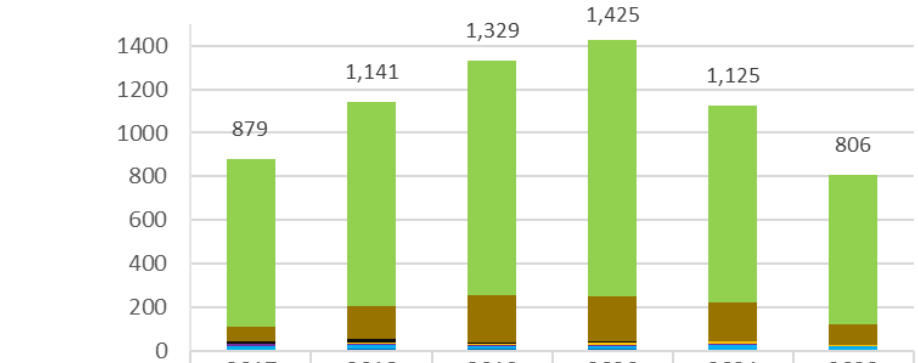
Their colistin use primarily concerned individual treatment, as indicated by parental administration being the main route of administration at farms with sows and suckling piglets (Table A25).

Layer farms are another main contributor to the total amount of colistin used. Their colistin use remained relatively high in 2022, even though they did manage to achieve a 45.4% reduction in the number of kilograms used. The layer farming sector has formulated improvement measures that should help layer farmers further reduce their colistin use. The 0-day withdrawal period for eggs is presumed to be one of the main reasons why layer farmers opt to use colistin in layers. The proportion of layer farms recording colistin use has declined by about half compared to 2021. In 2022, 52 out of 816 layer farms (6.4%) used colistin. Mean colistin use on these farms was 5.30 $DDDA_F$.

Colistin use in the broiler, dairy cattle, non-dairy cattle and veal farming sectors was low (<0.1 $DDDA_F$). No colistin use was recorded for the turkey and rabbit farming sectors.

The EMA considers 1 milligram per population correction unit (mg/PCU) or lower a desirable level for colistin use. The 45.4% reduction realised by the layer farming sector in 2022 was not sufficient to reach this level. Colistin use in the various other livestock sectors did not exceed the EMA-proposed maximum of 1 mg/PCU (Figure 3) (EMA, 2016). The SDa expert panel does note, however, that it is critical of expressing antibiotic consumption in mg/PCU. In livestock sectors with meat-producing animals, the indicator's denominator (PCU, described in the "Terms and definitions" section) is based on the number of kilograms of meat produced. This is a suboptimal measure for the denominator, and its application will result in systematic underestimation of the amounts used in livestock sectors with meat-producing animals (the pig, veal and broiler farming sectors in particular). Moreover, it cannot be used to quantify the amounts used at individual livestock farms, which means the EMA-proposed threshold of 1 mg/PCU does not allow for farm-level benchmarking.

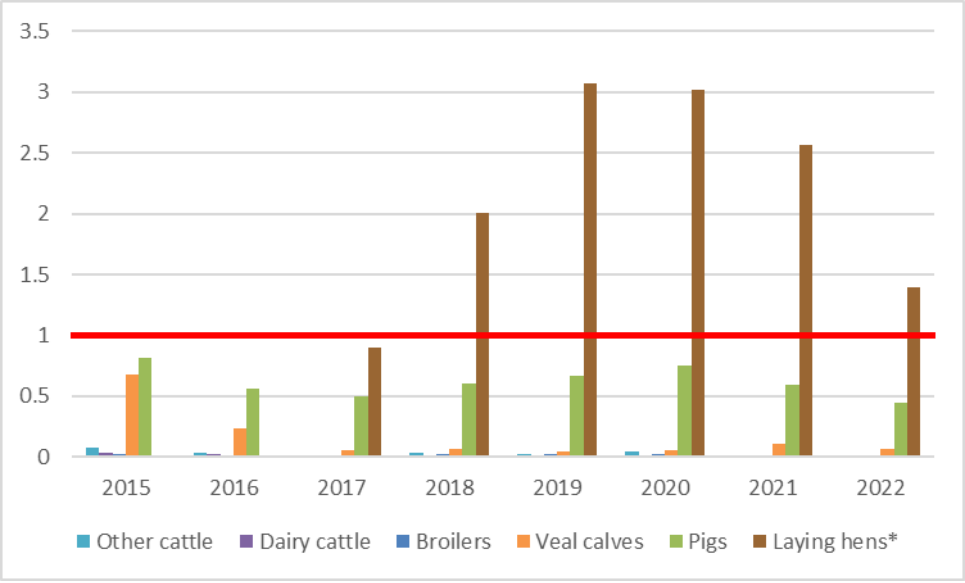
Figure 2. Colistin use in kilograms of active substance from 2017 to 2022, by animal species category



	2017	2018	2019	2020	2021	2022
Pigs	767	935	1075	1175	905	683
Laying hens	66	152	218	209	177	97
Other poultry*	13	13	7	7	2	3
Other cattle	2	8	4	8	11	1
Dairy cattle	12	8	4	5	5	4
Veal calves	13	15	11	13	23	14
Broilers	5	7	8	9	3	5
Rabbits	0	1	3	0	0	0
Turkeys	0	0	0	0	0	0
Total	879	1,141	1,329	1,425	1,125	806

* In this figure, the “Other poultry” category includes layer pullets, layer parent/grandparent stock and broiler parent/grandparent stock.

Figure 3. Colistin use in mg/PCU from 2015 to 2022, by animal species category (the red line represents the EMA-proposed maximum of 1 mg/PCU)



* As the ESVAC population correction unit template does not include a standardised body weight for layers, layers are assumed to weigh 1.6 kg, the standardised body weight used within the layer farming sector.

Amounts of antibiotics sold

In 2022, the overall number of kilograms of active substances sold declined by 22.9%, to 111,540 kg (Figure 4). Figure A1 in the online appendix shows, by pharmacotherapeutic group, how the amounts sold have changed over the 2011-2022 period. The 2022 sales data reveal a 77.4% reduction from the government-specified reference year of 2009, indicating measures introduced since 2009 have been successful in promoting more prudent usage of antibiotics in the Dutch livestock sector.

In 2021, sales of third- and fourth-generation cephalosporins (in kg of active substances) had increased from less than 1 kg to over 5 kg. This was partially reversed in 2022, with sales of third- and fourth-generation cephalosporins amounting to 2.6 kg. Sales of colistin declined by 26.8% in 2022.

Of the number of kilograms of antibiotics sold in 2022, 3,558 kg (3.2%) could not be attributed to recorded antibiotic use in monitored livestock sectors (versus 14.4% in 2021). Selective monitoring of antibiotic use in the Netherlands seems to be the most likely reason why a proportion of the kilograms of antibiotics sold cannot be attributed to a particular sector or animal category. As the SDa's monitoring results currently only include antibiotic use in poultry, dairy cattle, non-dairy cattle, veal calves, pigs and meat rabbits, no data are available on antibiotic use in other animals, such as sheep, horses and companion animals. It is possible to identify which substances included in the total volume of antimicrobial veterinary medicines sold are only authorised for use in non-food-producing animals. Sales of these substances amounted to 4,002 kg in 2022, which is more than the above-mentioned 3,558 kg discrepancy between the total number of kilograms sold and the total number of kilograms used. The number of kilograms sold within a particular calendar year is not only driven by the actual application of these substances within the various livestock sectors in the year concerned, but by other factors as well. Increases or reductions in the amounts of antibiotics kept in stock after purchase from the manufacturer (both at wholesalers and at veterinary practices) probably contribute greatly to any observed discrepancies between the number of kilograms sold and the number of kilograms used. Moreover, a limited amount of sold antibiotics will be stored at livestock farms for future use in the treatment of individual animals. Fluctuations in the amount of antibiotics stored at livestock farms will also affect the numbers of kilograms of antibiotics that appear to have been used. When adding the sales data-based number of kilograms of antibiotics only authorised for use in companion animals and horses to the total number of kilograms of antibiotics used in SDa-monitored livestock sectors in 2022, the resulting number of kilograms exceeds the total number of kilograms sold in 2022. This suggests some of the kilograms used in 2022 pertain to

antibiotics purchased in 2021 and kept in stock until 2022 (in 2021, the amount of antibiotics sold exceeded the amount used by 14.4%).
While the goat farming sector was added to the livestock sectors subject to SDa monitoring two years ago, not all of the sector's 2022 antibiotic usage data have been provided to the SDa (as explained under "Antibiotic use in the main livestock sectors", page 15). As a result, the number of kilograms of antibiotics used in the goat farming sector has not been included in this section. Pursuant to Regulation (EU) 2019/6, as of 2026 EU member states will be legally required to collect data on the use of antimicrobial veterinary medicinal products in goats, sheep and horses, among other animal species. In light of this, the SDa expert panel expects the total numbers of kilograms used and sold to move closer together when over the next few years usage monitoring will extend to include the remaining animal species categories. It should be noted, however, that year-to-year fluctuations in the amount of veterinary medicines kept in stock could still result in occasional larger discrepancies between the number of kilograms used and sold.
Article 115 of Regulation (EU) 2019/6 also introduces a new challenge, as it provides a legal basis for purchasing antimicrobial veterinary medicines not authorised in the Netherlands in other EU member states, for use under the cascade when there are shortages of Dutch veterinary medicines. While data on the use of these products in the Netherlands will be recorded, corresponding sales data might not. Vice versa, other EU member states might import Dutch veterinary medicines initially purchased by a party located in the Netherlands. The EMA's Antimicrobial Sales and Use (EMA-ASU) data monitoring system to be set up will probably enable identification of such discrepancies between data on the volumes sold and used.

Figure 4. Developments in sales of antibiotics over the 1999-2022 period, in number of kilograms of active substances sold (x1,000) (source: FIDIN), by main pharmacotherapeutic group

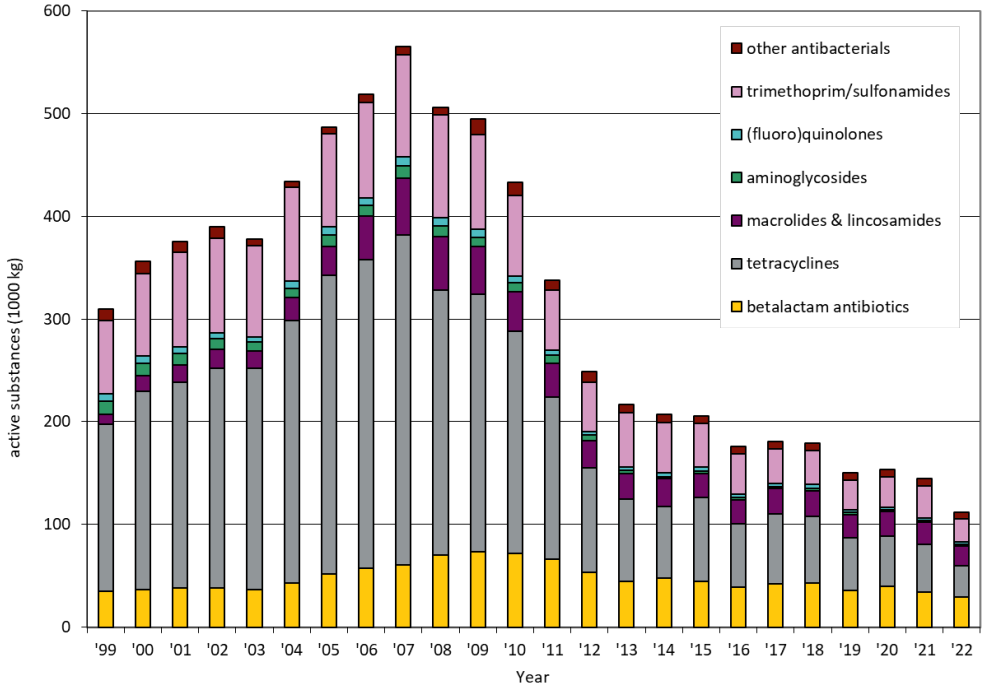
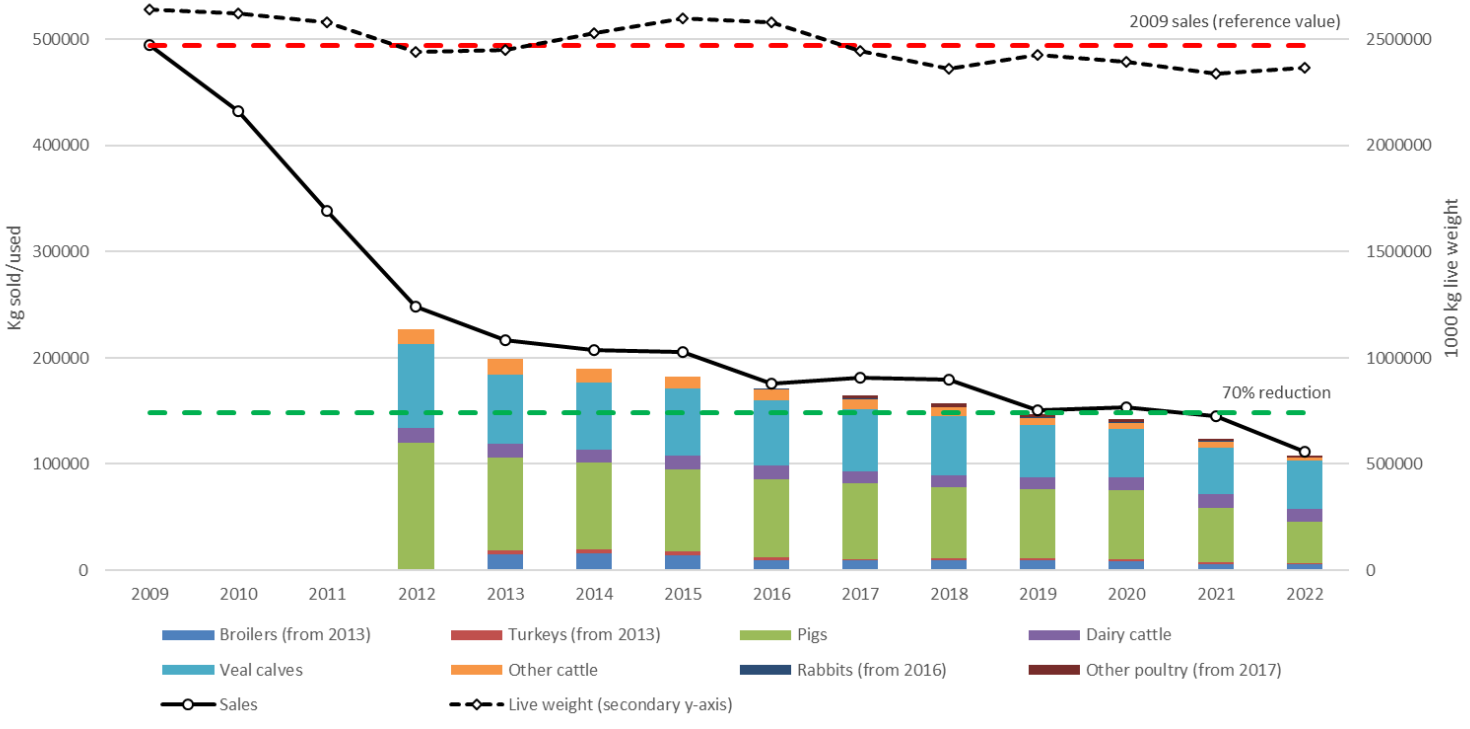


Figure 5 shows the long-term developments in both the amount of antibiotics sold (in kilograms, solid line) and the amount of antibiotics used (in kilograms, bars) in monitored livestock sectors. It also shows the annual numbers of kilograms of live weight of agricultural livestock present in the monitored livestock sectors (in tonnes, black dotted line). The bars reflect the total amount of antibiotics used (in kilograms), with the different colours representing the amounts used in the various livestock sectors.
It shows a modest downward trend in the number of kilograms of live weight of agricultural livestock, which has declined by 10% from the 2009 level. The numbers of kilograms of antibiotics sold and used have declined much more prominently over this period, indicating these reductions were not caused by a declining livestock population.
The bars in Figure 5 show individual livestock sectors' relative contributions to the total number of kilograms used. Close to 80% of the total number of kilograms sold is used in the veal and pig farming sectors. This is in part due to the mere size of the animals in these two livestock sectors, as veal calves and pigs require higher doses of active

substances than smaller animals. However, the mass of active substances used is not a great indicator of the actual level of exposure to antibiotics in a particular type of livestock. One cannot conclude, for example, that given the small number of kilograms used in the broiler farming sector according to Figure 5, antibiotic exposure in broilers must have been limited. Given these limitations of mass-based data, livestock sectors' Defined Daily Doses Animal ($DDDA_{NAT}$ values) are better suited to express the average level of exposure to antibiotics (see Figure 1).

Figure 5. Long-term developments in the numbers of kilograms of active substances sold and used. The bars comprise the numbers of kilograms used in the individual monitored livestock sectors, and the black dotted line reflects the annual numbers of kilograms of live weight of agricultural livestock for the livestock sectors subjected to SDa monitoring in 2022



Benchmarking of livestock farms

The SDa's current benchmarking method for livestock farms is based on two different types of benchmark thresholds:

1. Benchmark thresholds representing acceptable use, and
2. Provisional benchmark thresholds.

Benchmark thresholds that represent acceptable use of antibiotics will not be adjusted for several years following their implementation, whereas provisional benchmark thresholds have to be adjusted on a regular basis.

Benchmark thresholds representing acceptable use are used for types of farms or production categories whose antibiotic usage patterns are characterised by very low usage levels and by limited between-farm and year-to-year variation in antibiotic use. However, some of the types of farms or production categories benchmarked by means of benchmark thresholds representing acceptable use might still include a limited number of livestock farms with high usage levels, which can result in a long-tailed $DDDA_F$ distribution for the type of farm or production category concerned.

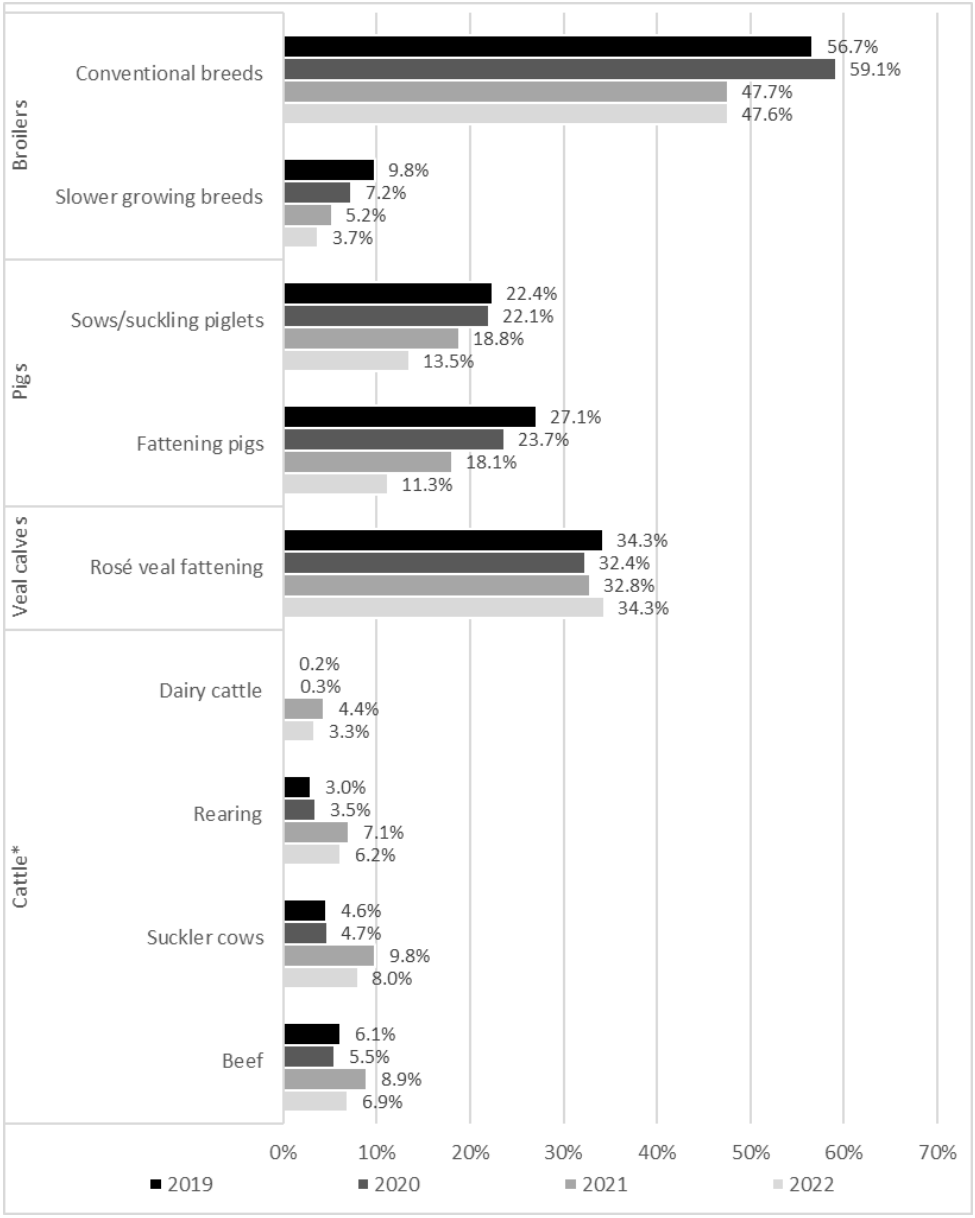
For types of farms or production categories still showing relatively wide $DDDA_F$ distributions indicative of substantial and structural usage level and prescription pattern differences between individual livestock farms and veterinarians, as well as high degrees of variation over time, no benchmark thresholds consistent with acceptable use have been derived. For these types of farms or production categories, the SDa expert panel has set provisional benchmark thresholds, which are based on pragmatic considerations and will be evaluated after two to three years. The SDa expert panel intends to evaluate its current provisional benchmark thresholds towards the end of this year.

Sector-negotiated transitional benchmark thresholds

Some of the livestock sectors (the turkey, rabbit and broiler farming sectors) have negotiated transitional benchmark thresholds with the Ministry of Agriculture, Nature and Food Quality in order to help livestock farmers move towards their SDa-defined benchmark threshold in a more gradual fashion. In these livestock sectors, livestock farms and veterinarians are benchmarked by means of transitional benchmark thresholds until their transitional benchmark thresholds are replaced by the SDa-defined benchmark threshold. The pig farming sector used to be one of the livestock sectors with transitional benchmark thresholds, but as of 2022 the sector's SDa-defined benchmark thresholds

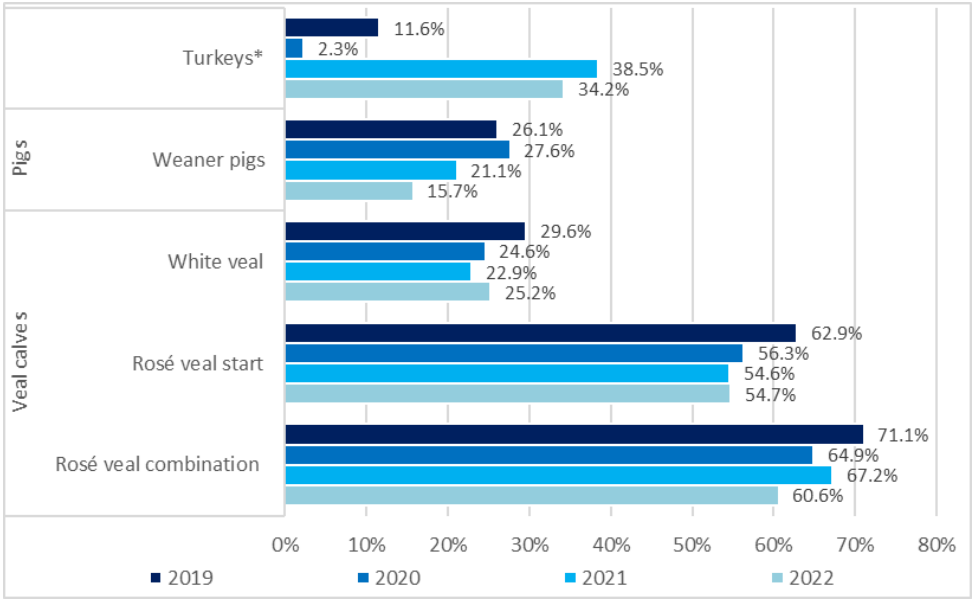
apply. Sector-specific transitional benchmark thresholds and their respective periods of validity can be found in Tables A54 to A60 in the online appendix.
In 2022, most types of farms or production categories had fewer farms exceeding their SDa-defined action threshold compared to the year before (see Figures 6 and 7). Detailed information on benchmarking results for the various types of farms and production categories is presented in the sections below.

Figure 6. 2019-2022 benchmarking results for types of farms and production categories assigned benchmark thresholds representing acceptable use. Percentages represent the proportion of farms included in the SDa-defined action zone for the type of farm or production category concerned



* In 2021, lower benchmark thresholds were implemented for the various types of cattle farms.

Figure 7. 2019-2022 benchmarking results for types of farms and production categories assigned provisional benchmark thresholds. Percentages represent the proportion of farms included in the SDa-defined action zone for the type of farm or production category concerned



* In 2021, lower benchmark thresholds were implemented for turkey farms.

Broiler farms

In 2022, the amount of antibiotics used in the broiler farming sector declined slightly, to a mean $DDDA_F$ of 4.8. A distinction is made between two different categories of broilers: conventional breeds and slower growing breeds. Conventional breeds are mainly intended for the foodservice industry (e.g. restaurants, catering operations and institutions) and for export, while slower growing breeds are primarily intended for supermarkets in the Netherlands. Mean $DDDA_F$ values recorded for broiler farms with conventional breeds consistently exceed those recorded for farms with slower growing breeds (Figures 8a and 8b). 2022 saw a 16.4% rise in mean $DDDA_F$ for broiler farms with conventional breeds, and no distinct downward trend can be observed for the amount of antibiotics used at these farms. Their wide $DDDA_F$ distribution suggests there is still room for usage level reductions at broiler farms with conventional breeds.
Antibiotic usage levels at broiler farms with slower growing breeds are low (Figure 8b) and continued to decline in 2022. The majority of these farms (80%) did not record any antibiotic use for 2022. 2022 saw another rise in the number of broiler farms with slower growing breeds, and the shift from conventional towards slower growing breeds over the past few years has contributed significantly to the usage level reductions observed for the broiler farming sector as a whole.
The broiler farming sector's $DDDA_F$-based relative contributions of first-, second- and third-choice antibiotics are not in line with their $DDDA_{NAT}$-based equivalents (Tables A1 and A5 in the online appendix, respectively). Second-choice antibiotics accounted for only 42.6% of overall antibiotic use in terms of $DDDA_F$, while accounting for 72.4% of overall antibiotic use in terms of $DDDA_{NAT}$. This discrepancy can be explained by broilers' body weight at the time of treatment, which tends to be higher for second-choice antibiotics compared to first-choice antibiotics. $DDDA_F$ calculations account for such differences in body weight, while $DDDA_{NAT}$ calculations are based on a standardised body weight of 1 kg. Consequently, when calculating $DDDA_{NAT}$ values for second-choice antibiotics the denominator (i.e. the average number of kilograms of animal present) will be lower than the denominator in $DDDA_F$ calculations, which will result in relatively high $DDDA_{NAT}$ values.

Benchmarking

In 2019, the broiler farming sector's benchmark threshold representing acceptable use was set at 8 $DDDA_F$, irrespective of the type of breed. This threshold should be regarded as a distant goal to work towards, in particular for broiler farms with conventional breeds. The Ministry of Agriculture, Nature and Food Quality and the broiler farming sector have agreed on a phased implementation process for both types of broiler farms (i.e. those with conventional and those with slower growing breeds). In 2022, broiler farms

continued to be benchmarked by means of their sector-negotiated signalling and action thresholds, which for broiler farms with conventional breeds were 14 and 26 $DDDA_F$, respectively, and for boiler farms with slower growing breeds were 8 and 15 $DDDA_F$, respectively. Details on the phased implementation of the SDa-defined benchmark threshold for the broiler farming sector can be found in the online appendix (Tables A57 and A58).

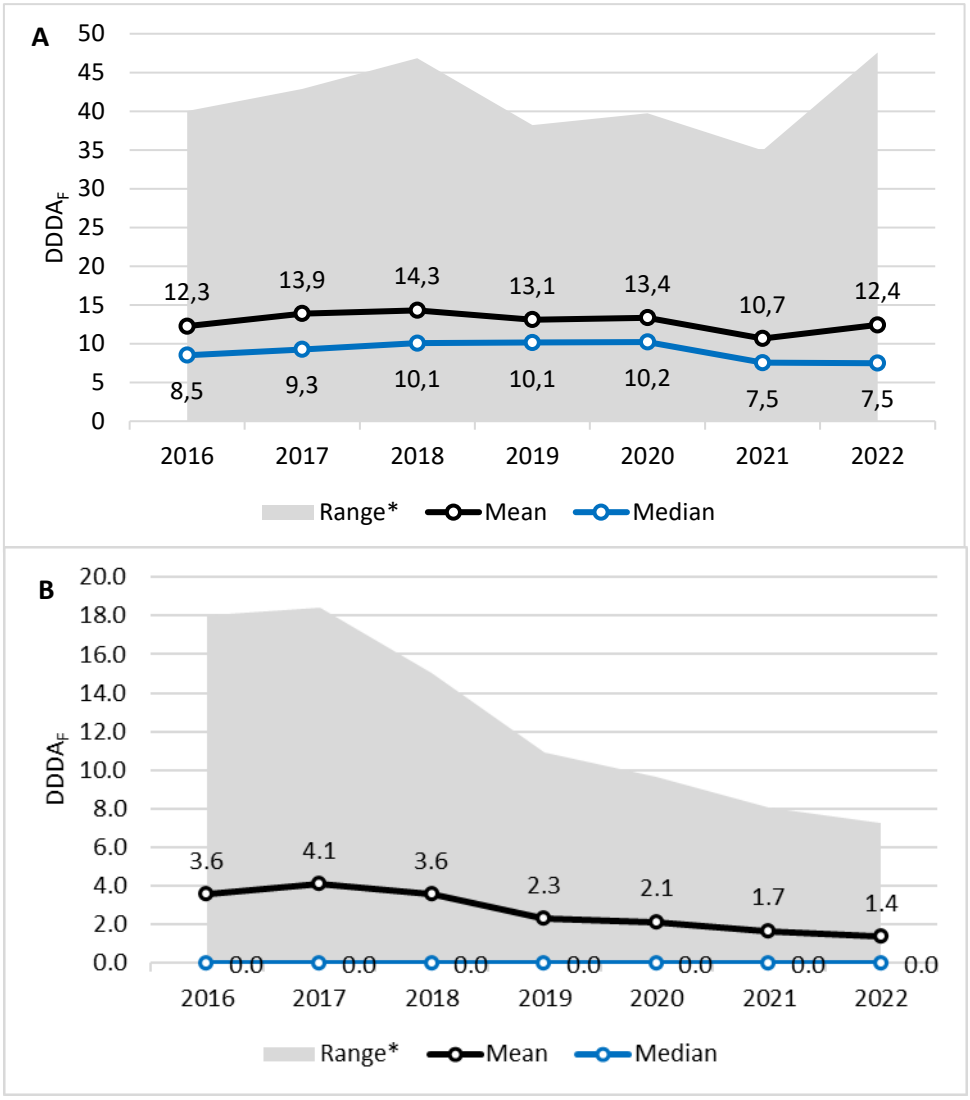
At 48%, the proportion of broiler farms with conventional breeds exceeding the SDa-defined benchmark threshold was the same as in 2021. Many of the farms recording action zone usage levels for 2022 had also done so the year before (Figure A5). In 2022, the sector-negotiated action threshold of 26 $DDDA_F$ was exceeded by 13% of broiler farms with conventional breeds, and 18% had signalling zone usage levels (Table 2). The $DDDA_F$ distribution for broiler farms with conventional breeds has a long tail consisting of farms with usage levels several times higher than the benchmark threshold representing acceptable use (Figure 9a). Reducing the amounts of antibiotics used at these farms should be the main focus of reduction efforts in this livestock sector.

Only 4% of broiler farms with slower growing breeds exceeded the SDa-defined action threshold in 2022. Persistently high usage levels (i.e. $DDDA_F$ values that have exceeded the SDa-defined action threshold two years in a row) are rare for broiler farms with slower growing breeds (see Figure 27). These findings show the positive effect the introduction of slower growing breeds has had on the usage of antibiotics in the broiler farming sector.

Table 2. 2021 and 2022 benchmarking results for broiler farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds, by type of farm

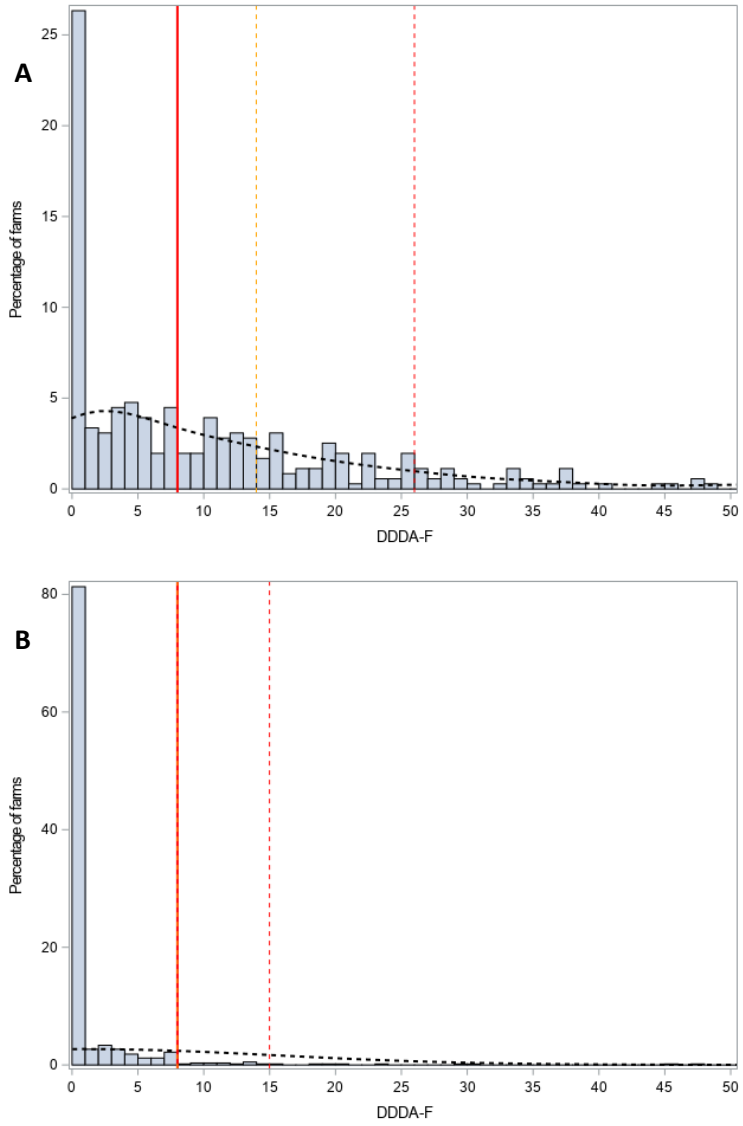
Type of benchmark threshold(s)	Farms in	Type of farm			
		Broiler farms with conventional breeds		Broiler farms with slower growing breeds	
		2021	2022	2021	2022
SDa-defined	Target zone	190 (52%)	187 (52%)	531 (95%)	577 (96%)
	Action zone	173 (48%)	170 (48%)	29 (5%)	22 (4%)
Sector-negotiated (transitional)	Target zone	260 (72%)	246 (69%)	531 (95%)	577 (96%)
	Signalling zone	74 (20%)	63 (18%)	22 (4%)	12 (2%)
	Action zone	29 (8%)	48 (13%)	7 (1%)	10 (2%)

Figures 8a and 8b. Long-term $DDDA_F$ trends for (a) broiler farms with conventional breeds and (b) broiler farms with slower growing breeds. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Figures 9a and 9b. 2022 $DDDA_F$ distributions for broiler farms with conventional breeds (N = 357, Figure 9a) and broiler farms with slower growing breeds (N = 599, Figure 9b). The red solid lines represent the SDa-defined action threshold. The orange and red dotted lines represent the sector-negotiated signalling and action thresholds, respectively. At 8 $DDDA_F$, the sector-negotiated signalling threshold for broiler farms with slower growing breeds equals the SDa-defined action threshold



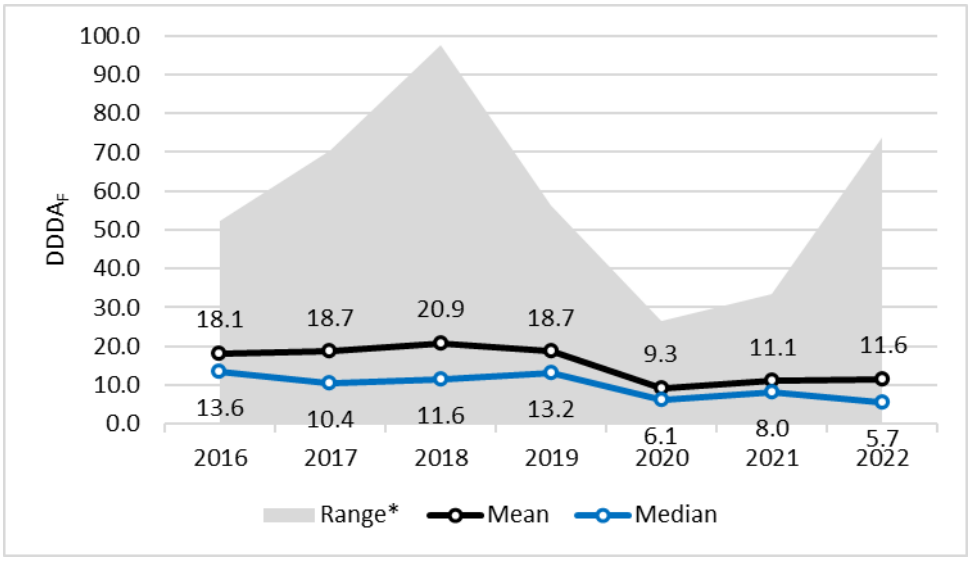
Turkey farms

In 2022, the turkey farming sector's mean $DDDA_F$ increased by 4.0%. Its median $DDDA_F$, however, dropped by 29.6% and has reached the lowest level in the turkey farming sector's monitoring history. These seemingly contradictory findings are the result of a small number of turkey farms with high usage levels (>50 $DDDA_F$). Those farms greatly affect the turkey farming sector's mean $DDDA_F$ value, in part because the turkey farming sector comprises a relatively small number of livestock farms. Between-farm usage level differences increased in 2022, as shown in Figure 10. In view of the above, reduction efforts in the turkey farming sector should be aimed at reducing the amounts of antibiotics used at turkey farms with high or persistently high $DDDA_F$ values.

Benchmarking

In 2021, the SDa implemented a 10 $DDDA_F$ action threshold for the turkey farming sector. Application this new SDa-defined action threshold to 2021 and 2022 usage level data results in 38% and 34% of turkey farms being included in the action zone, respectively. In order to gradually move towards this more stringent new benchmark threshold, the turkey farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the application of transitional benchmark thresholds (Table A59 in the online appendix). Table 3 shows turkey farms' benchmarking results according to both sector-negotiated transitional benchmark thresholds and the SDa-defined action threshold. When the 2022 usage levels are assessed by means of the 20 $DDDA_F$ sector-negotiated transitional action threshold, the action zone includes five turkey farms (13%). Their impact on the turkey farming sector's mean $DDDA_F$ value is significant. If action zone usage level farms were excluded from the mean $DDDA_F$ calculation, the turkey farming sector's mean $DDDA_F$ would amount to 5.4, corresponding to a 53.1% reduction from 2021.

Figure 10. Long-term $DDDA_F$ trends for turkey farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Figure 11. 2022 $DDDA_F$ distribution for turkey farms (N = 38). The red solid line represents the SDa-defined provisional benchmark threshold. The orange and red dotted lines represent the sector-negotiated signalling and action thresholds, respectively

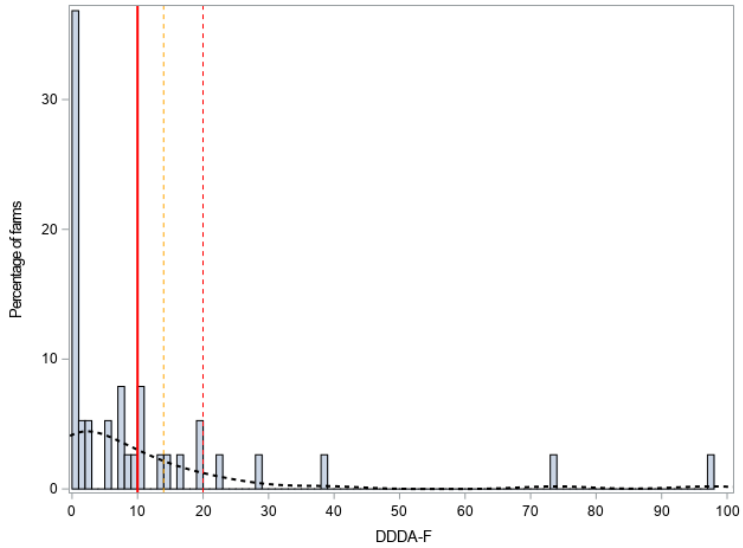


Table 3. 2021 and 2022 benchmarking results for turkey farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds

Type of benchmark threshold(s)	Farms in	Turkey farms	
		2021	2022
SDa-defined	Target zone	24 (62%)	25 (66%)
	Action zone	15 (38%)	13 (34%)
Sector-negotiated (transitional)	Target zone	32 (82%)	29 (76%)
	Signalling zone	3 (8%)	4 (11%)
	Action zone	4 (10%)	5 (13%)

Pig farms

Farms with sows and suckling piglets and farms with fattening pigs

Mean $DDDA_F$ values for farms with sows and suckling piglets and farms with fattening pigs were low. The reductions recorded for 2021 (Figures 12a and 12b) were followed by a 12.5% mean $DDDA_F$ reduction for the sows and suckling piglets production category and a 20.2% mean $DDDA_F$ reduction for the fattening pigs production category. For both production categories, this reduction was accompanied by a narrower $DDDA_F$ distribution, even though farms with usage levels several times higher than the mean $DDDA_F$ value were still a regular occurrence (Figures 13a and 13b). The farms concerned will need to take action to reach usage levels below their SDa-defined benchmark threshold representing acceptable use. In 2022, both production categories saw a further decline in the number of farms (Tables A24 and A28 in the online appendix). According to their antibiotic usage data, farms ceasing their operations in 2022 did not record higher usage levels for 2020 and 2021 than the farms still active in 2022. This shows the lower mean $DDDA_F$ values observed for these production categories in 2022 cannot be attributed to certain farms with sows and suckling piglets and farms with fattening pigs having ceased their operations.

Benchmarking

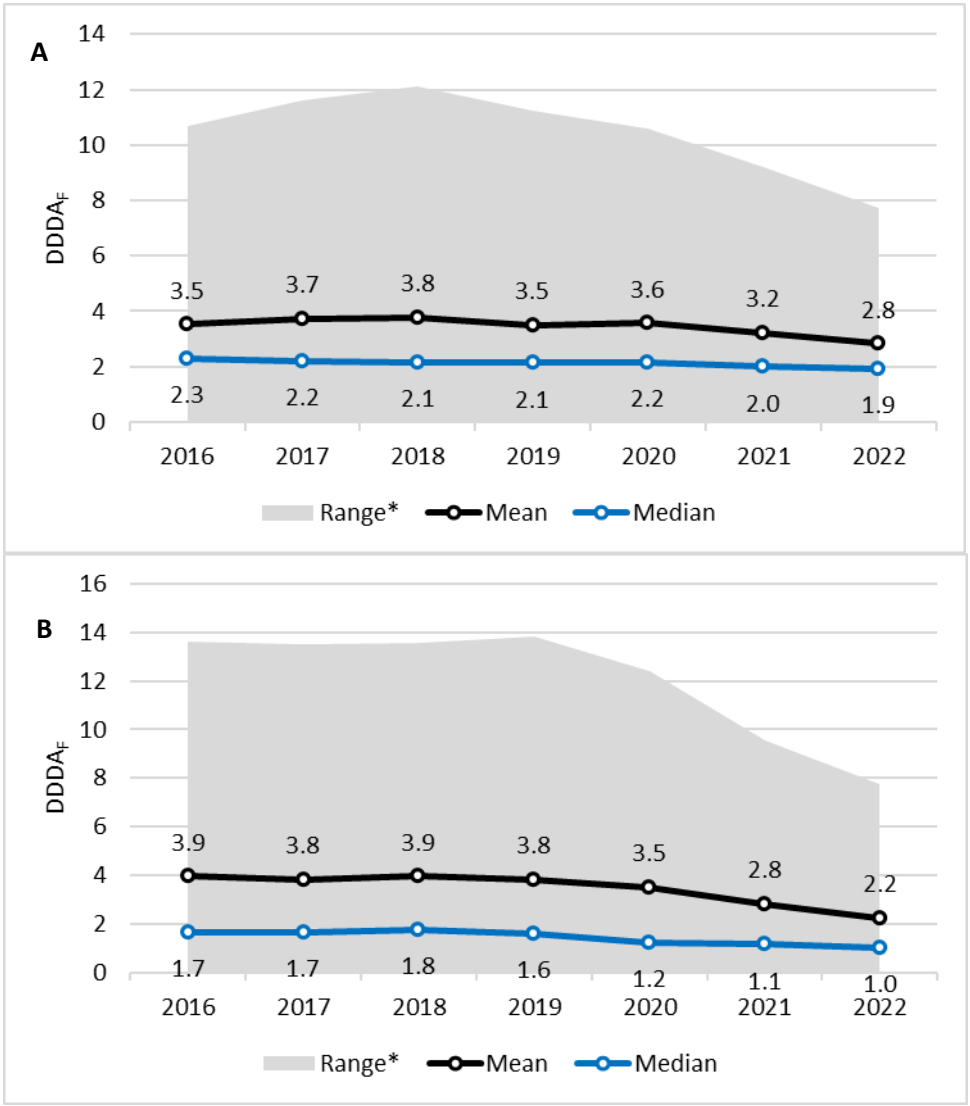
The SDa-defined benchmark threshold representing acceptable use has been set at 5 $DDDA_F$ for both production categories. As of 2022, transitional benchmark thresholds previously agreed between the pig farming sector and the Ministry of Agriculture, Nature and Food Quality no longer apply (Tables A54 and A55), meaning pig farms are now benchmarked by means of their SDa-defined benchmark threshold.

Figures 13a and 13b show the $DDDA_F$ distributions and benchmark thresholds for the sows/suckling piglets and fattening pigs production categories. As shown in Table 4, both production categories saw a decline in the proportion of farms exceeding the SDa-defined action threshold, with 14% of farms with sows and suckling piglets and 6% of farms with fattening pigs recording action zone usage levels for 2022. The mean $DDDA_F$ value also continued to decline for both production categories, and between-farm usage level differences were smaller than the year before. Both production categories had over 85% of farms recording usage levels consistent with acceptable use for 2022.

Table 4. 2021 and 2022 benchmarking results for farms with sows and suckling piglets and farms with fattening pigs, according to the SDa-defined action threshold

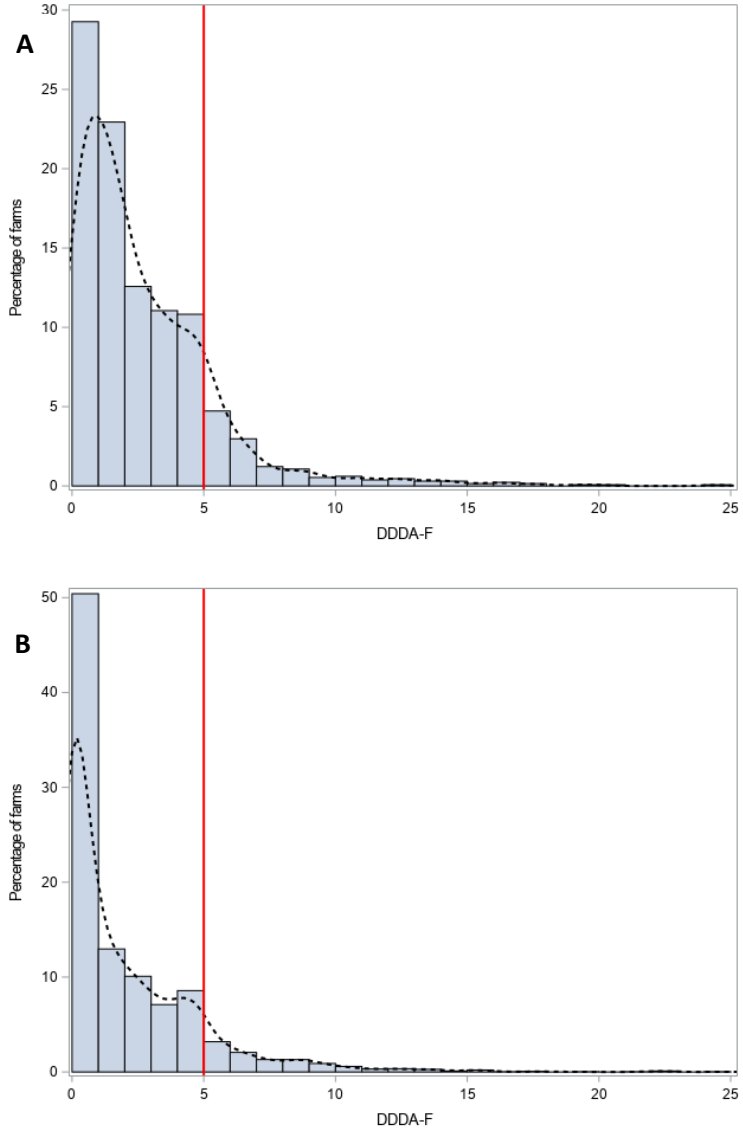
Farms in	Production category			
	Sows/suckling piglets		Fattening pigs	
	2021	2022	2021	2022
Target zone	1,216 (81%)	1,140 (86%)	2,569 (82%)	2,754 (94%)
Action zone	283 (19%)	178 (14%)	573 (18%)	177 (6%)

Figures 12a and 12b. Long-term $DDDA_F$ trends for (a) farms with sows and suckling piglets and (b) farms with fattening pigs. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

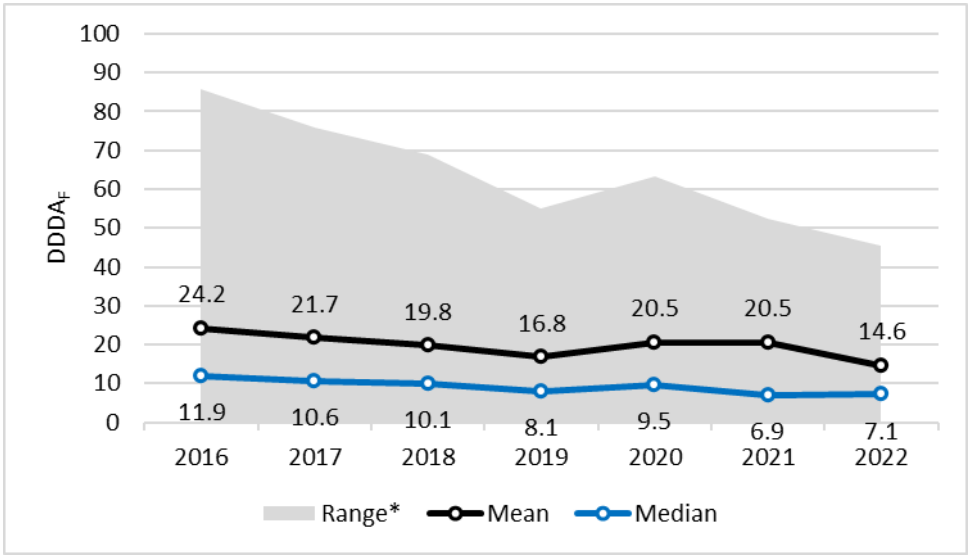
Figures 13a and 13b. 2022 $DDDA_F$ distributions for farms with sows and suckling piglets (N = 1,318, Figure 13a) and farms with fattening pigs (N = 2,931, Figure 13b). The red lines represent the SDa-defined action threshold



Farms with weaner pigs

Mean antibiotic use in weaner pigs dropped by 29.0% in 2022, while the production category's median $DDDA_F$ value was similar to the year before (Figure 14). One of the main drivers for the lower mean $DDDA_F$ value was a decline in the number of farms with high or very high usage levels. In spite of this, the weaner pigs production category's $DDDA_F$ distribution continues to be characterised by a very long tail (Figure 15). If farms with usage levels over 50 $DDDA_F$ were to be excluded from the mean $DDDA_F$ calculation, the production category's mean $DDDA_F$ would amount to 9.3, corresponding to a 54.9% reduction from its 2021 level. The SDa expert panel is pleased to see mean antibiotic use starting to decline and welcomes the less pronounced between-farm usage level differences observed for 2022. However, the number of farms recording high or even extremely high usage levels is still substantial, suggesting it should be possible to achieve additional reductions in the amounts of antibiotics used in weaner pigs.

Figure 14. Long-term $DDDA_F$ trends for farms with weaner pigs. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

In 2022, the proportion of farms with weaner pigs included in the action zone declined from 21% to 16% (Table 6). As shown in Table 5, there were substantial usage level differences between farms with action zone usage levels. Farms with high, extremely high and/or persistently high $DDDA_F$ values should be the main focus of reduction efforts aimed at this production category.

Figure 15. 2022 $DDDA_F$ distribution for farms with weaner pigs (N = 1,463). The red line represents the SDa-defined action threshold

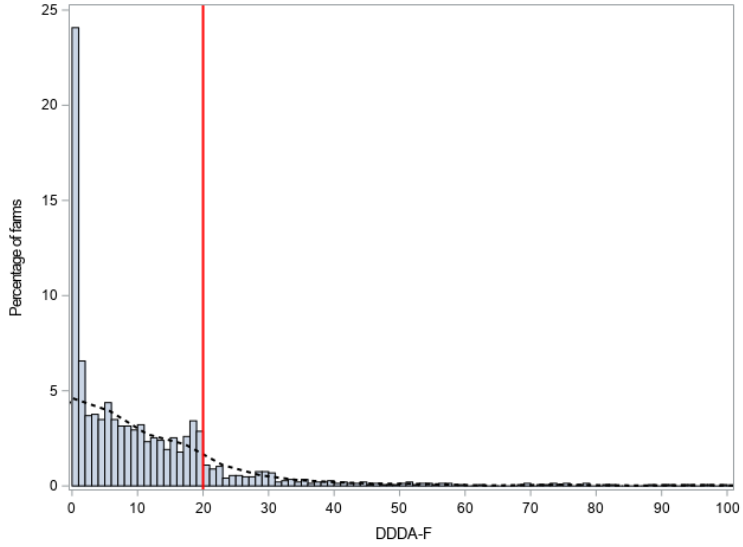


Table 5. Numbers of farms with weaner pigs by 2022 usage level category

$DDDA_F$-based usage level category	Number of farms	Proportion of farms
≤20	1,233	84.3%
20-25	58	4.0%
25-30	44	3.0%
30-35	25	1.7%
35-40	17	1.2%
40-45	12	0.8%
45-50	6	0.4%
>50	68	4.7%

Table 6. 2021 and 2022 benchmarking results for farms with weaner pigs, according to the SDa-defined action threshold

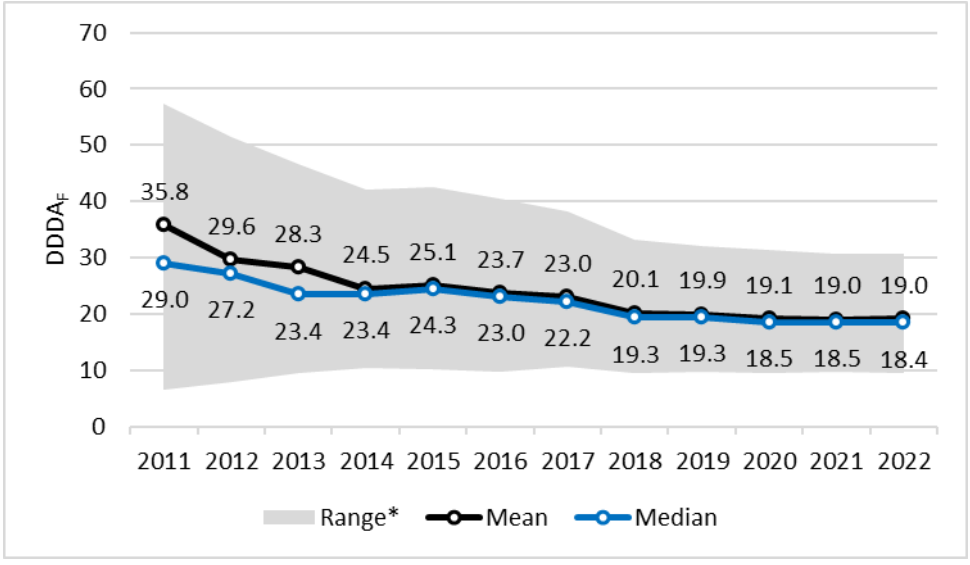
Farms in	Weaner pigs production category	
	2021	2022
Target zone	1,316 (79%)	1,233 (84%)
Action zone	352 (21%)	230 (16%)

Veal farms

White veal farms

Antibiotic use at white veal farms has been relatively stable over the past five years (Figure 16), but individual usage levels show a lot of variation. Relatively few farms recorded low usage levels for 2022, and white veal farms' $DDDA_F$ values exhibit a nearly symmetrical distribution curve. The SDa expert panel had expected white veal farmers to record lower usage levels as a result of implementing sector-specific findings of phase 2 of the critical success factor study (KSF2, Bokma-Bakker et al., 2019), but this expectation has apparently not been realised. In addition to the substantial usage level differences observed between these farms, white veal farms also show significant individual year-to-year usage level fluctuations (Figure A26 in the online appendix). Limiting the amounts of antibiotics used seems to be a challenge for white veal farmers.

Figure 16. Long-term $DDDA_F$ trends for white veal farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned

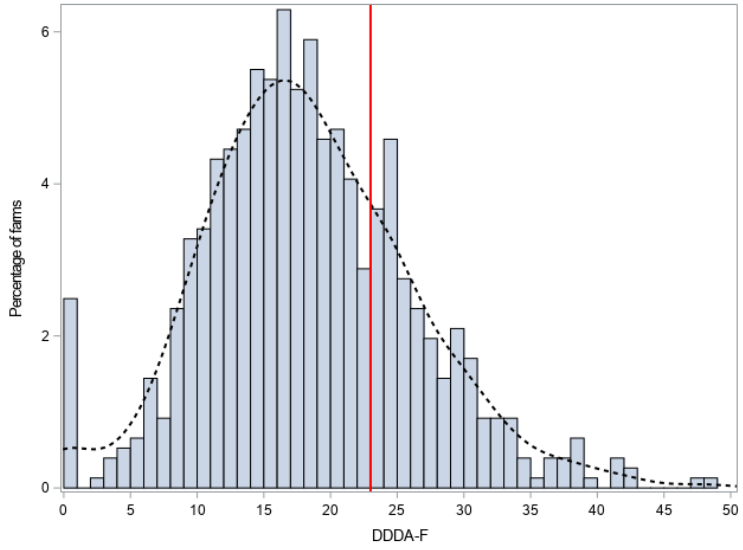


* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

White veal farms are benchmarked by means of a provisional benchmark threshold of 23 $DDDA_F$. In 2022, 25% of farms exceeded this threshold (Table 7). Individual white veal farms show pronounced year-to-year usage level fluctuations (Figure A26). In 2023, this SDa-defined action threshold will also be implemented in the veal farming sector's quality assurance scheme, replacing the older SDa-defined signalling and action thresholds. The SDa expert panel expects this change to result in lower antibiotic consumption at white veal farms whose $DDDA_F$ values exceed the current SDa-defined benchmark threshold.

Figure 17. 2022 $DDDA_F$ distribution for white veal farms (N = 765). The red line represents the SDa-defined provisional benchmark threshold

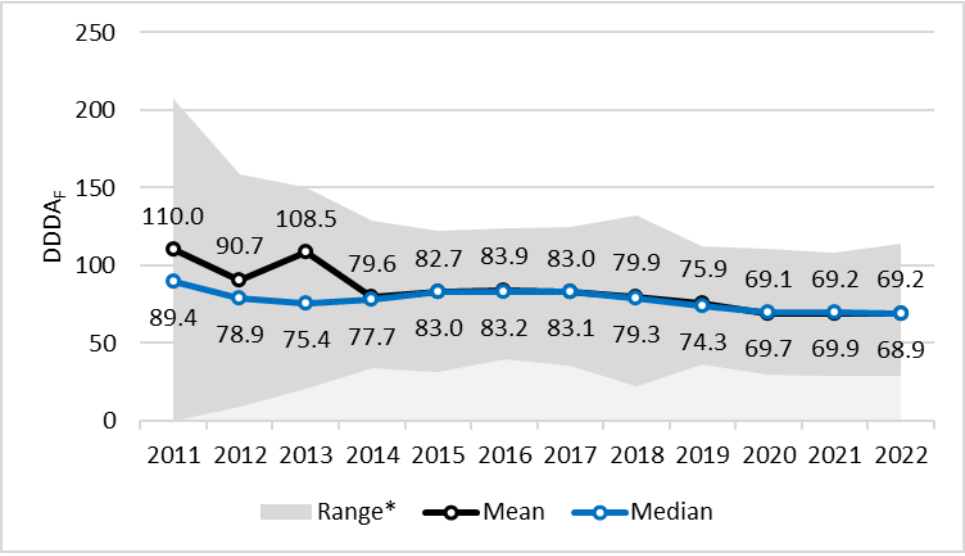


Rosé veal starter farms

Antibiotic use at rosé veal starter farms is very high and no downward trend can be distinguished in the $DDDA_F$ data recorded for the last three years (Figure 18). In 2022, usage levels differed substantially between individual rosé veal starter farms (Figures 18 and 19). Hardly any farms recorded low usage levels for 2022, and the 2022 $DDDA_F$ distribution is characterised by a nearly symmetrical distribution curve. The livestock sector is still working on a new calculation method which should enable more accurate registration of the amounts of antibiotics used at individual rosé veal starter farms. This should help veal farmers in understanding the antibiotic usage calculated for their farm. The new calculation method will also enable provision of group-based data on the amounts of antibiotics used. It is expected to be fully implemented by the end of 2023.

The SDa expert panel hopes this will increase veal farmers' understanding and awareness of their usage of antibiotics, which will hopefully encourage and enable them to achieve sufficient usage level reductions to break through the current 3-year plateau. The substantial between-farm usage level differences do suggest there is still room for improvement in this respect at rosé veal starter farms.

Figure 18. Long-term $DDDA_F$ trends for rosé veal starter farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned

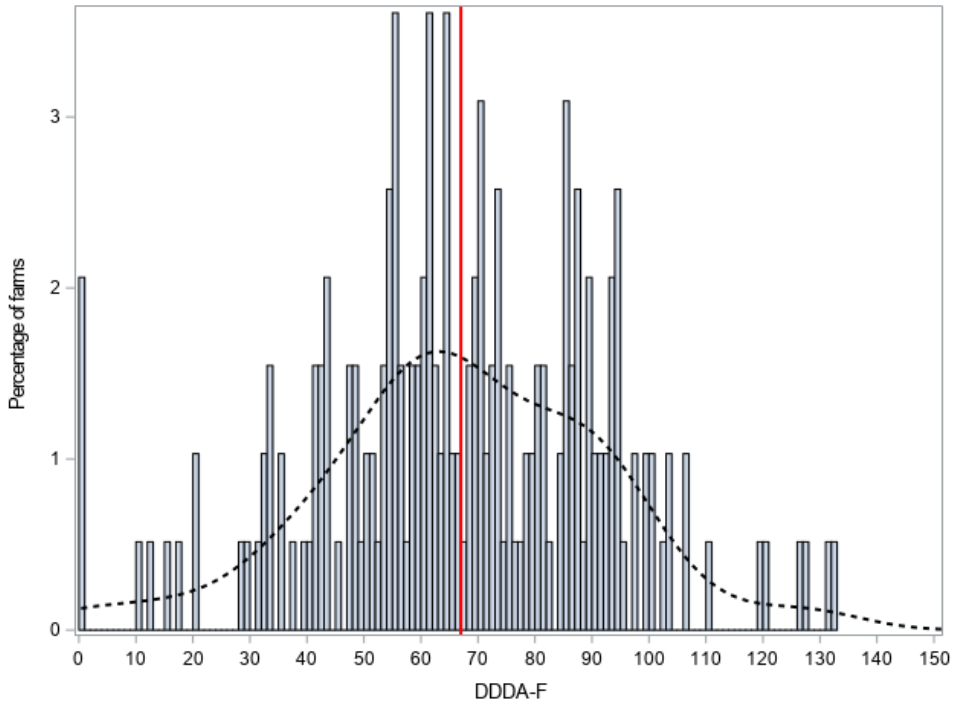


* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

Rosé veal starter farms are benchmarked by means of a provisional benchmark threshold of 67 $DDDA_F$. The majority of rosé veal starter farms (54%) recorded action zone usage levels for 2022 (Table 7). At 35%, the proportion of rosé veal starter farms with persistently high usage levels in 2022 was considerable. As of 2023, the veal farming sector will also apply the 67 $DDDA_F$ benchmark threshold, which will replace the previous action threshold of 110 $DDDA_F$. This will require more rosé veal starter farms to step up their efforts in order to make sure their antibiotic usage level will not exceed the benchmark threshold.

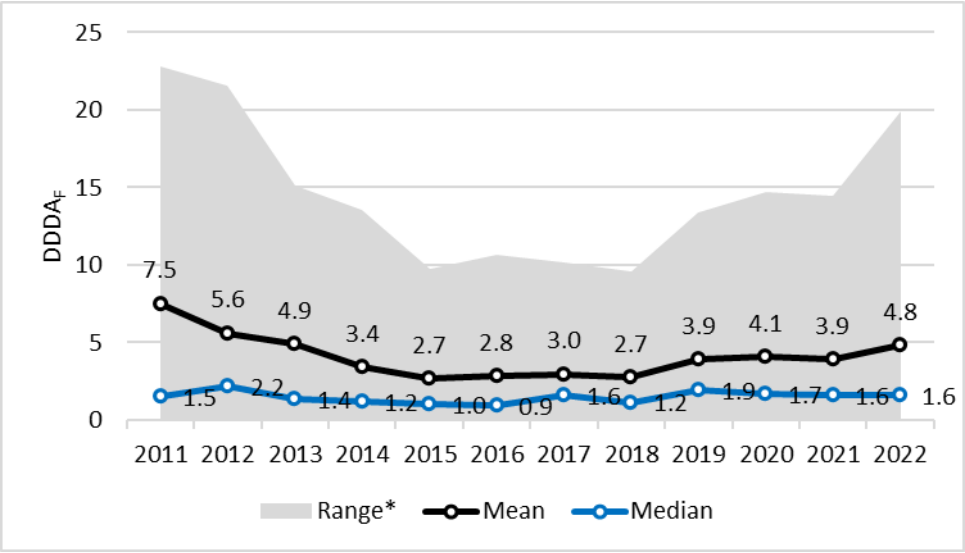
Figure 19. 2022 $DDDA_F$ distribution for rosé veal starter farms (N = 195). The red line represents the SDa-defined provisional benchmark threshold



Rosé veal fattening farms

At 1.6 $DDDA_F$, median antibiotic use at rosé veal fattening farms in 2022 was low. Rosé veal fattening farms are, however, characterised by a wide $DDDA_F$ distribution, and this distribution has widened over the past few years (Figure 20). Usage levels several times higher than the median $DDDA_F$ value were still quite common in 2022. Reduction efforts aimed at reducing the amounts of antibiotics used at rosé veal fattening farms should be targeted more specifically at this subset of farms.

Figure 20. Long-term $DDDA_F$ trends for rosé veal fattening farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned

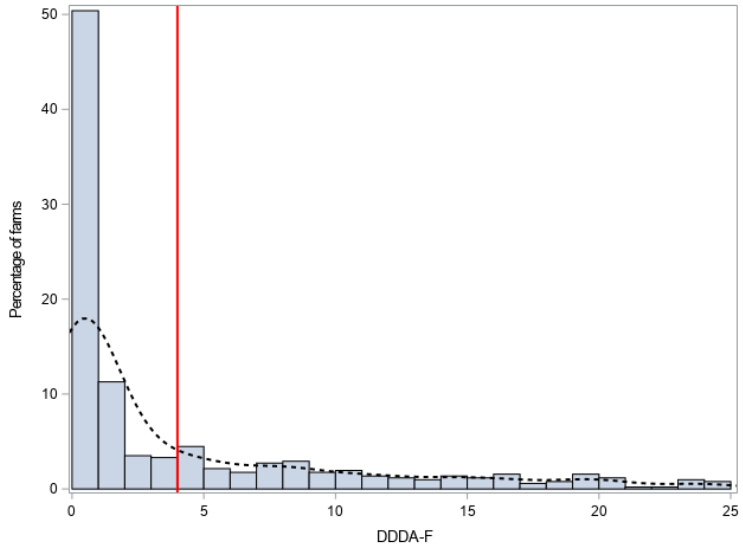


* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Benchmarking

Rosé veal fattening farms are benchmarked by means of a 4 $DDDA_F$ benchmark threshold representing acceptable use. The majority of rosé veal fattening farms recorded target zone usage levels for 2022, and 0 $DDDA_F$ usage levels were a regular occurrence (Table 7). The wide $DDDA_F$ distribution referred to above is associated with a substantial proportion of farms being included in the action zone (34%).

Figure 21. 2022 $DDDA_F$ distribution for rosé veal fattening farms (N = 536). The red line represents the SDa-defined action threshold



Rosé veal combination farms

The number of rosé veal combination farms has dropped sharply over the years, from 186 in 2018 to 66 in 2022. This is the result of a prior agreement between the SDa and the veal farming sector to discontinue the rosé veal combination farms reporting category and start recording the farms' antibiotic usage data under either the rosé veal starter farms reporting category or the rosé veal fattening farms reporting category. However, this transition has not yet been finalised for all rosé veal combination farms. Similar to 2021, the $DDDA_F$ distribution for rosé veal combination farms is wide and includes outliers with usage levels exceeding 50 $DDDA_F$ (Figure 22 and Figure A31 in the online appendix).

Benchmarking

61% of rosé veal combination farms exceeded the SDa-defined provisional benchmark threshold in 2022 (Table 7), and 18% had persistently high usage levels (Figure 27). The SDa expert panel urges the veal farming sector to take action in order to reduce the amounts of antibiotics used at rosé veal combination farms wherever possible.

Figure 22. 2022 $DDDA_F$ distribution for rosé veal combination farms (N = 66). The red line represents the SDa-defined provisional benchmark threshold

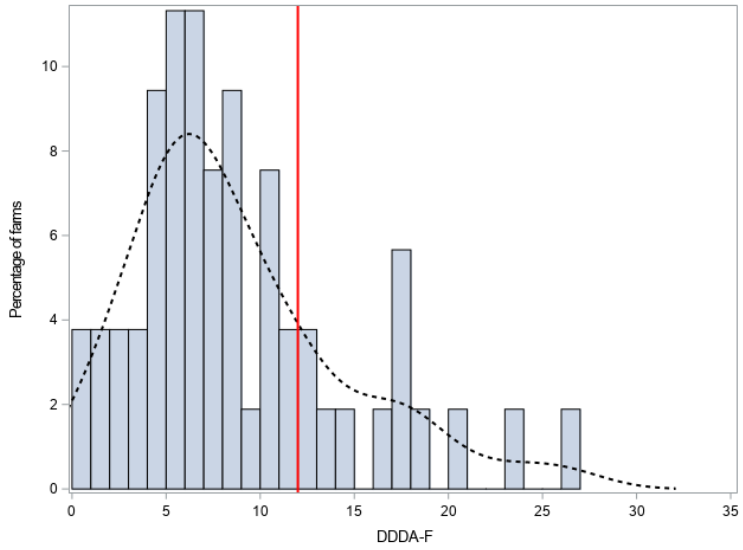


Table 7. 2021 and 2022 benchmarking results for veal farms according to the SDa-defined action threshold, by type of farm

Farms in	Type of farm							
	White veal farms		Rosé veal starter farms		Rosé veal fattening farms		Rosé veal combination farms	
	2021	2022	2021	2022	2021	2022	2021	2022
Target zone	615 (77%)	572 (75%)	84 (45%)	90 (46%)	389 (67%)	352 (66%)	21 (33%)	26 (39%)
Action zone	183 (23%)	193 (25%)	101 (55%)	105 (54%)	190 (33%)	184 (34%)	43 (67%)	40 (61%)

Cattle farms

The cattle farming sector is characterised by low, acceptable levels of antibiotic use and little between-farm variation in the amounts of antibiotics used. At 2.3 $DDDA_F$, mean antibiotic use at dairy cattle farms remained unchanged from the 2021 level (Figure 23a). Mean $DDDA_F$ values for non-dairy cattle farms (suckler cow farms, rearing farms and beef farms) declined in 2022 (Figures 23b, 23c and 23d, respectively). The most prominent decline was recorded for beef farms, which managed to reduce their mean antibiotic use from 1.1 to 0.6 $DDDA_F$. The majority of non-dairy cattle farms did not use any antibiotics at all in 2022.

Benchmarking

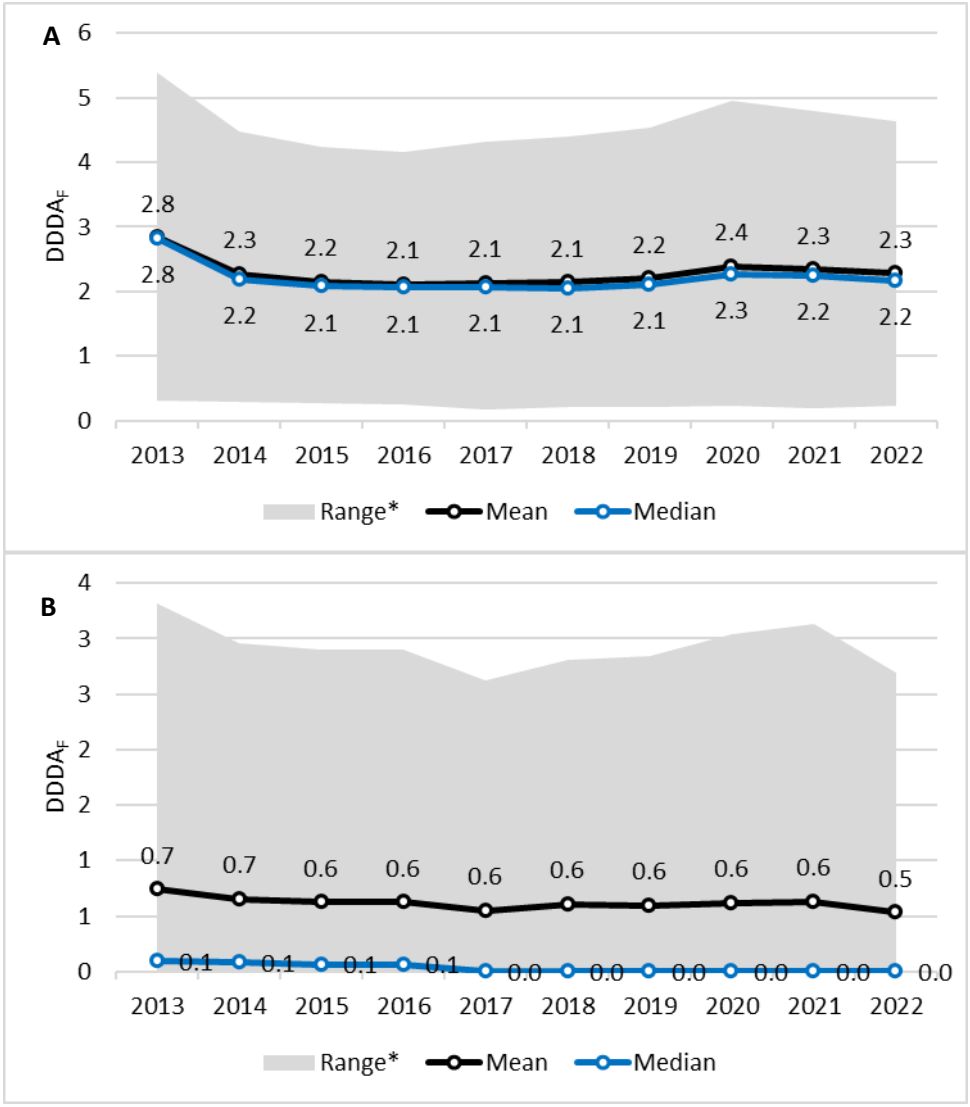
Dairy cattle farms are benchmarked by means of a 5 $DDDA_F$ benchmark threshold representing acceptable use. This action threshold was exceeded by just 3% of dairy cattle farms in 2022.

Non-dairy cattle farms are benchmarked by means of a 2 $DDDA_F$ benchmark threshold representing acceptable use. In 2022, every type of farm in the non-dairy cattle farming sector saw a decline in the proportion of farms included in the action zone. The proportion of farms exceeding the 2 $DDDA_F$ action threshold was highest for suckler cow farms (8%), followed by beef farms (7%) and rearing farms (6%) (Table 8).

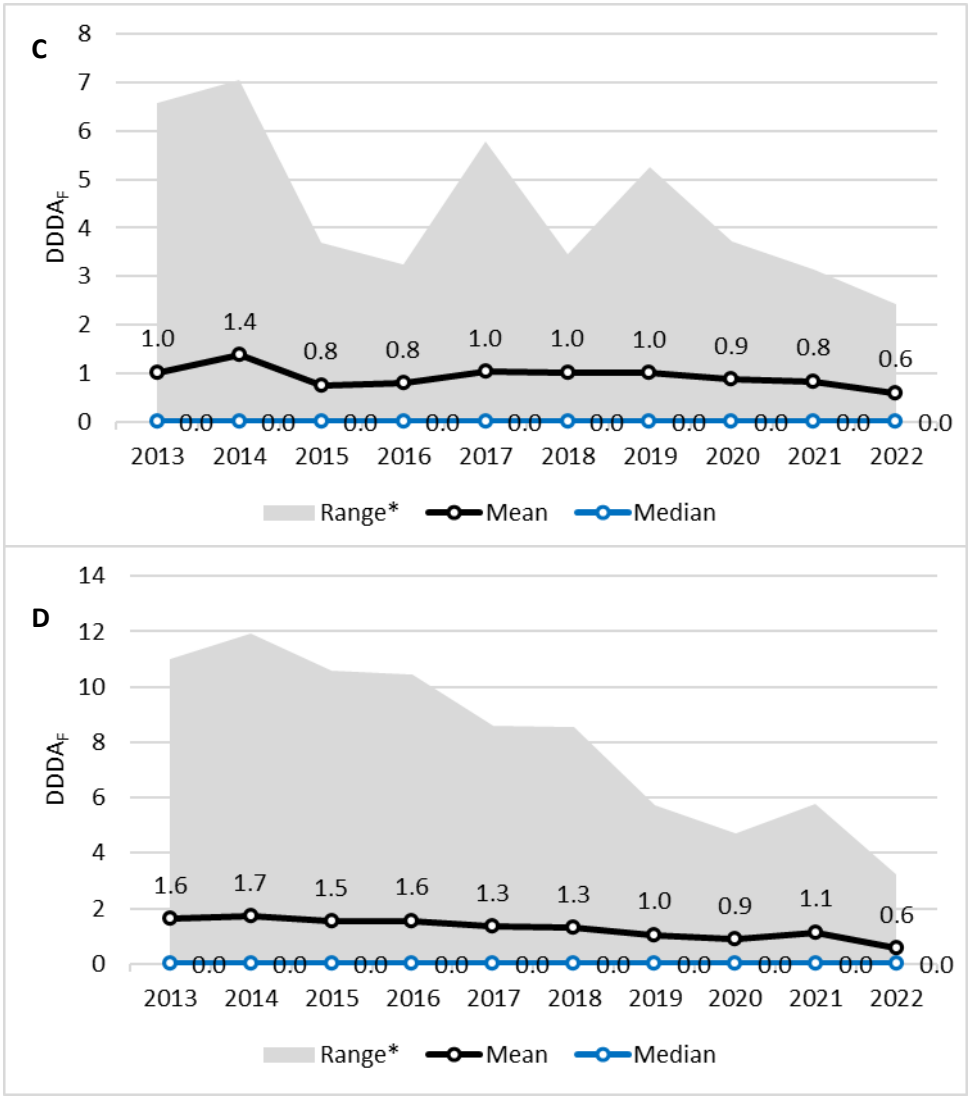
Table 8. 2021 and 2022 benchmarking results for cattle farms according to the respective SDa-defined action thresholds, by type of farm

Farms in	Type of farm							
	Dairy cattle farms		Rearing farms		Suckler cow farms		Beef farms	
	2021	2022	2021	2022	2021	2022	2021	2022
Target zone	14,705 (96%)	13,997 (97%)	617 (93%)	669 (94%)	6,801 (90%)	7,247 (92%)	2,359 (91%)	2,434 (93%)
Action zone	674 (4%)	477 (3%)	47 (7%)	44 (6%)	739 (10%)	629 (8%)	230 (9%)	180 (7%)

Figures 23a to 23d. Long-term $DDDA_F$ trends for (a) dairy cattle farms, (b) suckler cow farms, (c) rearing farms, and (d) beef farms. The graphs show the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.



* DDDA$_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Rabbit farms

Mean antibiotic use at rabbit farms saw a steep 43.0% decline in 2022, to 24.7 $DDDA_F$. This reduction was accompanied by a considerable narrowing of the $DDDA_F$ distribution (Figure 24 and Figure A40 in the online appendix). 2022 was the first year none of the rabbit farms had a usage level above 50 $DDDA_F$. The SDa expert panel welcomes this decline in the amounts of antibiotics used at rabbit farms. As rabbit farms still exhibit significant between-farm variation in $DDDA_F$ values, the SDa expert panel feels there is potential for further usage level reductions.

Benchmarking

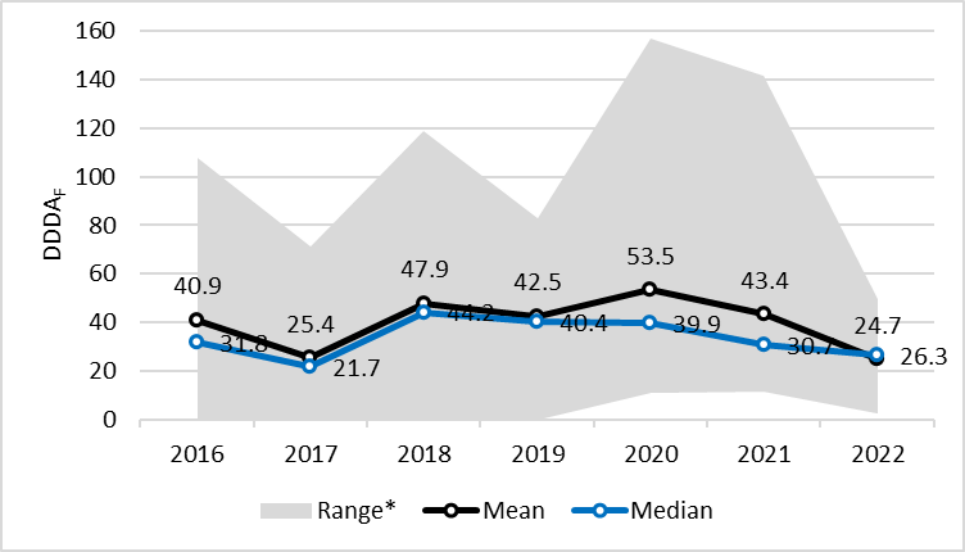
In 2022, a 30 $DDDA_F$ provisional benchmark threshold was introduced for rabbit farms. Application of this SDa-defined benchmark threshold to the 2022 usage level data results in 13 of 31 rabbit farms being included in the action zone (Table 9). To help rabbit farms move towards this SDa-defined benchmark threshold of 30 $DDDA_F$ in a gradual fashion, the rabbit farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on transitional signalling and action thresholds of 30 and 40 $DDDA_F$, respectively. The 40 $DDDA_F$ transitional action threshold was exceeded by four rabbit farms in 2022. The implementation of benchmark thresholds for rabbit farms and the actions taken by the rabbit farming sector have resulted in substantial usage level reductions, and the most recent benchmarking results do suggest there is still room for improvement in this respect.

Table 9. 2021* and 2022 benchmarking results for rabbit farms according to both the SDa-defined action threshold and sector-negotiated transitional benchmark thresholds

Type of benchmark threshold(s)	Farms in	Rabbit farms	
		2021	2022
SDa-defined	Target zone	15 (48%)	18 (58%)
	Action zone	16 (52%)	13 (42%)
Sector-negotiated (transitional)	Target zone	15 (48%)	18 (58%)
	Signalling zone	6 (19%)	9 (29%)
	Action zone	10 (32%)	4 (13%)

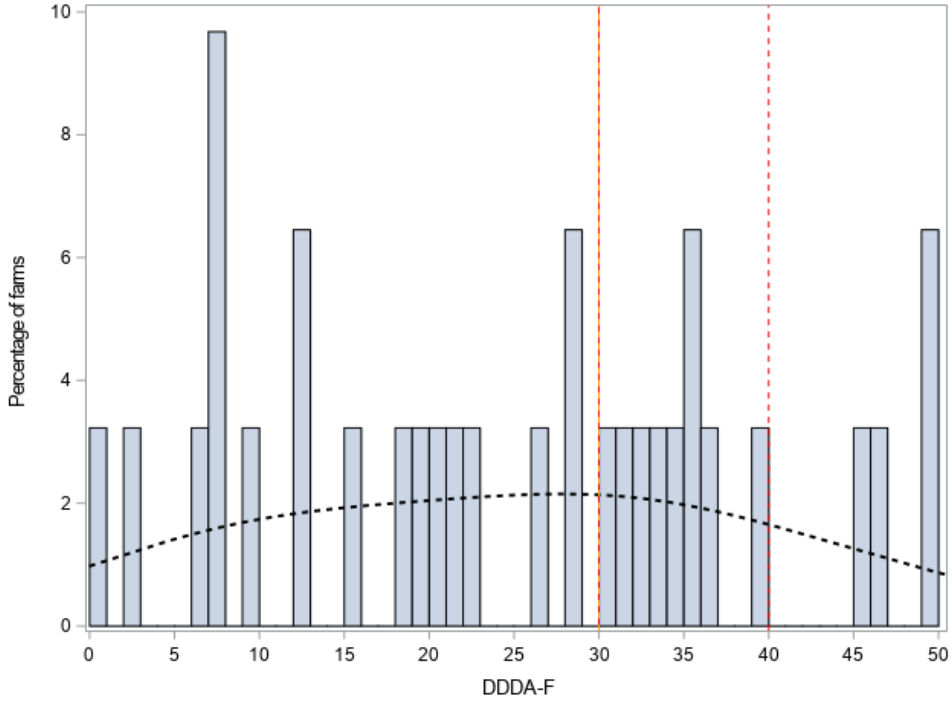
* According to the benchmark thresholds introduced in 2022.

Figure 24. Long-term $DDDA_F$ trends for rabbit farms. The graph shows the mean and median $DDDA_F$ values and $DDDA_F$ ranges for the years concerned



* $DDDA_F$ ranges represent the middle 90% of farms, with the lower limit corresponding to the 5th percentile and the upper limit corresponding to the 95th percentile.

Figure 25. 2022 $DDDA_F$ distribution for rabbit farms (N = 31). The red solid line represents the SDa-defined action threshold. The orange and red dotted lines represent the sector-negotiated signalling and action thresholds, respectively. The sector-negotiated signalling threshold equals the SDa-defined action threshold (30 $DDDA_F$)



Goat farms

Dairy goat farms

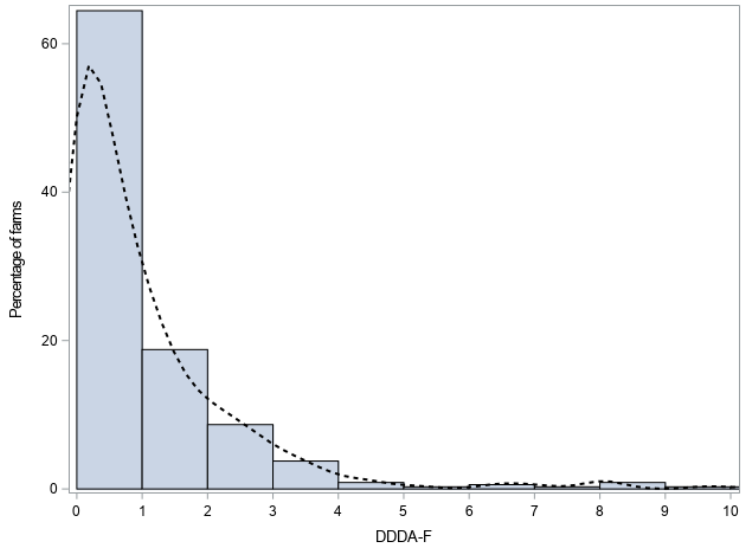
This is the second SDa report in which antibiotic usage data on the dairy goat farming sector are included. Approximately 85% of dairy goat farms provided data on the amounts of antibiotics used (approximation based on CBS data on the total number of dairy goat farms in the Netherlands, see also Table 1). Consequently, Table 10 and Figure 26 do not reflect all of the dairy goat farms in the Netherlands, which should be taken into account when interpreting the data.

In 2022, dairy goat farms' mean antibiotic use was low, with limited between-farm variation in usage levels (Figure 26).

Table 10. Descriptive statistics on dairy goat farms' antibiotic usage levels in 2021 and 2022

$DDDA_F$ values	**Dairy goat farms**	
	2021	**2022**
N	322	348
Mean	1.2	1.3
Median	0.4	0.6
P75	1.1	1.4
P90	2.1	2.8

Figure 26. 2022 $DDDA_F$ distribution for dairy goat farms that had provided sufficient data regarding the amounts of antibiotics used and the number of animals (N = 348)



Other animal categories within the goat farming sector

No data are presented on the usage of antibiotics in the other goat farming sector animal categories (i.e. fattening lambs, rearing goats, and goats kept as a hobby). As noted in the beginning of this report, the SDa expert panel feels the data provided on non-dairy goat categories are not yet of sufficient quality and quantity to be included in its report.

Persistently high usage levels

Livestock sectors and veterinarians have committed themselves to help reduce the number of livestock farms with persistently high usage levels, i.e. livestock farms with antibiotic usage levels that have exceeded their action threshold two years in a row. In general, this action threshold refers to the SDa-defined action threshold. However, if the livestock sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the application of a transitional action threshold for the type of farm or production category concerned, this sector-negotiated action threshold is used to identify farms with persistently high usage levels. The paragraphs below provide information on farms with persistently high usage levels within particular livestock sectors.

Broiler farming sector

The amount of antibiotics used at broiler farms greatly depends on the type of breed. Persistently high usage levels are rare at broiler farms with slower growing breeds (Figure 27). At broiler farms with conventional breeds, on the other hand, $DDDA_F$ values exceeding the SDa-defined action threshold are still a regular occurrence, resulting in a relatively large number of farms with persistently high usage levels (Figure 27).

Transitional benchmark thresholds

For both broiler farms with conventional breeds and broiler farms with slower growing breeds, the SDa-defined benchmark threshold representing acceptable use should be regarded as a distant goal to work towards. The broiler farming sector and the Ministry of Agriculture, Nature and Food Quality have agreed on the application of transitional benchmark thresholds intended to help broiler farmers move towards their SDa-defined benchmark threshold over a period of several years. In 2022, only 0.2% of broiler farms with slower growing breeds exceeded their transitional action threshold for the second year in a row, while the proportion of farms with conventional breeds persistently exceeding their transitional benchmark threshold was slightly higher than the year before, at 2.8%. The broiler farming sector has drawn up an action plan aimed at reducing the number of farms with persistently high usage levels. The SDa expert panel expects the implementation of this plan will reduce the occurrence of persistently high usage levels at broiler farms with conventional breeds.

Turkey farming sector

In 2021, a 10 $DDDA_F$ action threshold was implemented for turkey farms, replacing their previous action threshold of 31 $DDDA_F$. As a result of the introduction of this more stringent action threshold, the proportion of farms with persistently high usage levels for the 2021-2022 period was considerably higher than the proportion of farms with persistently high usage levels for the 2020-2021 period (Figure 27). Approximately one in four turkey farms exceeded the action threshold in both 2021 and 2022.

Transitional benchmark thresholds

2021 also saw the introduction of sector-negotiated transitional benchmark thresholds for turkey farms (Table A59 in the online appendix), and turkey farmers' usage of antibiotics is currently benchmarked by means of these benchmark thresholds. In 2022, three turkey farms exceeded their transitional action threshold for the second year in a row (Figure 28).

Pig farming sector

Two production categories in the pig farming sector have been assigned benchmark thresholds representing acceptable use: sows and suckling piglets, and fattening pigs. For both production categories, the proportion of farms persistently (i.e. in two subsequent years) exceeding their SDa-defined action threshold continued to decline in 2022 (Figure 27). The weaner pigs production category is still benchmarked by means of a provisional benchmark threshold, set at 20 $DDDA_F$. The proportion of farms with weaner pigs with persistently high usage levels also continued to decline in 2022, with 9.8% having recorded action zone usage levels for both 2021 and 2022. The SDa expert panel is pleased the pig farming sector's action plan aimed at reducing the number of farms with persistently high usage levels appears to be effective. This action plan (in Dutch) can be accessed on the website of the Dutch pig farmers' association *Producentenorganisatie Varkenshouderij* (POV, n.d.).

Transitional benchmark thresholds

As of 2022, the transitional benchmark thresholds agreed between the pig farming sector and the Ministry of Agriculture, Nature and Food Quality no longer apply. Pig farms are currently benchmarked by means of the SDa-defined action threshold for the product category concerned.

Veal farming sector

The veal farming sector is characterised by large proportions of farms with persistently high usage levels. White veal, rosé veal starter and rosé veal combination farms are benchmarked by means of provisional benchmark thresholds, which are not consistent with acceptable use. Until the current reporting year, the veal farming sector had been using the older SDa-defined signalling and action thresholds, but as of 2023, veal farmers are assessed by means of the current SDa-defined action thresholds. This means more veal farms will have to reduce their usage of antibiotics if they are to avoid a written notification by the quality assurance scheme's Certifying Body informing them of the need for additional reduction measures to be implemented. Additionally, in 2023 the veal farming sector's coaching programme for farmers with persistently high usage levels is extended to include white veal farms and rosé veal starter farms. Initially, only rosé veal fattening farms could be assigned external coaching. This approach is currently being implemented for an initial selection of veal farms with the highest $DDDA_F$ values, but considering the generally high antibiotic usage levels in the veal farming sector, it would be preferable if all veal farms with persistently high usage levels were to be included. The SDa expert panel expects both the number of veal farms with persistently high usage levels and the overall amounts of antibiotics used in the veal farming sector to decline in response to these measures.

The proportion of white veal farms with persistently high usage levels increased slightly in 2022 (Figure 27). White veal farms continued to show a high degree of year-to-year and between-farm variation in antibiotic usage levels (Figure A26 in the online appendix), indicating across-the-board usage level reductions are needed.

The proportion of rosé veal starter farms with persistently high usage levels remained high despite continuing its modest decline (Figure 27). Given the generally high $DDDA_F$ values recorded for rosé veal starter farms, measures aimed at reducing antibiotic usage levels across the board are called for with respect to these veal farms.

Rosé veal fattening farms still had over 20% of farms recording persistently high usage levels. The veal farming sector has drawn up and implemented an action plan aimed at reducing the number of rosé veal fattening farms with persistently high usage levels, but this has not yet resulted in sufficient improvements. Although rosé veal fattening farms are characterised by low median $DDDA_F$ values, the number of farms with persistently high usage levels remains relatively high. Consequently, reduction efforts aimed at reducing the amounts of antibiotics used at rosé veal fattening farms should be targeted primarily at farms with persistently high usage levels.

The rosé veal combination farms reporting category has now been largely discontinued,

with the farms' antibiotic usage data being recorded under either the rosé veal starter farms reporting category or the rosé veal fattening farms reporting category.

Cattle farming sector

In 2022, the various types of cattle farms (dairy cattle farms, suckler cow farms, rearing farms and beef farms) each had relatively few (<5%) farms with persistently high usage levels.

Rabbit farming sector

As the rabbit farming sector's provisional benchmark threshold of 30 $DDDA_F$ was only introduced in 2022, no data on persistently high usage levels could be included in this year's SDa report. If this benchmark threshold were applied to rabbit farms' 2021 and 2022 $DDDA_F$ values, nine farms would be considered to have persistently high usage levels. The SDa expert panel thinks the 2022-2023 data will show a smaller number of rabbit farms with persistently high usage levels, since 2022 saw a steep decline in the amounts of antibiotics used at rabbit farms.

Figure 27. Proportions of livestock farms with persistently high usage levels according to their then-current SDa-defined action thresholds over the 2019-2022 period, by livestock sector and type of farm/production category. The turkey and cattle farming sectors show relatively few farms with persistently high usage levels for the 2019-2020 and 2020-2021 periods, as a result of the application of their previous, less stringent action thresholds in 2019 and 2020

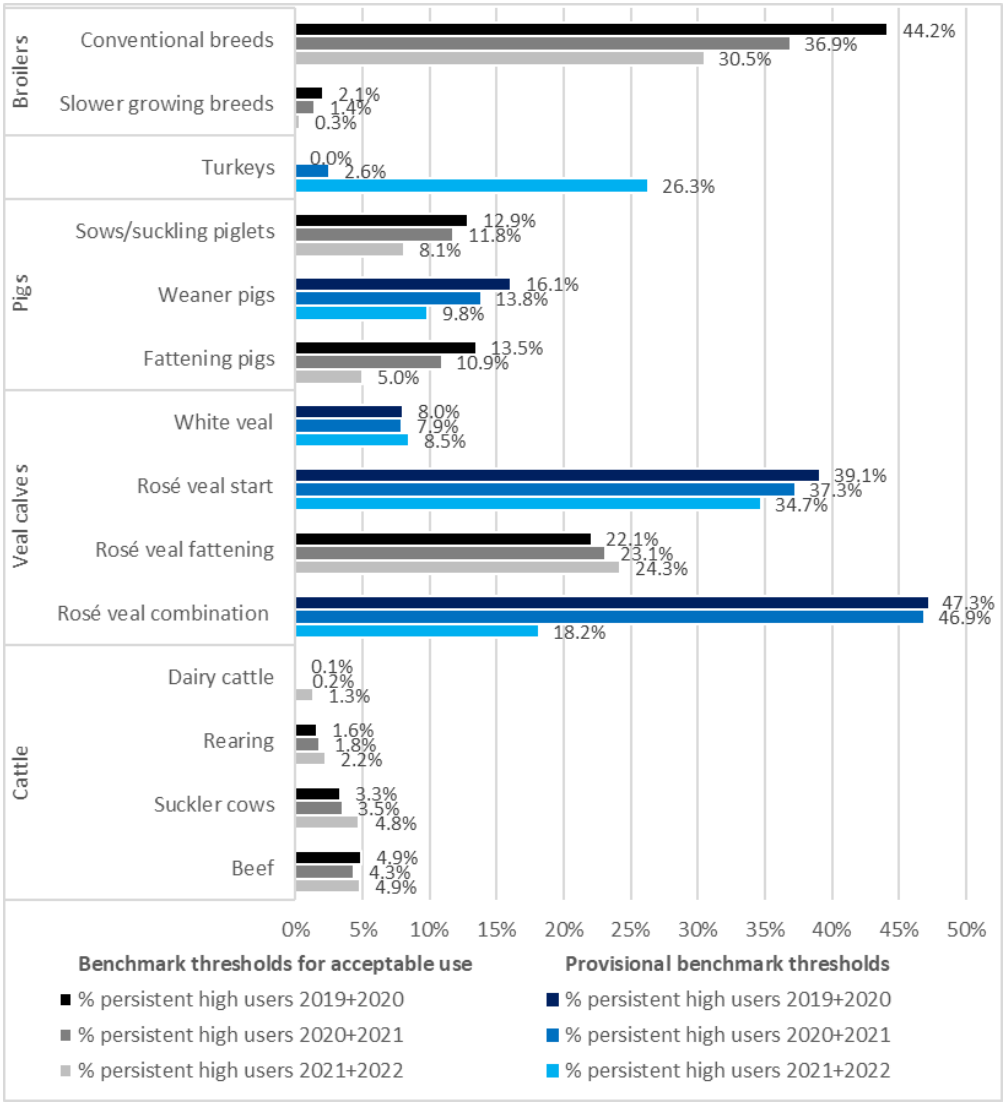
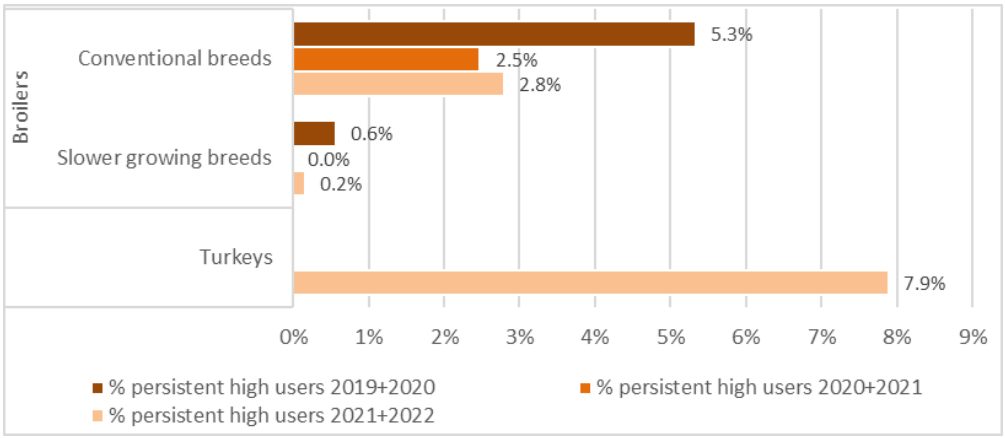


Figure 28. Proportions of broiler and turkey farms with persistently high usage levels according to their transitional action thresholds over the 2019-2022 period, by type of farm



* As the transitional benchmark threshold for turkey farms was only introduced in 2021, the 2021-2022 period was the first for which the proportion of turkey farms with persistently high usage levels could be determined.

Livestock sectors' progress towards government-defined reduction targets

Following the introduction of new benchmark thresholds in 2019, the Dutch government and the livestock sectors discussed and agreed on required antibiotic usage level reductions and the time frame within which they should be realised. Those agreements were based on the SDa's pre-2019 benchmarking method which relied on both a signalling threshold and an action threshold, whereas the SDa's current benchmarking method is based on just a single benchmark threshold per type of farm or production category. The veal, pig and broiler farming sectors and the Ministry of Agriculture, Nature and Food Quality agreed on the following reduction targets, with 2017 as the reference year.

- By 2022: a 25% reduction in the number of farms exceeding the old signalling threshold (for pig farms) or the old action threshold (for broiler and veal farms).
- By 2024: a 50% reduction in the number of farms exceeding their old signalling or action threshold.

The veal farming sector additionally agreed to realise a 15% reduction from its 2017 overall $DDDA_{NAT}$ value by 2022.

The broiler farming sector has already met its 2024 target of reducing the number of farms with usage levels above the old action threshold by 50%. The 2024 reduction targets for the various production categories in the pig farming sector have also been met, facilitated by the usage level reductions realised in 2022. The veal farming sector has managed to meet its 2022 $DDDA_{NAT}$ reduction target of 15%, but an additional reduction in the number of farms exceeding the old action threshold is needed for rosé veal fattening farms to meet their 2024 reduction target. White veal farms and rosé veal starter farms, on the other hand, have already met their 2024 reduction target of 50%.

The progress results described above are not adjusted for any changes in the number of active farms in the livestock sector concerned. In many cases, less prominent reductions in the number of farms with high usage levels would be observed if the data were adjusted to account for changes in the number of active livestock farms (Table A61 in the online appendix).

The SDa expert panel would like to stress that high usage levels in the context of reduction target agreements between livestock sectors and the Dutch government are distinct from *persistently* high usage levels, a concept introduced by the SDa in 2020 in light of the introduction of its new benchmarking method for veterinarians. In the context of the SDa's new benchmarking method, livestock farms are deemed to have persistently high usage levels if their $DDDA_F$ values have exceeded the (new) action threshold two years in a row. Livestock farms with persistently high usage levels are not included when calculating a veterinarian's VBI value, and they require targeted measures aimed at reducing their antibiotic usage levels. Although livestock sectors and veterinarians have committed themselves to help reduce the number of livestock farms with persistently high usage levels, no quantitative reduction targets have been set in this respect.

Benchmarking of veterinarians

The original benchmarking method for veterinarians was introduced in March 2014 to enable monitoring and assessment of veterinarians' prescription patterns. Whereas livestock farms are benchmarked by means of their $DDDA_F$, veterinarians are benchmarked by means of their Veterinary Benchmark Indicator (VBI). As of 2021, veterinarians' prescription patterns are monitored by means of a new benchmarking method, with DDDA-based VBI values. This DDDA-based method is described below.

The DDDA-based Veterinary Benchmark Indicator (VBI)

The new VBI represents the number of days per year the average animal within an animal population for which a particular veterinarian was responsible, was given antibiotics. This VBI is calculated using data from all livestock farms with which the veterinarian concerned had a registered one-to-one relationship, excluding those with persistently high usage levels (i.e. farms whose $DDDA_F$ values have exceeded the then-applicable SDa-defined action threshold for two consecutive years). The resulting VBI value is then compared with the benchmark threshold for the type of farm or production category concerned.

In case of livestock sectors that have negotiated transitional action thresholds with the Ministry of Agriculture, Nature and Food Quality (i.e. the turkey and broiler farming sectors), the SDa expert panel will present benchmarking results according to both the sector-negotiated transitional benchmark thresholds and the SDa-defined action threshold. With respect to livestock sectors with sector-negotiated benchmark thresholds, livestock farms and veterinarians will be benchmarked by means of transitional benchmark thresholds until the transitional benchmark thresholds are replaced by the SDa-defined benchmark threshold. For a more detailed explanation of the new benchmarking method for veterinarians (currently only available in Dutch), visit the SDa website.

Targeted measures for farms with persistently high usage levels

Livestock sectors are required to develop and implement targeted measures aimed at reducing the amounts of antibiotics used at livestock farms with persistently high usage levels, in close consultation with veterinarians. Farms with persistently high usage levels do not contribute to the VBI value of their veterinarian. If, after the exclusion of any farms with persistently high usage levels, the VBI value exceeds the applicable action threshold, veterinarians should review their antibiotic prescription patterns with the aim of reducing the amounts of antibiotics used at livestock farms with which they have a

one-to-one relationship.

Prescription pattern trends

All types of farms and production categories except dairy and non-dairy cattle farms still show considerable prescription pattern differences between individual veterinarians, both in terms of VBI values (to which farms with persistently high usage levels do not contribute) and in terms of $DDDA_{VET}$ values (Table 11 and Figure A42 in the online appendix, respectively). As $DDDA_{VET}$ values represent veterinarians' prescription patterns that are based on all delivery record data, including those from livestock farms with persistently high usage levels, this measure is better suited for monitoring prescription pattern trends.

With regard to slower growing broiler breeds, sows/suckling piglets, weaner pigs, fattening pigs and turkeys, $DDDA_{VET}$ data indicate that both the amount of antibiotics prescribed and the amount of variation in veterinarians' prescription patterns have declined over the 2017-2022 period. The relatively large amount of variation in the amounts of antibiotics prescribed for weaner pigs and turkeys does suggest there is still room for improvement in this respect (Figure A42).

With regard to conventional broiler breeds, veterinarians' mean $DDDA_{VET}$ did not decline over the 2017-2022 period and the amount of variation in veterinarians' prescription patterns has remained relatively stable. These observations are largely in line with what is shown by $DDDA_F$ data.

While a modest decline can be observed for white veal farms and rosé veal starter farms, the amounts of antibiotics prescribed for rosé veal fattening and rosé veal combination farms have increased. With regard to the various types of veal farms, the years 2017 and 2022 show similar variation between veterinarians in the amounts of antibiotics prescribed (Figure A42).

Dairy cattle and non-dairy cattle farms are only prescribed small amounts of antibiotics by their veterinarians, and veterinarians active in the dairy and non-dairy cattle farming sectors show little variation in the amounts prescribed.

Benchmarking results

All types of farms and production categories had the majority of their veterinarians recording target zone prescription patterns for 2022. The highest proportions of veterinarians with action zone prescription patterns were observed for rosé veal combination farms (36%), broiler farms with conventional breeds (34%), rosé veal starter farms (22%) and rosé veal fattening farms (15%) (Table 12). The other types of farms and production categories (broiler farms with slower growing breeds, turkey farms, all of the

pig farming sector's production categories, white veal farms, dairy cattle farms and non-dairy cattle farms) had only a small proportion of veterinarians being included in the action zone. Veterinarians active in livestock sectors with sector-negotiated transitional benchmark thresholds for 2022 (i.e. the broiler and turkey farming sectors), have been benchmarked by means of those transitional benchmark thresholds. Their benchmarking results are included in Table 13.

The proportions of veterinarians included in the action zone are smaller than the proportions of livestock farms with action zone usage levels, in part as a result of farms with persistently high usage levels not contributing to VBI values. The SDa expert panel wants to stress that livestock sectors are expected to implement targeted measures, developed in close consultation with veterinarians, to reduce the amounts of antibiotics used at livestock farms with persistently high usage levels. In addition, veterinarians with action zone prescription patterns are required to take appropriate steps to facilitate usage level reductions at the farms with which they have a registered one-to-one relationship.

Table 11. 2022 VBI data, by type of farm/production category. VBI data include mean and median VBI values and interquartile ranges. The interquartile range (IQR) is a measure of statistical dispersion, and is defined as the difference between the third quartile (75th percentile) and the first quartile (25th percentile) of the distribution

Livestock sector	Type of farm/production category	N	Mean	Median	IQR
Broiler farming sector	Farms with conventional breeds	67	8.8	5.4	7.2
	Farms with slower growing breeds	71	0.9	0.0	1.5
Turkey farming sector	Turkey farms	9	2.6	0.0	4.8
Pig farming sector	Sows/suckling piglets	164	2.5	2.1	1.8
	Weaner pigs	164	7.9	7.5	8.9
	Fattening pigs	196	2.0	1.8	1.5
Veal farming sector	White veal farms	54	19.3	15.8	3.4
	Rosé veal starter farms	45	59.5	57.3	15.0
	Rosé veal fattening farms	91	2.4	1.3	2.5
	Rosé veal combination farms	25	12.7	10.4	10.3
Cattle farming sector	Dairy cattle farms	686	2.5	2.4	0.7
	Non-dairy cattle farms	686	0.6	0.4	0.5

Table 12. Benchmarking results for veterinarians according to the DDDA-based method (implemented in 2021)

Livestock sector	Type of farm/ production category	Benchmark threshold	Target zone		Action zone	
			N	%	N	%
Broiler farming sector	Farms with conventional breeds	8	44	66%	23	34%
	Farms with slower growing breeds	8	71	100%	0	0%
Turkey farming sector	Turkey farms	10	9	100%	0	0%
Pig farming sector	Sows/suckling piglets	5	153	93%	11	7%
	Weaner pigs	20	155	95%	9	5%
	Fattening pigs	5	190	97%	6	3%
Veal farming sector	White veal farms	23	52	96%	2	4%
	Rosé veal starter farms	67	35	78%	10	22%
	Rosé veal fattening farms	4	77	85%	14	15%
	Rosé veal combination farms	12	16	64%	9	36%
Cattle farming sector	Dairy cattle farms	5	677	99%	9	1%
	Non-dairy cattle farms	2	667	97%	19	3%

Table 13. Benchmarking results for veterinarians active in livestock sectors with transitional benchmark thresholds, according to the DDDA-based method (implemented in 2021)

Livestock sector	Type of farm	Benchmark thresholds*	Target zone		Signalling zone		Action zone	
			N	%	N	%	N	%
Broiler farming sector	Farms with conventional breeds	14 + 26	54	76%	12	17%	5	7%
	Farms with slower growing breeds	8 + 15	71	100%	0	0%	0	0%
Turkey farming sector	Turkey farms	14 + 20	8	80%	2	20%	0	0%

* This column lists both the action threshold and the (lower) signalling threshold for the type of farm concerned.

Antibiotic monitoring in an international context

Implications of Regulation (EU) 2019/6 for monitoring efforts in the Netherlands

On 28 January 2022, Regulation (EU) 2019/6 of the European Parliament and of the Council of 11 December 2018 on veterinary medicinal products entered into force, repealing the directive on the Community code relating to veterinary medicinal products, Directive 2001/82/EC (EUR-Lex, 2019). Regulation (EU) 2019/6, commonly referred to as the Veterinary Medicinal Products Regulation, sets out that all EU member states are to collect data on the sales and use of antimicrobials (including antibiotics) used in animals and subsequently report their data to the European Medicines Agency (EMA).

Means have been made available by the European Commission to facilitate member states' implementation of this Regulation. In light of this, the Ministry of Agriculture, Nature and Food Quality together with the SDa and the Medicines Evaluation Board (MEB) submitted a proposal for a project entitled IMPROVE (Improving and Expanding Veterinary Antimicrobial Use and Sales Monitoring in the Netherlands), which has since been approved. At the time of publication of this SDa report, the details of the IMPROVE project are being fleshed out. The general aim of this project is to expand and optimise the antibiotic monitoring system currently used in the Netherlands in order to bring it in line with the requirements set out in the Veterinary Medicinal Products Regulation.

The Regulation allows for a progressive stepwise approach with regard to the monitoring obligations. As of 2024, data on the use of antimicrobial medicinal products in the main livestock populations will have to be reported, with the reported data pertaining to the preceding calendar year. This initial reporting obligation concerns data on antimicrobial use in all types of cattle (with several EU member states, including the Netherlands, having to report data pertaining to veal calves separately), pigs, broilers and turkeys. As of 2027, data on the use of antimicrobials in goats, sheep, ducks, geese, layers, farmed fish and all horses (including those not intended for human consumption) during the preceding calendar year will have to be reported too. As of 2030, member states will also have to report on antimicrobial use, during the preceding calendar year, in companion animals (i.e. dogs and cats) and fur animals. The current monitoring infrastructure in the Netherlands is ready for the initial stage of this process, pertaining to the main food-producing animal species, but it is not yet fully equipped to facilitate monitoring of the animal species to be added during the subsequent stages. The IMPROVE project addresses the required expansion of the current monitoring system.

Animal population data are a key variable for monitoring the usage of antibiotics in a particular food-producing or non-food-producing animal species. With regard to the additional animal species for which monitoring will be required pursuant to the Veterinary Medicinal Products Regulation, a method has to be developed for determining the annual (average) population sizes, i.e. the numbers of animals. As part of the IMPROVE project, existing methods for determining the numbers of animals within currently monitored livestock sectors will be examined. At the moment, livestock sectors vary in their collection of population data. The IMPROVE project aims to harmonise livestock sectors' data collection practices in order to reduce the risk of errors.

Moreover, as of 2023 more extensive sales data reporting is required to enable the provision of data on all antimicrobials sold, including antimicrobials purchased in other EU countries for use under the cascade (e.g. veterinary medicinal products not available in the Netherlands) and antimicrobial-containing preparations prepared for individual animals (veterinary medicinal products prepared extemporaneously in accordance with the terms of a veterinary prescription and used in accordance with Regulation (EU) 2019/6, Articles 112-114; primarily intended for use in companion animals). Use of antimicrobials which until January 2022 could be made available under an exceptional provision (such as small pack sizes of antimicrobial veterinary medicinal products intended for doves, for example), is no longer allowed under Regulation (EU) 2019/6.

In order to minimise the administrative burden on all levels, the Union Product Database (UPD) has been established to facilitate the more extensive sales data reporting. In this database, all marketing authorisation holders will record the annual volumes of sales for their veterinary medicinal products. The EMA will extract the sales data from the UPD and ask member states to validate the data. It would be most logical for the Netherlands to set up a similar system in line with its current data collection system. The Ministry of Agriculture, Nature and Food Quality will serve as our country's rapporteur, and the SDa and FIDIN will be responsible for verifying the reported data. The final data will also be included in future SDa reports. Currently, in 2023, the UPD is still being developed. A Minimal Viable Product (MVP) version of the UPD was released in 2022 and has been updated several times since. In April 2023, the MVP UPD did not yet include sufficient data to enable monitoring at the national level.

In addition to the mandatory monitoring of the use and volume of sales of a subset of antimicrobials (i.e. antibacterials), member states can opt to monitor the use and volumes of sales of antifungals, coccidiostats and antivirals on a voluntary basis. They may choose to limit this voluntary expansion to the volumes of sales, or opt not to voluntarily expand their monitoring and reporting efforts for the time being. It should be noted, however, that the expansion option chosen by a member state will apply throughout the years concerned. The SDa expert panel intends to discuss the options with relevant stakeholders in 2023. Following these discussions, it will be determined

which additional parties are to be involved in the (further) implementation of Regulation (EU) 2019/6 in the Netherlands.

Once it has been determined exactly how primary antimicrobial usage data for the various livestock populations in the Netherlands will be collected and reported to the EMA, optional antimicrobial categories are to be incorporated into the *Diergeneesmiddelen* database in consultation with the Ministry of Agriculture, Nature and Food Quality. A database structure has been suggested that will enable automated data exchange with regard to new veterinary medicinal product authorisations, new commercial products (packages of authorised veterinary medicinal products), and products included in veterinary practice management systems. Setting up a suitable veterinary medicinal products database is one of the objectives of the IMPROVE project.

Reporting of data on the sales of veterinary antimicrobial agents in Europe

Since 2010, data on sales of veterinary antimicrobial agents from all EU member states have been collected and reported on an annual basis as part of the EMA's European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) project (EMA, 2021). Pursuant to Regulation (EU) 2019/6, collection of these data has become mandatory as of 2023. As a result, the ESVAC project will be terminated following publication of the 2022 sales data in the ESVAC report to be issued in 2023. ESVAC activities will be transferred to the EMA Project Group for the Collection of Antimicrobial Sales and Use data (ASU Project Group).

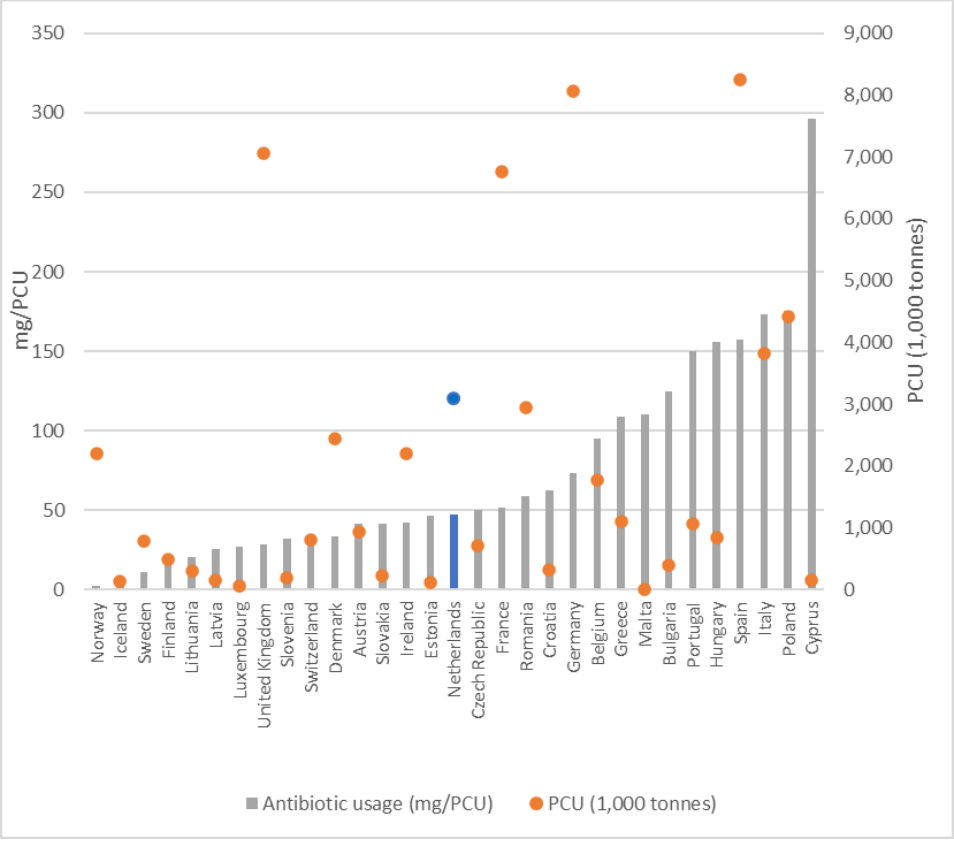
The twelfth ESVAC report was published in November 2022 and presents data on the sales of veterinary antibiotic agents in European countries and trends over time (EMA, 2022). In 2023, the EMA will publish its last ESVAC report, containing veterinary antibiotic sales data for 2022. In ESVAC reports, sales of antimicrobial veterinary medicinal products are expressed in mg/PCU. In general, the PCU is calculated using the number of animals slaughtered in a particular year (adjusted for imported and exported animals). However, in case of livestock not kept for meat production (e.g. dairy cattle), the PCU is calculated using the number of live animals present within the livestock sector concerned. As discussed in a journal article by the SDa expert panel, mg/PCU is a suboptimal indicator for quantifying antimicrobial use and will result in systematic underestimation of usage levels in livestock sectors characterised by relatively high meat production (Sanders et al., 2021).

Summary of the main findings of the twelfth ESVAC report:

- Overall sales of antibiotics in Europe (in mg/PCU) showed a downward trend between 2011 and 2019, this trend stagnated in 2020, and overall sales returned to the 2019 level in 2021.
- Following an initial rise, sales of third- and fourth-generation cephalosporins have been low and stable since 2015.
- Aggregated sales of polymyxins have continued to decline until 2021, resulting in an 80% reduction (in mg/PCU) from the 2011 level.
- In a sales volume ranking (with sales volumes in mg/PCU ranked from lowest to highest) the Netherlands ranked 16th out of 31 participating countries (see also Figure 29).

- Other quinolones (quinolones other than fluoroquinolones) have been included as one of the AMEG (EMA Antimicrobial Advice Ad Hoc Expert Group) Category B antimicrobials highlighted in the ESVAC report. In the Netherlands, other quinolones (effectively only comprising flumequine) are categorised as second-choice antibiotics. The Netherlands turns out to be one of a select number of countries (together with Denmark and Sweden) in which fluoroquinolones only account for a small proportion (5%) of overall quinolone consumption.
- In the Netherlands, sales of quinolones (including fluoroquinolones) amounted to 0.66 mg/PCU, while the EU median was 2.6 mg/PCU.
- In 2021, sales of polymyxins in the Netherlands amounted to 0.38 mg/PCU, while the median for all participating countries combined was 2.2 mg/PCU.

Figure 29. Antibiotic consumption in 2021 according to the twelfth ESVAC report, in mg/PCU per country. The graph also includes each country's PCU. Data for the Netherlands are indicated in blue



Appendix to the report

The appendix to this report is published on the SDa website.

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Usage of Antibiotics in Agricultural Livestock in the Netherlands in 2022
Trends and benchmarking of livestock farms and veterinarians
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